

Draft Environmental Impact Statement and Draft Section 4(f) Evaluation

**BALTIMORE-WASHINGTON
SUPERCONDUCTING MAGLEV PROJECT**

January 2021



U.S. Department of Transportation
Federal Railroad Administration



**Baltimore-Washington
Superconducting MAGLEV Project**

**Draft Environmental Impact Statement and
Draft Section 4(f) Evaluation**

Prepared by:

**US Department of Transportation –
Federal Railroad Administration
and
Maryland Department of Transportation**

With Cooperating Agencies:

Federal Aviation Administration (FAA)
Federal Transit Administration (FTA)
National Capital Planning Commission (NCPC)
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Submitted Pursuant To:

National Environmental Policy Act of 1969 (NEPA) (42 U.S.C. § 4321 et seq.) and the Council on Environmental Quality Implementing Regulations for NEPA (40 CFR Parts 1500-1508);
Federal Railroad Administration Procedures for Considering Environmental Impacts (64 FR 28545, May 26, 1999, as updated by 78 FR 2713, January 14, 2013);
Efficient Environmental Reviews for Project Decision making (23 U.S.C. § 139);
Section 4(f) of the United States Department of Transportation Act of 1966 (49 U.S.C. § 303);
Section 106 of the National Historic Preservation Act (NHPA) of 1966 (54 U.S.C. § 306101);
the Clean Air Act of 1970, as amended (42 U.S.C. § 7401 et seq.);
the Clean Water Act of 1972 (33 U.S.C. § 1251-1387); and the
Endangered Species Act of 1973 (16 U.S.C. § 1531-1544).



Paul Nissenbaum
Associate Administrator for Railroad Policy and Development
Federal Railroad Administration

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Date of Approval

The following individuals may be contacted for additional information concerning this document:

Brandon Bratcher
Environmental Protection Specialist
USDOT Federal Railroad Administration
RPD-13: Environment and Corridor Planning Division
1200 New Jersey Ave SE
West Building, Mail Stop 20
Washington, DC 20590
brandon.bratcher@dot.gov

Jacqueline Thorne
Project Manager Priority Projects
The Secretary's Office
Office of Freight and Multimodalism
Maryland Department of Transportation
7201 Corporate Center Drive
Hanover, MD 21076
jthorne@mdot.maryland.gov

The Federal Railroad Administration (FRA) and Maryland Department of Transportation (MDOT) have prepared this Draft Environmental Impact Statement (DEIS) to document the evaluation of the potential beneficial and adverse environmental impacts of the Superconducting Magnetic Levitation (SCMAGLEV) Project. The Project Sponsor, Baltimore Washington Rapid Rail, LLC proposes to construct and operate an SCMAGLEV system between Baltimore, MD and Washington, D.C. The SCMAGLEV Project is a high-speed rail technology that runs on a grade-separated, fixed guideway powered by magnetic forces at speeds of over 300 miles per hour. This system does not operate on standard steel wheel railroad tracks and therefore requires a dedicated grade-separated guideway.

The SCMAGLEV Project includes two terminal stations (Washington, D.C., and Baltimore, MD) and one intermediate station at the Baltimore-Washington International Thurgood Marshall Airport (BWI Marshall Airport Station). The system requires additional facilities to operate including one trainset maintenance facility (TMF), two maintenance of way (MOW) facilities, and various smaller ancillary facilities. The ancillary facilities include fresh air and emergency egress (FA/EE) facilities, substations, SCMAGLEV wayside system facilities and stormwater management. The system proposes to operate on both underground (deep tunnel) and an elevated guideway (viaduct). Stations and ancillary facilities are generally above, below, or adjacent to the guideway and would provide for access to passenger and employee parking as applicable.

The purpose of the SCMAGLEV Project is to evaluate, and ultimately construct and operate, a safe, revenue-producing, high-speed ground transportation system that achieves the optimum operating speed of the SCMAGLEV technology to significantly reduce travel time to meet the capacity and ridership needs of the Baltimore-Washington region.

FRA may provide Federal funding for construction of the SCMAGLEV Project or take regulatory action, including issuing a Rule of Particular Applicability, to ensure the proposed system is operated safely. Either of these actions (funding or regulatory) constitutes a major federal action and triggers environmental review under the National Environmental Policy Act (NEPA).

This DEIS documents the evaluation of the reasonably foreseeable potential beneficial and adverse environmental impacts of implementing the proposed SCMAGLEV system, including a No Build Alternative and twelve Build Alternatives between Washington D.C., and Baltimore, MD. Measures being considered by FRA and MDOT to avoid, minimize, or mitigate the potential adverse impacts of the twelve Build Alternatives are described. This document provides a comparative analysis between the No Build Alternative and the Build Alternatives. The Preferred Alternative will be identified in the Final Environmental Impact Statement. FRA has also prepared a Draft Section 4(f) Evaluation for the SCMAGLEV Project in compliance with Section 4(f) of the United States Department of Transportation Act of 1966, and a Draft Programmatic Agreement in accordance with Section 106 of the National Historic Preservation Act.

FRA is seeking input from the public on the DEIS, Draft Section 4(f) Evaluation, and Draft Programmatic Agreement, which are being made available to the public in accordance with NEPA and NHPA, and are available at the Project website:

<https://www.bwmaglev.info/index.php>.

For the most up to date information visit www.bwmaglev.info. If additional assistance is required to review the DEIS, please send an email to info@bwmaglev.info.

The 90-day comment period for the DEIS starts on **January 22, 2021**. Comments on the DEIS can be submitted by email to info@bwmaglev.info, or through the online comment form at www.bwmaglev.info. Comments must be sent no later than **April 22, 2021**. FRA strongly encourages the submission of comments via email or through the online comment form and will consider all comments received during the comment period. For the most up to date information, sign up to join the project mailing list and visit www.bwmaglev.info.

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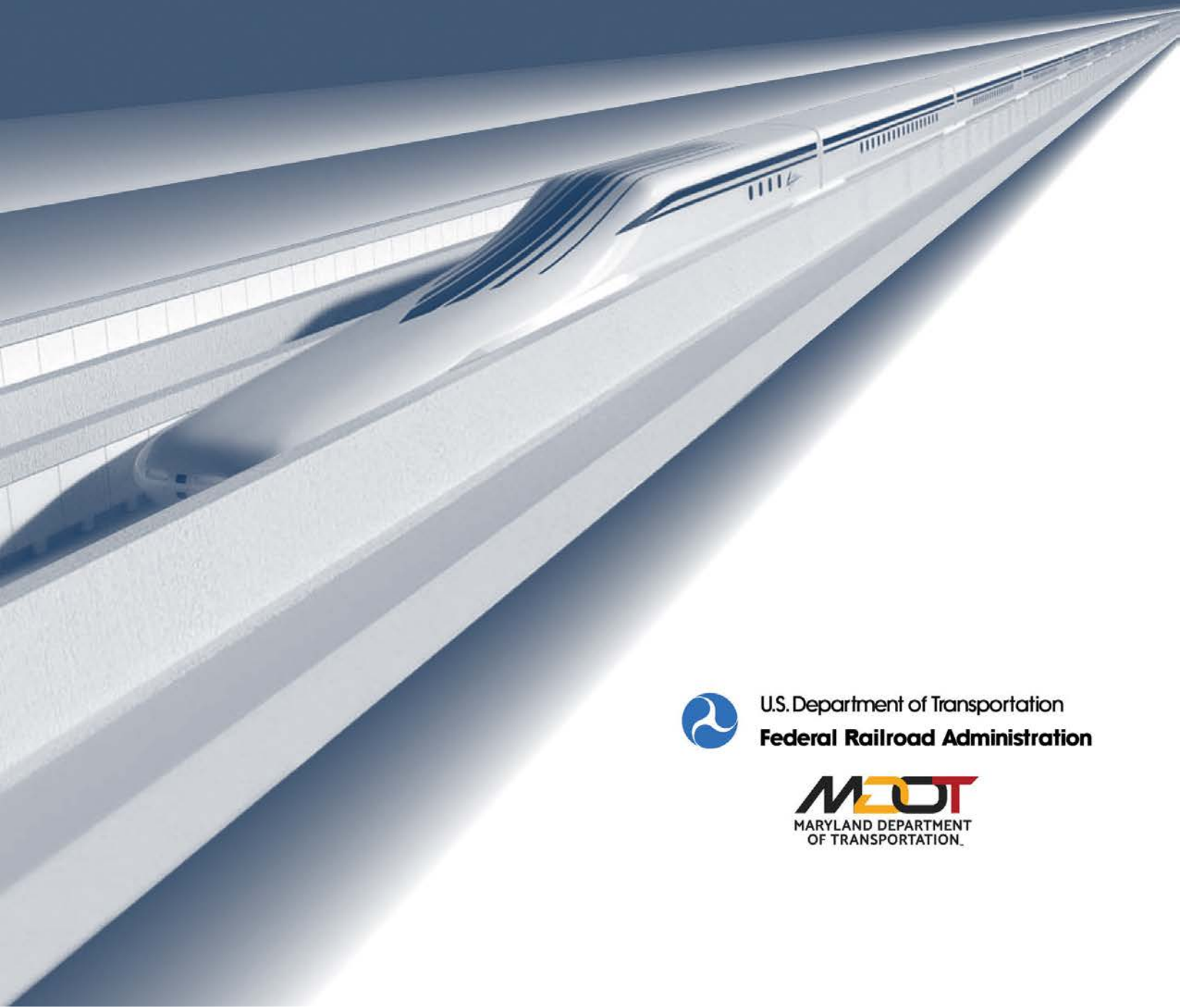
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*The Draft Programmatic Attachment is included in Appendix D.5 as an attachment.

Executive Summary

BALTIMORE-WASHINGTON SUPERCONDUCTING MAGLEV PROJECT

DRAFT ENVIRONMENTAL IMPACT STATEMENT AND
SECTION 4(f) EVALUATION



U.S. Department of Transportation
Federal Railroad Administration



Executive Summary

ES.1 Introduction

The U.S. Department of Transportation's (USDOT) Federal Railroad Administration (FRA) is preparing this Draft Environmental Impact Statement (DEIS) in accordance with the National Environmental Policy Act (NEPA) (42 U.S.C. § 4321 et seq.) to assess the potential environmental impacts from implementing the proposed Superconducting Magnetic Levitation (SCMAGLEV) system between Baltimore, MD and Washington, D.C. (SCMAGLEV Project).

FRA is conducting this environmental review process in accordance with the Council on Environmental Quality's (CEQ) NEPA regulations (40 C.F.R. § Parts 1500-1508), and FRA's *Procedures for Considering Environmental Impacts* (64 Fed. Reg. 28545 (1999)). FRA is the lead Federal agency for preparation of the EIS. The Maryland Department of Transportation's (MDOT) Maryland Transit Administration (MTA) provided technical assistance to FRA in the preparation of the EIS. Baltimore-Washington Rapid Rail, LLC (BWRR), the private Project Sponsor, is the entity that would design, construct, and operate the SCMAGLEV system. Other Federal, state and local agency stakeholders directly involved in implementation of the Project include a wide range of entities that FRA identified and coordinated with during the NEPA process.

FRA has jurisdiction over all railroads, as defined in 49 U.S.C. 20102, except urban rapid transit operations that are not connected to the general railroad system of transportation, and broad authority to prescribe regulations and issue orders, as necessary, for every area of railroad safety (49 U.S.C. 20101 et seq.; 49 C.F.R. § 1.89, Parts 200-299). In addition, FRA is providing funding for Project planning under Section 1307 of The Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU) Act (P.L. 109-59, August 10, 2005), which authorized funding for a MAGLEV project, defined as transportation systems employing magnetic levitation that would be capable of safe use by the public at a speed in excess of 240 miles per hour. There is no funding appropriated for construction as of the publication of this DEIS.

In November 2015, the Maryland Public Service Commission approved BWRR's application to acquire a passenger railroad franchise to deploy a SCMAGLEV system between Baltimore, MD and Washington, D.C. In 2016, FRA awarded a \$27.8 million grant to MDOT MTA for Preliminary Engineering (PE) and Environmental Review for the SCMAGLEV Project. BWRR provided a 20 percent match for the grant for the NEPA study and preliminary engineering. However, there is no funding appropriated for construction as of the publication of this DEIS.

Current FRA safety regulations do not comprehensively address SCMAGLEV train operations, as this technology is not currently deployed in the United States. Therefore, FRA may issue a rule of particular applicability (RPA) (regulations that apply to a specific railroad or a specific type of operation), a rule of general applicability, impose requirements or conditions by order(s) or waiver(s), or take other regulatory action(s) to ensure the SCMAGLEV Project is operated safely. This regulatory action(s) and providing Project funding require an environmental review under NEPA.

ES.1.1 Agency Roles and Responsibilities

FRA, as the lead Federal agency, is responsible for ensuring that the environmental review process is conducted in accordance with NEPA and all applicable environmental laws and regulations. The FRA is coordinating with Cooperating and Participating Agencies as part of the NEPA process. Cooperating Agencies are those agencies that have jurisdiction by law or special expertise with respect to any environmental impact involved in a proposal (or a reasonable alternative). Participating Agencies are those agencies that may have an interest in the proposed project. By agreeing to be either a Cooperating or Participating agency in the NEPA process, agencies are committing to participate throughout the process and to provide input on methodology, analysis, findings and mitigation. FRA has invited applicable Federal, state, county and local government regulatory and jurisdictional agencies within the Project Study Area to be Cooperating and Participating Agencies. Chapter 5, Public Involvement and Agency Coordination provides a list of agencies and their roles.

The Project Team Members for the SCMAGLEV Project are using a modified version of Maryland's Streamlined Environmental and Regulatory Process to establish concurrent coordination of Section 106, Endangered Species Act, Clean Air Act, and Clean Water Act Section 404. This streamlined process helps to ensure the appropriate agencies have been provided an opportunity to communicate necessary information to the team and to review and comment on the preliminary findings of the NEPA studies.

Concurring agencies review, comment and provide formal concurrence at three key milestones for issuance of required wetlands and waterways permits following the NEPA phase. Milestones are:

1. Purpose and Need,
2. Alternatives retained for detailed study; and
3. Preferred Alternative/Conceptual mitigation.

Concurring agencies provide agreement to the decisions made at key milestones, unless there are substantial changes to the proposed action or significant new circumstances or information relevant to the environmental concern. For the SCMAGLEV Project, FRA identified the following concurring agencies: The U.S. Army Corps of Engineers (USACE), U.S. Fish and Wildlife Service (USFWS), U.S.

Environmental Protection Agency (USEPA), and the Federal Aviation Administration (FAA).

The Cooperating Agencies for the SCMAGLEV Project are:

- Federal Aviation Administration (FAA)
- Federal Transit Administration (FTA)
- National Capital Planning Commission (NCPC)
- U.S. Department of Interior (USDOI)-National Park Service (NPS)
- Surface Transportation Board (STB)
- U.S. Army Corps of Engineers (USACE)
- U.S. Department of Agriculture (USDA)–Beltsville Agricultural Research Center (BARC)
- U.S. Environmental Protection Agency (USEPA)
- National Aeronautics and Space Administration, Goddard Space Flight Center (NASA/GSFC)
- National Security Agency (NSA)
- U.S. Fish and Wildlife Service (USFWS)

ES.1.2 Description of the Project

The Project includes the construction and operation of a SCMAGLEV system between Baltimore, MD and Washington, D.C. The SCMAGLEV Project is a high-speed rail technology that runs on a grade-separated, fixed guideway powered by magnetic forces at speeds of over 300 miles per hour. This system does not operate on standard steel wheel railroad tracks and therefore requires a dedicated grade-separated guideway. Chapter 3, Alternatives Considered, and various appendices provide more information on the superconducting magnetic levitation technology.

The SCMAGLEV Project includes two terminal stations (Washington, D.C. and Baltimore, MD) and one intermediate station at the Baltimore-Washington International Thurgood Marshall Airport (BWI Marshall Airport). The system requires additional facilities to operate including one trainset maintenance facility (TMF), two maintenance of way (MOW) facilities, and other various smaller ancillary facilities. The ancillary facilities include fresh air and emergency egress (FA/EE) facilities, substations, SCMAGLEV wayside system facilities and stormwater management. The system would operate underground (deep tunnel) and on elevated (viaduct) guideway. Stations and ancillary facilities would have access to passenger and employee parking as applicable.

BWRR is providing technical input to FRA regarding the construction and operation of the SCMAGLEV system, as deployment of this technology would be new to the United

States. BWRR is responsible for securing all required approvals and permits to construct and operate the SCMAGLEV Project.

ES.1.3 Project Study Area

The Project Study Area is roughly bound by I-95 on the west and by the former Washington-Baltimore & Annapolis Electric Railroad alignment on the east, and it includes portions of Baltimore City, Baltimore County, Howard County, Anne Arundel County, Prince George's County, and Washington, D.C. (**Figure ES1.3-1**).

ES.1.4 Draft Environmental Impact Statement (DEIS)

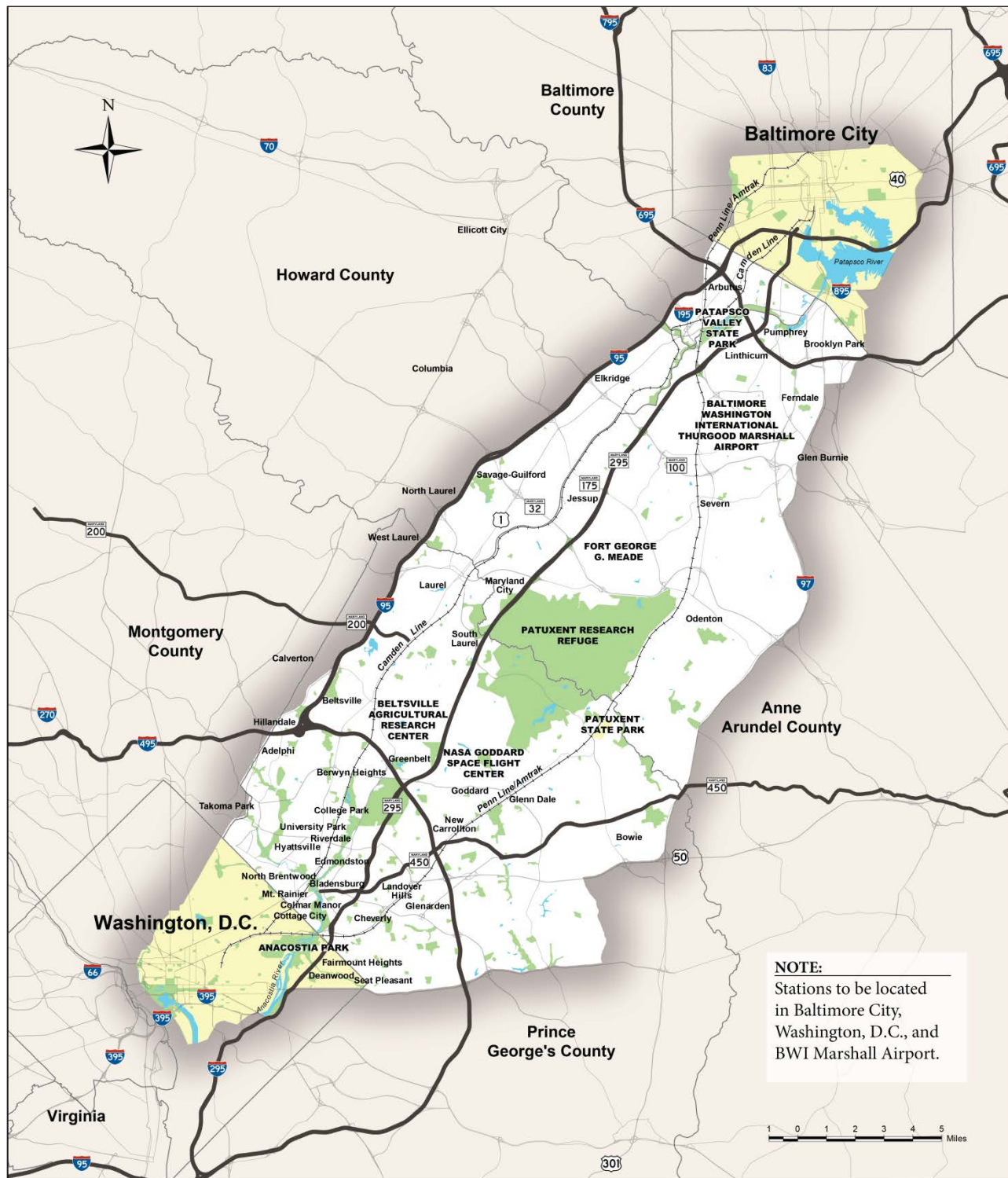
The DEIS provides a detailed description of the SCMAGLEV Project Purpose and Need, alternatives developed, the existing environmental conditions and the analysis of the potential beneficial and adverse environmental effects and consequences of the alternatives, and potential mitigation strategies. The DEIS provides a comparative analysis between the No Build Alternative and the Build Alternatives so that government agencies, elected official, interested citizens, businesses, and other stakeholders can assess the potential human and environmental effects of the SCMAGLEV Project. The DEIS is supported by appendices, technical reports and supporting technical information provided by the Project Sponsor.

After circulation of the DEIS, a Final Environmental Impact Statement (FEIS) will be developed. The FEIS will identify the Preferred Alternative and focus on any additional analysis and refinements of the data, as well as responding to substantive comment and testimony received on the DEIS. A Record of Decision, which identifies the Selected Alternative as a result of the analysis, after considering a reasonable range of alternatives and all practicable means to avoid, minimize, or mitigate environmental impacts would complete the EIS process.

ES.1.4.1 Scope of the DEIS Document

The DEIS provides a summary of technical studies and contains 5 chapters. Detailed documentation of existing conditions, methodologies, assessment of effects, and potential mitigation strategies are included in the document appendices and are available on the project website (www.bwmaglev.com).

- Chapter 1 presents an introduction to the SCMAGLEV Project and NEPA process.
- Chapter 2 presents the Purpose and Need for the SCMAGLEV Project.
- Chapter 3 provides an overview of the alternatives' development process and definition of the No Build and Build Alternatives evaluated in the DEIS.

Figure ES1.3-1: Project Study Area

- Chapter 4 presents a description of the existing conditions, potential effects of the Build Alternatives, and mitigations strategies to address adverse effects.
- Chapter 5 provides a summary of public and agency involvement through the publication of the DEIS.

ES.2 Project Purpose and Need

The purpose of the SCMAGLEV Project is to evaluate, and ultimately construct and operate, a safe, revenue-producing, high-speed ground transportation system that achieves the optimum operating speed of the SCMAGLEV technology to significantly reduce travel time to meet the capacity and ridership needs of the Baltimore-Washington region. To achieve the operational and safety requirements needed for a SCMAGLEV system, the SCMAGLEV Project must include:

- Infrastructure, vehicles, and operating procedures required for the SCMAGLEV system.
- An alignment which allows the highest optimal speed attained by SCMAGLEV technology at a given location and which avoids the need for reduction in speed other than that imposed by the normal acceleration and braking curves into and out of stations.
- A system that complies with Federal safety requirements.
- Avoidance, minimization, and mitigation of impacts to the human and natural environments.

The objectives of the SCMAGLEV Project are to:

- Improve redundancy and mobility options for transportation between the metropolitan areas of Baltimore and Washington, D.C.
- Provide connectivity to existing transportation modes in the region (e.g., heavy rail, light rail, bus, air).
- Provide a complementary alternative to future rail expansion opportunities on adjacent corridors.
- Support local and regional economic growth.

In June 2001, FRA selected the Baltimore-Washington corridor as the location for further consideration of maglev technology under the Maglev Deployment Program. FRA selected the SCMAGLEV Project for funding due to the area's high level of congestion, economic importance, increased development, and the need for connectivity between the two cities. The SCMAGLEV Project is needed to address the following transportation issues and challenges:

- Increasing population and employment
- Growing demands on the existing transportation network

- Inadequate capacity of the existing transportation network
- Increasing travel times
- Decreasing mobility
- Maintaining economic viability

ES.3 Alternatives Development

FRA considered the No Build Alternative and Build Alternatives that focus on implementation of a SCMAGLEV 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 such, the Build Alternatives focus on the SCMAGLEV technology and related infrastructure, such as stations, TMF, and other ancillary facilities needed to support the operation of the SCMAGLEV system.

ES.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. Unlike typical electric trains in service in the United States, a SCMAGLEV system does not operate on standard steel railroad tracks. 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. Powerful superconducting magnets on the trains and propulsion coils in the guideway walls generate the acceleration forces that drive the SCMAGLEV system, resulting in traveling speeds of over 300 miles per hour. Direct links to power substations transfers the electrical power needed to operate the SCMAGLEV system along the 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 and is physically separated from existing roadways and railroads. In general, guideway alignments that FRA evaluated in the DEIS follow existing transportation corridors and provide multimodal connections to existing Washington Metro Area Transit Authority (WMATA) and MDOT MTA transit services to the extent reasonably feasible. Chapter 3 Alternatives Considered includes detailed descriptions and graphics of each SCMAGLEV technology elements.

SCMAGLEV technology requires the following ancillary facilities as listed in **Table ES3.1-1**.

Table ES3.1-1: Ancillary Facilities

Project Elements	Element Description
Tunnel Portals	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 Facility (TMF)	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.
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. 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.
Fresh Air and Emergency Egress (FA/EE) Facilities	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.
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 and 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.

ES.3.2 Alternatives Development Process

FRA conducted a multi-step screening process to identify potential alternatives, including previously studied alternatives and new alternatives. Screening included public and agency outreach and input to inform the process and the determination to either advance or eliminate alternatives from further consideration. FRA and MDOT MTA held public Scoping Meetings in December 2016 and Draft Purpose and Need and Screening meetings in April 2017 and October 2017, and the Cherry Hill/Patapsco Avenue Baltimore meeting in December 2018.

The screening process resulted in two reports: FRA's 2018 *Preliminary Alternatives Screening Report, Baltimore-Washington Superconducting Maglev Project* (Preliminary Alternatives Screening Report (PASR)) and FRA's 2018 *Alternatives Report, Baltimore-Washington Superconducting Maglev Project*. A No Build Alternative was defined and carried forward throughout the screening process.

The PASR identified a reasonable range of alignments and possible TMF and station locations for the SCMAGLEV Project. The PASR first focused on existing transportation corridors and alignments that would optimize operating speed for the SCMAGLEV system. FRA identified fourteen initial alignments in the PASR. The initial alignments, along with multiple station zones and TMF sites, went through a fatal flaw analysis that refined the alignments for further evaluation. Public and agency outreach occurred during the screening process to assist in evaluating the alignments, station zones, and maintenance facilities.

Alignments retained for further study from the PASR, in addition to the No Build Alternative, were Build Alternative J (Baltimore-Washington Parkway (BWP Modified-East)) and Build Alternatives J1 (BWP Modified-West). These alternatives achieved the geometrical requirements for SCMAGLEV operation and, compared to the other preliminary alternatives, would require relatively fewer residential property acquisitions and displacements; have fewer visual and noise impacts to surrounding neighborhoods and communities; would minimize/avoid disruption to the Northeast Corridor (NEC); would not impact the planned Odenton Town Center Transit-Oriented Development (TOD) at the Maryland Area Regional Commuter (MARC) Odenton Station; would not displace the MARC Seabrook Station; and would have fewer impacts on parks and trails.

FRA documented the alternatives development, refinement, and environmental evaluation of Build Alternatives J and J1 in the *Alternatives Report* (November 2018). FRA made refinements to Build Alternatives J and J1 based on input from Federal, state, and local agencies to reduce or eliminate property impacts, improve horizontal and/or vertical geometry, and lengthen tunnel sections. The evaluation of alternatives and ancillary facilities included refinement of initial station concepts within the station zones studied in the PASR. The evaluation resulted in FRA retaining these alternatives for further consideration and detailed comparative study of the benefits and impacts of each alternative including:

- New parking structures;
- Multiple ancillary facilities (power substations, FA/EE facilities (FA/EE), MOW facilities, and tunnel boring machine (TBM) launch/retrieval sites); and,
- One TMF (referred to as a 'rolling stock depot' (RSD) in the November 2018 Alternatives Report).

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 SCMAGLEV Project elements. This DEIS represents and evaluates those refinements resulting from newly adopted design criteria. For more information on the Alternatives Development Process see Chapter 3. **Table ES3.2-1** provides a summary of the previous and current assumptions for various elements of the SCMAGLEV Project.

Table ES3.2-1: Comparison of Previous and Current SCMAGLEV Project Elements

Project Elements	Previously Considered (2019)	Currently Considered (evaluated in this DEIS)
Alignment (dedicated guideway)	BWP East/West (J and J1); combination of tunnel and viaduct	Same general alignment, shifts in alignment to meet geometric design refinements
Stations	2 D.C. stations, 1 BWI Marshall Airport Station, 2 Baltimore Station options	1 D.C. station, 1 BWI Station, 2 Baltimore Station options
Trainset	12 Car Trains	16 Car Trains
TMF	Patapsco Avenue and MD 198 (approximately 150 acres in total size)	BARC Airstrip (new), Beltsville Agricultural Research Center (BARC) West (new), redesigned MD 198 (approximately 180 acres in total size)
Ancillary Facilities	Portals, FA/EE facilities, substations, MOW facilities, system operations center, and signals and communications facilities	All still applicable; changes in size/locations to be consistent with current trainset, stations, TMF assumptions

This DEIS considers 12 Build Alternatives and the No Build Alternative. Each Build Alternative comprises 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 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 Marshall 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 the 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. **Table ES3.2-2** provides a summary of the DEIS Build Alternatives. See Appendix G for more detailed engineering, including plans and profiles. Chapter 3 Alternatives Considered includes small scale mapping of all 12 build alternatives.

Table ES3.2-2: 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	X	X	X	-	-	-	X
J-02	EAST	X	X	X	-	X	-	-
J-03	EAST	X	X	X	-	-	X	-
J-04	EAST	X	X	-	X	-	-	X
J-05	EAST	X	X	-	X	X	-	-
J-06	EAST	X	X	-	X	-	X	-
J1-01	WEST	X	X	X	-	-	-	X
J1-02	WEST	X	X	X	-	X	-	-

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

Source: AECOM 2020.

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

ES.3.2.1 Avoidance and Minimization

The Project Sponsor considered opportunities to avoid and minimize impacts during the conceptual design of the SCMAGLEV system. These design elements were applied where reasonable and feasible, and include:

- Maximizing use of underground guideway (deep tunnel) and stations to avoid surface impacts;
- Locating the elevated guideway (viaduct) along or within existing transportation and utility corridors;
- Co-locating of ancillary facilities; and,
- Siting the Cherry Hill Station and TMFs in non-residential areas.

ES.4 Environmental Resources and Consequences

Chapter 4 of the DEIS presents the existing environmental conditions (SCMAGLEV Affected Environment) identified in the study area, the anticipated impacts to resources, and measures to avoid, minimize, and mitigate unavoidable impacts to those resources. Additional opportunities to avoid and minimize impacts will be considered in the FEIS.

ES.4.1 Methodology

For each resource topic, FRA evaluated both long -and-short-term effects on resources. Long-term effects are those that would be permanent, whereas short-term effects occur from temporary, often construction-related, impacts and are not considered permanent.

Effects on resources may result from operational (i.e., service frequencies, speed) or physical (i.e., infrastructure requirements, construction activities) characteristics of the SCMAGLEV Project. FRA assessed effects for each Build Alternative and the No Build Alternative for comparison. See Chapter 4 for resource specific methodologies.

For each resource topic, FRA defined geographic areas of study to assess where effects could occur (i.e., SCMAGLEV Project Affected Environment). The SCMAGLEV Project Affected Environment, varies in size according to the resource due to the unique and dynamic features associated with each resource. Impacts occur within the limits of operational/physical disturbance and can be permanent (Impact Area) or temporary (Construction-related Impact Area).

As engineering design of the SCMAGLEV system is still ongoing, FRA used a larger area to conservatively define the limits of disturbance (LOD).

ES.4.2 No Build Alternative

The No Build Alternative is included in this analysis as the baseline for comparison with the Build Alternatives. This is also known as the alternative of no action as required by NEPA. Under the No Build Alternative, the SCMAGLEV Project would not be constructed. Travel between Baltimore, MD and Washington, D.C. would continue via existing transportation infrastructure.

ES.4.3 Build Alternatives

The environmental consequences presented in Chapter 4 are described for the No Build and Build Alternatives. As shown in **Table ES4.2-1** the Build Alternatives would result in similar impacts to certain resources, due to the specific engineering requirements for the system. For the SCMAGLEV system to reach optimal speeds, and to ensure optimal performance of system features (i.e. TMF and ancillary features), the system has been designed with specific geometry and using a combination of underground tunnel and aboveground viaduct on a dedicated guideway. Technical reports detailing the engineering design of the system are located in Appendix G. **Table ES4.2-1** also shows where impacts between Build Alternatives would vary. For example, Build Alternatives J-01 to J-06 includes 25 percent viaduct and 75 percent tunnel whereas Build Alternatives J1-01 to J1-06 includes 14 percent viaduct and 86 percent tunnel. The respective resource chapters provide additional details on the identified impacts.

Section 4(f) of the Department of Transportation Act (DOT)

In accordance with Section 4(f) of the DOT Act (49 U.S.C. § 303), before approving a project that uses Section 4(f) property, FRA must determine that there is no feasible and prudent alternative that avoids the Section 4(f) properties and that the project includes all possible planning to minimize harm to the Section 4(f) properties; or, FRA makes a finding that the project has a *de minimis* impact on the Section 4(f) property.

Section 4(f) properties were identified within the Study Area. A draft Section 4(f) evaluation is provided in Appendix F. Coordination with Officials with Jurisdiction is ongoing to determine the nature of impacts to 4(f) properties, including *de minimis* impacts.

Section 106 of the National Historic Preservation Act (NHPA)

In accordance with Section 106 of the NHPA (55 U.S.C. § 306108), FRA initiated consultation with the appropriate consulting parties, including the State Historic Preservation Officers for Washington, D.C., and the State of Maryland, and the Advisory Council on Historic Preservation (ACHP). Pursuant to the ACHP's implementing regulations for Section 106 (36 CFR Part 800), FRA prepared a draft Programmatic Agreement (PA) to govern the Section 106 process. The draft PA is appended to this DEIS, and is being made available to the public for review and comment. Public involvement requirements regarding historic resources are being fulfilled with public outreach and NEPA public participation.

ES.4.3.1 Summary of Impacts

Each Build Alternative has the potential for beneficial and negative impacts on the human and natural environment.

Tables ES4.3-1 and ES4.3-2 provide a quantitative summary of the impacts from the Build Alternatives. Chapter 4 of the DEIS contains a detailed evaluation of all resources analyzed for the SCMAGLEV Project. In addition, the following common impacts are identified for all Build Alternatives and are summarized as follows:

Social Impacts:

- Impacts to neighborhoods and communities would occur in the vicinity of above-ground SCMAGLEV Project elements including the viaduct. The Build Alternatives could have an adverse impact on community cohesion, businesses, and community facilities; introducing large transportation structures near residential and into forested areas; changing residents' navigation routes around their community; and disrupting interaction between people and groups within a community. This includes visual impacts and increased noise. Large area impacts to land use would be associated with SCMAGLEV Project related buildings such as substations, FA/EE facilities, MOW facilities TMFs, and systems support buildings; construction laydown areas; and areas for stormwater management.
- Potentially spur development and commercial investment in neighborhoods near station locations. This could impact the long-term character of neighborhoods'

The following terms are used frequently in this DEIS:

Adverse: A negative or unfavorable condition.

Avoidance: The act of avoiding impacts to, or keeping away from, something or someone.

Minimization: Measures taken to reduce the severity of adverse impacts.

Mitigation: Measures taken to alleviate adverse impacts that remain after minimization.

economic and demographic makeup due to increased property values, changes to commercial and retail offerings, increased employment opportunities, higher wages, and changes to available community facilities.

- Environmental justice impacts would occur along the length of the SCMAGLEV Project corridor particularly in proximity to aboveground construction, including the stations, viaduct, tunnel portals, TMF sites, and ancillary facilities. The SCMAGLEV Project would provide a premium service at a higher fare, roughly seven times the cost of an existing MDOT MTA Maryland Area Regional Commuter (MARC) commuter train fare between Washington, D.C., and Baltimore City.

Economic Impacts:

- Total construction employment impacts would range between 161,000 job-years and 195,000 job-years. The economic impacts in terms of earnings from the construction of the SCMAGLEV Project would be between \$8.8 billion and \$10.6 billion (2018 dollars). Temporary negative construction impacts to business revenues in the affected areas may be significant, ranging from \$18.5 million to \$311.3 million (2018 dollars).
- The annual economic impacts from operation and maintenance would result in between 390 and 440 total jobs annually, and between \$24.3 and \$27.4 million in earnings (2018 dollars).
- The availability of the SCMAGLEV service option would change the travel patterns in the Combined Statistical Area (CSA). These changes include the net change in user benefits, increased reliability relative to other modes, increased safety, induced ridership, avoidance of congestion, pavement savings, reduced emissions as drivers divert to SCMAGLEV, and reduced revenue for publicly provided regional commuter rail service as riders on these modes divert to SCMAGLEV.

Resource Impacts:

- All Build Alternatives would likely impact historic resources including Mount Vernon Square Historic District, The New York (building), and Martins Woods; Build Alternatives will impact historic resources including the USDA's BARC and NPS's BWP.
- The visual prominence of SCMAGLEV System elements would alter the scenic character along and above the BWP. The viaduct elements would be located up to 150 feet higher than the elevation of the travel lanes of the parkway and would cross over the parkway to access TMF facilities.
- At BARC, USDA is conducting hazardous materials remediation activities. Data from monitoring wells indicate that chlorinated solvents (perchloroethylene and trichloroethylene) are present in the groundwater at a depth of approximately 30 feet and have migrated southeast from the site toward the BWP. Coordination

with USDA on the status of remedial investigations and remedial actions at BARC sites would be necessary to better understand the risks posed and liabilities. In particular, the consequences of siting facilities over the groundwater plume.

- There are potential surface water impacts to the following tributaries of the Chesapeake Bay: Patuxent River, Little Patuxent River, Anacostia River, and Beaverdam Creek.
- Construction of the entire SCMAGLEV Project will take approximately seven years. Construction will begin after completion of the final engineering design, and require Federal, state, and local permits and/or approvals. During this time, localized construction impacts, such as changes in traffic volume and circulation patterns, noise and vibration levels, visual effects have the potential to occur. Construction includes trucking and disposal of an estimated 23+ million cubic yards of soil. Given that the length of the SCMAGLEV Project Study Area is roughly 40 linear miles, construction activities occurring in any one location will not last for the entire construction period.
- Potential effects to public health attributed to air quality impacts, impacts to geologic resources, electromagnetic fields/electromagnetic interference, and potential implications for public safety.

Property Impacts:

- Build Alternatives J-01 and J-04 are generally the same and result in similar impacts except for the northern terminus station. Build Alternative J-01 uses the Cherry Hill Station whereas Build Alternative J-04 uses Camden Yards. As a result, Build Alternative J-01 requires more total permanent property acquisitions. The Cherry Hill Station results in more affected parcels and larger areas of permanent property acquisitions, including medical centers, commercial, and retail properties that support surrounding neighborhoods (Cherry Hill, Westport, Lakeland), than Build Alternatives that use the Camden Yards Station. While the Cherry Hill Station results in greater property impacts, the Camden Yard Station results in significant traffic impacts during construction, demolition of high rise office building (Bank of America) and the Federal Courthouse (Edward A. Garmatz U.S. District Court) and displacement of the Old Otterbein United Methodist Church, a historic resource, and an urgent care facility. A key differentiator with these Build Alternatives is that they would have the greatest permanent impacts on the following Federal properties: BWP, Fort George G. Meade, and the Patuxent Research Refuge (PRR) (although this is nearly the same for all Build Alternatives J). Most of these impacts are related to the viaduct associated with Build Alternatives J. The Fort George G. Meade property is impacted by the viaduct, proposed deep tunnel portal, stormwater management, SCMAGLEV system facilities and a new access road.
- A differentiator with the Build Alternatives J-02 and J-05 is that they would result in the greatest impacts to the BARC property and NASA's GSFC due to the

BARC Airstrip TMF. These Build Alternatives would also have permanent property impacts on the PRR and BWP. The BARC Airstrip TMF would result in direct and permanent impacts to the headwaters and first order streams of Beaverdam Creek and the greatest potential impact to Nontidal Wetlands of Special State Concern (NTWWSC). Although this TMF would result in the least acreage of forest removal, impacts to the headwaters would affect the habitat of sensitive species, including RTE species and habitat, important riparian corridors, and water quality to the one stream system noted Section 4.10 as having good water quality.

- In general, Build Alternatives J-03 and J-06 would have the greatest total impact to Federal lands. The BARC West TMF is the key differentiator in this set of Build Alternatives. The BARC West TMF is near residential properties on its far northwestern end and would require a small property acquisition from two residential properties. In general, use of the BARC West site requires the least amount of property from BARC. It does have similar impacts to Fort George G. Meade, PRR, and the BWP as described for the other Build Alternatives J with the differences resulting from TMF ramp configurations. The BARC West TMF would have permanent wetland impacts, including NTWSSC associated with Beaverdam Creek and its tributaries, and the greatest impact to FIDS habitat (approximately 175 acres associated with the Build Alternatives J). The BARC West TMF results in the greatest impacts to areas designated as Sensitive Species Project Review Area (SSPRA).
- Build Alternatives J1-01 and J1-04 have a MOW associated with the MD 198 TMF located just north of Powder Mill Road. This MOW requires an additional two-mile long access ramp for maintenance vehicles to access the mainline viaduct. In addition, these Build Alternatives also have a 3.5-mile access ramp from the mainline viaduct to MD 198. The Cherry Hill Station results in more affected parcels and larger areas of permanent property acquisitions than Build Alternatives that use the Camden Yards Station. These Build Alternatives have the least total acres of impacts to Federal lands. Their biggest impact to Federal lands is associated with the BWP as part of the viaduct associated with these Build Alternatives and the fresh air/emergency egress, stormwater management, SCMAGLEV system facilities, and an access road to the Fort George G. Meade property. A key differentiator with these Build Alternatives is that they avoid impacts to PRR and NASA Goddard Space Flight Center. The types of impacts to wetlands would be similar as described for Build Alternatives J-01 and J-04. However, Build Alternatives J1-01 and J1-04 would have the greatest total wetland impacts per any Build Alternative. Another key differentiator for all Build Alternatives J1 is forest impacts. These Build Alternatives result in forest habitat impacts on City of Greenbelt property and forest impacts on M-NCPPC park property. The acreage of impact to City of Greenbelt parkland eliminates most of the natural habitat and buffer between the residential areas and the BWP.
- Build Alternatives J1-02 and J1-05 have the second highest total acreage of impact to Federal lands. Most of the impacts are related to the BARC Airstrip

TMF, resulting in the second highest acreage impacts to BARC and the NASA Goddard Space Flight Center. These Build Alternatives have the least impact to the BWP and avoid impacts to PRR. The BARC Airstrip TMF will result in direct and permanent impacts to the headwaters and first order streams of Beaverdam Creek and the greatest impact to NTWWSC. Although this TMF will result in the least acreage of forest removal, impacts to the headwaters will affect the habitat of sensitive species, including RTE species and habitat, important riparian corridors, and affect water quality to the one stream system on record within the SCMAGLEV Project Affected Environment as having good water quality. Another key differentiator for all Build Alternatives J1 is forest impacts. These Build Alternatives result in forest habitat impacts on City of Greenbelt property and forest impacts on M-NCPPC park property. The acreage of impact to City of Greenbelt parkland eliminates most of the natural habitat and buffer between the residential areas and the BWP.

- The BARC West TMF is the key differentiator for Build Alternatives J1-03 and J1-6. The BARC West TMF is near residential properties and requires a small property acquisition from 2 residential properties. In general, use of the BARC West TMF requires the least amount of property from BARC. It does have similar impacts to Fort George G. Meade, PRR, and the BWP as described for the other Build Alternatives J1. The BARC West TMF has permanent wetland impacts, including NTWSSC associated with Beaverdam Creek and its tributaries, and the greatest impact to FIDS habitat (approximately 180 acres associated with Build Alternatives J1). The BARC West TMF results in the greatest impacts to areas designated as Sensitive Species Project Review Area (SSPRA). SSPRAs are state and locally significant habitat areas that may include RTE species and their habitat, Natural Heritage Areas, colonial water bird sites, NTWSSCs, habitat protection areas, areas subject to Critical Area review, and geographic areas of concern. Another key differentiator for all Build Alternatives J1 is forest impacts. These Build Alternatives result in forest habitat impacts on City of Greenbelt property and forest impacts on M-NCPPC park property. The acreage of impact to City of Greenbelt parkland eliminates most of the natural habitat and buffer between the residential areas and the BWP.

Table ES4.3-1: Build Alternatives Environmental Resource Impacts

Resource	Build Alternative											
	J-01	J-02	J-03	J-04	J-05	J-06	J1-01	J1-02	J1-03	J1-04	J1-05	J1-06
Permanent Property Impacts to Recreational Facilities and Parklands (Acres)	109	93	88	109	96	88	141	102	105	132	102	105
Total Acres of Permanent Floodplain Impact	74	59	46	53	38	26	76	52	40	56	32	20
Total Acres of Permanent Wetland Impact	45	26	22	45	25	22	51	27	23	51	27	23
Total Wetland Impact (acres) Classified as NTWSSC	6	19	9	6	19	9	4	14	5	4	14	5
Total Impact to Waterways (linear feet)	10,261	12,624	12,896	9,946	12,310	12,581	12,009	12,108	12,659	11,694	11,794	12,344
Total Acres of Permanent Forest Impact	420	381	451	402	363	432	388	324	392	370	306	374
Total Permanent Forest Interior Dwelling Species (FIDS) Habitat Impact (Acres)	404	354	437	404	354	437	330	268	352	330	268	352
Total Permanent Sensitive Species Project Review Area (SSPRA) Impact (Acres)	173	218	272	175	220	275	197	227	282	200	229	284
Total Critical Area Boundary Impacts (Acres)	128	128	128	85	85	85	128	128	128	85	85	85

Notes: Total Permanent Acres of Wetland Impact and Total Impact by Waterway: All Build Alternatives impacts exclude published wetland data associated with the long-term construction laydown area near MD 200 and I-95; Total Wetland Impact Classified as NTWSSC: acreage is calculated separately from the total acreage, based on state-published boundaries, not field-delineated boundaries.

Table ES4.3-2: Build Alternatives Engineering Resource Impacts

Resource	Build Alternative											
	J-01	J-02	J-03	J-04	J-05	J-06	J1-01	J1-02	J1-03	J1-04	J1-05	J1-06
Linear Miles of Guideway	39	38	38	41	39	39	40	38	38	41	39	39
Total Number of Parcels Permanently Impacted	312	294	297	207	189	192	334	313	314	229	208	210
Total Acres of Permanent Impacts	1,000	1,066	1,019	852	918	871	1,009	1,053	1,009	861	905	861
Public Property Acres of Permanent Impacts	210	63	63	203	58	58	260	108	698	255	102	104
Federal Property Acres of Permanent Impacts	57	293	245	57	293	245	26	248	201	26	248	201
Total Number of Parcels Temporarily Impacted	162	170	167	113	123	120	167	183	178	121	134	132
Total Acres of Temporary Impacts	203	239	214	216	252	228	120	161	133	134	174	147
Public Property Acres of Temporary Impacts	49	48	48	55	54	54	40	43	68	46	49	46
Federal Property Acres of Temporary Impacts	50	87	63	50	87	63	14	50	25	14	50	25
Project Construction Cost (\$ Millions)	10,950	10,640	10,640	12,370	12,060	12,060	11,480	11,170	11,170	12,900	12,590	12,590

Notes: Parcels Permanently Impacted and Acres of Permanent Impacts: includes Full and Partial Permanent property impacts
 Number of Parcels Temporarily Impacted and Acres of Temporary Impacts: property impacts that would occur during construction.

ES.4.3.2 Federal Property Impacts

Coordination with various stakeholders, including the public, special interest groups, private property owners, and agencies, has occurred throughout the NEPA process. Implementation of the SCMAGLEV Project will impact Federal property, therefore the Project Sponsor and FRA consulted with affected Federal agencies to understand potential impacts and necessary avoidance, minimization, and mitigation measures. The following is a summary of critical feedback from Federal agencies directly affected by the proposed Build Alternatives. FRA will continue to coordinate with the relevant regulatory agencies to further understand the potential impacts of the SCMAGLEV Project on Federal property. For more information on all agency and public involvement, see Chapter 5 Public Involvement and Agency Coordination.

NASA

NASA has expressed concerns over the BARC Airstrip TMF. NASA expressed serious concerns with the location of the BARC Airstrip TMF due to the proximity of the Goddard Geophysical and Astronomical Observatory (GGAO). The GGAO supports numerous NASA activities that are sensitive to vibration, artificial lighting, and electromagnetic interference. The location of the GGAO was specifically chosen to be remote from disturbances and human activities. This facility has a long history and changes related to the Project have the potential to impact the scientific integrity of some research. NASA is concerned about the negative impacts the BARC Airstrip TMF would likely have on the operations of sensitive equipment located at the facility. They also expressed concern over the reconstruction of Explorer Road.

USFWS

USFWS noted several areas of concern where the Build Alternatives could interfere with the National Wildlife Refuge System, specifically PRR. The concerns included impacts to high-quality habitat for rare, threatened, endangered and protected species; disruption to established vegetative communities; impacts to forests and related bat communities; impacts to birds, bats, and pollinators from train pass-bys; impacts to recreational activities including hunting, fishing and hiking; and impacts to historic cemeteries on site. Areas of the PRR have known unexploded ordnances. USFWS also noted that in many areas of the PRR, prescribed burns occur to manage vegetation that could interfere with SCMAGLEV Project operations. USFWS also stated that proposed project elements affecting PRR are incompatible with the purpose and mission. Furthermore, USFWS noted that the land transfer process for PRR in Maryland would require legislative action.

USDA

USDA owns the BARC facility where the Project Sponsor proposes two alternative TMF locations. USDA noted that legislation and congressional approval is needed to convert BARC property to a non-agricultural use. This transfer can be a lengthy process, even when transferring between Federal agencies. USDA indicated that nearby communities would likely be impacted due to the potential light, noise, vibration and traffic generated

by the TMF sites. Beaverdam creek was identified as a sub watershed with low development in the Anacostia watershed. They also raised concerns over the peak activity hours associated with the TMF facilities. USDA scientists are concerned with potential permanent impacts to research fields on the eastern side (BARC Airstrip TMF) of the property and an active study of solar fields on the western side (BARC West TMF) of the property. Additionally, USDA research animals and sensitive equipment may be impacted by construction and operation of the SCMAGLEV project. USDA also identified potential concerns on the eastern side of the property where the NASA facilities exist.

Fort George G. Meade/National Security Agency (NSA)

Fort George G. Meade and NSA raised concerns over the MD 198 TMF and with the alternative alignments.

National Park Service (NPS)

NPS owns and manages several properties along the SCMAGLEV Project corridor, including small park reservations associated with the L'Enfant Plan throughout Washington, D.C., crossing the Anacostia River, and the BWP. NPS expressed concerns about direct and indirect impacts to these resources including flyover ramps over the BWP, temporary occupancies of small park reservations, locations of SCMAGLEV system elements, and the need for visual screening/buffers from surface features. NPS has indicated a preference for tunnels, particularly in the Anacostia River/Kenilworth, Park and BWP areas.

Department of Labor (DOL)

Construction of the MD 198 TMF would require closure of the Woodland Job Corp building. The closure of the current facility would result in the loss of 125 jobs, and the services provided by the center. DOL estimated that it will take over four years and cost tens of millions of dollars to acquire land and construct a replacement facility in kind. DOL opposes Alternatives J-01, J-04, J1-01 and J1-04.

General Services Administration (GSA)

Alternatives J-04, J-05, J-06, J1-04, J1-05 and J1-06 that include the Camden Yards Station will require the demolition of the Edward A. Garmatz Federal Courthouse to build a parking structure. The Courthouse is considered a long-term GSA asset. It supports the federal court's continued mission in Baltimore and the District of Maryland, 4th circuit. GSA expressed concerns with the proposed parking and impacts to the Courthouse. Permanent and temporary federal property impacts have been identified in **Table ES4.3-3**. It is a quantitative summary of the impacts from the Build Alternatives on properties where there will be multiple acres of impact.

Table ES4.3-3: Federal Property Impacts

Build Alternative	Federal Property														Build Alternatives - Total Permanent Acres of Impact	Build Alternatives - Total Temporary Acres of Impact
	BARC		Fort George G. Meade		NASA Goddard Space Flight Center		NSA		Patuxent Wildlife Research Refuge		Secret Service		BWP/ NPS			
	P	T	P	T	P	T	P	T	P	T	P	T	P	T		
J-01	16.5	18.4	43.3	8.5	6.7	5.6	5.2	0.9	24.0	22.9	0.9	0.5	88.9	27.2	185.5	84.0
J-02	187.4	38.5	18.5	8.5	24.5	9.2	5.2	0.9	23.7	23.1	2.0	7.0	66.3	33.0	327.6	120.2
J-03	164.9	26.9	18.5	8.5	6.7	5.6	5.2	0.9	23.7	23.1	1.0	3.4	67.2	36.1	287.2	104.5
J-04	16.5	18.4	43.3	8.5	6.7	5.6	5.2	0.9	24.0	22.9	0.9	0.5	88.9	27.2	185.5	84.0
J-05	187.4	38.5	18.5	8.5	24.5	9.2	5.2	0.9	23.7	23.1	2.0	7.0	66.7	33.0	328.0	120.2
J-06	164.9	26.9	18.5	8.5	6.7	5.6	5.2	0.9	23.7	23.1	1.0	3.4	67.2	36.1	287.2	104.5
J1-01	18.7	10.0	29.8	5.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	53.4	13.6	101.9	29.0
J1-02	180.6	32.6	5.0	5.4	17.7	3.5	0.0	0.0	0.0	0.0	0.9	3.5	40.3	14.8	244.5	59.8
J1-03	155.0	20.0	5.0	5.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	42.1	14.1	202.1	39.5
J1-04	18.7	10.0	29.8	5.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	53.4	13.6	101.9	29.0
J1-05	180.6	32.6	5.0	5.4	17.7	3.5	0.0	0.0	0.0	0.0	0.9	3.5	40.3	14.8	244.5	59.8
J1-06	155.0	20.0	5.0	5.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	42.1	14.1	202.1	39.5

P - includes Full and Partial Permanent property impacts

T - Temporary property impacts that would occur during construction.

ES.4.4 Mitigation Strategies

FRA has identified potential mitigation strategies to address the impacts evaluated in the DEIS. Potential mitigation strategies range from implementation of best management practices and conducting additional coordination to the development of detailed mitigation plans with detailed mitigation measures. The estimates of potential impacts in this DEIS are based on the level of design undertaken by the Project Sponsor to date. As the SCMAGLEV Project design advances, the mitigation measures will be refined with the goal of avoiding or minimizing impacts to the extent feasible. FRA will continue to refine the mitigation measures specified in the DEIS through additional coordination with the Project Sponsor, relevant Federal, state, and local agencies, and through public involvement.

ES.5 Permits, Approvals and Authorizations

In addition to NEPA compliance, many permits, approvals and authorizations are being coordinated with the NEPA process or would be obtained prior to construction the SCMAGLEV Project. Appendix D-1 summarizes the Federal, state, and local permits, authorizations and approvals that will likely be required based on the current project design associated impacts and coordination with stakeholders. These permits and authorizations include, but are not limited to, a Joint Federal/State Application for the Alteration of Any Floodplain, Waterway, Tidal or Nontidal Wetland in Maryland (JPA); Incidental Take Permits in accordance with Section 7 of the Endangered Species Act; Chesapeake Bay Critical Area Consistency approval; Forest Conservation Act approval; Archaeological Resources Protection Act Permit; NPS Special Use Permit; pollutant and discharge construction permits; and Right of Entry (ROE) Permits necessary for private rights-of-way, ROE to existing utility, rail, and Federal/state properties traversed by the SCMAGLEV Project. FRA recognizes that this does not include details of all Federal actions necessary by each bureau and the specific authorities that would allow them to authorize or approve the Project.

Several Federal properties would be affected through the selection of a Build Alternative. If a transfer of Federal property is proposed and converted to transportation use, environmental review, in accordance with NEPA, and related reviews may be required. For example, the USFWS generally must prepare a Compatibility Determination when a third party proposes to use a National Refuge System property.

For certain agencies, a Congressional Act may be required to authorize the agency's action. For example, an act of Congress is generally required to allow a non-conforming (i.e. a non-agricultural) use at the BARC. Similarly, USFWS will require congressional approval for impacts to the PRR if land is converted to transportation use.

In addition, the FAA would require review of aboveground structures and associated construction plans via the submission of Form 7460 Notice of Proposed Construction or Alteration for both BWI and Tipton Airport (FME). STB authorization may be required if the Board is determined to have jurisdiction over the SCMAGLEV Project.

The FRA is conducting ongoing coordination with the agencies throughout the planning phase of the Project. Coordination with the regulatory and resource agencies will continue through further design phases, review and construction. **Table ES5.0-1** summarizes the likely Federal permits and approvals that will be required to build the Project.

Table ES5.0-1: Likely Federal Permits and Approvals

Permit/Approval	Responsible Permitting Agency
National Environmental Policy Act – Record of Decision Section 4(f), Department of Transportation Act - Approval	Federal Railroad Administration
Construction at BWI Airport - Permit	Federal Aviation Administration
TBD	Surface Transportation Board
Section 7, Endangered Species Act	U.S. Fish and Wildlife Service
Special Use Permit	National Park Service*
Land-owning Agency	U.S. Department of Agriculture*
Section 404/408, Clean Water Act - Permit	U.S. Army Corps of Engineers
Coordination/Land-owning Agency	National Security Agency/Fort George Meade (U.S. Army)
Coordination/Land-owning Agency	National Aeronautics and Space Administration
Land-owning Agency	U.S. Secret Service/James J. Rowley Training Center
Land-owning Agency	General Services Administration
Coordination/Land-leasing Agency	U.S. Department of Labor/Woodland Jobs Corps Center
Coordination	National Capital Planning Commission

*Denotes where a Congressional Act may also be required to authorize agency action.

ES.6 Public and Agency Outreach

FRA and MDOT MTA are engaging Federal, state, and local agencies and the public throughout the NEPA process. Public engagement will continue during the DEIS public comment period and through the FEIS and Record of Decision (ROD).

ES.7 Preferred Alternative

FRA is not identifying a Preferred Alternative in the DEIS to allow the agency an opportunity to consider agency and public feedback on the DEIS prior to identifying a preferred alternative. FRA will consider all relevant available information when identifying its Preferred Alternative in the FEIS.

CEQ's NEPA regulations require a NEPA document to specify the alternative that is considered to be environmentally preferable (Section 1505.2(b)). CEQ defines an environmentally preferable alternative as the alternative that would cause the least damage to the human and natural environments. In addition, Section 4(f) prohibits a Federal agency from approving a project that would result in the use of significant parks, recreation areas, wildlife and waterfowl refuges, or historic sites if there is a feasible and prudent alternative to the use of the resource.

BWRR has identified its preferred configuration; Build Alternative J, BARC West TMF, and Cherry Hill as the north terminus station (Build Alternatives 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.

ES.8 Next Steps

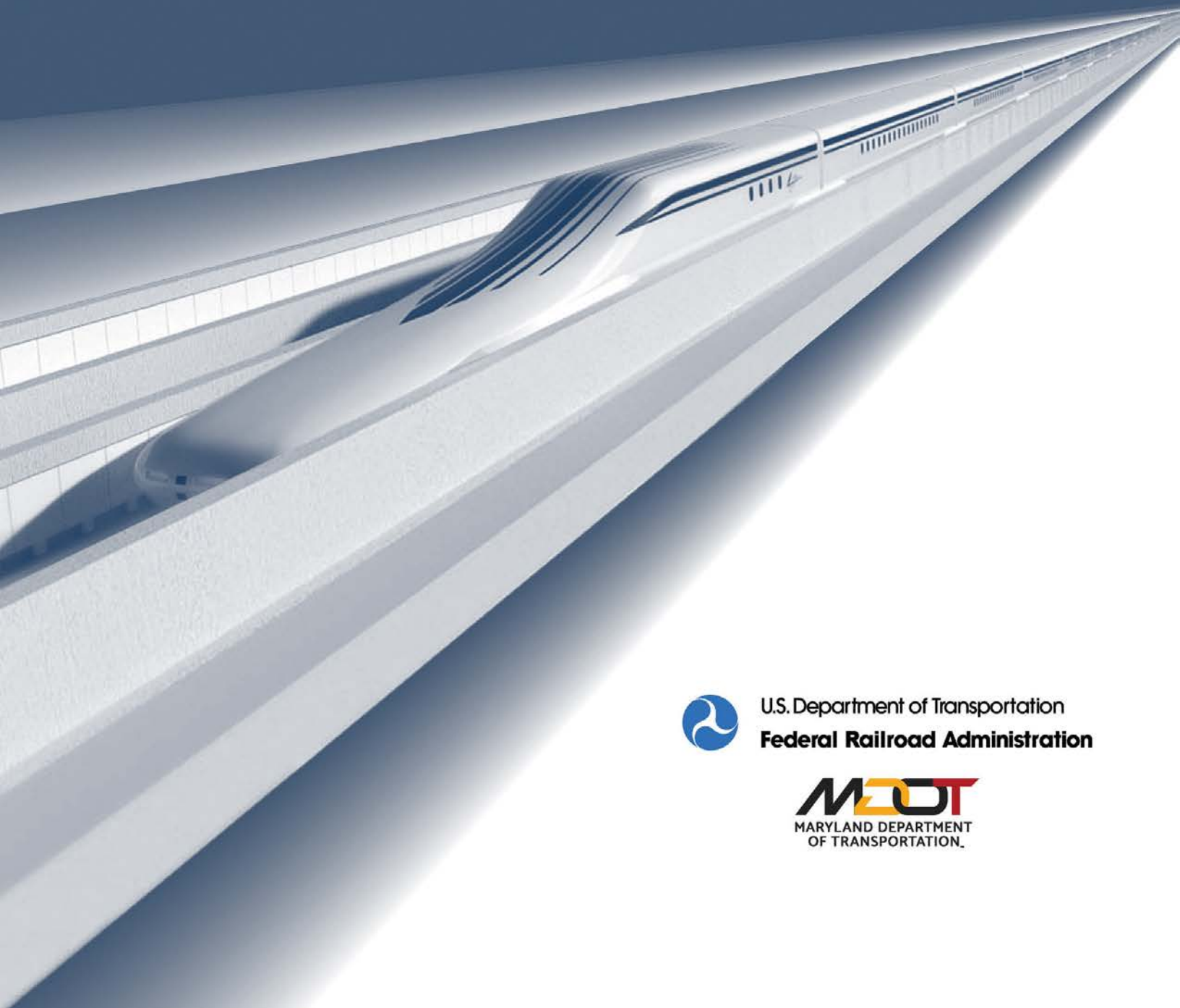
FRA is circulating the DEIS to affected local jurisdictions, state and Federal agencies, tribes, community organizations and other interested groups, interested individuals and the public. FRA is circulating the DEIS for a review and comment period, which will include public hearings, to accept agency and public comment on the contents of the DEIS. After taking into account comments received on the DEIS, FRA will prepare an FEIS that will include responses to comments. Upon completion of the FEIS, FRA expects to issue a ROD for the SCMAGLEV Project in compliance with NEPA.

Chapter 1

Introduction

BALTIMORE-WASHINGTON SUPERCONDUCTING MAGLEV PROJECT

DRAFT ENVIRONMENTAL IMPACT STATEMENT AND
SECTION 4(f) EVALUATION



U.S. Department of Transportation
Federal Railroad Administration



Chapter 1: Introduction

The Draft Environmental Impact Statement and Draft Section 4(f) Evaluation (DEIS) presents the analysis of a proposed Superconducting Magnetic Levitation (SCMAGLEV) Project (SCMAGLEV Project) high-speed rail system between Baltimore, Maryland (MD) and Washington, D.C. (Proposed Action). The Federal Railroad Administration (FRA) published a Notice of Intent (NOI) in the *Federal Register* on November 25, 2016 (stating the intent to prepare a DEIS on the Proposed Action). FRA has prepared this DEIS in accordance with the National Environmental Policy Act (NEPA) of 1969, as amended (42 U.S.C. 4321–4327 and 40 C.F.R. Parts 1500–1508); 23 U.S.C 139; Section 4(f) of the Department of Transportation Act; FRA Procedures for Considering Environmental Impacts (64 FR 28545, May 26, 1999; 78 FR 2713, January 14, 2013); 23 C.F.R. Part 771 – Environmental Impact and Related Procedures, and other applicable laws and regulations.

The Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU), as amended, authorized funding for pre-construction planning activities related to SCMAGLEV technology for eligible projects. In March 2015, FRA issued a Notice of Funding Availability (NOFA) to solicit applications for construction of high-speed rail. In April 2015, acting on behalf of the Project Sponsor (Baltimore-Washington Rapid Rail (BWRR)), Maryland Department of Transportation Maryland Transit Administration (MDOT MTA) submitted an application to FRA for the SAFETEA-LU funds to perform preliminary engineering and NEPA studies related to BWRR's proposal to build a SCMAGLEV system. However, there is no Federal funding appropriated for construction, as of the publication of this DEIS.

In November 2015, the Maryland Public Service Commission approved BWRR's application to acquire a passenger railroad franchise to deploy a SCMAGLEV system between Washington, D.C. and Baltimore. In 2016, FRA awarded a \$27.8 million SCMAGLEV grant to MDOT MTA for preliminary engineering and to complete a NEPA study for the Proposed Action. BWRR committed to provide a 20 percent match contribution for the NEPA study and preliminary engineering.

FRA is the lead Federal agency and MDOT MTA is the joint lead agency. BWRR, a private corporation, is the Project Sponsor and developer of the proposed SCMAGLEV service. For more information about BWRR visit their SCMAGLEV Project website <https://bwrapidrail.com/>.

This DEIS reflects public and agency input received during the formal Scoping period and throughout the development of this document. MDOT MTA created a website to inform and allow public and stakeholder input <https://www.bwmaglev.info/>. The feedback received and analysis presented in this DEIS will inform and provide the basis for FRA's identification of a Preferred Alternative, following a series of public hearings. This chapter provides a project description, defines the Project Study Area and planning context, explains the NEPA process, and lays out the scope of the DEIS in two volumes.

1.1 Project Description

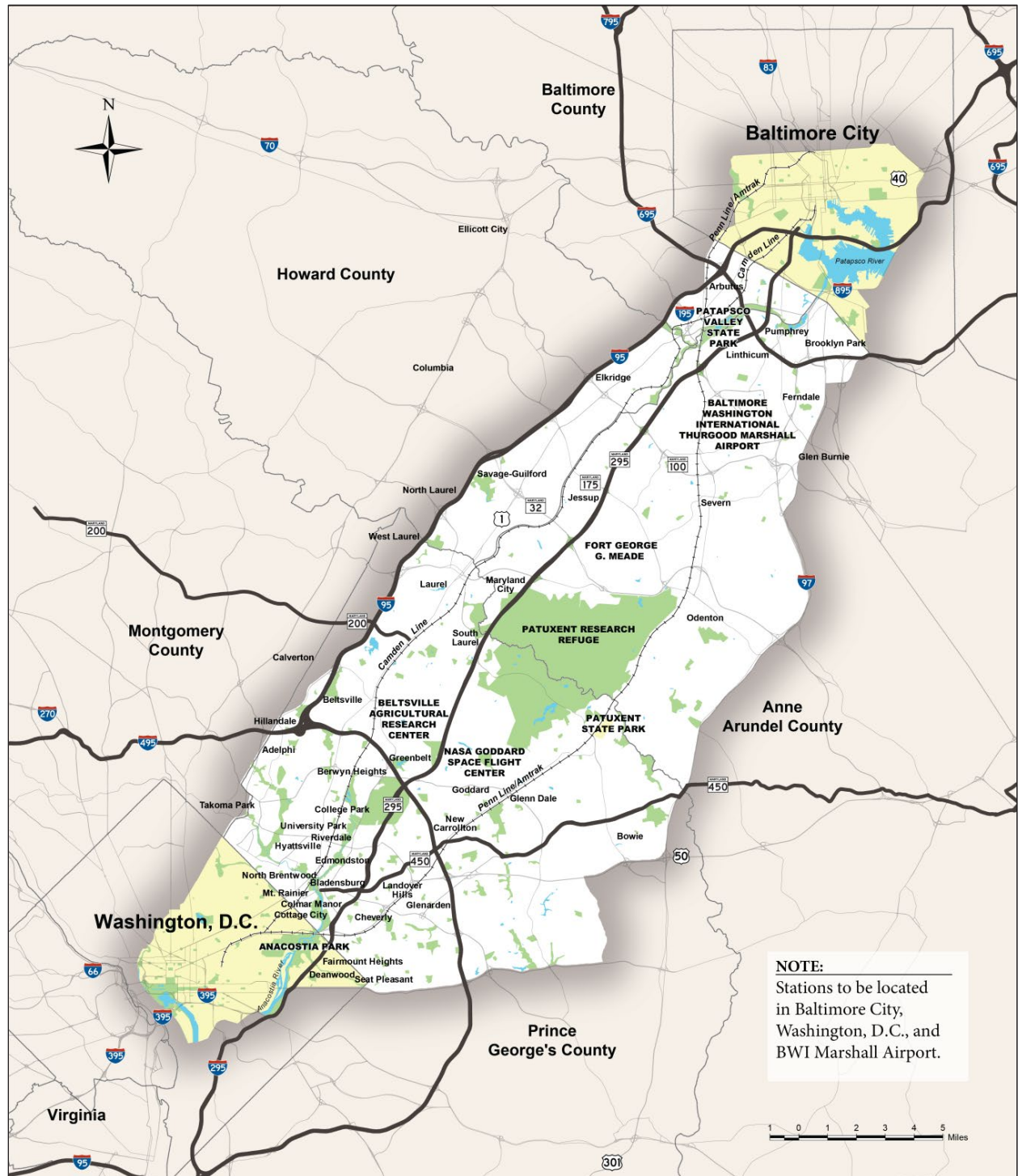
1.1.1 Proposed Action

The Proposed Action includes the construction and operation of a SCMAGLEV system between Baltimore, MD and Washington, D.C. The SCMAGLEV Project is a high-speed rail technology that runs on a grade-separated, fixed guideway powered by magnetic forces. This system can operate at speeds of over 300 miles per hour. This system does not operate on standard steel wheel railroad tracks and therefore requires a separate operating environment. Chapter 3, Alternatives Considered, provides more information on the superconducting magnetic levitation technology.

The SCMAGLEV Project includes two terminal stations (Washington, D.C. and Baltimore, MD) and one intermediate station at the Baltimore-Washington International Thurgood Marshall Airport (BWI Marshall Airport Station). The system requires additional facilities to operate including one trainset maintenance facility (TMF), two maintenance of way (MOW) facilities, and various smaller ancillary facilities. The ancillary facilities include fresh air and emergency egress (FA/EE) facilities, substations, SCMAGLEV wayside system facilities and stormwater management. The system proposes to operate on both underground (deep tunnel) and an elevated guideway (viaduct). Stations and ancillary facilities are generally above, below, or adjacent to the guideway and would provide for access to passenger and employee parking as applicable.

1.1.2 Project Study Area

The Project Study Area for the SCMAGLEV Project is roughly bound by I-95 on the west and by the former Washington-Baltimore & Annapolis Electric Railroad alignment on the east. It spans approximately 40 miles north to south and ten miles east to west. It includes portions of the Washington, D.C, Prince George's County, Anne Arundel County, Howard County, Baltimore County, and the City of Baltimore, MD. **Figure 1.1-1** shows the Project Study Area.

Figure 1.1-1: Project Study Area

Source: AECOM 2018

1.2 Planning Context

1.2.1 Previous Maglev Studies

In 2001, FRA published a Record of Decision (ROD) following completion of a Programmatic Environmental Impact Statement (PEIS)¹ for the Maglev Deployment Program (MDP). The purpose of this action was to demonstrate Maglev technology by identifying a viable Maglev project in the United States, and by assisting a public/private partnership with the planning, financing, construction, and operation of a project. As published in the ROD, FRA concluded that Maglev was an appropriate technology for use in new transportation options in Maryland and Pennsylvania and should be further studied at the project level.

In coordination with MDOT MTA, FRA prepared and circulated a DEIS in 2003, for a Maglev project linking Union Station in Washington, D.C., BWI Marshall Airport Station and downtown Baltimore. The DEIS documented project needs, including transportation demand, regional economic growth, and reducing corridor congestion. The DEIS also documented feasible mitigation measures for the environmental impacts and the benefits of the project alternatives.

The 2001 PEIS and 2003 DEIS considered German Transrapid, Inc technology, which is an early form of Maglev technology and different from the Japanese SCMAGLEV technology evaluated in this DEIS. The Japanese SCMAGLEV technology is a more current technology, and its use has been successfully demonstrated in multiple places in the world.

1.2.2 Northeast Corridor (NEC) FUTURE Program

In 2012, FRA launched the Northeast Corridor (NEC) FUTURE program to consider the role of rail passenger service along the 457-mile NEC rail line between Washington, D.C. and Boston, MA. The NEC is the rail transportation spine of the Northeast and the most heavily utilized rail network in the United States. The NEC FUTURE Environmental Impact Statement (EIS) included an evaluation of current and future transportation demands and the appropriate level of investment in capacity improvements for the NEC. Through the NEC FUTURE program, FRA identified a long-term vision and investment strategy for the NEC. The Selected Alternative resulting from that process is documented in the ROD for the NEC FUTURE program (July 2017).

The Selected Alternative includes proposed improvements to the existing NEC between Washington, D.C. and Baltimore, MD. Improvements included increased frequencies for

¹ A programmatic EIS evaluates broad, planning-level decisions that may cover a range of individual projects, implementation of projects over a long-time frame and/or implementation of projects over a large geographic area. A programmatic EIS does not evaluate project-level issues, such as precise footprints or specific design details; these types of detailed evaluations are undertaken in a traditional, project-level EIS.

passenger rail (intercity and regional), new station connections, conflict-free operations by increasing rail capacity, and support for integrated rail network connections to points south and north of the NEC. FRA did not incorporate advanced guideway options or similar new technologies, such as maglev technology, in the alternatives' development process for the NEC FUTURE program. However, the NEC FUTURE program did not preclude such technologies from being studied separately as a future investment in the regional transportation system.

1.2.3 NEPA Process

The NEPA process applies when a project requires Federal funding or approvals (e.g., Federal permits). Through the NEPA process, Federal agencies must consider the impact of their proposed action(s) on the built and natural environment and engage with the public.

For each project subject to NEPA, a "class of action" is determined by the lead Federal agency. The NEPA class of action is determined based on the potential for the project to result in significant impacts and the potential for public controversy. FRA, as the lead Federal agency, determined that the appropriate class of action for the SCMAGLEV Project is an EIS. An EIS requires:

- A NOI to prepare an EIS published in the Federal Register (FR);
- A formal Scoping process, initiated with the NOI, that provides interested parties with an opportunity to provide input on the scope of analysis, the range of alternatives evaluated, and the purpose and need for the Proposed Action;
- An opportunity for the public to review and comment on the DEIS, which may also include a public hearing; and
- The preparation of a Final EIS (FEIS) that incorporates and addresses relevant comments from the DEIS public hearing and comment period and identifies the Preferred Alternative.

Based on the EIS and public comments, a Federal agency may issue a Record of Decision (ROD).

1.2.3.1 Agency Roles and Responsibilities

FRA, as the lead Federal agency is responsible for ensuring that the environmental review process is conducted in accordance with NEPA and all applicable environmental laws. Cooperating Agencies are those agencies that have jurisdiction by law or special expertise with respect to any environmental impact involved in a proposal (or a reasonable alternative). Participating Agencies are those agencies that may have an interest in the proposed project. By agreeing to be either a cooperating or participating agency in the NEPA process, agencies are committing to participate throughout the process and to provide input on things such as methodology, analysis, findings and mitigation. FRA has invited applicable Federal, state, county, and local government regulatory and jurisdictional agencies within the Project Study Area to be cooperating

and participating agencies. Some of the identified agencies with jurisdiction over affected resources or property may require additional approvals to authorize the project. More information on required approvals for each agency is provided in Appendix D.01. Chapter 5, Public Involvement and Agency Coordination provides a list of agencies and their roles.

FRA and MDOT MTA invited a broad range of Federal, state, and local agencies to review and comment on documentation at three key milestones as part of the EIS process: 1) Purpose and Need; 2) Alternatives Retained for Detailed Study; and 3) Preferred Alternative and Conceptual Mitigation. For this DEIS, the FRA has not identified a Preferred Alternative. The FRA will seek input from the public and agencies prior to identifying a Preferred Alternative and conceptual mitigation. Select agencies are considered “Concurring Agencies” and are requested to concur to the decisions made at key milestones. For the SCMAGLEV Project, FRA identified the following concurring agencies: The U.S. Army Corps of Engineers (USACE), U.S. Fish and Wildlife Service (USFWS), U.S. Environmental Protection Agency (USEPA), and the Federal Aviation Administration (FAA) (**see Table 1.2-1**).

Table 1.2-1: Likely Federal Permits and Approvals

Permit/Approval	Responsible Permitting Agency
National Environmental Policy Act – Record of Decision Section 4(f), Department of Transportation Act - Approval	Federal Railroad Administration
Construction at BWI Airport - Permit	Federal Aviation Administration
TBD	Surface Transportation Board
Section 7, Endangered Species Act	U.S. Fish and Wildlife Service
Special Use Permit	National Park Service*
Land-owning Agency	U.S. Department of Agriculture*
Section 404/408, Clean Water Act - Permit	U.S. Army Corps of Engineers
Coordination/Land-owning Agency	National Security Agency/Fort George Meade (U.S. Army)
Coordination/Land-owning Agency	National Aeronautics and Space Administration
Land-owning Agency	U.S. Secret Service/James J. Rowley Training Center
Land-owning Agency	General Services Administration
Coordination/Land-leasing Agency	U.S. Department of Labor/Woodland Jobs Corps Center
Coordination	National Capital Planning Commission

*Denotes where a Congressional Act may also be required to authorize agency action.

1.3 Scope of this Document

This DEIS is presented in two volumes:

Main Body

- A detailed Purpose and Need (Chapter 2, Purpose and Need) for the SCMAGLEV Project.
- An overview of the alternatives' development process and definition of the No Build and Build Alternatives evaluated in this DEIS (Chapter 3, Alternatives Considered).
- A description of the existing conditions, potential effects of the Alternatives Considered, and mitigation strategies to address adverse effects (Chapter 4, SCMAGLEV Project Affected Environment, Environmental Consequences and Mitigation).
- A summary of public and agency involvement through the publication of this DEIS (Chapter 5, Public Involvement and Agency Coordination).

Appendices

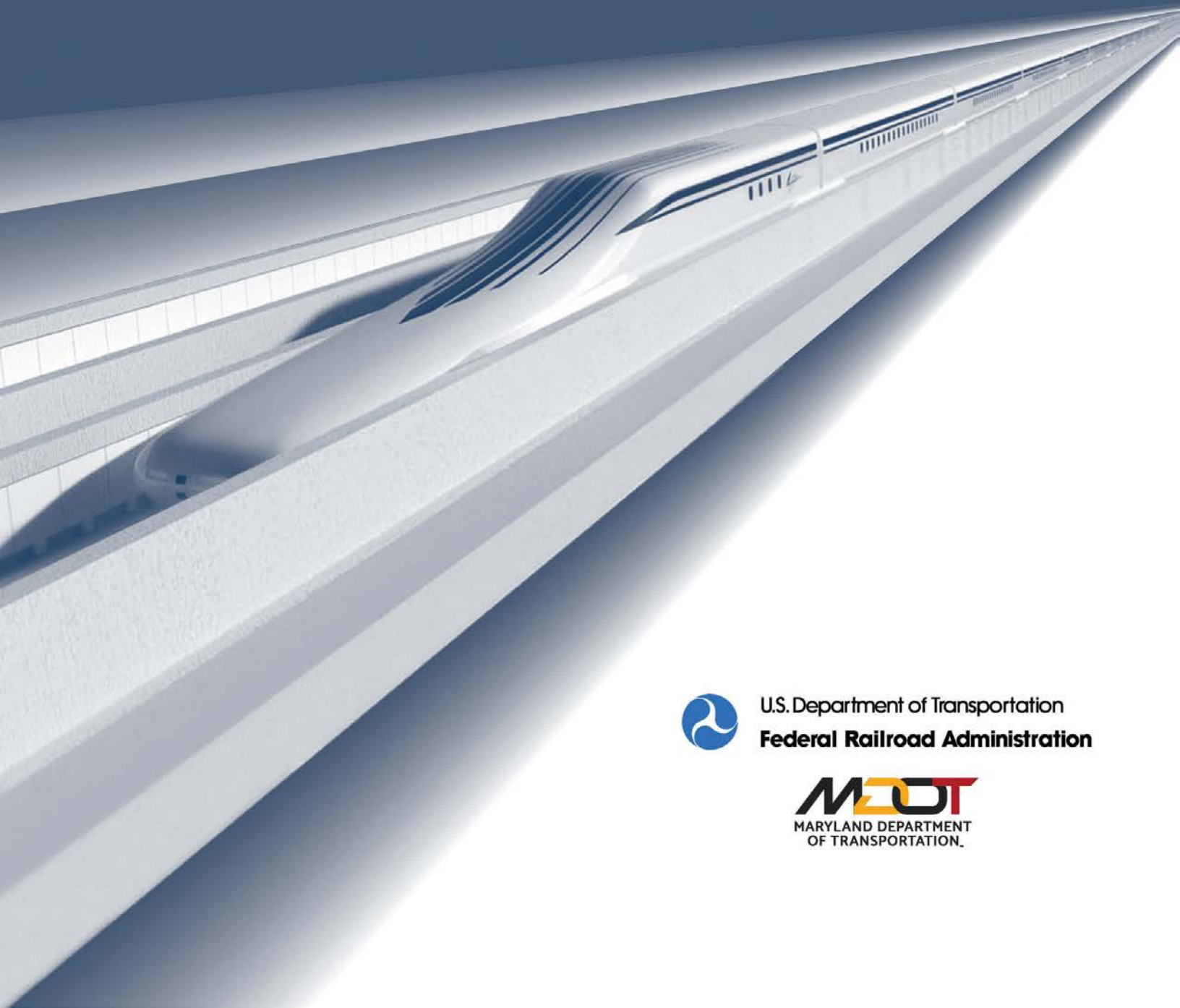
- List of Acronyms, Glossary of Terms, References, and List of Preparers (Appendix A)
- A mapping atlas (Appendix B)
- Supporting Alternatives Development (Appendix C)
- Chapter 4 Supporting Technical Documents and Mapping (Appendix D)
- Agency Correspondence and Outreach Documentation (Appendix E)
- A Draft Section 4(f) Evaluation (Appendix F)
- The Preliminary Engineering and Design Specifications of the Build Alternatives. (Appendix G)

Chapter 2

Purpose and Need

BALTIMORE-WASHINGTON SUPERCONDUCTING MAGLEV PROJECT

DRAFT ENVIRONMENTAL IMPACT STATEMENT AND
SECTION 4(f) EVALUATION



U.S. Department of Transportation
Federal Railroad Administration



Chapter 2: Purpose and Need

As discussed in Chapter 1, the Proposed Action includes the construction and operation of a Superconducting Magnetic Levitation Project (SCMAGLEV Project) system between Baltimore, MD and Washington, D.C. The SCMAGLEV Project is a high-speed rail technology that can operate at speeds of over 300 miles per hour on a grade-separated, fixed guideway powered by magnetic forces. The evaluation of the SCMAGLEV technology in the Washington, D.C. to Baltimore corridor is the result of Congressional direction in annual appropriations relating to Maglev technology, and previous studies that have identified this corridor as the location for development of a project under the Maglev Deployment Program (MDP).

Note to reader – this section has been augmented to include any pertinent data that has been updated since the Purpose and Need document was concurred upon in October 2017. All data updates are included for informational and comparative purposes only.

2.1 Project Purpose

The purpose of the SCMAGLEV Project is to evaluate, and ultimately construct and operate, a safe, revenue-producing, high-speed ground transportation system that achieves the optimum operating speed of the SCMAGLEV technology to significantly reduce travel time in order to meet the capacity and ridership needs of the Baltimore-Washington region. To achieve the operational and safety metrics, the SCMAGLEV Project must include:

- Infrastructure, vehicles, and operating procedures required for the SCMAGLEV system.
- An alignment which allows the highest practical speed that can be attained by SCMAGLEV technology at a given location and which avoids the need for reduction in speed other than that imposed by the normal acceleration and braking curves into and out of stations.
- A system that complies with Federal safety requirements.
- Avoidance, minimization, and mitigation of impacts to the human and natural environment.

The objectives of the SCMAGLEV Project are to:

- Improve redundancy and mobility options for transportation between the metropolitan areas of Baltimore and Washington, D.C.
- Provide connectivity to existing transportation modes in the region (e.g., heavy rail, light rail, bus, and air).
- Provide a complementary alternative to future rail expansion opportunities on adjacent corridors.

- Support local and regional economic growth.

2.2 Project Need

In 2005, Congress passed the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU), authorizing funding to study magnetic levitation transportation projects (Section 1307 of the SAFETEA-LU Act (P.L. 109-59, 2005). The Federal Railroad Administration (FRA) identified the Baltimore-Washington corridor as the location for FRA's evaluation of a magnetic levitation (Maglev) project due to the area's high level of congestion, economic importance, increased development, and the need for connectivity between the two cities. The SCMAGLEV Project is needed to address the following transportation issues and challenges:

- Increasing population and employment: The Baltimore-Washington region makes up one of the largest and densest population centers in the United States. Between 2015 and 2040, the population in this region is projected to increase 20 percent along with an approximately 25 percent increase in employment workforce.¹ Since publication of the Purpose and Need, MWCOG has updated their forecast to Round 9.1². As of December 2020, the population in this region is projected to increase 23 percent between 2015 and 2045, along with a 33 percent increase in employment workforce.
- Growing demands on the existing transportation network: Travel demand will continue to increase in the Project Study Area along major roadways and railways, including Interstate 95 (I-95), the Baltimore-Washington Parkway (BWP), MD 295, I-295, US 29, US 1, and the Northeast Corridor (NEC).
- Inadequate capacity of the existing transportation network: All of the major roadway corridors between Baltimore and Washington, D.C. include roadway segments that operate at level of service (LOS) E/F (heavy congestion) or LOS F (severe congestion) during AM and PM peak hours. Heavy congestion within the peak AM and PM hours is likely to spill over to non-peak hours because travelers shift their departure times to avoid peak period congestion. With the increased demand on the roadway network, the number of severe congestion segments is projected to increase.³

Likewise, the Northeast Corridor FUTURE (NEC FUTURE) Tier 1 Final Environmental Impact Statement (FEIS) documented the increasing demand for improved rail service between Baltimore and Washington, D.C. The FEIS also demonstrated that multiple

¹ 2015 to 2040 population and employment forecasts are based on the Baltimore Metropolitan Council (BMC) Round 8A Forecast and Metropolitan Washington Council of Governments (COG) Round 9.0 Cooperative Forecasts

² 2015 to 2045 population and employment forecasts are based on the BMC Round 9 Forecast and Metropolitan Washington COG Round 9.1 Cooperative Forecasts.

³ Maryland Department of Transportation, State Highway Administration. (January 2015). [Congestion Assessment Maps](#). These county wide maps show levels of congestion on all major state roadways in Maryland, on an average weekday, during the AM and PM peak hours.

portions of the NEC, including those in the Project Study Area, are experiencing congestion and delays due to capacity constraints and maintenance activities.

- Increasing travel times: According to the 2015 Maryland State Highway Mobility Report, 14 of the 30 most unreliable roadway segments in Maryland are located between Baltimore and Washington, D.C. These segments experience travel time delays totaling more than 50 minutes per trip between Baltimore and Washington.⁴

Transit travel time between Baltimore and Washington, D.C. is more consistent than vehicular travel based on scheduling and the dedicated transit right-of-way (ROW). However, emergency repairs, deferred maintenance, and heavy use of the NEC have affected on-time performance.⁵ Bus service in the corridor, specifically Metrobus B30 from Greenbelt Metrorail Station to Baltimore-Washington International Thurgood Marshall Airport Station (BWI Marshall Airport Station), has less consistent travel times, related to congestion issues along the BWP.⁶

For transit and airport users, trips to and from transit stations, park and ride lots, or airports are also impacted by travel time delays. As congestion on the roadway network increases, transportation planners expect the total travel time for all modes to increase.

- Decreasing mobility: The increase in demand, travel time delays, and worsening levels of service directly impact the reliability of transportation options and the mobility of travelers within the Baltimore-Washington region.
- Maintaining economic viability: The Baltimore-Washington area is an important economic engine in the Mid-Atlantic region. Improvements to the transportation network would help support the predicted population and employment growth and sustain the economic health of the region.

2.2.1 Increasing Population and Employment

The increasing population and employment, as well as tourism, will have a direct effect on increasing traffic congestion levels and transportation demand in the Baltimore-Washington region. The Baltimore-Washington region is comprised of two Metropolitan Planning Organizations (MPOs), the National Capital Region Transportation Planning Board (TPB) and the Baltimore Regional Transportation Board (BRTB). The Metropolitan Washington Council of Governments (MWCOG) and Baltimore Metropolitan Council (BMC) staff and coordinate the TPB and BRTB, respectively.

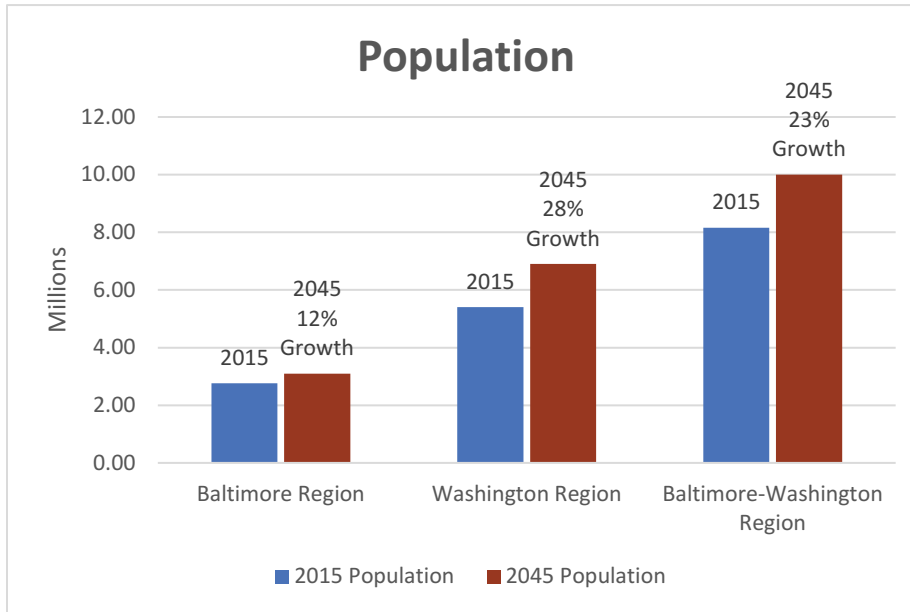
⁴ Maryland Department of Transportation, State Highway Administration. (December 2015). [Maryland State Highway Mobility Report](#).

⁵ AMTRAK. (September 2015). [AMTRAK: Top Management and Performance Challenges – Fiscal Year 2016 and Beyond](#) and [AMTRAK: Top Management and Performance Challenges for Fiscal Year 2021](#)

⁶ Washington Metropolitan Area Transit Authority. (May 2011). Metrobus Service Evaluation Studies 2011: Display Boards for Public Meetings.

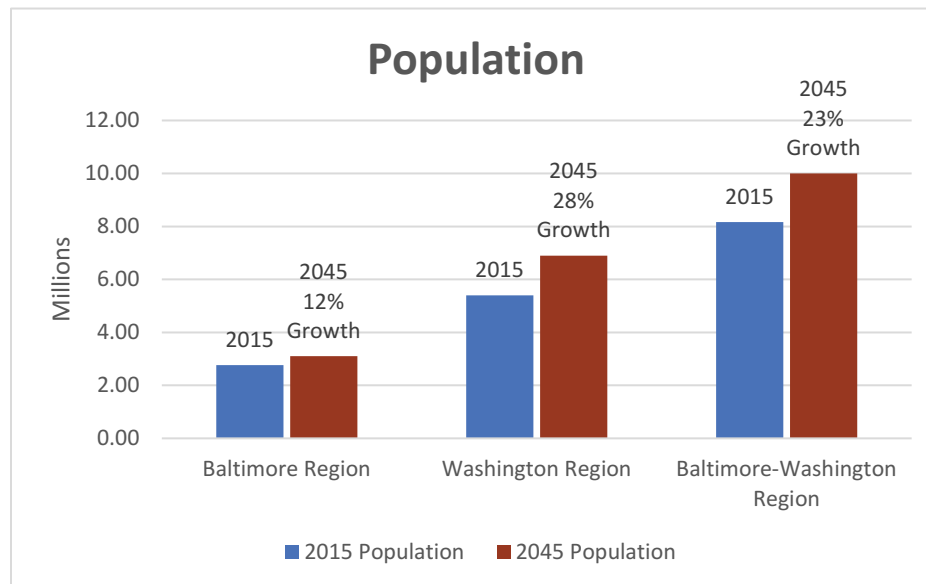
Figures 2.1-1 and 2.1-2 forecast growth in population and employment in the Baltimore-Washington area between 2015 and 2045. Population growth rates range from 12 percent in the Baltimore region to 28 percent in the Washington region.⁷ Employment growth rates range from 28 percent in the Baltimore region to 35 percent in the Washington region.

Figure 2.1-1: Population



Source: BMC Round 9 Forecast and Metropolitan Washington COG Round 9.1 Cooperative Forecasts

Figure 2.1-2: Employment



Source: BMC Round 9 Forecast and Metropolitan Washington COG Round 9.1 Cooperative Forecasts

⁷ 2015 to 2045 population and employment forecasts are based on the BMC Round 9 Forecast and Metropolitan Washington COG Round 9.1 Cooperative Forecasts.

The continued growth in population and employment in the Baltimore-Washington region can be attributed to the presence of many diverse and stable employers, and the highest concentration of Federal Government civilian employment in the country.⁸ Washington, D.C., the Nation's Capital, is the seat of the Federal Government, and contains a myriad of supporting services and agencies. In addition, the Baltimore-Washington region is home to dozens of major industries in different sectors, including, but not limited to, higher education, health care, information technology and defense, retailers and distributors, finance and insurance, manufacturers, transportation, wholesale and utilities.

There are also several active and/or planned major development and redevelopment projects in the Baltimore-Washington region. The Washington, D.C. Economic Partnership⁹ estimates more than \$11.8 billion worth of projects are under construction in Washington, D.C. and an additional \$34.8 billion worth of projects are planned to be completed by 2020. A 2019-2020 update performed by the D.C. Economic Partnership now estimates \$13.9 billion worth of projects under construction in Washington, D.C. and an additional \$36.6 billion worth of projects in the near-term (2019) and long-term (2022 and beyond) planning pipeline.¹⁰ For example, northern Prince George's County, within the Project Study Area, is attracting new development, particularly in College Park, Laurel, and Bowie. One such development is the University of Maryland Research Park (now known as the Discovery District) located in College Park. When complete, it will be the largest research park in the state and one of the largest in the country.

Development activities in the Baltimore portion of the Project Study Area include, but are not limited to, the Penn Station redevelopment, Port Covington redevelopment, expansion of the Port of Baltimore, and various projects at BWI Marshall Airport. Similarly, Fort George G. Meade in Anne Arundel County continues to expand and could add an additional 3,000 jobs by 2020.¹¹

Tourism is a significant driver of the economy in both the City of Baltimore and Washington, D.C. In Washington, D.C., tourism totaled 21.3 million visitors in 2015 (24.6 million total visitors in 2019 based on updated information¹²), which included two million international travelers (down to 1.8 million in 2019), most of whom utilize the three major airports in the region (BWI Marshall Airport, Ronald Reagan Washington National Airport, and Washington Dulles International Airport). According to the Washington, D.C., Economic Partnership, 2015 was the sixth consecutive year of record-level visitation to the Nation's Capital (according to the update, 2019 is the tenth consecutive year of record-level visitation). In Baltimore, tourism totaled 25.2 million visitors in 2015, according to the *Visit Baltimore Annual Report*.¹³ Annual tourism in

⁸ Economic Alliance of Greater Baltimore. (2012). [Statistics for Government: Federal, State & Local](#).

⁹ Washington D.C. Economic Partnership. (2016). *Washington, DC Development Report*

¹⁰ Washington D.C. Economic Partnership. [2019-2020 DC Development Report](#).

¹¹ Maryland Department of Business and Economic Development. (April 2014). [BRAC and Related Jobs Summary](#).

¹² Washington, D.C. Visitor Research available at www.washington.org.

¹³ Visit Baltimore. (Fiscal Years 2016 and 2017). [Visit Baltimore Annual Report & Business Plan](#).

Baltimore has increased by 2.9 million visitors since 2012. The 2019-2020 annual report notes 26.7 million visitors in 2018, an increase of 14.6 percent since 2012.¹⁴

As a result, a need exists for additional transportation capacity in the Project Study Area.

2.2.2 Growing Demand on the Existing Transportation Network

The Project Study Area includes major transportation facilities that are currently operating at or near capacity.¹⁵ Interstate 95 between the Baltimore Beltway (I-695) and the Capital Beltway (I-495) is one of the most travelled sections of highway in the country. Other major parallel roadway corridors include the BWP, MD 295, US 1, and US 29. In 2014, various segments of I-95 and the BWP ranked within the top ten bottleneck locations in Maryland. As of the 2018 MDOT SHA Mobility Report update, these segments remain “some of the most congested freeways/expressway sections (average weekday)”.¹⁶ Transit passengers in the corridor are served primarily by the NEC, which includes both Amtrak for regional travel and Maryland Area Regional Commuter (MARC) for intercity and local service. In addition, MDOT MTA operates commuter bus service from several destinations throughout the Baltimore-Washington corridor. The BWI Marshall Airport – also located within the corridor – is the 22nd busiest US airport, based on passenger boarding¹⁷. Subsequent sections describe the demand for each mode.

2.2.2.1 Roadway Network

The State of Maryland is ranked first in the nation in terms of longest commuting times of 32.5 minutes each way, according to the 2016 U.S. Census American Community Survey. Washington, D.C., which includes many Maryland commuters, is fourth in the nation with commuting times on average of 29.9 minutes each way. American Community Survey 2019 data indicates Maryland is ranked second in the nation at 33.7 minutes each way (note that while the ranking has moved down, the commuting time has increased), and Washington, D.C. is still ranked fourth at 31.7 minutes each way.

In 2014, the Washington, D.C. area was ranked as the most congested metropolitan area in the country for yearly delay per auto commuters, according to the Texas Transportation Institute’s 2015 Urban Mobility Scorecard.¹⁸ The Baltimore metropolitan area was also ranked among the 25 most congested areas. According to the 2019

¹⁴ Visit Baltimore. (Fiscal Years 2019 and 2020). [FY2019-2020 Visit Baltimore Annual Report & Business Plan](#).

¹⁵ Maryland Department of Transportation, State Highway Administration. (December 2015). [Maryland State Highway Mobility Report](#).

¹⁶ Maryland Department of Transportation, State Highway Administration. (2019). [Maryland State Highway Mobility Report](#).

¹⁷ 2019, [FAA Airports ACAIS data](#).

¹⁸ Sharnk, D., Eisele, B., Lomax, T., & Bak, J. (August 2015). [2015 Urban Mobility Scorecard](#). Published jointly by The Texas A&M Transportation Institute and INRIX.

Urban Mobility Scorecard, the Washington, D.C. area is now ranked as the third-most congested metropolitan area in the country.¹⁹

On average, an automobile commuter in the Washington, D.C. metropolitan area spends 63 hours per year in traffic, incurring \$1,433 in additional annual expenses, including the cost of 35 gallons in excess fuel. This translates to \$4.5 billion of annual cost due to congestion, more than 100 million gallons of excess fuel, and associated emissions and air quality degradation. The 2019 report indicates an automobile commuter in the Washington, D.C. metropolitan area spends 102 hours per year in traffic, incurring \$2,015 in additional annual expenses, including the cost of 38 gallons in excess fuel. This translates to \$5.0 billion of annual cost due to congestion, more than 89 million gallons of excess fuel.

In the Baltimore region, the 2015 Urban Mobility Scorecard¹⁸ (conducted by the Texas A&M Transportation Institute and INRIX) estimates the annual cost due to congestion at more than \$2 billion. The 2019 Urban Mobility Report¹⁹ states that the cost of congestion in the Baltimore region is \$1.9 billion.

Maryland roadways in the Baltimore-Washington region have some of the highest traffic volumes in the state and these volumes, along with crashes, have increased in the last 25 years.¹² The growth in vehicle miles traveled (VMT) in the area is surpassing the ability of state agencies to improve or expand the roadway network. The 2015 *Maryland State Highway Mobility Report*¹⁵ notes that the 2014 VMT for the Baltimore region was 25.2 billion vehicle miles, and for the Washington region it was 19.2 billion vehicle miles. VMT for the Washington region is lower than the Baltimore region due to higher transit usage and more modal options. The Mobility Report also notes that many sections of the highways between Washington and Baltimore have heavy to severe congestion, especially in the afternoon peak period. According to the 2019 *Maryland State Highway Mobility Report*¹⁶, the total VMT of Maryland roadways was 59.6 billion in 2018.

In addition, roadway congestion in the region is so severe, MDOT SHA is currently investigating Public-Private Partnership (P3) opportunities to expand capacity on the Capital Beltway and I-270 as part of the *I-495 & I-270 Managed Lanes Study*.

2.2.2.2 Rail and Transit Network

The NEC runs parallel to I-95 in the Project Study Area. It is the busiest rail network in the U.S., with trains carrying passengers and goods north and south through Boston, New York City, Philadelphia, Baltimore, Washington, D.C., and beyond. Amtrak, MARC, CSX and Norfolk Southern Railway all compete for track usage on the NEC. According to the 2010 NEC Infrastructure Master Plan prepared by the NEC Master Plan Working Group, almost half of the passenger rail segments on the NEC from Boston to Washington, D.C. exceed 75 percent of practical capacity, and the plan estimates that

¹⁹ Sharnk, D., Eisele, B., & Lomax, T. (August 2019). [2019 Urban Mobility Report](#). Published jointly by The Texas A&M Transportation Institute and INRIX.

by 2030, passenger rail between Baltimore and Washington, D.C. could realize capacity utilization higher than 100 percent.²⁰

Amtrak Service

Amtrak, which owns the NEC, operates intercity passenger rail service on the corridor and has long-term lease agreements with MDOT MTA for operation of MARC commuter rail service and with CSX and the Norfolk Southern Railway for operation of freight rail service on portions of the NEC. Each of these services competes for operational times for service in the corridor, and the demand for additional transit and freight service continues to increase.

The Washington, D.C. region will have approximately 18 million annual regional rail trips, while the Baltimore region will have 4.6 million regional trips in 2040.²¹ Anticipated Amtrak intercity ridership between Baltimore and Washington, D.C. for 2040 is projected to be 167,800 annual passenger rail trips.

Today, Amtrak provides weekday service southbound from Penn Station in Baltimore to Union Station in Washington, D.C., with 12 trains in the AM and 26 trains in the PM. Amtrak provides weekday service northbound from Union Station to Penn Station with 18 trains in the AM and 20 trains in the PM. On weekends, Amtrak provides service between Penn Station and Union Station with 26 trains each direction on Saturday and 28 trains in each direction on Sunday. As of 2020, the weekday Amtrak schedule now shows five southbound trains in the AM and 14 southbound trains in the PM, which could be a COVID-19 related reduction in service due to changes in demand. Amtrak services include both local and limited stop trains between Penn and Union Stations. The implications of COVID-19 on the existing transportation system have been evolving and are anticipated to continue into the future. At present, this has resulted in reduced daily train schedules. A number of initial predictions regarding the long-term impacts of COVID-19 on the transportation system have been made and continue to be made, but there is not yet a consensus regarding those long-term impacts.

On-time performance is becoming more challenging on the NEC. Endpoint on-time performance for 2016 for the Northeast Regional and Acela Express service was 82 percent and 83 percent, respectively. As noted earlier, the deferred maintenance and heavy usage of the infrastructure continues to cause degradation and emergency repairs to become more common. Train interference from freight, commuter, and other Amtrak trains cause approximately 27.5 percent of delays on the Northeast Regional service. Approximately 32 percent of delays on the Acela Express service are related to

²⁰ The NEC Master Plan Working Group consisted of FRA, Amtrak, 12 northeast states, and the District of Columbia. [Northeast Corridor Infrastructure Master Plan](#).

²¹ US Department of Transportation, Federal Railroad Administration. (December 2016). [NEC FUTURE: A Rail Investment Plan for the Northeast Corridor. Tier 1 Final Environmental Impact Statement](#).

problems with railroad infrastructure, including tracks or signals, or delays associated with maintenance or reduced speeds to allow for safe operations.²²

According to the NEC FUTURE FEIS Purpose and Need, rail and track infrastructure has fallen short of the improvements necessary to maintain system reliability and meet growing demand. Intercity and commuter rail service quality is constrained by numerous state-of-good-repair needs throughout the NEC, including the following critical infrastructure needs identified in the Washington, D.C. - Baltimore segment: Washington Union Station Improvements; Ivy City Yard Facilities Renewal/Service & Inspection Expansion; Grove to Hanson Fourth Track; BWI Marshall Airport Station Improvements and Fourth Track; and Baltimore and Potomac (B&P) Tunnel Replacement.

Freight Service

One of the busiest CSX freight lines runs through the Project Study Area, parallel to the NEC corridor. This line carries freight from the west and south to terminals in Baltimore, Philadelphia, and New York. The volume of freight is expected to grow due to the expansion of the Panama Canal in July 2016 and the ability of Panamax container ships to access the Port of Baltimore.²³ As freight volumes along this CSX line grow, the corridor uses additional capacity by occupying the tracks between Baltimore and Washington, D.C.

MARC Service

MARC commuter trains share the NEC with Amtrak passenger rail and freight operations. In 2014, the Baltimore Metropolitan Council estimated MARC commuter rail would serve 9.2 million riders.²⁴ MDOT MTA estimates expected growth to be in line with historic trends. Current growth over the past 10 years has been 23 percent and that includes the addition of weekend service and extra trains. Additionally, the MARC Penn line (NEC) continues to grow at about 3 percent per year, and the other two lines (Camden and Brunswick) are growing at lower rates; hence, the overall average is below 3 percent.

MDOT MTA expects at least 70 percent of all MARC system stations to be at capacity by 2025.²⁵ MARC currently provides weekday service southbound on the NEC from Penn Station in Baltimore to Union Station in Washington, D.C. with 15 trips in the AM and 12 trips in the PM, and service northbound from Union Station to Penn Station with

²² AMTRAK. (February 2017). Amtrak Train Route On-Time Performance. Retrieved March 2017 from <https://www.amtrak.com/historical-on-time-performance>.

²³ Maryland Port Administration. (July 2016). [State Officials Welcome First Big Container Ship to Arrive at Port of Baltimore through the Newly Expanded Panama Canal](#).

²⁴ The Baltimore Metropolitan Council. (October 2015). [The Transit Question: Baltimore Regional Transit Needs Assessment](#).

²⁵ Maryland Department of Transportation, Maryland Transit Administration. *MARC Growth and Investment Plan Update 2013 to 2050*. Retrieved March 2017 from https://mta.maryland.gov/sites/default/files/mgip_update_2013-09-13.pdf.

11 trips in the AM and 17 trips in the PM. On weekends, MARC provides service between Penn Station and Union Station with nine trains in each direction on Saturday and six trains in each direction on Sunday. As noted previously, the implications of COVID-19 on the existing transportation system have been evolving and are anticipated to continue into the future. Initial impact predictions have been made, but there is not yet a consensus regarding those long-term impacts.

Because of the high volume of Amtrak trains, the number of MARC trips that can be provided on the NEC is limited without additional capacity improvements. These capacity constraints mean that the number of MARC trips will remain stagnant even as demand for MARC service grows.

MARC also currently provides weekday service on the Camden Yards Station Line southbound from Camden Yards Station to Union Station with six trains in the AM and four trains in the PM. MARC provides weekday service northbound from Union Station to Camden Yards Station with four trains in the AM and six trains in the PM. COVID-19 has and may continue to affect service at the time of publication of this document. There are no current estimates on when service will return to full function.

The MARC Camden line service utilizes the CSX line parallel to the NEC corridor in the two peak periods, but because of heavy CSX freight volumes, expansion of the MARC service on this line to relieve pressure on the NEC corridor is not currently feasible.

Regional Transportation Agency of Central Maryland

The Regional Transportation Agency of Central Maryland (RTA) provides transit services to the jurisdictions of Anne Arundel County, Howard County, northern Prince George's County and the City of Laurel. Services include bus service to and from BWI Marshall Airport Station.

MDOT MTA Commuter Bus Service

MDOT MTA provides commuter bus service within the Baltimore-Washington region. In 2015, this service had an approximate annual ridership of 4.0 million²⁶; and between 2006 and 2015, experienced a 26 percent growth. The increase in ridership is an indicator of the demand for transportation choices in the Baltimore-Washington corridor. However, buses must operate in mixed traffic and experience the same congestion factors as cars. According to MDOT MTA, annual ridership in 2019 was 3.6 million, which is slight reduction from 2015. COVID-19 has, and may continue to, affect service at the time of publication of this document.²⁷ There are no current estimates on when service will return to full function nor how it may impact ridership.

²⁶ Maryland Department of Information Technology, Open Data Portal. (November 2016). [Total MDOT MTA Public Transit Ridership by Fiscal Year](#).

²⁷ Maryland Department of Transportation, Maryland Transit Administration. [MDOT MTA Performance Improvement](#).

WMATA Services

The Washington Metropolitan Area Transit Authority (WMATA) provides bus service, the B30 line, between the Greenbelt Metrorail Station and BWI Marshall Airport Station. In 2014, this service had an approximate average weekday ridership of 444²⁸; and between 2011 and 2014, experienced a 33 percent reduction in average daily ridership.²⁹ The decrease in ridership is likely an indicator of long travel times and delays experienced by buses running in heavy traffic on the BWP and MD 295 corridors. These conditions result in the need for more reliable transportation choices in the Baltimore-Washington corridor. The 2019 data shows 186 daily ridership, between 2011 and 2019 ridership decreased from 765 riders to 186 riders each day (76 percent reduction).²⁶

WMATA Metrorail does not extend to the BWI Marshall Airport Station or Baltimore. However, commuters could use Metrorail to get to a SCMAGLEV station in Washington D.C. or to travel to Greenbelt and New Carrollton Stations and transfer to MARC trains destined to Baltimore and the BWI Marshall Airport Station.

2.2.2.3 Airports

The number of air passengers who begin their trips in the Baltimore-Washington region is at the highest level since 2005.³⁰ Baltimore and Washington, D.C. are major hubs for domestic and international air travel. Three major airports serve the Baltimore-Washington region: BWI Marshall Airport, Ronald Reagan Washington National (Reagan National) Airport, and Washington Dulles International (Dulles) Airport. Travelers must have reliable ground transportation options to and from the airports.

Commercial passenger trips at BWI Marshall Airport increased by 5.5 percent between 2015 and 2016, based on the BWI Marshall Airport summary of air traffic and passenger statistics.³¹ In 2016, BWI Marshall Airport served over 25.1 million commercial passengers (including both enplaned and deplaned passengers), with an average of 68,829 passengers per day. The Federal Aviation Administration (FAA) forecasts upwards of 22.2 million enplanements (number of revenue passengers boarding a plane) in 2045 compared to 12.2 million enplanements in 2016, or an 82 percent growth.³² As the demand for air travel continues to grow at BWI Marshall Airport, there is a need for a reliable transportation network supporting passenger ingress and egress.

²⁸ Washington Metropolitan Area Transit Authority. [WMATA Data Viewer](#).

²⁹ WMATA. (May 2011). Metrobus Service Evaluation Studies 2011: Display Boards for Public Meetings. Published May 2011.

³⁰ National Capital Region Transportation Planning Board. (April 2019). [2017 Washington-Baltimore Regional Air Passenger Survey Geographic Findings Report](#).

³¹ Maryland Department of Transportation, Maryland Aviation Administration. (December 2016). [Monthly Statistical Report Summary for the month of December 2016](#). Maryland Department of Transportation, Maryland Aviation Administration. December 2016. 2015 BWI General Passenger Statistics, Maryland Department of Transportation Maryland Aviation Administration.

³² Federal Aviation Administration. (January 2017). [APO Terminal Area Forecast Detail Report: Forecast Issued January 2017](#). Terminal Area Forecast Summary is available for FY 2019–2045.

The latest numbers show that there has been a 42 percent decrease in passengers at BWI Marshall Airport during the twelve-month period between September 2019 and September 2020.³³

According to the *2014 State of NEC Report*³⁴, the flight delay-per-passenger is 14 minutes at BWI Marshall Airport, 20 minutes at Reagan National Airport, and 23 minutes at Dulles Airport. Flight delays result in economic losses to many groups including airport passengers, operators and owners.

2.2.3 Inadequate Capacity of the Existing Transportation Network

As demand on the existing roadway, transit and rail networks continues to increase, the levels of service of systems that operate near, or above capacity also continue to worsen. Additional infrastructure capacity would improve the LOS.

2.2.3.1 Roadway Network

According to MDOT State Highway Administration's (SHA) 2013 Congestion Assessment Maps³⁵, all four of the main roadway corridors (US 29, I-95, US 1 and BWP) between the Baltimore and Washington, D.C. area experience heavy and/or severe congestion during peak hours. US 29 is a major travel corridor between the Baltimore and Washington, D.C. region. The corridor is located outside the Project Study Area but travel in the corridor is impacted by many of the same factors described for Project Study Area roadways.

2.2.3.2 Rail and Transit Network

As identified by the NEC Commission in 2014, multiple segments of the NEC are experiencing critical infrastructure challenges due to capacity constraints. The NEC FUTURE Selected Alternative, set forth in the NEC FUTURE EIS Record of Decision (ROD) (July 2017), includes infrastructure improvements in Maryland and Washington, D.C. in the Project Study Area that support operations necessary to meet market growth. These projects include chokepoint relief at New Carrollton, Odenton and BWI Marshall Airport stations; new track from New Carrollton to Halethorpe; and the B&P Tunnel replacement. Projects also include Washington Union Station expansion, Odenton station modifications, BWI Marshall Airport Station expansion and high density signaling from Washington, D.C. to New Carrollton and from Seabrook to West Baltimore.

³³ <https://www.bwiairport.com/sites/default/files/Sep2020.pdf>

³⁴ Northeast Corridor Infrastructure and Operations Advisory Commission. (February 2014). [State of the Northeast Corridor Region Transportation System](#).

³⁵ Maryland Department of Transportation, State Highway Administration. (January 2015). [Congestion Assessment Maps](#). These county wide maps show levels of congestion on all major state roadways in Maryland, on an average weekday, during the AM and PM peak hours.

2.2.4 Increasing Travel Time

Travel time between Baltimore and Washington, D.C. continues to increase on the roadways within the Project Study Area, adding to commuting time as well as travel time to and from transit stations and BWI Marshall Airport Station. This increase in travel time is directly related to the degradation in LOS on the transportation network.

2.2.4.1 Roadway Network

According to the 2015 *Maryland State Highway Mobility Report*¹⁵, several segments in the Baltimore-Washington corridor were ranked among the top 30 unreliable segments in Maryland in 2014. This ranking is based on the Travel Time Index (TTI), which represents how much longer, on average, travel times are during congestion compared to free flow conditions. For example, a TTI of 2.0 indicates a trip that takes 10 minutes in light traffic takes twice as long in congested conditions.

Roadways with TTI values between 1.3 and 2.0 experience heavy congestion; and roadways with a TTI higher than 2.0 experience severe congestion. Fourteen of the 30 most unreliable segments in Maryland are located between Baltimore and Washington, D.C. These segments have TTI values greater than 5.0, which represents a significant travel time delay.

Travel times can range from 45 minutes to well over an hour during peak hours for the 30-mile trip from Washington to BWI Marshall Airport Station. Due to non-recurring congestion, (i.e., an unexpected incident) travel times by automobile could range from 90 minutes to two hours. Congested and unreliable roadways also likely result in more congested and unreliable travel during off-peak periods, due to travelers shifting their departure times to avoid peak period congestion.

2.2.4.2 Transit Travel Time

The BMC has estimated that travel from Baltimore to Washington in a single-occupancy vehicle takes, on average, 50.7 minutes. For transit riders driving to existing rail stations, trips to and from the stations add to overall travel time. The mean travel time to work for Baltimore region residents to the Washington region is 83.2 minutes for MARC riders and 71.5 minutes by bus, which includes travel to and from the stations.

2.2.4.3 MDOT MTA Commuter Bus Service

MDOT MTA provides eight commuter bus routes within the Baltimore-Washington area³⁶, which use major roadways such as I-95 and US 29, as well as local roadways. In 2015, the average weekday daily ridership for individual commuter bus routes ranged between 111 and 689 passengers or a total of 5,179 MDOT MTA commuter bus

³⁶ Maryland Department of Transportation, Maryland Transit Administration. (2017). [Maryland Transit Administration Commuter Bus Website](#).

passengers in the corridor on an average weekday.³⁷ COVID-19 has and may continue to affect service at the time of publication of this document and current numbers may rebound, but future ridership is uncertain.

Currently, there are no dedicated busways along major corridors in Maryland. As a result, the travel time of the MDOT MTA service is dependent on the operations of the existing roadway network. As the travel time increases on the roadway network, the efficiency of MDOT MTA commuter service worsens as well.

2.2.4.4 Airports

Based on the results of the Air Passenger Regional Surveys, BWI Marshall Airport continues to have the highest proportion of regional enplanements (compared to Dulles and Reagan National Airports) and experiences record-high passenger volumes.³⁸ As a result, BWI Marshall Airport attracts travelers from throughout the Mid-Atlantic region, most arriving by automobile. For Washington-area passengers seeking to fly out of BWI Marshall Airport and arriving by automobile or bus, travel times could range from 45 minutes to well over an hour. During non-recurring congestion, (i.e., an unexpected incident), travel times from Washington, D.C. to BWI Marshall Airport by automobile sometimes approach 90 minutes or more. Similar to the NEC and MDOT MTA Commuter Bus services, as demand on the supporting transportation network increases, the travel time to and from BWI Marshall Airport is projected to increase.

2.3 Decreasing Mobility

As indicated in the previous sections, the demand on the roadway and transit infrastructure in the Baltimore-Washington corridor will continue to increase. This increase in demand, increase in travel times and decrease in LOS have a direct relationship to the reliability and predictability of travel and mobility within the Baltimore-Washington region.

Given the diverse population and employment needs within the Baltimore to Washington, D.C. corridor, the need for transportation choices is important. With increased demand on the existing transportation network that comprises of a variety of choices exposed to physical, operational and other constraints, mobility in the Baltimore-Washington corridor is jeopardized.

Reliability is often measured by the consistency in travel time between Point A to Point B over time. Even with congestion, travel time that includes consistent and predictable delay helps travelers and commuters make choices and plan their trips. Given the

³⁷ Maryland Department of Transportation, Maryland Transit Administration. (Fiscal Year 2015). Transit Ridership Weekday Averages.

³⁸ Transportation Planning Board. (December 2016). [2015 Washington-Baltimore Regional Air Passenger Survey](#). December 2020 - [2019 MWCOG Washington-Baltimore Regional Air Passenger Survey - General Findings Report](#) (April 2020)

volume and congestion along the major corridors such as I-95, the BWP, MD 295, US 29 and US 1, any incident can contribute to a breakdown of the system, resulting in unreliable and unpredictable estimated travel times, thereby complicating transportation mode decisions.

Capacity chokepoints along the NEC have repercussions throughout the NEC because they limit overall system capacity. Other chokepoints on the NEC include locations where physical constraints, such as geometry, or curvature of the tracks, require reduced-speed operations.

2.4 Maintaining Economic Viability

A direct relationship exists between transportation infrastructure and economic viability. Economic development and growth opportunities are restricted without commensurate transportation improvements and choices in the Baltimore-Washington corridor. A transportation system that provides options for reliable, efficient, and cost-effective movement of passengers and goods is needed to support continued economic growth³⁹, including the retention of, and an increase in jobs in the region.

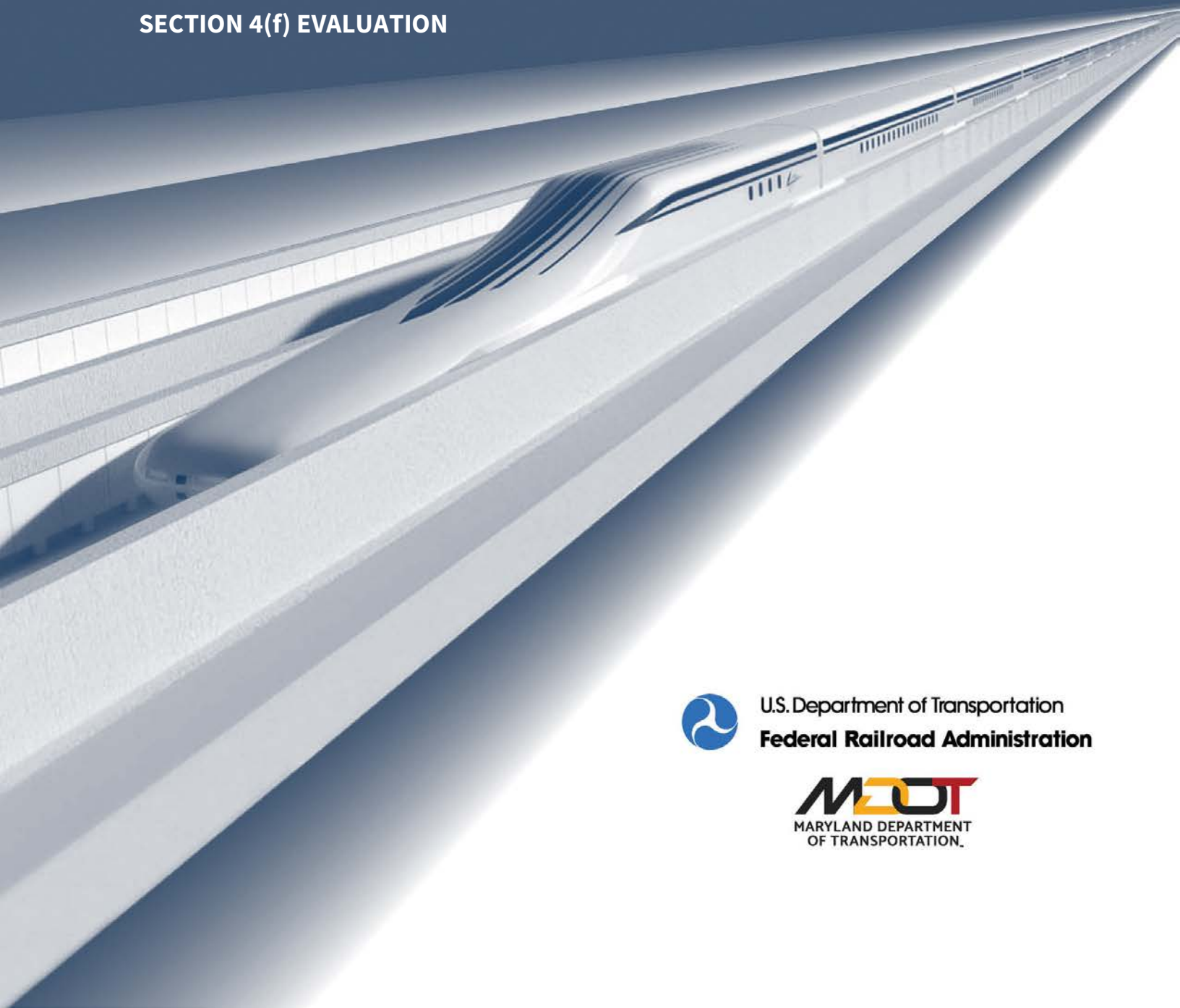
³⁹ The National Economic Council and the President's Council of Economic Advisers. (July 2014). [*An Economic Analysis of Transportation Infrastructure Investment*](#).

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



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.

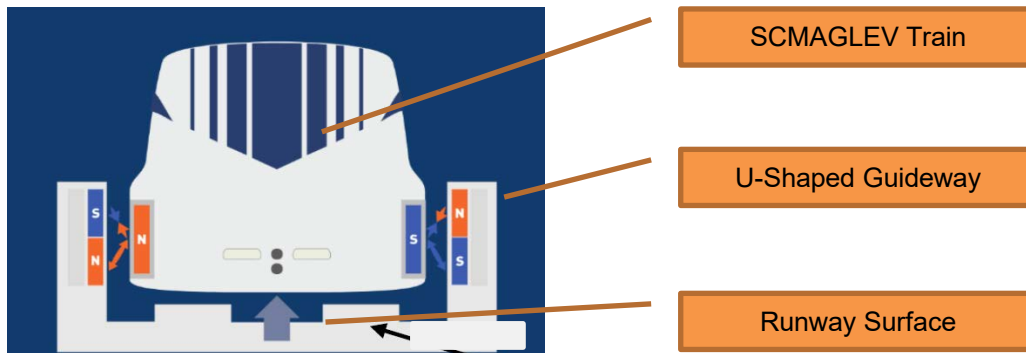
As such, the Build Alternatives focus on the SCMAGLEV technology and related infrastructure, such as stations, trainset maintenance facility (TMF), and other ancillary facilities needed to support the operation of the SMAGLEV system. Additional details regarding the alternatives' evaluation process are 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 transfer 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.

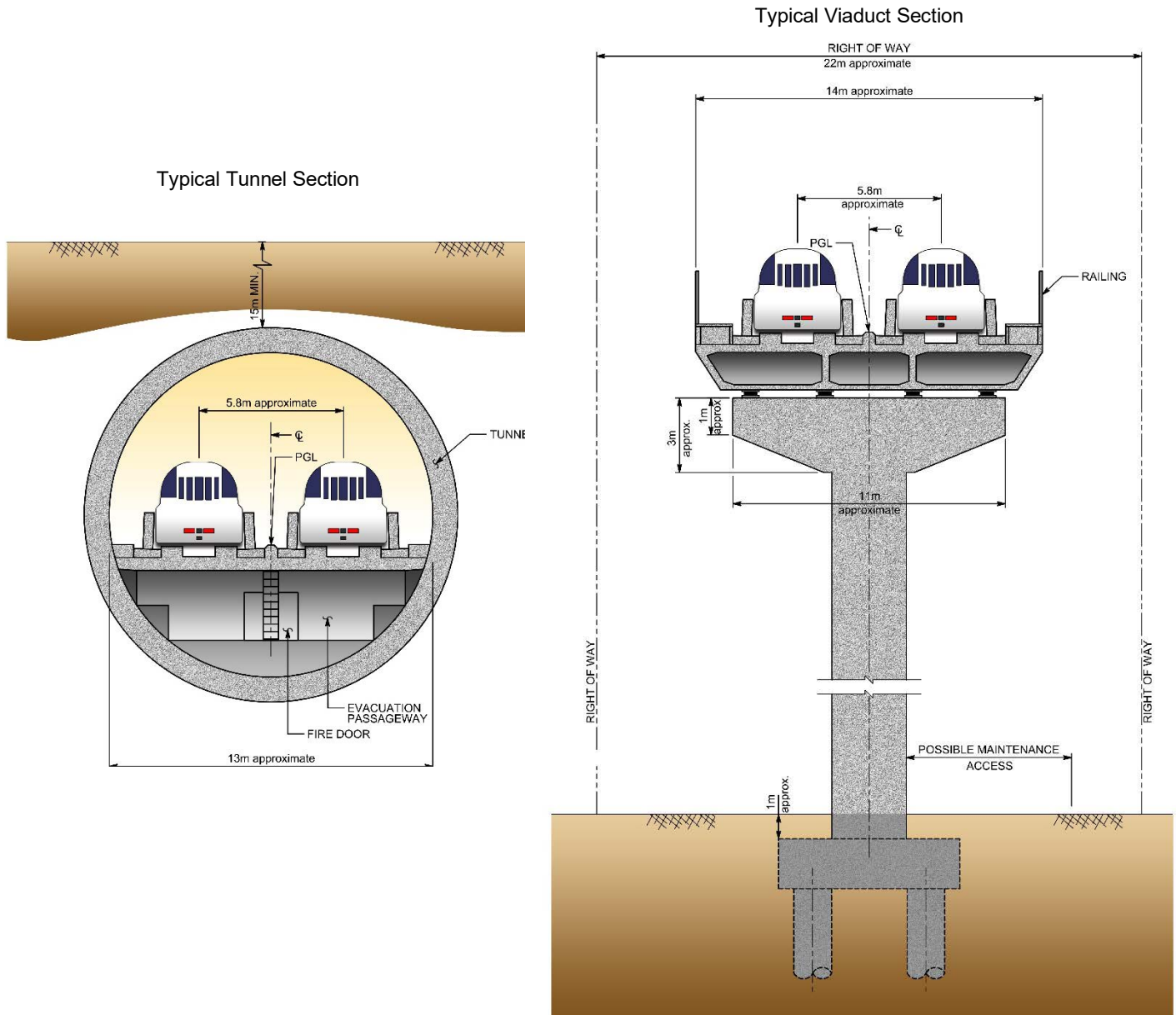
To achieve optimal performance, the Project Sponsor, in coordination with the SCMAGLEV technology owner JRC, has proposed a specific design, which constrains modifications to the overall system. For example, the SCMAGLEV alignment is designed with a certain curvature and geometry, which allows the SCMAGLEV 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 that 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 station 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 sites³. 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

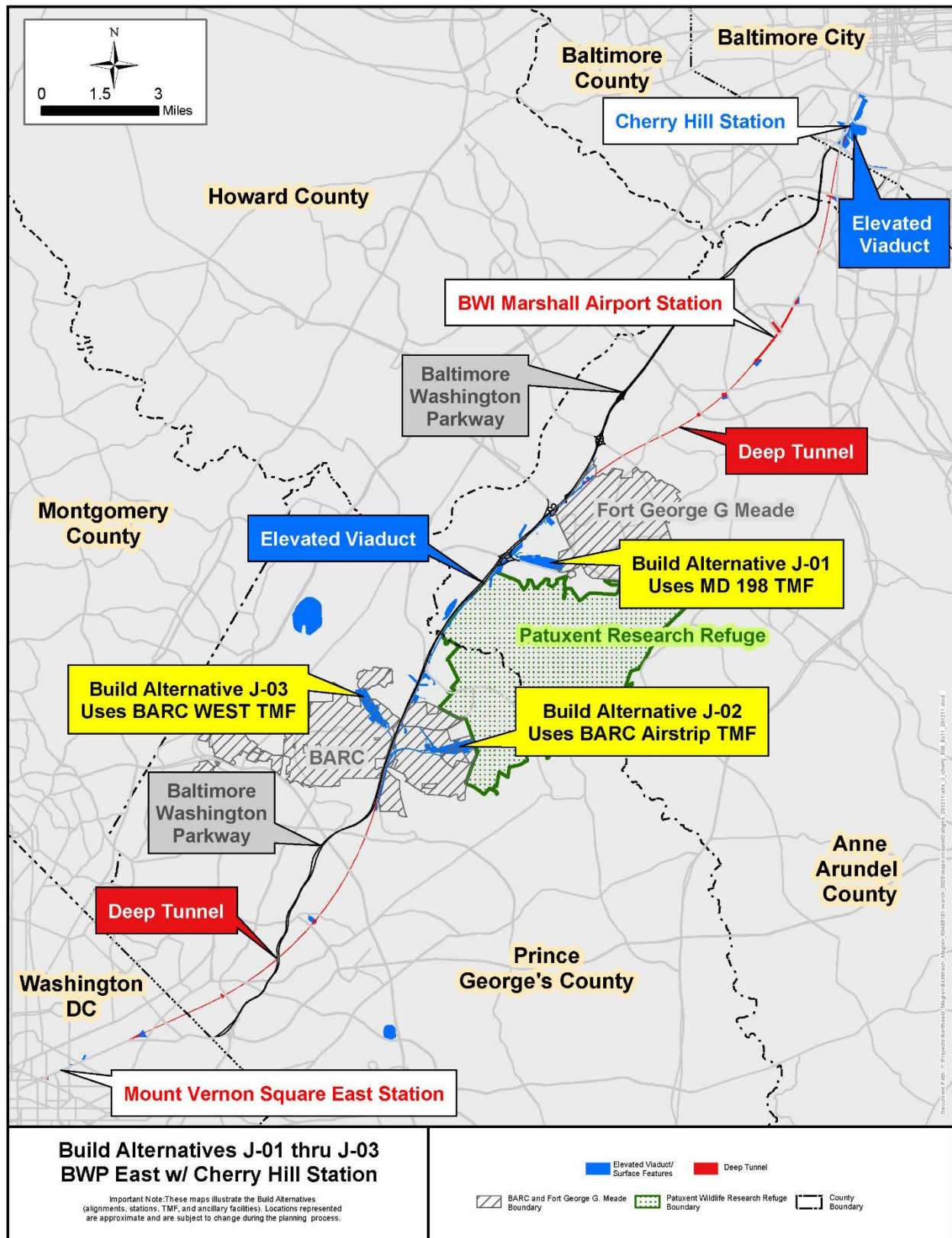


Figure 3.4-2: Build Alternatives J-04 through J-06 – BWP East with Camden Station

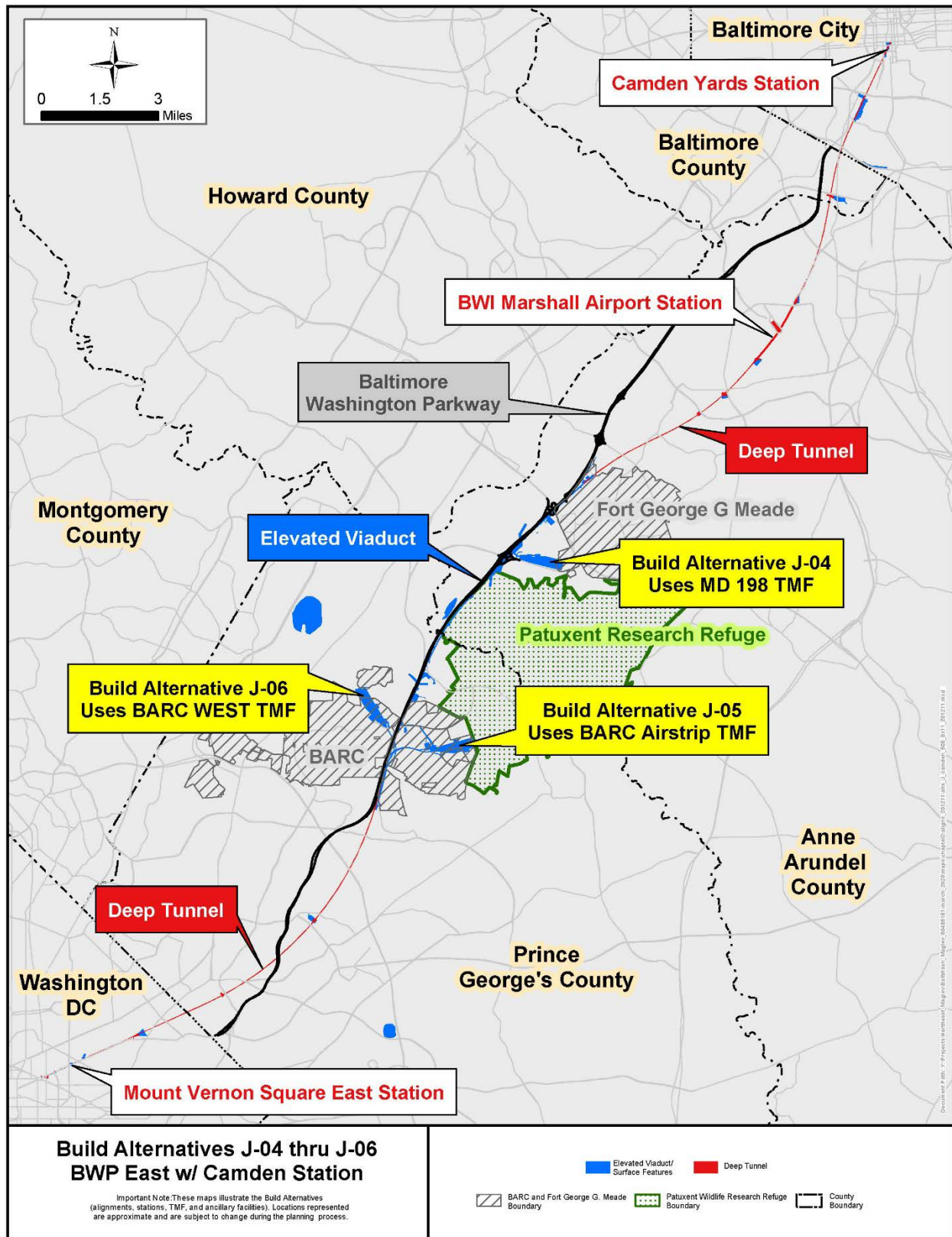


Figure 3.4-3: Build Alternatives J1-01 through J1-03 – BWP West with Cherry Hill Station

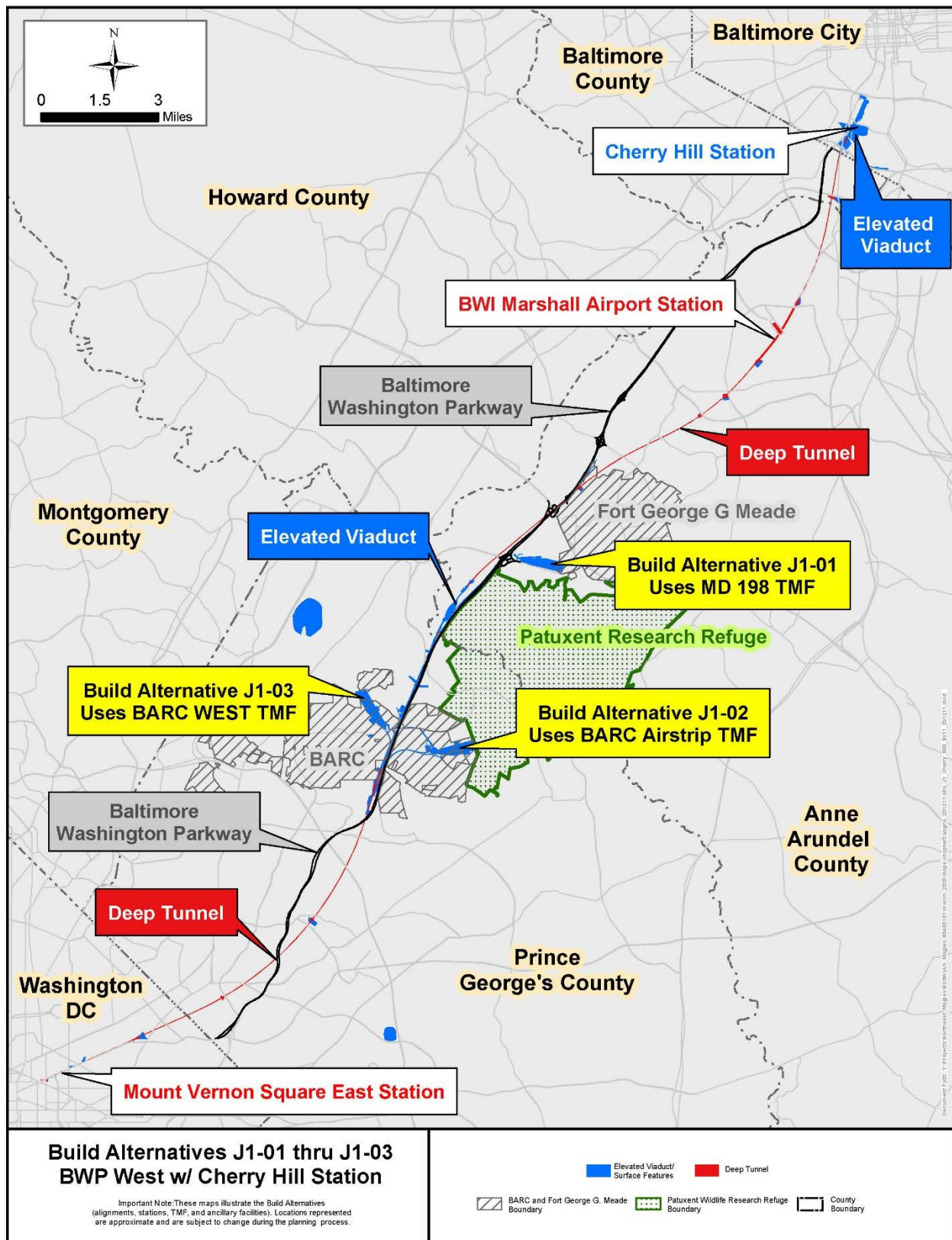
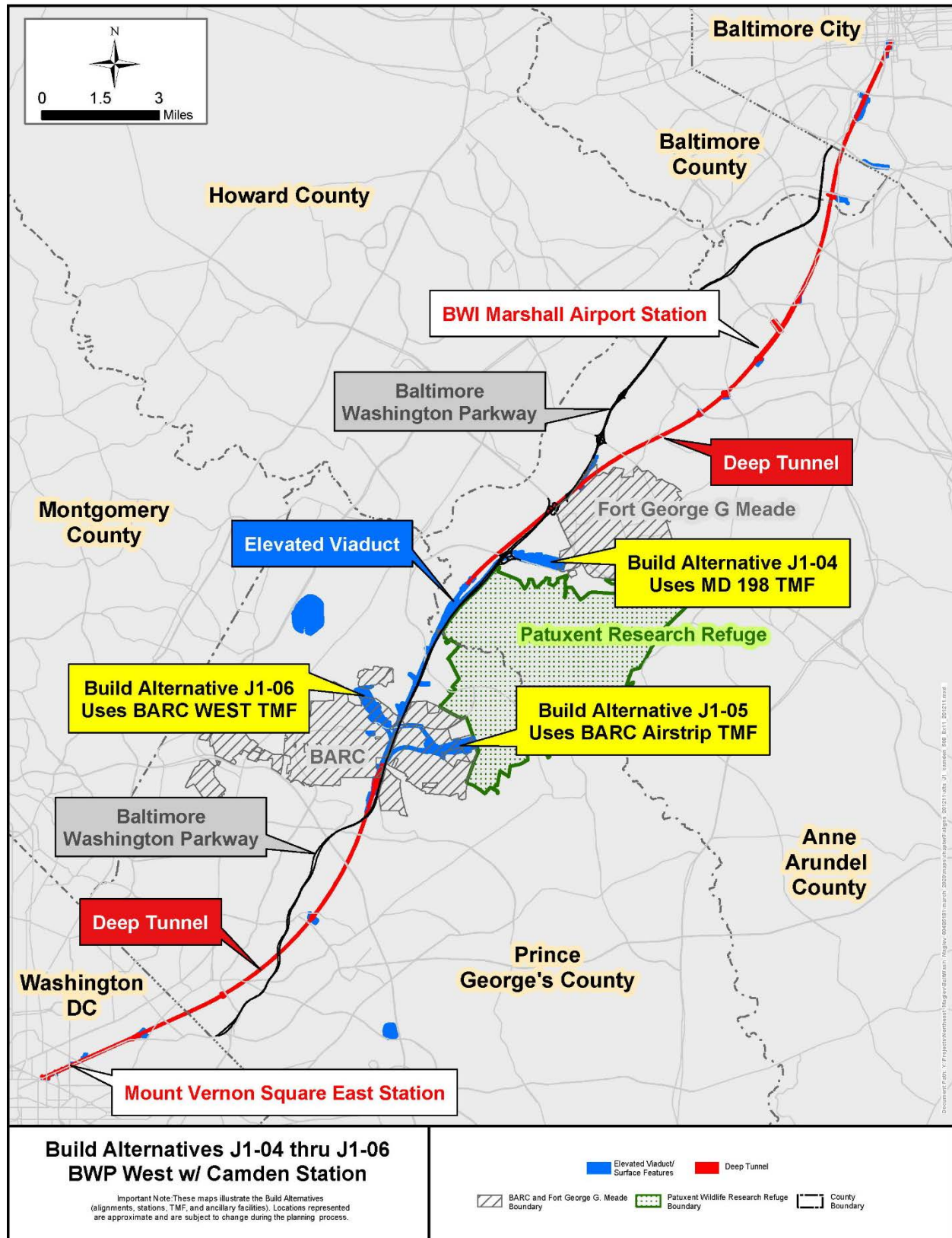


Figure 3.4-4: Build Alternatives J1-04 through J1-06 – BWP West with Camden Station



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	Just north of Washington, D.C., the Build Alternatives J route (in tunnel) would shift to the east side of BWP	Just north of Washington, D.C., the Build Alternatives J1 route (in tunnel) would shift to the west side of BWP
Build Alternatives J and J1 would be in tunnel through BWI Marshall Airport area	Build Alternatives J would emerge from tunnel onto viaduct at Greenbelt near the USDA BARC and NASA Goddard properties	Build Alternatives J1 would emerge from tunnel onto viaduct at Greenbelt near USDA BARC property
Build Alternatives J and J1 would be in tunnel from BWI Marshall Airport to Cherry Hill	Build Alternatives J would be on viaduct east of the BWP	Build Alternatives J1 would be on viaduct west of the BWP
	Build Alternatives J would return to tunnel from viaduct	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

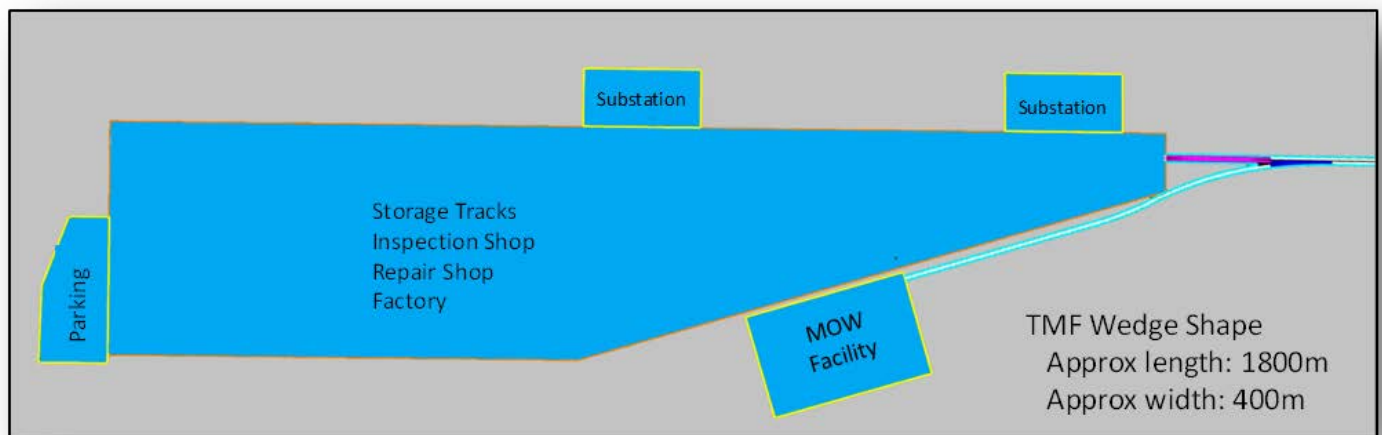
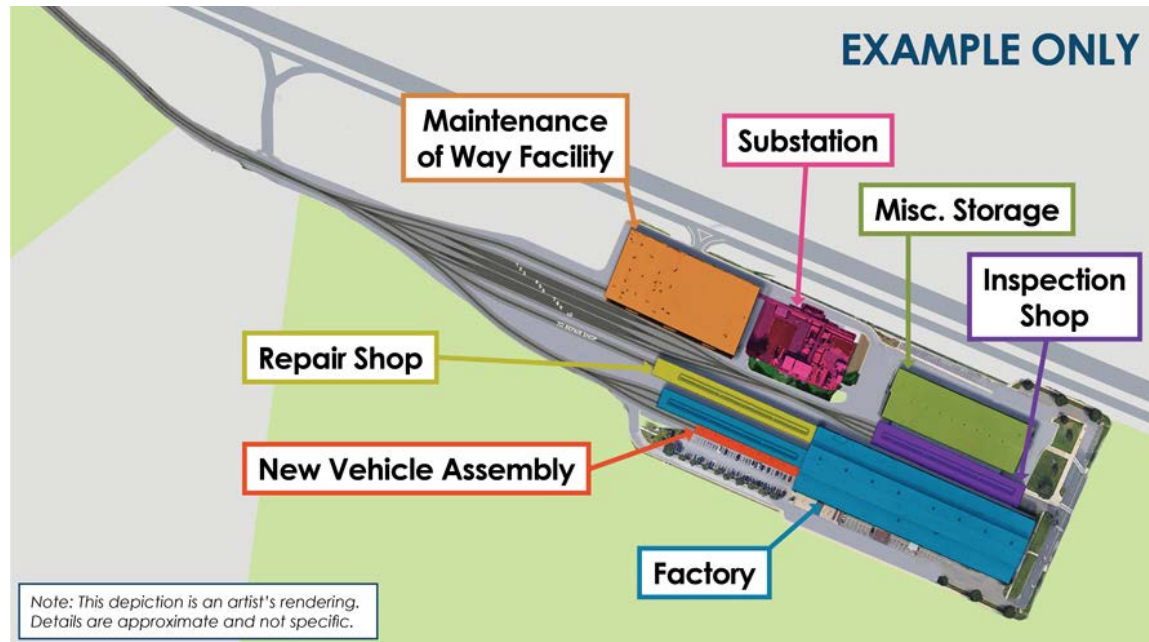
TMF Option	Location	Viaduct Ramps	Maintenance of Way Facility
BARC Airstrip	BARC airfield	Build Alternatives J connection: no new BWP crossing Build Alternatives J1 connection: one new BWP crossing	Adjacent to the TMF
BARC West	BARC forest at Entomology Road	Build Alternatives J connection: one new BWP 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

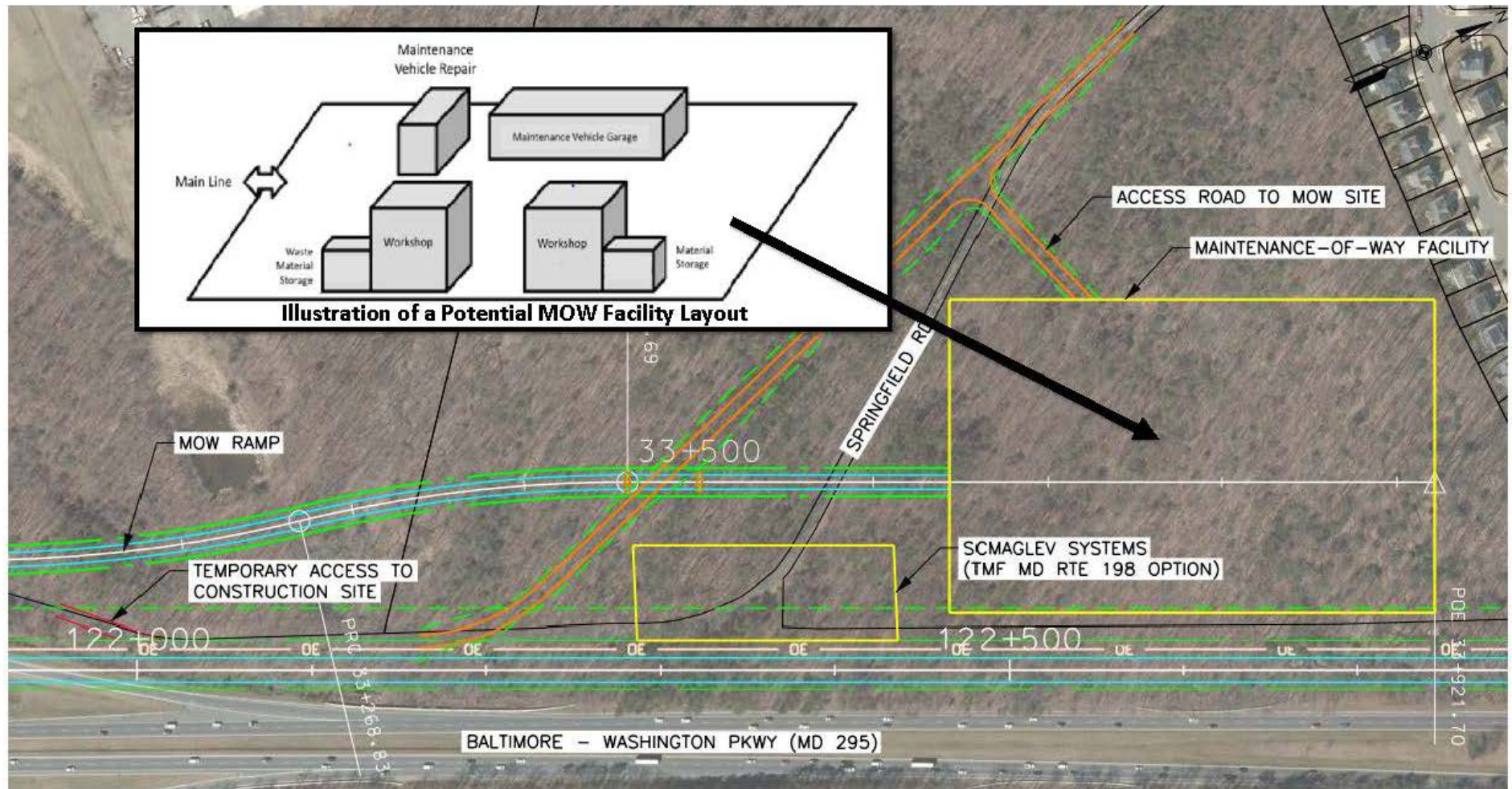


Illustration of a Proposed MOW Facility for the Build Alternatives J1-01 and J1-04 (MD 198 TMF)

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.

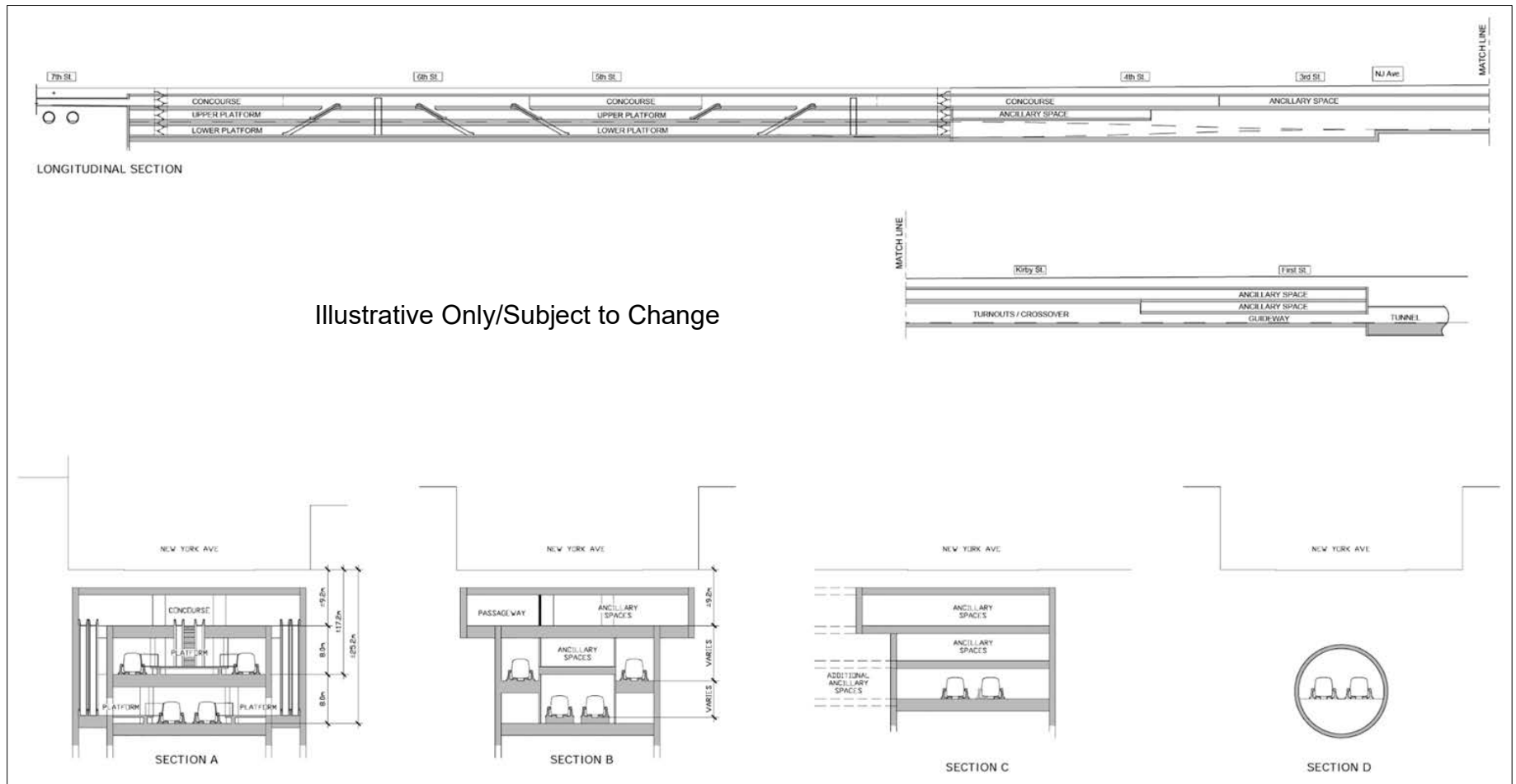
Table 3.4-4 provides a summary of the stations evaluated in the DEIS. Each station would consist of the following elements: access points, ticketing area, waiting area, boarding platforms, and operations spaces (offices, mechanical room, and employee areas). Utilities to these sites, including electric, 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 7 th Street NW and 4 th 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

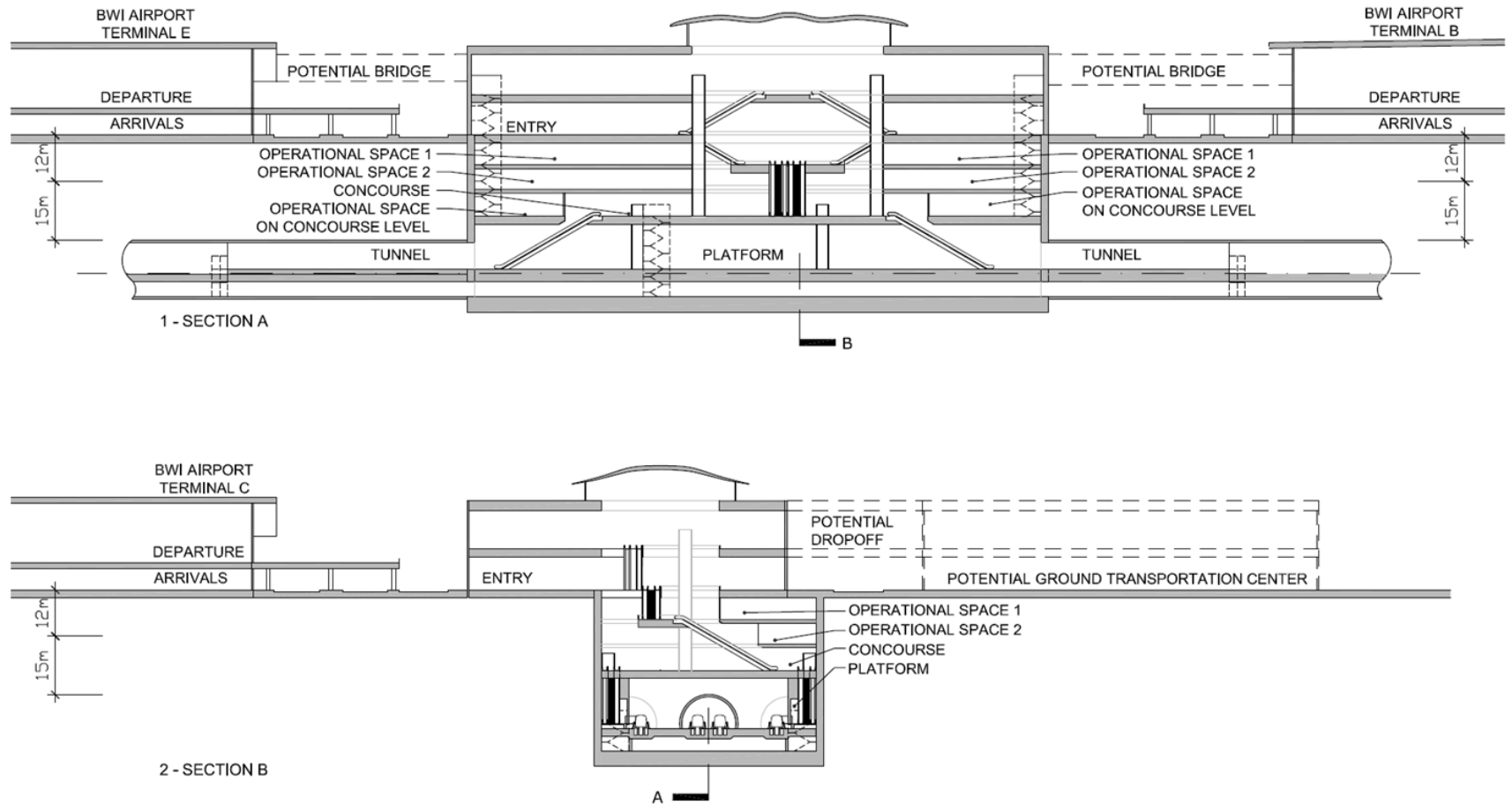
Sources: Alternatives Report, November 2018; Baltimore-Washington SCMAGLEV Project, Washington, D.C. Station Comparison, 2018-12-19

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



Source: BWRR 2020

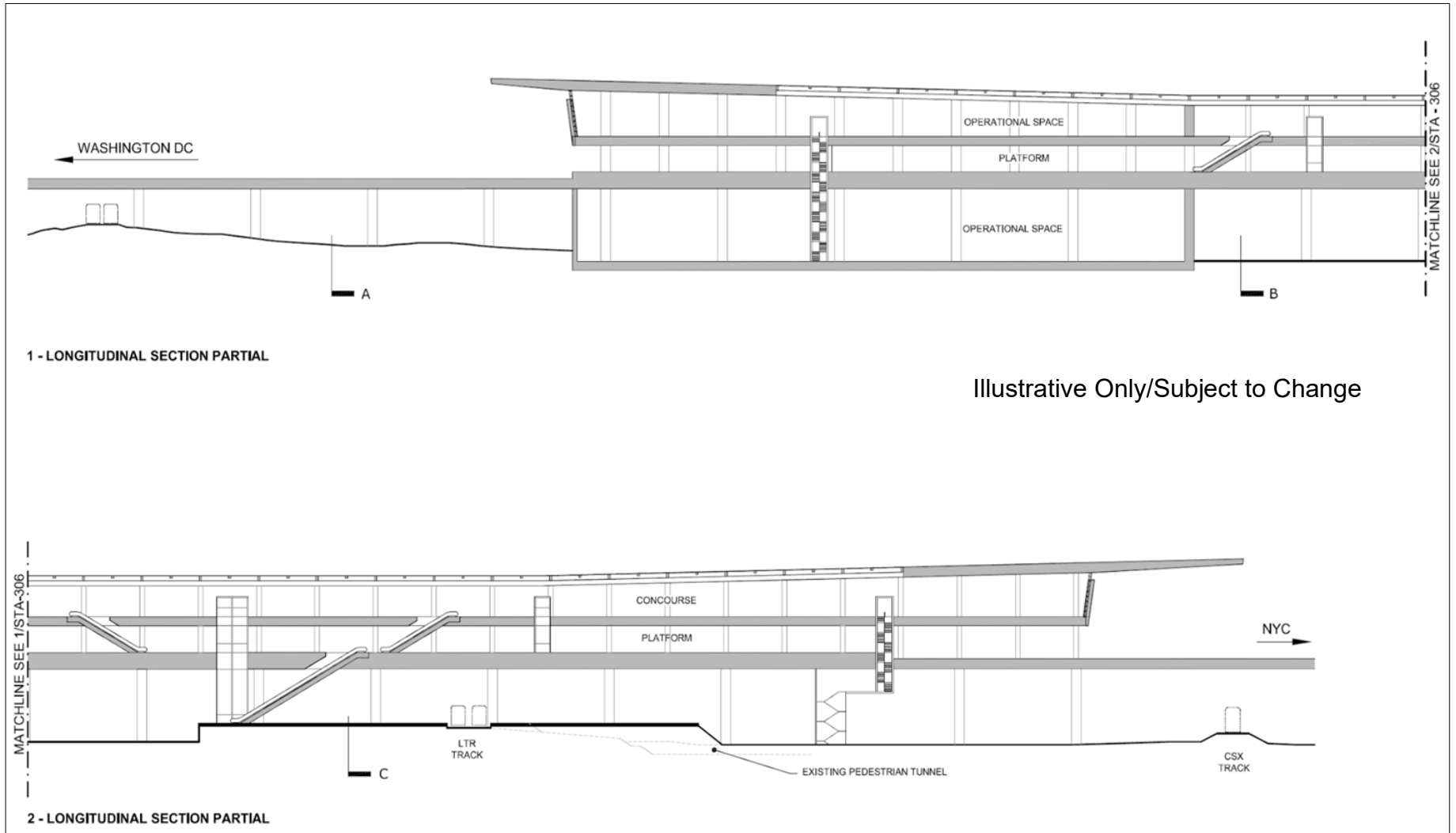
Figure 3.4-8: Concept Plans for Mount Vernon Square East Station and BWI Marshall Airport Station



Illustrative Only/Subject to Change

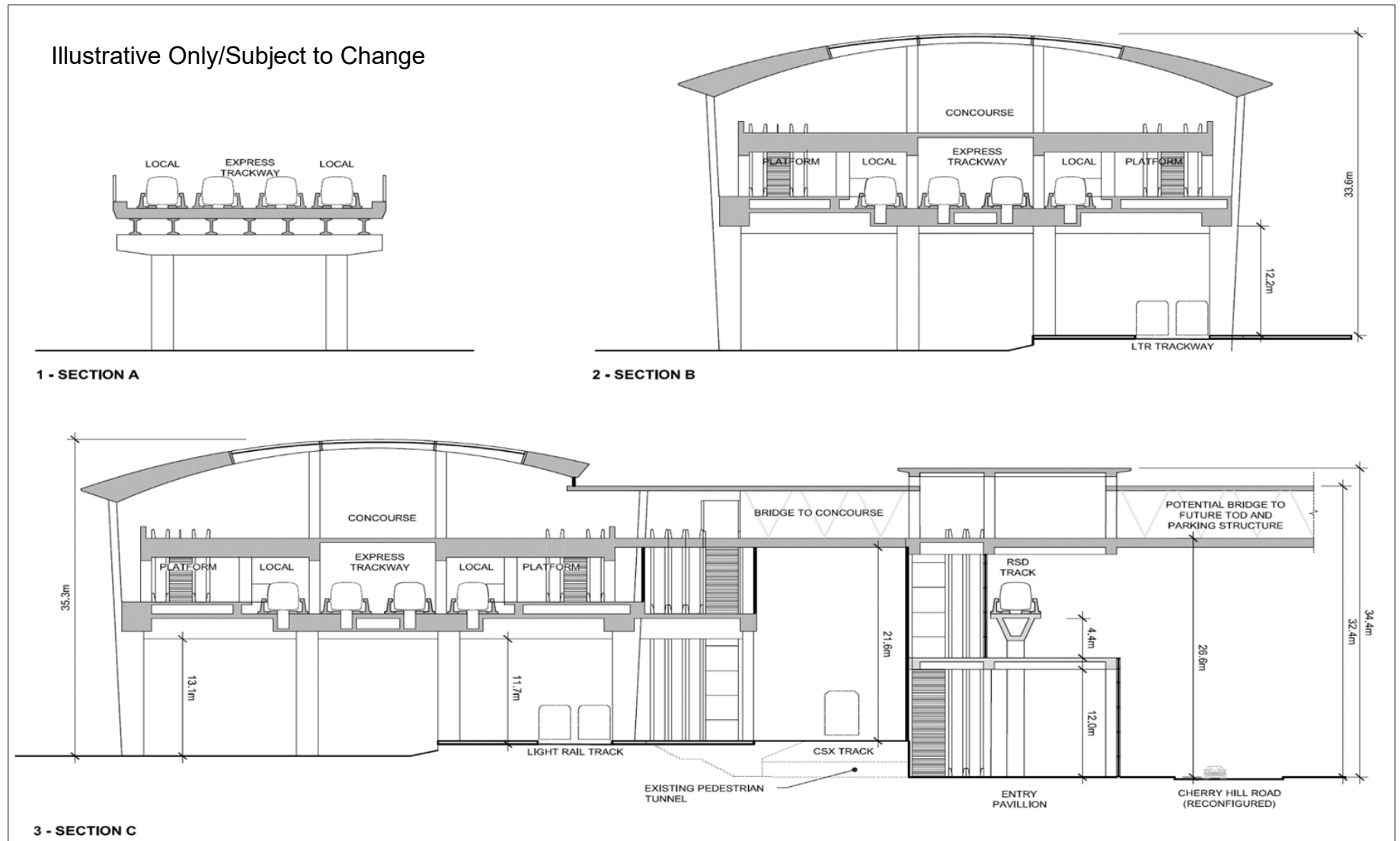
Source: BWRR 2020

Figure 3.4-9: Concept Plans for Cherry Hill Station



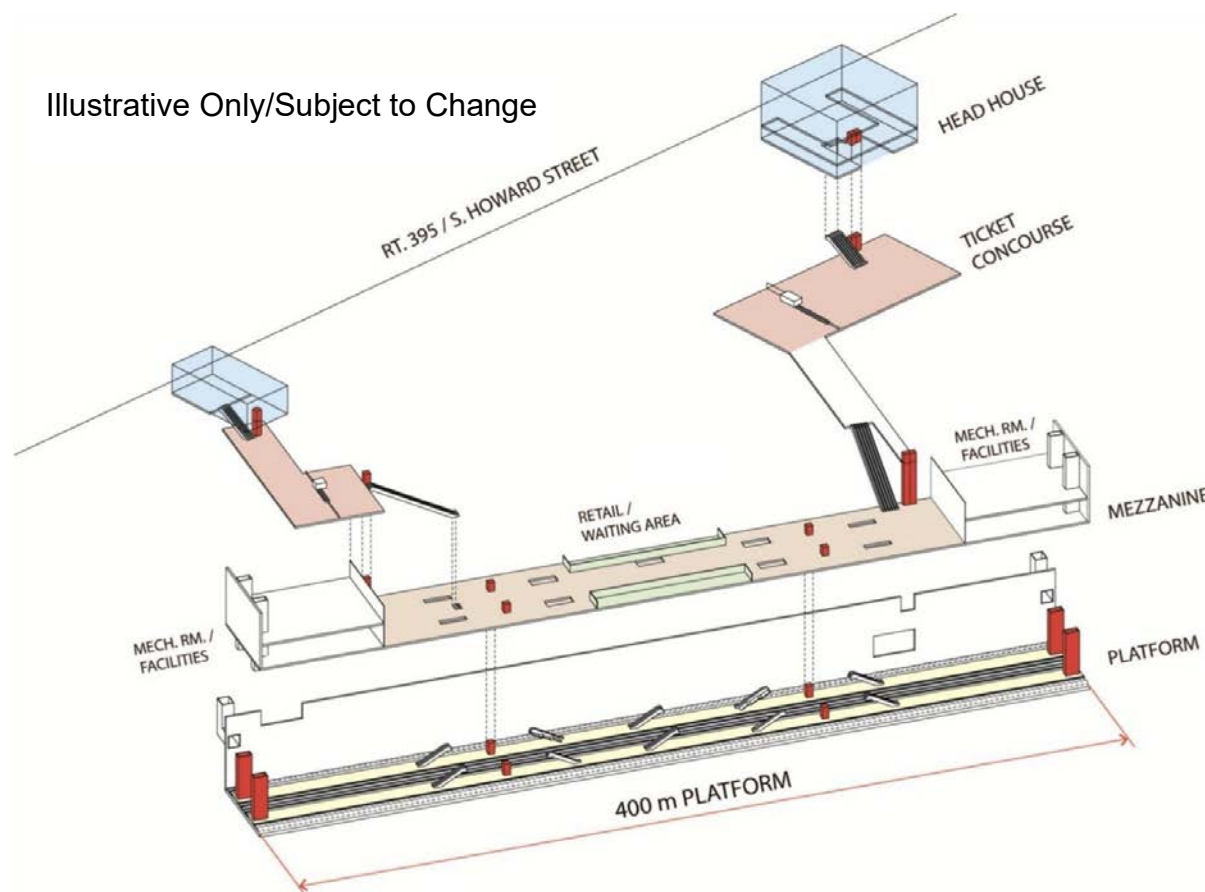
Source: BWRR 2020

Figure 3.4-10: Concept Plans for Cherry Hill Station



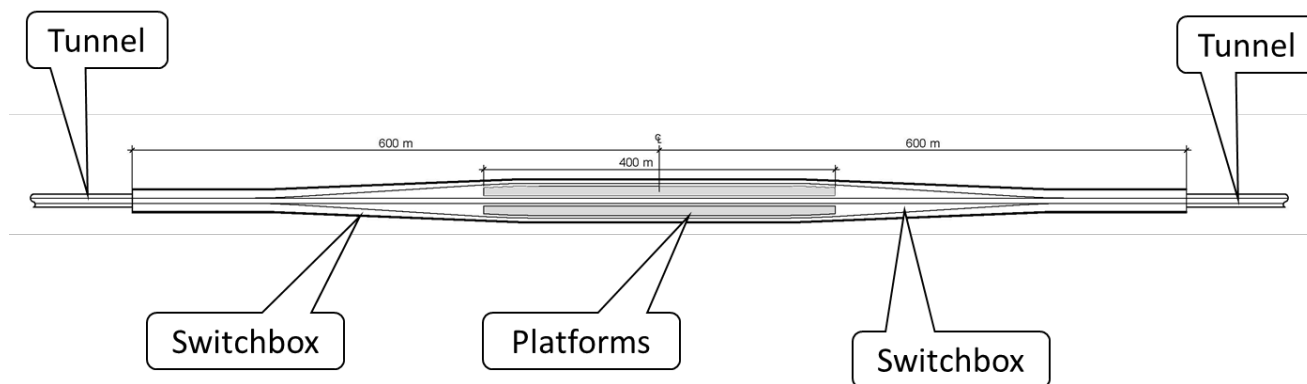
Source: BWRR 2020

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



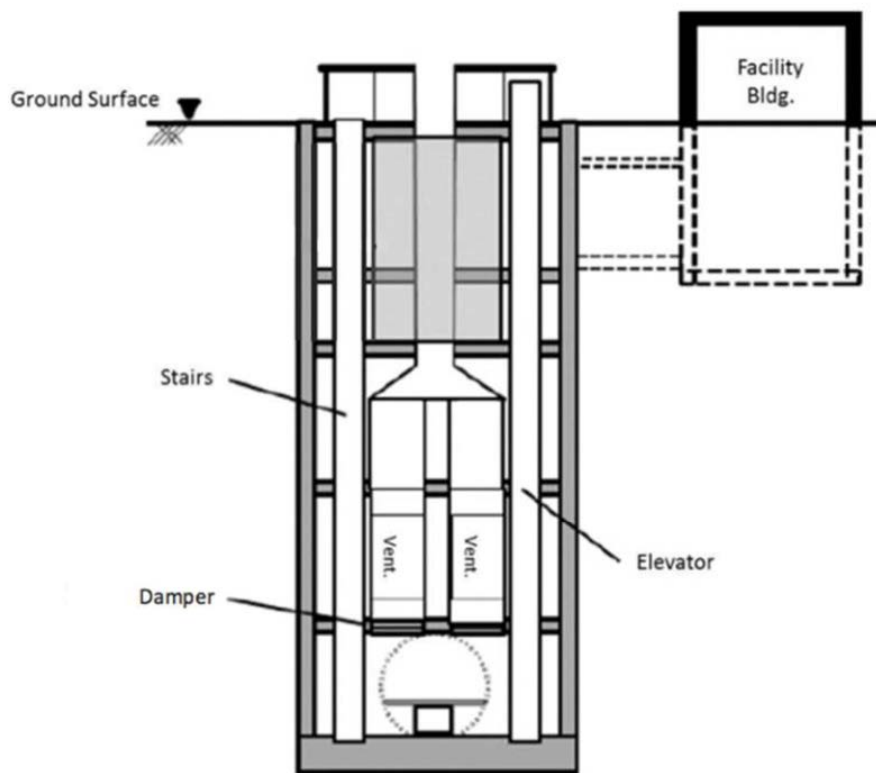
Source: AECOM 2020

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.

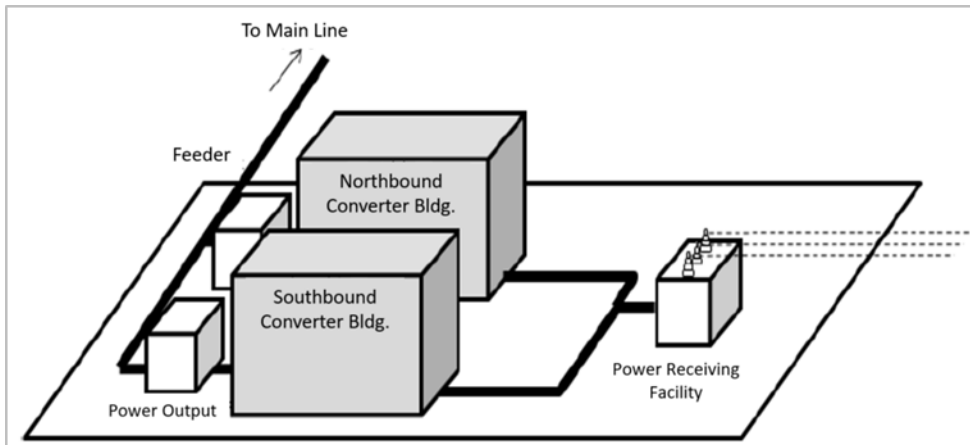
Each substation would require approximately 7 acres, give or take depending upon the location constraints and system requirements. The actual size will be confirmed as the design is finalized. Substations would be collocated with other SCMAGLEV facilities,

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 Road¹ 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 impervious 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.

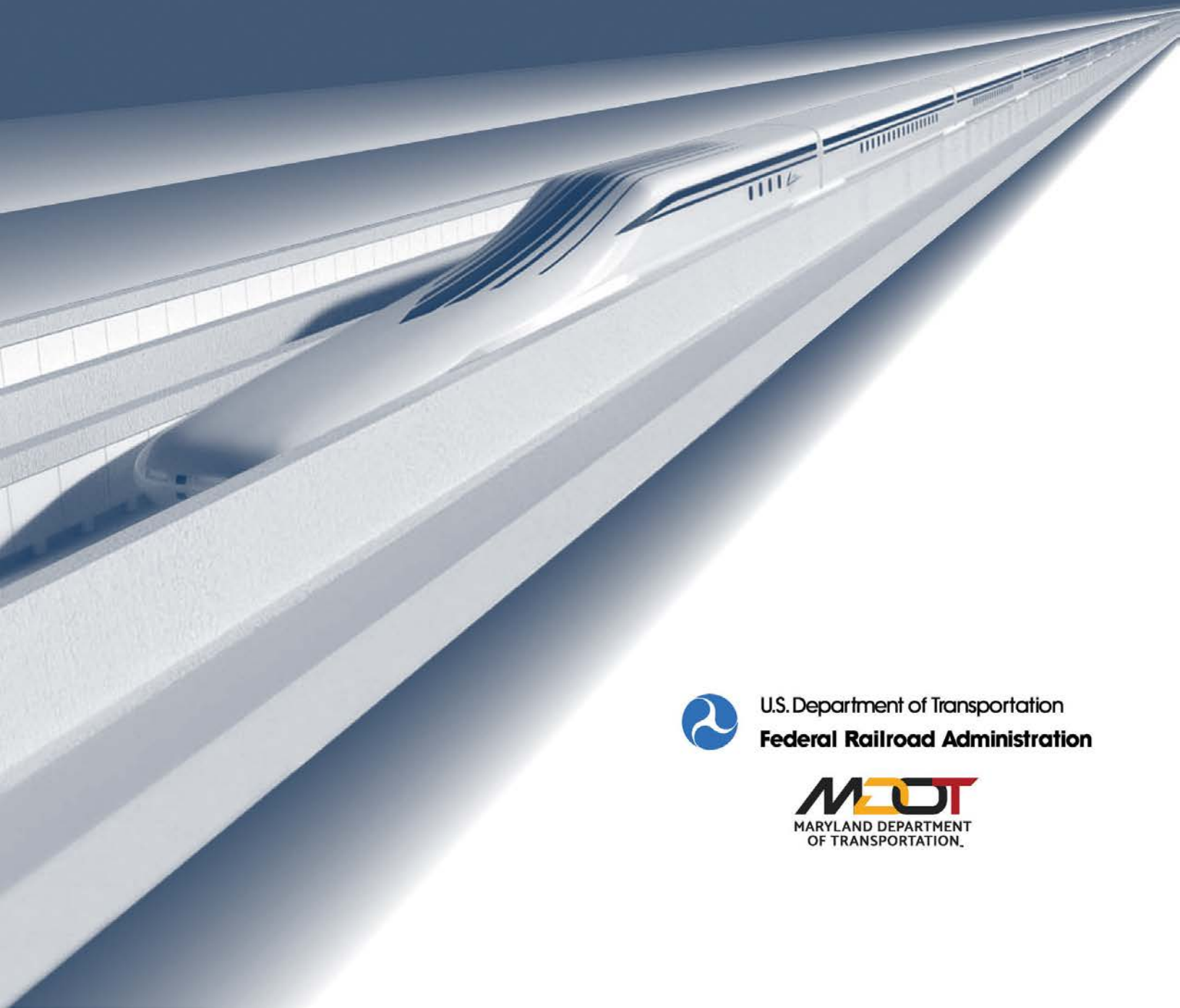
3.4 Project Sponsor Preferred Configuration

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.

Section 4.1

Introduction

BALTIMORE-WASHINGTON SUPERCONDUCTING MAGLEV PROJECT DRAFT ENVIRONMENTAL IMPACT STATEMENT AND SECTION 4(f) EVALUATION



U.S. Department of Transportation
Federal Railroad Administration



4.1 Introduction

Chapter 4 of this Draft Environmental Impact Statement (DEIS) presents the existing conditions and evaluates the potential effects of the Superconducting Magnetic Levitation Project (SCMAGLEV Project) on the human, natural, and physical environment. The Federal Railroad Administration (FRA) evaluated the 12 Build Alternatives and the No Build Alternative. Information presented in Chapter 4 supports the evaluation of alternatives and will support FRA's identification of the Preferred Alternative in the Final Environmental Impact Statement.

This Section provides geographic context for the SCMAGLEV Project, the general approach used for effects assessment and provides a guide to the organization of Chapter 4.

Chapter 4 evaluates the short-term impacts related to construction of the Build Alternatives. The construction methods for the SCMAGLEV system would generally be the same across all Build Alternatives, with minor variations related to locations of facilities and the length of the viaduct section. The construction methods are described in this Section and evaluated by resource throughout Chapter 4. Appendix G.7 Construction Planning Memorandum describes the construction methods in greater detail.

4.1.1 Geographic Context

The SCMAGLEV Project generally extends between Washington, D.C., at its southern terminus, and Baltimore, MD at its northern terminus. The alignment starts as a deep tunnel (typically 80 feet to 260 feet deep) at Mount Vernon Square following US 50 (New York Avenue) and continues through portions of the northwest and northeast quadrants of Washington, D.C. The alignment crosses the Washington, D.C./Maryland state line in the vicinity of the Fort Lincoln Cemetery and continues into Prince George's County, MD. After passing under the Anacostia River at Coleman Manor Park, the Capital Beltway (I-95/I-495), and MD 193, the alignment splits into two possible routes: one east (Build Alternatives J) and one west (Build Alternatives J1) of the Baltimore-Washington Parkway (BWP). Both alignments transition from deep tunnel to a viaduct between the National Aeronautics and Space Administration (NASA) Goddard Space Flight Center overpass and Beaver Dam Road in Greenbelt. Notable landmarks in this area include the Beltsville Agricultural Research Center (BARC), NASA Goddard Space Flight Center, the eastern end of the City of Greenbelt and the Patuxent Research Refuge (PRR). The alignments continue into Anne Arundel County, near Laurel, and runs adjacent to Fort George G. Meade on the east of the BWP and near Maryland City Park on the west side. The viaduct transitions back to a tunnel in the vicinity of Fort George G. Meade for the eastern Build Alternatives J and just east of Brock Bridge Elementary School for the western Build Alternatives J1. Both alignments, now in deep tunnel, become concurrent just north of MD 175 and pass under the Baltimore--Washington International Thurgood Marshall Airport (BWI Marshall Airport)

as it continues north to Baltimore, MD where there two station choices, either above grade at the Cherry Hill Light Rail Station or in deep tunnel near Camden Yards.

Figure 4.1-1 shows the geographic context for the Build Alternatives, including the alignment (deep tunnel and viaduct), station locations options, and trainset maintenance facility (TMF) options. For more information on the definition of alternatives, refer to Chapter 3, Alternatives Considered.

4.1.2 Approach to Resource Analysis

This DEIS evaluates resource topics identified in FRA's Procedures for Considering Environmental Impacts (64 Fed. Reg. 28545, May 26, 1999). For each resource topic, FRA evaluated both long -and-short-term effects on resources. Long--term effects are those that would be permanent, whereas short-term effects occur from temporary, often construction-related impacts and are not considered permanent. Effects on resources may result from operational (i.e., service frequencies, speed) or physical (i.e., infrastructure requirements, construction activities) characteristics of the SCMAGLEV Project. FRA assessed effects for each Build Alternative and the No Build Alternative for comparison.

For each resource topic, FRA defined geographic areas of study to assess where effects could occur (i.e., SCMAGLEV Project Affected Environment). The SCMAGLEV Project Affected Environment, varies in size according to the resource due to the unique and dynamic features associated with each resource. Impacts occur within the limits of operational/physical disturbance and can be permanent (Impact Area) or temporary (Construction-related Impact Area).

Geographic Area Definitions in the DEIS

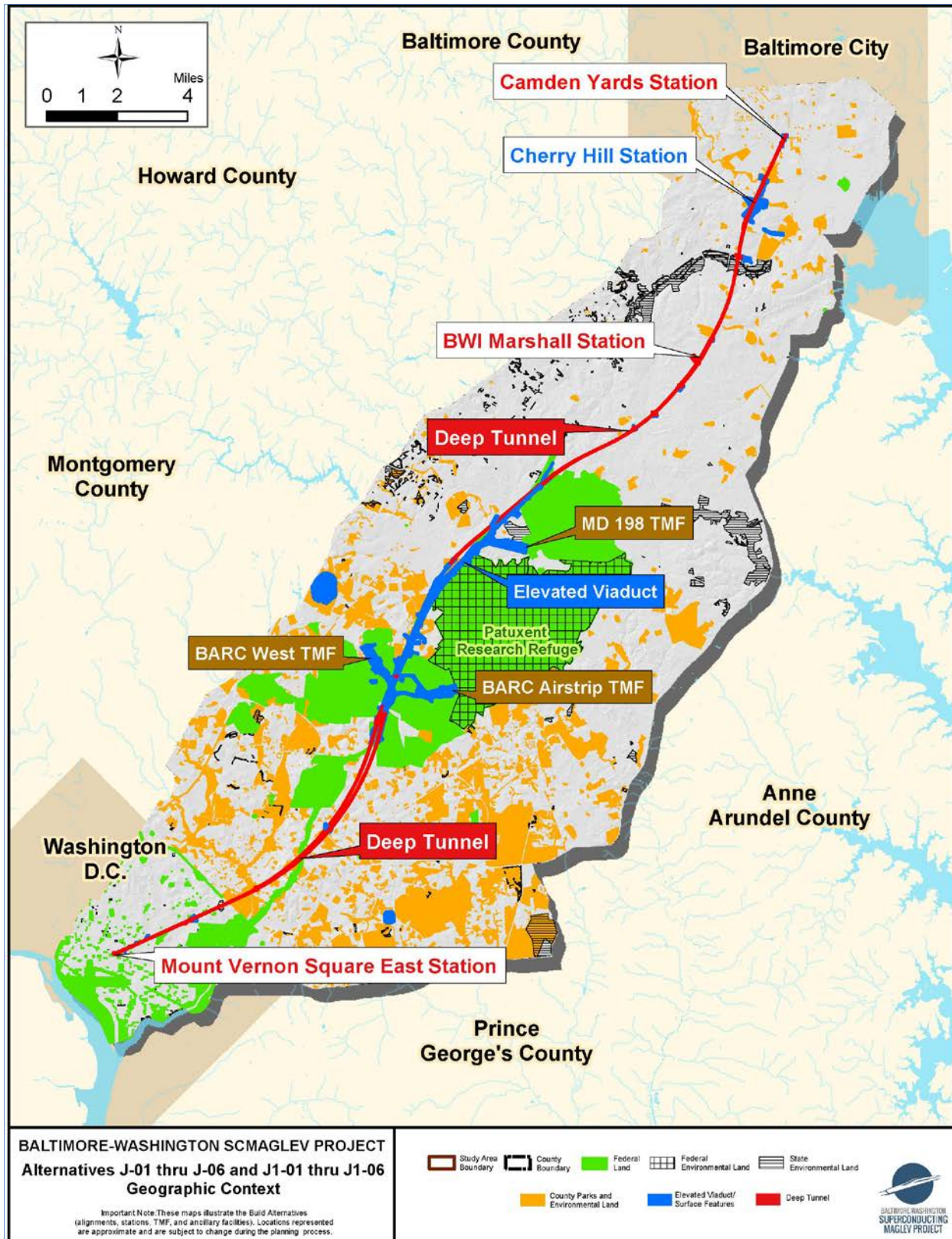
Project Study Area = The broadest geographic area that extends for approximately 40 miles from Washington, D.C. to Baltimore City.

SCMAGLEV Project Affected Environment = A geographic area of study that extends on either side of a Build Alternative alignment and associated facilities. The dimensions differ by resource.

Impact Area = The geographic area within the limits of operational/physical disturbance for each alternative.

Construction-related Impact Area = The geographic area defined by the temporary disturbance area that is required for construction activities.

Figure 4.1-1: Build Alternatives Geographic Context



4.1.2.1 No Build Alternative

FRA developed a No Build Alternative (see Chapter 3, Alternatives Considered) that considers planned and regionally significant transportation capacity improvements to existing modes between Washington, D.C. and Baltimore, MD. The analysis presented in Chapter 4 does not quantify the effects associated with the capacity improvements included in the No Build Alternative. The No Build Alternative assumes that the SCMAGLEV Project would not be built and, therefore, no impacts related to the construction or operation of the SCMAGLEV Project would occur.

4.1.2.2 Build Alternatives

As described above, impacts associated with the Build Alternatives could occur from either physical disturbance or from the operations of the SCMAGLEV Project and result in long-term, permanent impacts and short-term, temporary impacts.

Overall Construction Schedule and Planning

The Project Sponsor, BWRR, anticipates that construction of the entire SCMAGLEV Project will take approximately seven years. Construction will begin after completion of the final engineering design, and subject to Federal, state, and local permits. During this time, localized construction impacts, such as changes in traffic volume and circulation patterns, noise and vibration levels, visual effects have the potential to occur. As the engineering design advances, the Project Sponsor will develop a specific construction plan describing construction sequencing, equipment, methodologies, and safety practices. In addition, they will develop and implement a construction management plan that will govern how, where, and when construction activities will take place. The plan will incorporate, implement, and manage commitments made in the forthcoming Final Environmental Impact Statement (FEIS) and Record of Decision (ROD) to avoid or minimize and mitigate natural and built environment impacts. Additional details related to construction are included in Appendix G.7.

As part of construction planning, the Project Sponsor will coordinate with affected property owners and stakeholders to ensure that the construction management plan accommodates their needs and concerns to the extent reasonably feasible. The construction management plan will address noise and vibration impacts, property access, fencing, safety and security, and restoration of disturbed land. The construction detail is conceptual, and the Project Sponsor will continue to refine construction planning during design in coordination with state and local jurisdictions.

Given that the length of the SCMAGLEV Project is 40 linear miles, construction activities occurring in any one location will not last for the entire construction period. The Project Sponsor will plan and undertake construction to maximize efficiency and minimize temporary impacts. They will also develop and implement a variety of mitigation and minimization measures to be applied corridor wide and specific to each site and the local construction activities. Examples of these measures include locating the elevated structure piers outside floodplains and wetlands when possible, locating

the piers to avoid roads and prevent sight distance issues, installing cofferdams will be required for in-water pier construction, preparing and implementing a plan to dispose of excavated soils, preparing and implementing a noise and vibration control plan, protecting local building foundations during construction, and implementing traffic management and control plans.

The following discussion provides a general overview of the construction activities used to identify potential impacts in Chapter 4.

Construction Staging Areas

Staging and/or laydown areas are used to store construction-related vehicles, equipment, and materials. Where reasonably-feasible identified construction sites are within the limits of disturbance (LOD). The Project Sponsor located staging areas by identifying areas that were previously developed for non-residential use and are currently underutilized.

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

- 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

For the tunnel construction, activities within the construction staging areas include setup, insertion, operation, and extraction of tunnel boring machines (TBM). Construction contractors will typically organize the tunnel laydown areas into work zones to support tunnel excavation operations, including areas for processing and removing tunnel spoils, handling precast concrete tunnel-lining segments, and housing tunnel utilities (such as ventilation, water supply, wastewater removal, and power supply).

The Project Sponsor will erect fencing around staging areas and secure these areas with designated access points. In addition to providing a secure storage location, these measures will minimize the potential for impacts to surrounding properties and resources, and limit effects on the transportation network by preventing encroachment onto the adjacent property and/or resources and limiting access to the construction site.

Appendix B shows the locations of proposed construction staging areas. The construction staging areas are labeled as viaduct laydown, tunnel laydown, construction laydown area, miscellaneous construction LOD, or LOD for new electrical transmission.

Material Haul Routes

The Project Sponsor will designate haul routes for controlling vehicles carrying construction materials and debris use. Where possible, haul routes will use public roads in non-residential areas to minimize potential for traffic, noise, and vibration impacts from construction vehicles. No commercial or construction vehicles are allowed on the Baltimore Washington Parkway (BWP) south of MD 175 since this section of the road is maintained by the National Park Service (NPS).

The former Suburban Airport site is accessible to the mid-section of the viaduct for Build Alternative J1 directly from the Suburban Airport site and that of the Build Alternative J via Brock Bridge Road to MD 197. Crews will access the northern viaduct section via Brock Bridge Road to MD 198 and MD 32, and the southern section via Brock Bridge Road to MD 197 and local roads. The Brock Bridge Road Bridge over the Patuxent River has a posted weigh limit of five tons; the Project may require bridge reinforcement. To avoid local bridge replacement, construction workers could alternatively access Brock Bridge Road to MD Route 198; however, the route passes through the Maryland City residential neighborhood and may have time of use restrictions.

The undeveloped land owned by Konterra Associates LLC is accessible from I-95 and MD 200 (ICC) and can accommodate the stockpiling of spoils. The access to the project site from the Konterra storage location can be via Contee Road to MD 197 towards the mid-section of the viaduct, from I-95 to MD 32 and MD 198 to access the northern section and via MD 197 to local roads to access the southern section.

The former Landover Mall lot is accessible from I-95 and MD 202. Access to the project site can be via I-95 to MD 201 to Powder Mill Road and Beaver Dam Road to the south.

Construction crews will require temporary access roads and spoil routes along the viaduct for the delivery and transport of materials. In addition, the fresh air and emergency egress (FA/EE) facilities and substations will also require access. Appendix G.7 includes additional maps depicting the proposed haul routes between respective project elements (including the FA/EE facilities, substations, tunnel portals, and stations) and the nearest limited access highway or main artery.

Viaducts

The viaduct structures will be precast concrete superstructure elements supported on hammerhead piers of the same material and with drilled shaft foundations. The equipment to construct the foundation, footings, and piers for the guideway and viaducts will be typical of roadway and railroad construction activity: drill rigs, cranes, excavators, dump trucks, pay loaders, bulldozers, rock drills, sheet pile vibrators/hammers, flatbed delivery trucks, concrete trucks, concrete pump trucks, and general construction vehicles.

During construction, temporary access roads along the viaducts will facilitate materials movement and construction activities. The viaduct of Build Alternatives J will generally

follow the BWP along the east side. In some cases, parallel local roads may serve as access points to the construction area. Powder Mill Road, MD 197, MD 198, and MD 32 are potential construction access points during viaduct construction. The viaduct of Build Alternatives J1 will generally follow the BWP along the west side. Powder Mill Road, MD 197, and Brock Bridge Road are potential access points to the viaduct construction area.

Tunnels

The Project Sponsor proposes two types of construction for the tunnels: boring and cut/cover. Construction crews may use Sequential Excavation Method (SEM) in some localized areas for tunnel construction entrances or other elements not easily addressed by TBM or cut/cover methods. The tunnel boring method will require a TBM that enters the ground and carves the tunnel from below ground. Tunnel boring requires TBM procurement and mobilization, preparation of the work area, assembly of the machine and its components, and tunnel excavation. The equipment required to support a TBM operation will include gantry/boom cranes, erectors for positioning lining segments, excavators, dump trucks and pay loaders.

In urbanized areas and where no space is available to set up a TBM staging area, the Project Sponsor will use cut/cover tunnel construction. The cut/cover construction method involves excavating the ground where the tunnel will be located, building the tunnel, and then covering the tunnel and re-establishing the ground surface. For example, the Project Sponsor will use cut/cover along New York Avenue in Washington, D.C. The Project Sponsor will excavate the roadway, build the tunnel below ground, and then restore the roadway to its original condition.

Portals and Fresh Air and Emergency Egress Facilities

In portal areas, the Project Sponsor will use short sections of cut/cover tunneling and open cut construction for the transitions between the viaduct and tunnel sections and for TBM launch locations located along the deep tunnel. The equipment anticipated to be used to construct the transition portals includes gantry or boom cranes, excavators, dump trucks, loaders, generators, grouting plant, rock drills, sheet pile vibrators/hammers, concrete trucks, and concrete pump trucks. Fresh air and emergency egress facilities will require a combination of traditional above ground construction techniques and top-down construction of underground components such as the ventilation shafts connecting to the tunnels.

Stations

Each Build Alternative includes an underground station in Washington, D.C., an underground station at BWI Marshall Airport, and underground (Camden Yards) and above ground (Cherry Hill) station options in Baltimore, MD.

For underground stations, the preferred method of construction will be top-down. Similar to cut/cover for the tunnels, the Project Sponsor will excavate the surface area, build the

underground station, and restore the ground surface on top of the station. Typically, slurry walls retain the perimeter of excavation and provide support in top-down excavation. Temporary cross braces and tie-back structures provide additional support. Temporary covers over the excavation area would be used during construction to maintain some degree of surface use, and phase top-down construction to minimize daytime travel lane closures.

The Mount Vernon Square East Station will be relatively straightforward to construct in a top-down method. The Camden Yards station is more challenging because the project orientation and alignment cannot match the existing Baltimore street grid. To access the station area, all buildings above the proposed station for a distance of 1,970 linear feet will have to be demolished to create open space for the top-down construction activity. It is not feasible to build a station in this location with the tunnel boring method because of the width required for a station, the presence of underground utilities and the presence of adjacent building and roadway support structures.

The Project Sponsor will construct the Cherry Hill Station above ground using conventional building materials and methods and a combination of cast-in-place concrete and structural steel. They will build a portion of the station and its approaches on elevated structures crossing over existing roadways and railway lines and above the existing light rail station platform. The Project Sponsor may use precast structural elements to minimize potential for disruptions of roadway and rail. The Cherry Hill Station will require modifications to local roadways and pose temporary traffic disruptions during construction. The bored tunnel will emerge from the ground south of the station via a cast in place concrete portal structure and become elevated on a rising concrete viaduct structure. The elevated station is expected to be constructed with precast and cast in place concrete. It will be connected to a new parking garage via an elevated pedestrian bridge and vertical transportation tower. Foundations will utilize deep-driven pile or drilled-shaft elements.

The equipment anticipated to perform the station construction will include cranes, excavators, dump trucks, payloaders, rock drills, sheet pile vibrators/hammers, concrete trucks, generators, and concrete pump trucks.

Substations and Standalone Maintenance of Way Facilities

The Project Sponsor will use traditional building techniques to construct above ground power substations and the maintenance of way (MOW) facilities. The equipment anticipated to construct the substations will include cranes, excavators, dump trucks, pay loaders, backhoes, bulldozers, trailers, concrete trucks mixers, concrete pumps, and vibrating rollers.

The northern MOW facility for Build Alternatives J-04 thru J-06 and J1-04 thru J1-06 (alternatives with the underground Camden Yards Station) require an underground switch and tunnel portal to connect to the mainline guideway. The southern MOW facility under Build Alternatives J-01, J-04, J1-01, and J1-04 (alternatives with the

MD 198 TMF) will not be co-located adjacent to the MD 198 TMF but separately located along the respective mainline near Powder Mill Road. This requires additional MOW connector ramps as compared to the alternatives with either BARC TMF that utilize the TMF connector ramp for the respective co-located MOW facility.

Trainset Maintenance Facility (TMF)

The Project Sponsor will use traditional building techniques to construct the TMF. The equipment anticipated to construct the footings and piers for the TMF will include cranes, excavators, dump trucks, pay loaders, rock drills, caisson drill rigs, sheet pile vibrators/hammers, flatbed delivery trucks, bulldozers, concrete trucks, and general construction vehicles. Buildings and parking lots will require additional types of equipment, such as paving machines, rollers, and aerial lifts.

As compared to either of the BARC TMF sites, the MD 198 TMF site has a significant variation in existing ground elevation, dropping significantly from west to east across the proposed facility. The eastern half of the MD 198 facility will be constructed on retaining walls up to 100 feet tall, surmounted by 65-foot-high maintenance shop buildings. The northeast corner of the MD 198 TMF impacts the Little Patuxent River, which will have to be rerouted in a new channel to the east. The site conditions for the MD 198 TMF facility will add a year to the construction duration.

Roadway Relocations

The Project Sponsor will use traditional building techniques for the roadways that will be relocated or reprofiled as part of the SCMAGLEV Project. The equipment anticipated for this work will include cranes, excavators, dump trucks, pay loaders, backhoe, bulldozers, trailers, concrete trucks mixers, concrete pumps, and vibrating rollers.

The roadway relocations include the following: Explorer Road (Build Alternatives J-01 thru J-06); Springfield Road around the BARC Airfield TMF (Build Alternatives J-02, J-05, J1-02, and J1-05); Springfield Road around the southern MOW facility associated with the MD 198 TMF (Build Alternatives J1-01 and J1-04); River Road around the MD 198 TMF (Build Alternatives J-01, J-04, J1-01, and J1-04); and both West Patapsco Avenue and Annapolis Road for the Cherry Hill Station (Build Alternatives J-01 thru J-03 and J1-01 thru J1-03). Refer to Appendix G.7 for mapping illustrating the roadway relocations.

4.1.3 Chapter 4 Organization

This chapter provides individual sections for each resource topic, as shown in **Table 4.1-1**. Each section provides the following:

- **Introduction:** Defines the resource topic being discussed and provides an overview of what is covered in that section.

- **Regulatory Context and Methodology:** Provides an overview of the regulations and procedures used for effects assessment.
- **SCMAGLEV Project Affected Environment:** Describes the existing conditions relevant to each resource topic.
- **Environmental Consequences:** Describes the effects for the No Build Alternative and Build Alternatives, short-term construction effects, and mitigation strategies.

Chapter 4 provides an overview of the analysis. FRA organized each resource topic section depending on the type of impact (physical or operational). **Table 4.1-1** identifies the organization for each resource topic covered in Chapter 4.

- **Physical (localized) Effects:** For resource topics associated with physical impacts, FRA organized the effects assessment by the types of elements: alignment (both deep tunnel and viaduct), stations, and TMF sites. The long-term effects assessment generally presents a quantitative analysis. Short-term effects are generally discussed qualitatively.
- **Service-related (corridor-wide) Effects:** For resource topics associated with service, or operational, effects, FRA organized the effects to present a corridor-wide assessment that does not focus necessarily on a specific physical element. In some cases, the analysis presents both quantitative and qualitative data. Short-term effects are generally discussed qualitatively.
- **Exceptions:** Some resource topics are exceptions to the physical and corridor-wide assessment. These topics either require unique analysis or are more general in nature. Depending on the resource topic, the analysis presents a mix of quantitative and qualitative data.

Table 4.1-1: Resource Topic Organization

Section Number	Resource	Evaluated Effects	Technical Appendix	Additional Information
4.1	Introduction	Exception	D.1 Permits and Authorizations	G.7 Construction Planning Memorandum
4.2	Transportation	Exception	D.2 Transportation Technical Report	G.8 Traffic Control Plans Memorandum
4.3	Land Use and Zoning	Physical Effects	D.3 Socioeconomic Environment Technical Report	
4.4	Neighborhoods and Community Resources	Physical Effects	D.3 Socioeconomic Environment Technical Report	

Section Number	Resource	Evaluated Effects	Technical Appendix	Additional Information
4.5	Environmental Justice	Physical Effects	D.3 Socioeconomic Environment Technical Report	
4.6	Economic Resources	Exception	D.4 Economic Impact Analysis Technical Report	G.9 Capital and Construction Costs Memorandum
4.7	Recreation Facilities and Parklands	Physical Effects	NA	
4.8	Cultural Resources	Physical Effects	D.5 Cultural Resources Appendix	
4.9	Aesthetics and Visual Quality	Physical Effects	D.6 Aesthetics, Visual Quality and Light Emissions Appendix	
4.10	Water Resources	Physical Effects	D.7 Natural Environment Technical Report	
4.11	Waters of the U.S., Including Wetlands	Physical Effects	D.7 Natural Environment Technical Report	
4.12	Ecological Resources	Physical Effects	D.7 Natural Environment Technical Report	
4.13	Geology	Physical Effects	D.7 Natural Environment Technical Report	G.13 Geotechnical Report
4.14	Soils and Farmlands	Physical Effects	D.7 Natural Environment Technical Report	
4.15	Hazardous Materials and Solid Waste	Physical Effects	D.8 Hazardous Material Sites and Solid Waste Appendix	
4.16	Air Quality	Corridor-wide Effects	D.9 Air Quality Technical Report	
4.17	Noise and Vibration	Corridor-wide Effects	D.10 Noise and Vibration Appendix	
4.18	Electromagnetic Fields and Interference	Corridor-wide Effects	D.11 Electromagnetic Fields and Interference Appendix	G.3 Electromagnetic Fields (EMF) Memorandum
4.19	Energy	Corridor-wide Effects	NA	
4.20	Utilities	Corridor-wide Effects	NA	

Section Number	Resource	Evaluated Effects	Technical Appendix	Additional Information
4.21	Public Health and Safety	Exception	NA	
4.22	Safety and Security	Corridor-wide effects	NA	G.6 Safety and Security Technical Memorandum
4.23	Indirect and Cumulative Effects	Corridor-wide Effects	NA	
4.24	Irreversible and Irretrievable Use of Resources	Exception	NA	

Additional information, such as mapping, agency correspondence and more detailed data is provided in the following Technical Appendices:

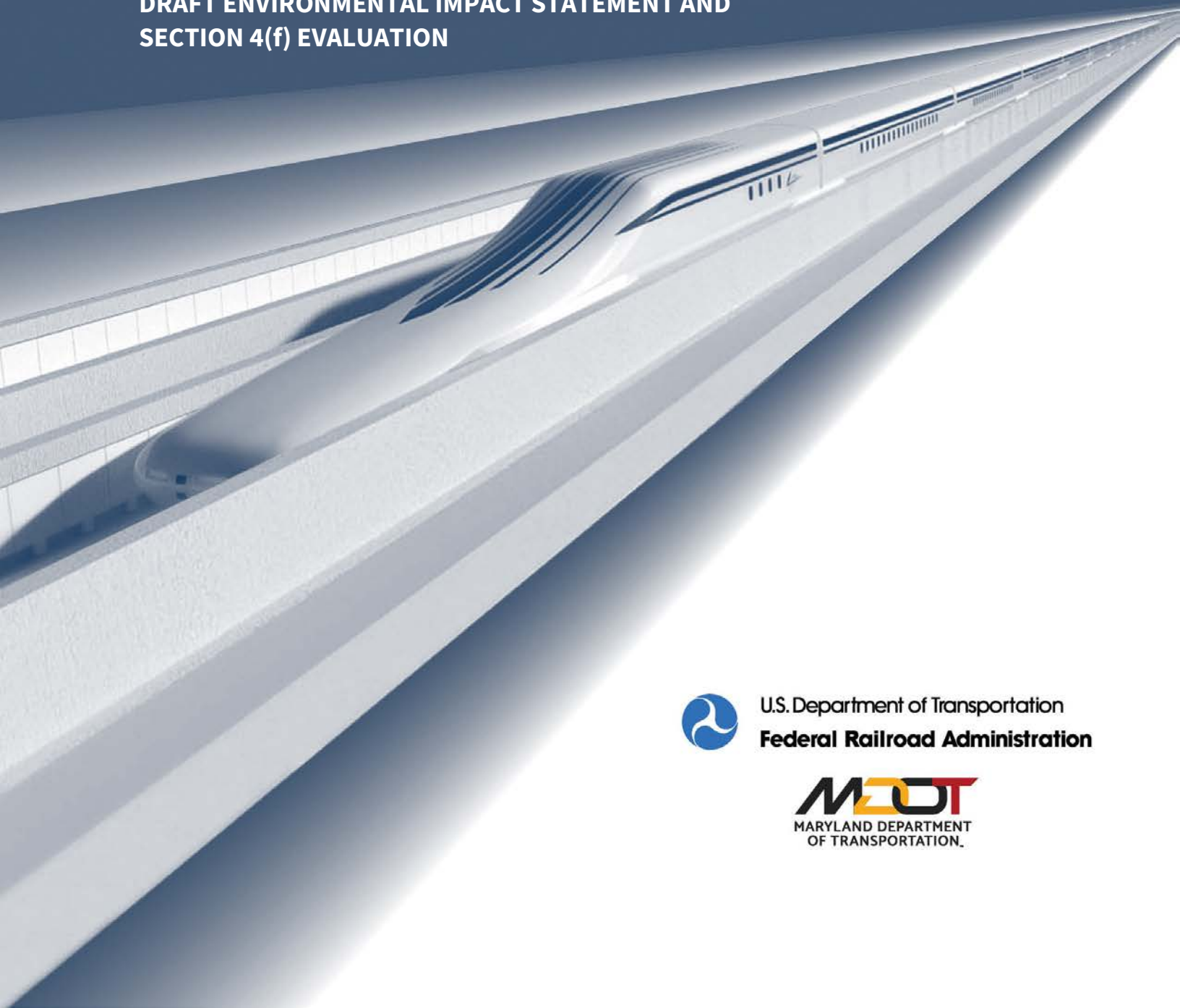
- **Appendix A** provides a list of acronyms, glossary of terms, references, and list of preparers
- **Appendix B Mapping Atlas** - provides a mapping atlas that illustrates the relationship of physical resources to the Build Alternatives
- **Appendix C Supporting Alternative Development** - provides supporting document for the alternatives' development process
- **Appendix D Chapter 4 Supporting Technical Documents** - provides supporting documentation to resource topics analyzed in Chapter 4
- **Appendix E Public Involvement Agency Coordination** - provides documentation of public and agency coordination
- **Appendix F Section 4(f)** - provides the Draft Section 4(f) Evaluation
- **Appendix G Preliminary Engineering and Design Specifications of the Build Alternatives** - provides preliminary engineering associated with the Build Alternatives

Section 4.2

Transportation

BALTIMORE-WASHINGTON SUPERCONDUCTING MAGLEV PROJECT

DRAFT ENVIRONMENTAL IMPACT STATEMENT AND
SECTION 4(f) EVALUATION



U.S. Department of Transportation
Federal Railroad Administration



4.2 Transportation

4.2.1 Introduction

This section describes existing and planned transportation systems, services, and facilities within the vicinity of the Superconducting Magnetic Levitation Project (SCMAGLEV Project) Affected Environment of the SCMAGLEV Project and analyzes the potential effects of introducing SCMAGLEV Project as a new transportation mode.

This section is presented differently than other sections in Chapter 4. It is organized by transportation service type, i.e., SCMAGLEV Service and Operations, commuter rail, intercity passenger rail, etc. Within each subsection, discussion is provided for both existing and planned conditions because this discussion for each relevant transportation system is then followed by a discussion of effects under the future No Build and Build Alternatives (2030 and 2045). Potential mitigation is provided in each subsection where adverse effects are identified. Additional information is included in Appendix D.2 Transportation Technical Report.

4.2.2 Regulatory Context and Methodology

4.2.2.1 Regulatory Context

In accordance with the National Environmental Policy Act (NEPA), 42 U.S.C. § 4321 et seq., the Council on Environmental Quality (CEQ) regulations, 40 C.F.R. Parts 1500 - 1508, and the Federal Rail Administration's (FRA) Procedures for Considering Environmental Impacts, 64 Fed. Reg. 28545 (May 26, 1999) FRA assessed impacts to all modes of transportation, including passenger and freight rail, as well as potential impacts to roadway traffic congestion.

The Maryland Department of Transportation (MDOT) has regulatory authority over state roadways and transit systems in Maryland. Similarly, Baltimore City Department of Transportation (BCDOT) and District Department of Transportation (DDOT) have regulatory authority over local roadways and streets in the City of Baltimore and Washington, D.C., respectively. Any modifications to roadways in these jurisdictions would require review and approval by MDOT, BCDOT or DDOT.

Coordination with the Federal Aviation Administration (FAA) and the MDOT Maryland Aviation Administration (MAA) is required for any activities that might affect airport operation or safety.

4.2.2.2 Methodology

For the evaluation of transportation, the SCMAGLEV Project Affected Environment is the same as the Project Study Area defined in Section 4.1.

FRA evaluated the following transportation systems and networks:

- **SCMAGLEV Service and Operations** – New SCMAGLEV Service was added to the transportation network in the Build Alternatives.
- **Commuter Rail Network** – Maryland Area Regional Commuter (MARC) commuter rail service between the City of Baltimore, Baltimore-Washington International Thurgood Marshall (BWI Marshall Airport) Station, and Washington, D.C. (the Penn Line between Baltimore Penn Station, BWI Marshall Airport Station and Washington Union Station and the Camden Line between Baltimore Camden Yards Station and Washington Union Station).
- **Intercity Passenger Rail (Amtrak)** – Amtrak Intercity Passenger Rail service between Baltimore Penn Station, BWI Marshall Airport Station, New Carrollton, and Washington Union Station. Three Amtrak services operate along the corridor between Baltimore and Washington, D.C.: Acela high speed express service, Northeast Regional Service, which makes more stops within the corridor than Acela service, and long-distance intercity rail which operates within the corridor but is destined for cities outside the Northeast corridor.
- **Local Transit Systems** – In Baltimore this includes MDOT Maryland Transit Administration (MDOT MTA) Citylink local bus routes, commuter bus, Light RailLink (hereafter Light Rail) and Metro SubwayLink heavy rail (hereafter Metro). In Washington, D.C. this includes Washington Metro Area Transit Authority (WMATA) local bus and Metrorail, commuter bus run by multiple agencies, and the DC Streetcar and Washington, D.C. Circulator, both run by the District Department of Transportation. In Prince George's County local transit service includes the locally operated The Bus system, WMATA Metrorail and Metrobus service, and commuter bus service run by MDOT MTA; In Anne Arundel County, local transit service includes Baltimore Light Rail, local bus and commuter bus service run by MDOT MTA.
- **Intercity Bus** – Throughout the corridor, privately operated intercity bus service is provided by operators Greyhound, Peter Pan Trailways, and Mega Bus, each of whom provide service between Baltimore and Washington, D.C.
- **Regional Roadway Network** – Regional roadways that span the SCMAGLEV Project Affected Environment.
- **Station Area Street/Roadway Networks in Baltimore, MD, at BWI Marshall Airport, Washington, D.C., and around TMF Options** – The local street/roadway network around the proposed SCMAGLEV Project stations and the TMF options.
- **Airport Access** – BWI Marshall Airport access.
- **Station Area Parking** – Parking within the station area zones of each proposed station.
- **Station Area Urban Sidewalk, Bicycle and Pedestrian Networks** – Sidewalk, pedestrian and bicycle networks within the station area zone of each proposed station.

- **Station Area Pickup and Drop-Off Operations** – Vehicular drop-off and pick-up zones and pickup and drop-off operations at SCMAGLEV Project stations, including private auto, taxi, and transportation network companies such as Uber or Lyft.

FRA evaluated the overall transportation system and the individual transportation network elements listed above for the following conditions:

- Current conditions
- Future No Build Alternatives (Opening Year [2030] and Horizon Year [2045])
- Future Build Alternatives (Opening Year [2030] and Horizon Year [2045])
- Construction Related Impacts – impacts during construction for each affected transportation mode are summarized in Section 4.2.14.

The analysis also evaluates two different station alternatives in Baltimore at Camden Yards and Cherry Hill. In most aspects of the SCMAGLEV Project, there are no differences between the two station alternatives. Where there are differences, these are noted in the impact's evaluation throughout the chapter.

Appendix D.2 provides more detail on the characteristics and evaluation of each network element, for each condition. The analysis completed differed by mode/transportation network element but includes ridership impacts, travel time changes, Vehicle Miles Traveled changes, traffic impacts related to the Build Alternatives, trip diversions to SCMAGLEV station area impacts under the Build Alternatives, and traffic impacts associated with the construction period. Appendix D.2 also outlines the methodology for the different analyses that yielded the data that supported the evaluations in this chapter.

For this analysis, FRA considered a one-mile radius around the physical footprint of each passenger station. This one-mile radius was selected based on the anticipated geographic area that would be impacted by station activity and reflects access and egress to the station and associated traffic impacts and impacts to other modes such as pedestrians and public transportation modes. To support the evaluation of the different network elements within the SCMAGLEV Project Affected Environment, the Project Sponsor or FRA completed the following analyses.

SCMAGLEV Ridership Forecasts – Ridership forecasts were developed by the Project Sponsor (BWRR) to provide a range of inputs into the assessment of potential transportation impacts. Forecast-related data is provided for the years 2030 (opening year) and 2045 (horizon year), by Baltimore Station Scenario. Data outputs from the forecasts include:

- Forecasted daily and annual ridership.
- Forecasted travel times changes between the Build and No Build, aggregated for all daily trips made within the SCMAGLEV Project Affected Environment.

- Forecasted changes in annual Vehicle Miles Travelled (VMT) between the Build and No Build.
- Forecasted changes in Rail and Bus Passenger Miles Traveled (PMT) between the Build and No Build.
- Forecasted diversions of passengers/trips to SCMAGLEV Project from other modes operating within the SCMAGLEV Project Affected Environment.

The ridership forecasting methodology, approach, and assumptions are summarized in the Transportation Technical Report, available on the SCMAGLEV Project website, utilizing documentation developed by the Project Sponsor.

SCMAGLEV Operations Report – The Operations Report¹, developed by the Project Sponsor, outlines the following elements related to SCMAGLEV operations:

- SCMAGLEV revenue hours of operation by day of week
- SCMAGLEV service by time of day and day of week
- SCMAGLEV train consist configuration and total capacity
- SCMAGLEV end-to-end travel times

More detail on SCMAGLEV operations is included in the Appendix D.2.

SCMAGLEV Traffic Analysis – Traffic analysis was completed at both a regional and station-area level to understand the impacts to the SCMAGLEV Project Affected Environment roadway network of the addition of the SCMAGLEV Project to the Affected Environment Transportation Network. Deriving the data necessary to calculate impacts was a multi-step process that is outlined in detail in the Transportation Technical Report. This data development and analysis was completed by FRA based on Origin/Destination trip tables provided by the Project Sponsor.

This multi-step process yielded traffic volumes and turning movement counts that allowed for the calculation of Level of Service (LOS) and delay for station-area intersections under the No Build and Build Alternatives in order to assess the traffic operations impacts associated with the SCMAGLEV Project.

A sample of intersections impacted by SCMAGLEV construction activity was completed based on Maintenance of Traffic plans developed by the Project Sponsor for each construction phase. A summary of Maintenance of Traffic plans and associated temporary intersection modifications are provided in the Transportation Technical Report.

Review and Analysis of Public Documents – A significant amount of the data required to assess current and future network characteristics for both the Build and No Build Alternatives is available from public documents. These documents include public

¹ Baltimore-Washington SCMAGLEV Project; Operations Plan: BWRR – May 6, 2020 (see Appendix G.4 of this DEIS)

timetables for different transportation operators within the SCMAGLEV Project Affected Environment, long-range planning documents for different modes within the SCMAGLEV Project Affected Environment and the Constrained Long-Range Plans for the two Metropolitan Planning Councils within the SCMAGLEV Project Affected Environment; the Baltimore Metropolitan Council (BMC) and the Metropolitan Washington Council of Governments (MWCOC). These sources are cited throughout this chapter when data they provided was used in the impact evaluation.

4.2.3 SCMAGLEV Service and Operations

4.2.3.1 Current Conditions

The SCMAGLEV Project Affected Environment transportation network currently has no SCMAGLEV service or operation.

4.2.3.2 Future No Build

The SCMAGLEV service would not be part of the future No Build transportation network.

4.2.3.3 Future Build Network

FRA evaluated proposed SCMAGLEV service for opening year service in 2030 and horizon year 2045. Service would run between Baltimore, MD and Washington, D.C. and serve three stations; one in the City of Baltimore, one at BWI Marshall Airport and one in Washington, D.C. FRA evaluated two alternative station locations in Baltimore City (Cherry Hill and Camden Yards Stations). It should be noted that under the Cherry Hill Station alternative SCMAGLEV Project passengers would have to transfer to another transportation mode in order to access downtown Baltimore. Current options include Baltimore Light RailLink and local bus routes. Chapter 3 Alternatives Considered outlines the station zones and the SCMAGLEV Project alignments in greater detail. **Table 4.2-1** summarizes the SCMAGLEV Service Characteristics.

Table 4.2-1: Service Characteristics

Service Characteristic	Description
Number of Trains	16 car trains
Seated Capacity per train	762
Number of trains/hours	Weekday AM/PM Peak: 8 in each direction (train every 7.5 minutes/hour) Weekend: 4 in each direction (fewer trains occur during lower demand periods)
Service/service hours	7 days per week/ 5:00 AM to 11:00 PM
Travel time (between D.C. and Baltimore)	Approximately 15 minutes total. This total includes station dwell times

Source: BWRR, 2020

4.2.3.4 Impacts

The assessment focuses on the changes in how the transportation network will be used by trip-makers after the SCMAGLEV Project is added to the network. Key metrics to describe the impact of adding SCMAGLEV Project to the transportation network include total forecasted SCMAGLEV ridership (annual and daily), daily ridership by station, forecasted diversions of trips to SCMAGLEV Project from other modes, changes in Vehicle Miles Traveled (VMT), changes in Rail and Bus Person Miles Traveled (PMT), and aggregate travel time savings due to the addition of SCMAGLEV Project to the SCMAGLEV Project Affected Environment transportation network. Data for forecasted SCMAGLEV annual ridership and diversions of trips from other modes is outlined below. Data for the other metrics is provided in Appendix D.2A.2.

SCMAGLEV Annual Ridership

Table 4.2-2 depicts the forecasted SCMAGLEV annual ridership by year (2030 (opening year) and 2045 (horizon year)) and Baltimore Station Alternative. A forecasted range of 16.1 to 17.9 million riders would use the SCMAGLEV service in opening year 2030 depending on the Baltimore Station alternative, while a range of 18.9 to 20.6 million annual riders are forecasted in horizon year 2045. Further context for this ridership is provided in **Table 4.2-3**, which shows the source of these riders.

Table 4.2-2: Forecasted Annual Ridership on the SCMALEV: Years 2030 (Opening Year) and 2045 (Horizon Year)

	Cherry Hill		Camden Yards	
	2030	2045	2030	2045
Annual Ridership	17,056,911	18,657,769	18,960,622	20,578,553

Source: Project Sponsor: Baltimore-Washington SCMAGLEV Project

Source of SCMAGLEV Ridership and Diversions to SCMAGLEV Project from Other Modes

Introducing a new mode, like the SCMAGLEV Project, to the transportation network may divert ridership from one mode to another based on a change in perception of which mode will provide the most attractive trip based on factors such as trip cost and total trip time between origins and destinations. **Table 4.2-3** shows the forecasted annual diversions to SCMAGLEV Project from other modes for the years 2030 and 2045, by Baltimore Station Alternative. The impacts of these diversions are evaluated in detail for each mode affected within the section addressing that mode.

Generally, the large majority of forecasted trips on SCMAGLEV Project are diverted from other modes rather than induced new trips.

Table 4.2-3: Forecasted Source of SCMAGLEV Ridership and Forecasted Diversions to SCMAGLEV Project from other Modes for the Years 2030 and 2045, by Baltimore Station Alternative

Baltimore Station Alternative by Year	2030 Cherry Hill Station	2045 Cherry Hill Station	2027 Camden Yards Station	2045 Camden Yards Station
Diverted from Auto	11,380,467	14,877,281	12,609,501	16,480,393
Diverted from Rail	2,122,750	2,610,204	2,261,072	2,768,873
Diverted from Bus*	253,107	309,733	263,229	320,005
Diverted from Taxi/Rideshare	582,217	860,551	681,976	1,009,282
Total Diverted Trips	14,338,541	18,657,769	15,815,778	20,578,553
Total Forecasted Annual SCMAGLEV Trips	17,056,911	22,367,238	18,960,622	24,938,652
New Induced Trips	2,718,370	3,709,269	3,144,844	4,360,099

Source: Baltimore-Washington SCMAGLEV Project: Project Sponsor SCMAGLEV Daily Boardings and Alightings by SCMAGLEV Station

* This category covers diversions from all bus services in the SCMAGLEV Project Affected Environment, including local bus services, express services to Baltimore and Washington and privately operated inter-city bus services

Forecasted daily boardings by SCMAGLEV Project station for the horizon year 2045, by Baltimore Station Alternative, is shown in Appendix D.2A.2.1. The data in the Appendix table shows a range of 70,069 daily riders to 77,764 daily riders in the horizon year 2045. The highest ridership would occur at the Mount Vernon East Station in Washington, D.C., followed by Baltimore (either alternative) and then BWI Marshall Airport.

Changes in Annual Vehicle Miles Traveled (Build vs. No Build Alternatives)

The addition of SCMAGLEV Project to the transportation network will have an impact on how trips are made as well as the mode used (see discussion of trip diversions in previous section). This shift in how trips are made will, in turn, impact the aggregate number of Vehicle Miles Traveled within the SCMAGLEV Project Affected Environment as well as aggregate Rail and Bus Passenger Miles traveled. The forecasted changes in aggregate Annual Vehicle Miles Traveled between the No Build and Build Alternatives for the opening year and horizon year is outlined in detail in Appendix D.2A.2.2. The data in Appendix D.2A.2.2 shows a decrease in VMT compared to the No Build Alternative. This decrease reflects the diversion of trips from motorized modes such as single/low occupancy automobiles to SCMAGLEV Project. Decreases in VMT result in lower tail pipe emissions. Air quality impacts are evaluated in Section 4.16.

Changes in Rail Passenger Miles Traveled (Build vs. No Build Alternatives)

Forecasted changes in Rail Passenger Miles Traveled (RPMT) in the opening year and horizon year, as outlined in Appendix D.2A.2.3 is the companion data to the VMT data discussed in the previous section. The data in the Appendix table shows a decline in RPMT between the No Build and Build Alternatives, which reflects the forecasted diversion of trips from rail services in the SCMAGLEV Project Affected Environment to SCMAGLEV Project (see **Table 4.2-3** above). This forecasted decline in RPMT means rail services will be used less for trip making once SCMAGLEV Project is part of the transportation network.

Changes in Bus Passenger Miles Traveled (Build vs. No Build Alternatives)

Forecasted changes in Bus Passenger Miles Traveled (BPMT), as outlined in Appendix D.2A.2.4 is the companion data to the Rail Passenger Miles data discussed in the previous section. The data in the Appendix shows a decline in BPMT between the No Build and Build Alternatives, which reflects the forecasted diversion of trips from bus services to the SCMAGLEV Project (see **Table 4.2-3** above). As with rail service, this forecasted decline means bus services will be used less for trip making once SCMAGLEV Project is part of the transportation network. The decline in BPMT will result in benefits from lower tail pipe emissions based on fewer miles traveled.

Total Forecasted Aggregate Annual Travel Time Savings within SCMAGLEV Project Affected Environment (Build vs. No Build Alternatives)

As noted in previous sections, the addition of SCMAGLEV Project to the transportation network will change the way in which trips are made within the SCMAGLEV Project Affected Environment, with individual travelers making trip choices based on factors such as changes in cost and total trip time. One impact of the addition of SCMAGLEV Project to the network will be changes in forecasted Build Alternatives aggregate travel times within the SCMAGLEV Project Affected Environment when compared to the No Build Alternative, which are outlined in Appendix D.2A.2.5 for the years 2030 and 2045, by Baltimore Station scenario. The data shows that SCMAGLEV Project will result in forecasted travel times savings in both years, and for both Baltimore Station scenarios. This decline is a result of the forecasted diversion of trips from modes with longer travel times to SCMAGLEV Project and is a benefit for travelers within the SCMAGLEV Project Affected Environment. The economic impacts of these travel times savings are evaluated in Section 4.6 Economic Resources.

4.2.3.5 Mitigation Strategies

The evaluation of the impacts of adding to the SCMAGLEV Project Affected Environment transportation network show positive impacts associated with declines in Vehicle Miles Traveled and increases in aggregate travel time savings.

Changes in how trips are made within the SCMAGLEV Project Affected environment, however, will result in forecasted diversions from rail and bus service within the corridor to SCMAGLEV Project (see **Table 4.2-3** above). These forecasted diversions are significant and may require changes in how bus and rail service is provided after

SCMAGLEV Project implementation. More detail on the mitigation of the impacts of passenger diversions from corridor bus and rail services to SCMAGLEV Project are outlined in the sections below addressing each of the potentially impacted modes.

4.2.4 Commuter Rail Network

MARC commuter rail service operates on two different lines between downtown Baltimore, MD and Washington, D.C. Both lines run parallel to the Build Alternatives.

4.2.4.1 Current Conditions

Two MARC commuter rail service lines fall within the SCMAGLEV Project Affected Environment. The first line is the MARC Penn Line, with its alignment running on Amtrak's Northeast Corridor (NEC) between Penn Station in downtown Baltimore and Union Station in Washington, D.C. Penn Line service runs in both directions throughout the day and provides rail access to both downtown Baltimore and downtown Washington, D.C., as well as to activity centers along the line between the two cities.

The second line is the Camden Line, with its alignment running on CSX Transportation (CSXT) freight tracks between Camden Yards Station in downtown Baltimore, MD and Union Station in Washington, D.C. The Camden Line service runs in both directions during the AM and PM peak periods, and provides rail access to Baltimore, Washington, D.C. and local activity centers along the line. The two MARC rail lines are described in greater detail in the Appendix D.2A.3.

4.2.4.2 Future No Build Alternative

The MARC future No Build Alternative network consists of current conditions as well as improvements funded in the Baltimore Metropolitan Council (BMC) and Metropolitan Washington Council of Governments (MWCOC) Constrained Long Range Plans (CLRPs). These improvements are described in Chapter 3, Section 3.4.1.2.

The physical improvements to the MARC rail lines incorporated into the two CLRPs would allow for more frequent MARC service to accommodate increased forecasted demand by providing additional capacity as well as to provide a more attractive and convenient service to potential riders. The change in MARC service frequencies, as incorporated into the MWCOC regional forecasting model and reflecting the CLRPs, compared to current conditions, is summarized in **Table 4.2-4**.

The Maryland Department of Transportation, Maryland Transit Administration (MTA) also has developed the MARC Cornerstone Plan, which is a long-range plan that focuses on both prudent management of existing assets as well as system expansion through the year 2045. At this point the majority of the expansion initiatives outlined in the Cornerstone Plan are not funded through inclusion in the MWCOC or BMC Constrained Long-Range plans, but the intent is to fund the expansion projects over the life of the plan.

Table 4.2-4: Future MARC No Build Alternative Peak Period Service Frequencies

MARC Line/Direction	Current Peak Period Service Frequency	Future Peak Period Service Frequency
Penn Line – Baltimore to Washington	15-30 Minutes	15 – 20 minutes
Penn Line – Washington to Baltimore	30 minutes	20 minutes
Camden Line – Baltimore to Washington	30 minutes	20 minutes
Camden Line – Washington to Baltimore	30 minutes	20 minutes

Source: MWCOG Regional Forecasting Model – Future Network

4.2.4.3 Future Build Network Alternatives

At this time, there has been no indication that MDOT MTA is intending to scale back its expansion plans (funded in the CLRPs or in the Cornerstone Plan) to reflect SCMAGLEV Project's addition to the SCMAGLEV Project Affected Environment transportation network. Therefore, the MARC component of the future Build transportation network will be the same as its configuration in the Future No Build network.

4.2.4.4 Impacts

MARC carried 9,326,683 passengers in 2018, of which approximately 7,461,000 were carried on the Penn and Camden Lines (Federal Transit Administration: National Transit Database, MARC Cornerstone Plan:2019). The forecasted diversions from all rail to SCMAGLEV Project as outlined in **Table 4.2-3** are 2,768,873 in 2045 under the Camden Yards Baltimore Station Scenario. An estimated 88% (Project Sponsor Ridership Report dated November 2018) of the total will be diverted from MARC Penn Line and Camden Line service, resulting in a total forecasted diversion from MARC of 2,436,608 annual boardings. This means it is forecasted that approximately 32% of annual MARC ridership on the Penn and Camden Lines would divert to SCMAGLEV Project once implemented (based on current MARC ridership – future MARC ridership numbers are not available). While no plans to respond to these diversions have yet been developed, these significant forecasted trip diversions would likely require a lowering of MARC service levels to account for a decline in forecasted ridership demand as well as a likely decline in fare revenue.

Forecasted changes in ridership demand and lower levels of service would also likely require modifications to MARC's long-range expansion plans and other capital investments.

4.2.4.5 Mitigation Strategies

At this point, no changes to MARC service or long-range expansion plans and other capital investments have been identified by the Maryland Department of Transportation in response to the forecasted diversions of riders to SCMAGLEV. A specific mitigation

plan will need to be developed by the Project Sponsor in consultation with MDOT in order to address the impacts associated with the forecasted diversions. Specific strategies that might be included in this Mitigation Plan may include:

- **Development of New Operating Plans to Reflect New Ridership Demand** – This mitigation strategy would involve the development of new rail operating plans to reflect forecasted lower ridership demand on MARC. Service changes to reflect lower demand may include lower service frequencies, shorter hours of service, scaling back mid-day service on the Penn Line and scaling back of weekend service. MDOT will identify required assistance from the Project Sponsor in developing new operations plans.
- **Development of a Revised Financial Plan** – Changes in service levels in response to forecasted changes in ridership demand will require a new financial plan reflecting new operational levels. Service level changes will affect all aspects of operations including staffing levels for train crews, cleaning crews, vehicle maintenance crews, yard operations crews and station attendants. MDOT will identify required assistance from the Project Sponsor in developing a new financial plan.
- **Development of a New Six-Year Capital Plan** – Capital requirements will change across all elements of operations based on changes in service levels. This will include changes in vehicle-related capital requirements, passenger facility capital requirements, and operating support facilities. MDOT will identify required assistance from the Project Sponsor in developing a new six-year capital program as well as the required length of assistance in updating the plan on an annual basis.
- **Development of a New Long-Range Plan** – In addition to the six-year capital program, the existing Long-Range Plan (MARC Cornerstone Plan) will require updating to reflect changes in ridership demand. MDOT will identify required assistance from the Project Sponsor in developing a revised long-range plan.
- **Financial Support** – MDOT may require financial support during a transition period to the new operating configuration resulting from the forecasted diversion of trips to SCMAGLEV. This item will be part of the overall negotiations between the Project Sponsor and MDOT regarding the Project Sponsor's role in the transition to the new operating configuration resulting from forecasted rider diversions to SCMAGLEV.

4.2.5 Intercity Passenger Rail (Amtrak)

4.2.5.1 Current Conditions

Amtrak intercity rail service runs through the SCMAGLEV Project Affected Environment on the NEC, generally parallel to the proposed SCMAGLEV Project (Amtrak service runs on the same line as the MARC Penn Line service, as shown in Appendix D.2). The first of the three primary services in the corridor is the high-speed Acela Express, which

makes the fewest stops and has the fastest travel times within the SCMAGLEV Project Affected Environment. The second primary service is the Northeast Regional, which has longer travel times and provides more local stops within the SCMAGLEV Project Affected Environment. The Acela stops only at Baltimore Penn Station and Washington Union Station, while Northeast Regional trains stop at Baltimore Penn Station, the BWI Marshall Airport Station, the New Carrollton Rail Station, and Washington Union Station. The final services that run through the SCMAGLEV Project Affected Environment are long distance trains destined for locations beyond the NEC but which use NEC within the SCMAGLEV Project Affected Environment as part of their trip.

Amtrak trains run in both directions throughout the day, with service frequencies approximately every 15-20 minutes in the peak period and 30-40 minutes in the off-peak (these frequencies are based on the combined Acela/Northeast Regional services within the corridor).

4.2.5.2 Future No Build Alternative

A number of initiatives have been identified that are focused on improving intercity passenger rail service within the SCMAGLEV Project Affected Environment. These initiatives are identified in Chapter 3 Alternatives Considered and provide insight into the high level of planned capital investment in intercity passenger rail service within the SCMAGLEV Project Affected Environment. Of particular note are improvements identified by FRA in the NEC FUTURE ROD in order to meet service and performance objectives to improve and grow the role of passenger rail along the NEC. If projects identified in the NEC FUTURE Plan are implemented, the capacity and performance of intercity passenger rail within the SCMAGLEV Project Affected Environment would improve.

In addition to the initiatives outlined above, the new Acela 21 equipment is currently being manufactured and tested. This new equipment will allow for top operating speeds of 160 mph.

Amtrak is also evaluating the potential for low-cost intercity services within the NEC overall, including within the SCMAGLEV Project Affected Environment.

4.2.5.3 Future Build Alternatives

Currently, there are no planned changes to the capacity and service improvements as outlined in the NEC FUTURE ROD in response to the implementation of the SCMAGLEV Project. Based on these current plans, future intercity rail service would be the same as under the Future No Build Alternative.

4.2.5.4 Impacts

It is estimated that there were 354,800 Amtrak trips made between the Baltimore Penn Station, BWI Marshall Airport, and Washington Union Station stations in 2019 (Rail Passengers Association, Federal Railroad Administration). The forecasted diversions from Amtrak equal approximately 332,600 or 94% of annual Amtrak trips traveling between the three major Amtrak stations within the SCMAGLEV Project Affected

Environment. While no definitive plans to respond to these diversions have yet been developed, these trip diversions may require service changes to match train frequency and hours of service to new ridership demand as well as a scaling back of future planned expansion plans and new service initiatives within the SCMAGLEV Project Affected Environment.

4.2.5.5 Mitigation Strategies

At this point, no changes to Amtrak service or long-range expansion plans and other capital investments have been identified by Amtrak in response to the forecasted diversions of riders to SCMAGLEV. A specific mitigation plan will need to be developed by the Project Sponsor in consultation with Amtrak in order to address the impacts associated with the forecasted diversions.

It is important to consider in the mitigation plan development that Amtrak trips between stations within the SCMAGLEV Project Affected Environment are a small part of total boardings at these stations. Most SCMAGLEV Project Affected Environment station activity consists of trips destined for a destination outside the SCMAGLEV Project Affected Environment or trips coming from an origin outside the SCMAGLEV Project Affected Environment. Any mitigation plan, especially changes in service frequencies, must consider this origin/destination data.

Specific strategies that might be incorporated into an Amtrak Mitigation Plan may include:

- **Assessment of Whether Service Levels Should be Modified to Reflect Trip Diversions** – This analysis would evaluate whether the diversions occurring within the SCMAGLEV Project Affected Environment portion of the overall Northeast Corridor warrant changes to service levels that would cascade throughout the corridor. If it is determined that some modifications of service levels are warranted, this analysis would also consider financial and fare revenue impacts, capital improvement and future expansion impacts, and fleet and staffing impacts. Amtrak will identify required assistance from the Project Sponsor in developing this analysis.

4.2.6 Local Transit Systems

The Project Study Area consists of a highly developed transit network comprised of local bus, express bus, light rail and heavy rail. A brief description of the current local transit network is provided below, by geographic area within the Project Study Area, with a specific focus on interactions with potential SCMAGLEV Project stations. More detail is provided in Appendix D.2A.4.

4.2.6.1 Current Conditions – Baltimore

The City of Baltimore transit network is comprised of local bus routes known as LocalLink, commuter bus, Light Rail (known as Light RailLink) and Metro Heavy Rail (known as MetroLink). Each is described below. Service is operated by MDOT Maryland

Transit Administration (MDOT MTA) Maps of transit service in each SCMAGLEV Project station area is contained in Appendix D.2A.4.1.

Baltimore Local Bus (LocalLink)

MDOT MTA local bus network (known as LocalLink) in Baltimore consists of 56 LocalLink routes. The majority of these 56 LocalLink routes run through downtown Baltimore, thus providing access to the Camden Yards Station Area. A map showing the Camden Yard Station area transit network is provided in Appendix D.2A.4.1.

Four MTA LocalLink bus routes would provide service at the Cherry Hill Station alternative. Service characteristics for these routes as well as a map showing the routes are provided in Appendix D.2A.4.1.

Metro Heavy Rail (MetroLink)

The second transit mode serving Downtown Baltimore is MDOT MTA's Metro heavy rail line (known as MetroLink), with the closest stations to the SCMAGLEV Camden Yards Station being located at Lexington Market (five blocks north of the Camden Yards Station) and Charles Center (two blocks north of the Camden Yards Station). There is no Metro heavy rail service to the Cherry Hill Station option. More detail on MetroLink service characteristics is provided in Appendix D.2A.4.1.

Light Rail (Light RailLink)

The MDOT MTA Light Rail system (known as Light RailLink) runs north/south through Baltimore City, Baltimore County and Anne Arundel County and would interact with the SCMAGLEV system at multiple points, including direct connections to each of the Baltimore SCMAGLEV Project station alternatives and at BWI Marshall Airport. More detail on Light Rail service characteristics, alignment, and connections with different SCMAGLEV Project stations is provided in Appendix D.2A.4.1.

MTA Express Bus Service

There are nine express bus services directly run by the MDOT MTA and seven contractor operated commuter services that serve downtown Baltimore from throughout the Baltimore region. Each of these services provide access to downtown Baltimore and therefore would also provide access to the SCMAGLEV Camden Yards Station. No express service currently serves the Cherry Hill Station.

Privately Operated Inter-City Bus Services

Four private operators run bus service between Baltimore and Washington, D.C. Greyhound runs nine trips per day in each direction between the two cities. Megabus, Bolt Bus and Peter Pan Trailways each run two trips per day in each direction between the two cities.

4.2.6.2 Current Conditions – Anne Arundel County and Prince George’s County

The middle portion of the SCMAGLEV Project alignment between Baltimore City and Washington, D.C. would be located in Anne Arundel County and Prince George’s County Maryland. The transit network in this set of counties includes local bus, express bus, WMATA bus and Metrorail, and MDOT MTA Light Rail. More detail on each of these transit network elements is provided in Appendix D.2A.4.2.

4.2.6.3 Current Conditions - Washington, D.C.

Washington, D.C. and the area around the proposed SCMAGLEV Project station at Mount Vernon Square is served by a dense transit network that comprises WMATA Metrobus service, DC Circulator service, and WMATA Metrorail service. In addition, VRE commuter rail service provides connections from Northern Virginia and Washington, D.C. at Union Station and Commuter buses from both Virginia and Maryland also provide connections to the District. Finally, inter-city Amtrak rail service serves Washington Union Station (also the terminal for project area commuter rail service). Each of these network elements is outlined below, with greater detail provided in Appendix D.2A.4.3.

WMATA Metrobus

The Metrobus system is a region-wide bus system that is also the prime service provider in Washington, D.C. Multiple WMATA Metrobus routes run in the vicinity of the proposed Mount Vernon East Station. More detail on each of these local bus routes in the station area is provided in Appendix D.2A.4.3.

DC Circulator

The DC Circulator is a smaller bus system managed by the District Department of Transportation that supplements bus service provided by WMATA Metrobus. The Georgetown – Union Station Circulator route runs directly by the proposed Mount Vernon East Station on K Street. The Circulator runs every 10 minutes throughout the day.

Metrorail

Metrorail is a regional heavy rail system consisting of six lines and serving Virginia, Maryland and Washington, D.C. More detail on the Metrorail system overall as well as in the vicinity of the SCMAGLEV Mount Vernon Station is provided in Appendix D.2A.4.3.

Privately Operated Inter-City Bus Services

Four private operators run bus service between Baltimore and Washington, D.C. Greyhound runs nine trips per day in each direction between the two cities. Megabus, Bolt Bus and Peter Pan Trailways each run two trips per day in each direction between the two cities.

4.2.6.4 Future No Build Alternative

FRA identified transit improvements within the Project Study Area included in the two regional CLRPs. They are:

- MDOT MTA Bus Expansion Program;
- Bus Rapid Transit to BWI Marshall Airport - from Dorsey MARC Station to BWI Marshall Light Rail Station;
- U.S. 29 Bus Rapid Transit service;
- DC Streetcar Expansion; and
- MDOT MTA Purple Line.

The future No Build transit network will consist of the current network as well as these additional improvements.

4.2.6.5 Future Build Alternatives

No planned changes to local transit systems have been identified in response to the addition of the SCMAGLEV Project Affected Environment transportation network.

4.2.6.6 Impacts

Impacts to ridership demand and required service levels on local transit systems within the SCMAGLEV Project Affected Environment are expected to occur on two different sets of local transit routes.

The first set of routes are those serving the three SCMAGLEV Project stations. The SCMAGLEV ridership forecasting process identified daily mode of access and mode of egress for each trip made on SCMAGLEV, by SCMAGLEV Project station, by Baltimore Station Alternative. This data provides an understanding of transit modes from which SCMAGLEV Project riders are transferring from at the beginning of their trip or transferring to at the end of their trip.

These daily forecasted numbers have been further disaggregated into peak hour data using common factors regarding percent of ridership occurring in the AM and PM peak periods and further the percent of peak period ridership occurring in the peak hour of the peak period. The peak hour transit mode access and egress for each SCMAGLEV Project trip arriving or leaving via transit for each SCMAGLEV Project station is summarized in **Table 4.2-5**.

The data in the table shows that there will be increased demand on bus and rail routes serving the three SCMAGLEV Project stations, especially in Baltimore and Washington, D.C. This increased demand may require increased service frequencies on bus and rail, or longer trains on the rail services, serving the SCMAGLEV Project stations (Metrorail in Washington, D.C. and Baltimore Metro and Light Rail in Baltimore).

Table 4.2-5: Year 2045 Peak Hour Access and Egress Mode for SCMAGLEV Trips, by SCMAGLEV Project Station, by Station Alternative

Trips Arriving at Each SCMAGLEV Station by Transit (Access Trips by Transit Mode)				
SCMAGLEV Station	Cherry Hill Baltimore Station Alternative		Camden Yards Baltimore Station Alternative	
	Station Access by Bus	Station Access by Rail	Station Access by Bus	Station Access by Rail
Baltimore	255	1,139	301	1,214
BWI Marshall Airport	47	193	55	218
Washington, D.C.	371	1,456	408	1,611
Trips Leaving Each SCMAGLEV Station by Transit (Egress Trips by Transit Mode)				
	Station Egress to Bus	Station Egress to Rail	Station Egress to Bus	Station Egress to Rail
Baltimore	242	964	265	942
BWI Marshall Airport	31	120	36	133
Washington, D.C.	437	1,137	479	1,251

Source: Baltimore-Washington SCMAGLEV Project: BWRR

The second set of local transit routes that would be impacted by the addition of SCMAGLEV Project to the transportation network are those affected by diversions of trips to SCMAGLEV service. **Table 4.2-2** (Forecasted Source of SCMAGLEV Ridership and Forecasted Diversions to SCMAGLEV Project from other Modes for the Years 2030 and 2045, by Baltimore Station Alternative) shows that a range of 240,000 to 320,000 trips would be diverted from bus to SCMAGLEV Project depending on the year of analysis and the Baltimore Station Alternative. The large majority of these diversions would occur on publicly operated express bus services (predominantly MDOT MTA service) or privately-operated inter-city bus that currently run between the Baltimore and Washington, D.C. suburbs and the two downtowns anchoring the SCMAGLEV service, or between the two downtowns. These services are direct competitors to SCMAGLEV Project and therefore would stand to lose riders if SCMAGLEV Project would provide a more attractive trip, as shown by the forecasted diversions.

4.2.6.7 Mitigation Strategies

At this point no mitigation plans have been developed by the Project Sponsor and local transit operators or privately-operated intercity bus operators to respond to forecasted changes in demand (either an increase in demand for some routes or a decrease in demand for other routes) resulting from the addition of the SCMAGLEV Project to the Affected Environment transportation network. As a first step the Project Sponsor will assist, Local transit operators and private operators in developing these mitigation plans. Mitigation strategies may include:

- **Development of New Operating Plans to Reflect New Ridership Demand –**
This mitigation strategy would involve the development of new operating plans for local transit service impacted by additional demand from SCMAGLEV

passengers transferring to local bus and rail services, or conversely routes impacted by a decline in demand due to diversions to SCMAGLEV. Local transit operators and the private operators in the SCMAGLEV Project Affected Environment will identify required assistance from the Project Sponsor in developing new operations plans.

- **Development of a Revised Financial Plan** – Changes in service levels in response to forecasted changes in ridership demand will require a new financial plan reflecting new operational levels for each local operator and the private operators. Service level changes will affect all aspects of operations, which will impact operations and maintenance costs and fare revenues. Local operators and the private operators will identify required assistance from the Project Sponsor in developing new financial plans reflecting changes in forecasted ridership.
- **Development of a New Six-Year Capital Plan** – Capital requirements for local operators will change due to forecasted changes in ridership on local services. Based on the forecasted ridership changes, increased frequency on local buses serving the SCMAGLEV stations could require fleet additions. This would also be true of increased frequencies or longer trains on the Baltimore Metro and the Washington Metrorail heavy rail systems. The local operators will identify required assistance from the Project Sponsor in developing new six-year capital programs as well as the required length of assistance in updating the plan on an annual basis.
- **Financial Support** – The local operators may require financial support during a transition period to the new operating configurations resulting from the forecasted changes in ridership. This support may include capital support for fleet additions or operating support to offset the potential need to increase service frequencies to accommodate increased demand. This item will be part of the overall negotiations between the Project Sponsor and local operators regarding the Project Sponsor's role in the transition to the new operating configurations resulting from changes in forecasted riders.

4.2.7 Regional Roadway Network

The Project Study Area has a densely developed regional roadway network (ranging from local roads to major highways) that experiences moderate to severe congestion during peak travel periods of the day. FRA evaluated the current and future regional roadway network in order to determine impacts to this network associated with the addition of the SCMAGLEV Project to the regional transportation network. A comparable analysis is outlined in Section 4.2.8 for the local roadway network around each SCMAGLEV Project station.

4.2.7.1 Current Conditions

The SCMAGLEV Project corridor has a dense roadway network reflecting the highly developed nature of the SCMAGLEV Project Affected Environment. The regional roadway network is summarized below, with greater detail provided in Appendix D.2A.5.

North/South Roadways

FRA identified six major north/south roadways in the Project Study Area that run parallel to the SCMAGLEV Project. These roadways are I-95, the Baltimore-Washington Parkway (BWP), I-97, U.S. 29, U.S. 1, and MD Route 170. More detail on each of these roadways is provided in Appendix D.2A.5.1.

East/West Roadways

FRA identified ten major east/west roadways that run perpendicular to the proposed SCMAGLEV Project alignment. These roadways are I-195, MD Route 100, MD Route 175, MD Route 32, MD Route 198, MD 197, MD Route 200, MD Route 193, MD Route 450 and U.S. 50. Appendix D.2A.5.2 provides more detailed descriptions of each.

Circumferential Beltways

Both major cities within the SCMAGLEV Project Affected Environment, City of Baltimore (I-695) and Washington, D.C. (I-495), are encircled by a circumferential beltway. These are described in greater detail in Appendix D.2A.5.3.

4.2.7.2 Future No Build Alternative

FRA identified the future No Build Regional Roadway network as consisting of the current conditions network plus roadway improvements that are funded and programmed in the CLRPs of either MWCOG or BMC. Roadway projects that are funded or included in one of the CLRPs are primarily focused on improvements to enhance operations or in some instances add additional capacity. FRA has included relevant regional roadway projects within the SCMAGLEV Project Affected Environment in Chapter 3, Section 3.4.1.1.

4.2.7.3 Future Build Alternatives

The future Build Network consists of the Future No Build network plus the addition of the SCMAGLEV Project physical improvements and train operations to the network. The Project Sponsor is coordinating with MDOT Maryland Aviation Administration (MAA) to determine if additional roadway improvements need to be added to the current BWI Marshall Airport – Airport Master Plan. Currently, the Master Plan shows improvements to MD 170 (Aviation Boulevard), Interstate 195 and Friendship Boulevard.

4.2.7.4 Impacts

FRA compared estimated daily traffic volumes on regional roadways between the Horizon Year 2045 No Build SCMAGLEV Project Affected Environment transportation

network and the 2045 Build Transportation Network. To assess impacts to the regional roadway network associated with the addition of SCMAGLEV Project to the transportation network, FRA selected major roadway links within the SCMAGLEV Project Affected Environment roadway network to determine changes in vehicular traffic volumes between the future No Build and Build Alternatives. The 2045 No Build and Build Alternatives volumes are summarized in Appendix D.2 for both the Cherry Hill and Camden Yards Baltimore Station scenarios. Results showed small changes in volumes between the No Build and Build Alternatives, which reflects the fact that although there will be annual diversions to the SCMAGLEV Project from automobiles (see **Table 4.2-2**) these diversions are a small percentage of the total annual automobile trips made within the SCMAGLEV Project Affected Environment and are for a small set of distinct origin/destination (O/D) pairs that are part of a much larger set of O/D pairs that are not conveniently served by the SCMAGLEV Project.

To provide context, the highest annual forecasted diverted trips from auto to SCMAGLEV Project, as shown in **Table 4.2-2**, is 16,480,000 annual trips (year 2045, Camden Yards Baltimore Station Alternative), or an average of approximately 57,000 diverted trips per day over a seven-day week. These 57,000 daily diverted trips represent approximately 1.3 percent of the total projected 4,401,899 daily auto trips made under the No Build Alternative within the SCMAGLEV Project Affected Environment in 2045.

4.2.7.5 Mitigation

The change in daily traffic volumes at key links within the regional roadway network show small changes on a daily basis, with even smaller changes during the peak periods when roads are most congested. Given that these changes in roadway volumes between the 2045 No Build and Build Alternatives will have minimal impacts on the operation of the regional roadway network, no mitigation is proposed.

4.2.8 Station Area and Train Maintenance Facility Street Network Impacts

Section 4.2.7 evaluated the impacts of the addition of SCMAGLEV Project to the SCMAGLEV Project Affected Environment on the regional roadway network. Section 4.2.8 evaluates the impact of the addition of the SCMAGLEV Project Affected Environment transportation network on the local street network around each proposed SCMAGLEV Project station. Also included in Section 4.2.10 is an analysis of parking at each proposed station under the Build Alternatives, including an assessment of forecasted parking demand versus anticipated parking capacity.

The first sub-section, 4.2.8.1, evaluates the urban street network around the Camden Yards Baltimore Station Alternative.

4.2.8.1 Camden Yards Baltimore Station Current Conditions

Current conditions for the local street network around the Camden Yards SCMAGLEV Project station are summarized in Appendix D.2A.6.

4.2.8.2 Future No Build Alternative

FRA identified no funded capital improvements in the BMC CLRP that would change the street network surrounding the Camden Yards Station in the No Build transportation network.

4.2.8.3 Future Build Alternatives

The future Build Network consists of the Future No Build network plus the addition of the SCMAGLEV Project physical improvements and train operations to the network. The Project Sponsor's station design for the Camden Yards Station includes:

- drop-off areas serving taxi, Transportation Network Companies, and privately-owned vehicles near station entrances;
- a new seven-story 5,000 space parking facility constructed north of Pratt Street between Sharp and Charles Streets; and
- improvements to the Camden Yards Transportation Center to integrate with the SCMAGLEV Project station.
- The Project Sponsor did not include improvements to the street network for the Camden Yards Station.

4.2.8.4 Impacts

In order to assess the impacts of SCMAGLEV Project on local street operations, FRA analyzed LOS and delay for the future (2045) No Build and Build Alternatives at key analysis intersections within the Camden Yard Station area, with a key focus on the changes between No Build and Build Alternatives. Detailed results are provided in Appendix D.2A.6 with a results summary provided below.

Analysis of the change in LOS and delay between the No Build and Build Alternatives show marginal changes in LOS and delay between the Build and No Build Alternatives, meaning the addition of the SCMAGLEV Project Affected Environment transportation network would have minimal impacts to the local street network around the Camden Yards Station. Detailed results are included in Appendix D.2A.6.

4.2.8.5 Mitigation Strategies

Given the forecasted LOS and delay for the Build Alternatives show minimal changes in local roadway operations when compared to the No Build Alternative, no detailed mitigation plans are proposed.

4.2.9 Station Area Street Network – Baltimore Cherry Hill Station Alternative

This sub-section evaluates the urban street network around the Cherry Hill Baltimore Station Alternative.

4.2.9.1 Current Conditions

Current conditions for the local street network around the SCMAGLEV Project Cherry Hill Station are summarized in Appendix D.2A.7.

4.2.9.2 Future No Build Alternative

FRA identified one funded capital improvement in the BMC CLRP within the Cherry Hill Station area. The BMC CLRP proposes expansion of the BWP to four lanes in each direction. However, the improvement would not change the local street network surrounding the Cherry Hill Station Alternative and thus would not impact the future No Build transportation network.

4.2.9.3 Future Build Alternatives

The future Build Network consists of the Future No Build network plus the addition of the SCMAGLEV physical improvements and train operations to the network. The Project Sponsor is including a bus drop-off area and an auto drop off/pick-up area (including a taxi staging area) on the east side of the station and a new 4-level parking structure connected to the station through a skywalk opposite the drop off/pick-up area. The Project Sponsor is also including changes to the profile of Annapolis Road at Patapsco Avenue to accommodate the SCMAGLEV tunnel portal; a network of local roadways to allow for ample circulation in and around the station; signal upgrades and roadway changes at Waterview Avenue intersections with Cherry Hill Road, Sidney Avenue and Annapolis Road; and a fully integrated roadway with a direct connection to the MDOT MTA LRT Station that is located directly below the Cherry Hill Station.

4.2.9.4 Impacts

Analysis of the change in LOS and delay between the No Build and Build Alternatives show marginal changes in LOS and delay between the Build and No Build Alternatives in the Cherry Hill Station area. This means the addition of the SCMAGLEV Project Affected Environment transportation network will have minimal impacts to the local street network around the Cherry Hill Station. Detailed results are provided in Appendix D.2A.7.

4.2.9.5 Mitigation Strategies

Given that the minimal forecasted changes in roadway operations between the 2045 No Build and Build Alternatives, no specific mitigation strategies are proposed. The Project Sponsor has identified overall signal and striping improvements that would be implemented as part of the roadway upgrade completed as part of the station construction. These proposed improvements include:

- Annapolis Road and Manokin Street: Upgrade the traffic signal to a fully actuated system; stripe a 100-foot left-turn lane along the Annapolis Road northbound approach

- Annapolis Road and Russell Street: Install a new fully actuated traffic signal; stripe a 175-foot right-turn lane along the Russell Street eastbound approach; stripe a 350-foot left turn lane along the Annapolis Road northbound approach
- Annapolis Road and Waterview Avenue EB side of MD 295: Stripe a 375-foot four-lane cross section (two lanes in each direction) along the Annapolis Road southbound approach (ending near Maisel Street); upgrade signal to a fully actuated signal (this may be covered by the current proposed improvements)
- Annapolis Road and Waterview Avenue WB side of MD 295: Add a new 150-foot left turn lane along the Annapolis Road northbound approach; upgrade the traffic signal to a fully actuated signal (this may be covered by the current proposed improvements); note a 350-foot second northbound lane along the Annapolis Road northbound approach is proposed as part of the city project
- Annapolis Road and MD 295 SB ramps: Add a 120-foot second left-turn lane along the MD 295 SB off-ramp approach; add a right-turn lane along the Annapolis Road northbound approach extended back to the previous intersection; upgrade the traffic signal to a fully actuated signal (this may be covered by the current proposed improvements); note a 250-foot left-turn lane along the Annapolis Road southbound approach is proposed as part of the current city project.
- Annapolis Road and West Side Access North Driveway: Add a second southbound travel lane along the Annapolis Road southbound approach extended to the previous intersection; add a 250-foot right-turn lane along the Annapolis Road northbound approach; create a double-right and single left-turn lane along the site access exit roadway; install a new fully actuated traffic signal
- Waterview Avenue and MD 295 NB off-ramp/ Church Street: Add a left-turn lane along the MD 295 off-ramp approach; install a new fully actuated traffic signal
- Waterview Avenue and East Side Access West entrance: Upgrade traffic signal to a new fully actuated traffic signal to allow westbound traffic to make a left into the station site
- Waterview Avenue and East Side Access East entrance: Add a 150-foot left-turn lane along the Waterview Avenue westbound approach; add a 150-foot right-turn lane along the Waterview Avenue eastbound approach; create a double-left and single right-turn lane along the site access exit roadway; install a new fully actuated traffic signal
- The two Waterview Avenue intersections/signal should be designed as dynamic lane control to allow the lane use to be changed by reprogramming the signal and approach signs because the peak hour volumes might not reflect the off-peak and weekend volume demands by lane

4.2.10 Station Area Street Network – Washington, D.C. Mount Vernon East Station

This section evaluates the urban street network around the proposed Mount Vernon East Station in Washington, D.C.

4.2.10.1 Current Conditions

The Project Sponsor located the Mount Vernon East Station in the Mount Vernon neighborhood of downtown Washington, D.C. More detail on street network around the Mount Vernon East Station is provided in Appendix D.2A.8.

4.2.10.2 Future No Build Alternative

For this analysis, no future year capital improvements were included for the street network surrounding the Mount Vernon East Station. However, the MWCOG CLRP includes a major project nearby the station area known as the “Return to L'Enfant” project. The “Return to L'Enfant” project is a planned unit development that will cover I-395 with an at-grade platform above the highway that will be used to support new building.

4.2.10.3 Future Build Alternatives

The future Build Network consists of the Future No Build network plus the addition of the SCMAGLEV physical improvements and train operations to the network. The Project Sponsor is including an underground parking facility with 1,000 spaces and a drop off/pick-up area, including taxi staging, on the first below-ground floor of the proposed underground garage, between 5th and 6th Streets NW.

4.2.10.4 Impacts

Degradation in traffic operations between the No Build and Build Alternatives was found at the following intersections in the Mount Vernon East Station area. (**Figures 4.2-6 and 4.2-7**)

Table 4.2-6: Changes in LOS and Delay Between the No Build and Build Alternatives in Mount Vernon East Station Area (Camden Yards Station Alternative)

Intersection	No Build LOS	Build LOS	Increase in Delay (seconds)
AM Peak – No intersections			
PM Peak			
New York Avenue @ 10 th Street NW	B	F	84.3
New York Avenue @ 9 th Street NW	C	F	68.0
L Street NW @ 6 th Street NW	B	F	280.0
New York Avenue @ 6 th Street NW	C	F	84.7
Massachusetts Ave @ 6 th St. NW	E	F	24.1

Note: Level of Service defined as: LOS A – free flow; LOS B – Stable flow – slight delay; LOS C – stable flow – acceptable delays; LOS D – approaching unstable flow; LOS E – unstable flows – intolerable delays; LOS F – forced flow (significantly degraded traffic operations)

Table 4.2-7: Changes in LOS and Delay Between the No Build and Build Alternatives in Mount Vernon East Station Area (Cherry Hill Station Alternative)

Intersection	No Build LOS	Build LOS	Increase in Delay (seconds)
AM Peak – No Intersections			
PM Peak			
New York Avenue @ 10 th Street NW	B	F	84.3
New York Avenue @ 9 th Street NW	C	F	67.6
L Street NW @ 6 th Street NW	B	F	280.0
New York Avenue @ 6 th Street NW	C	F	83.3
Massachusetts @ 6 th Street NW	E	F	39.9

4.2.10.5 Mitigation Strategies

The Project Sponsor will coordinate with the District Department of Transportation to develop detailed mitigation measures, as appropriate. Potential mitigation strategies may include:

- Optimize all traffic signals in the station area to ensure the heaviest traffic movements are receiving optimum green time.

- Encourage drivers through public outreach efforts to choose alternative routes in order to avoid the station area to the degree possible. This would include avoidance of 7th NW to the degree possible by using other north/south streets and automobiles avoiding New York Avenue by using other routes such as Rhode Island Avenue to the degree possible, understanding that New York Avenue is a major freight route into the city.
- Channel SCMAGLEV traffic via specific routes to separate from general traffic to the greatest degree possible in order to mitigate impacts to general traffic.
- Evaluate the potential for adding roadway capacity in the station area including additional left turn capacity. Focus would be on separating station traffic from general traffic to the greatest degree possible.
- Evaluate potential for removing on-street parking during times of heaviest vehicle arrivals and departures from the SCMAGLEV Project station.
- Develop a variable message sign system to highlight potential delays in the station area and provide alternative routes for drivers traveling through the station area.

4.2.11 Road Network Around Train Maintenance Facility Alternatives

This section evaluates the roadway network around the three project Train Maintenance Facility (TMF) alternatives:

- The first alternative TMF site is located directly north of MD Route 198 and just to the east of the BW Parkway, in the Anne Arundel County portion of the SCMAGLEV Project Affected Environment (known as the MD 198 alternative).
- The second alternative site is to the north of Powder Mill Road on Beltsville Agricultural Research Center (BARC) property west of the Baltimore Washington Parkway (BWP) in the Prince George's County portion of the SCMAGLEV Project Affected Environment (known as the BARC West site).
- The third alternative site is on Springfield Road on Beltsville Agricultural Research Center property east of the BWP in the Prince George's County portion of the SCMAGLEV Project Affected Environment (known as the BARC Air Strip site).

4.2.11.1 Current Conditions

Current conditions for the roadway network around each of the Train Maintenance Facility (TMF) site alternatives are outlined in Appendix D.2A.9.

4.2.11.2 Future No Build Alternative

Future No Build conditions for the roadway network around each of the TMF site alternatives are outlined in Appendix D.2A.9.2.

4.2.11.3 Future Build Alternatives

Future Build Alternatives for the roadway network around each of the TMF site alternatives are outlined in Appendix D.2A.9.3.

4.2.11.4 Impacts

Impacts to the roadway network around each TMF alternative resulting from the addition of the respective alternatives to the SCMAGLEV Project Affected environment are outlined in Appendix D.2A.9.4.

4.2.11.5 Mitigation Strategies

Coordination efforts between the Project Sponsor and MDOT SHA, Anne Arundel County or Prince George's County, the National Park Service (NPS), and other key stakeholders will be required to develop specific mitigation requirements for traffic impacts associated with the different TMF options (this will build on the extensive inter-agency coordination carried out during the development of this document).

Development of these mitigation strategies will rely on more precise information on anticipated trip generation by the TMF facility as well as the distribution of those trips over the full day. Based on preliminary engineering design, potential mitigation strategies by TMF site may include:

MD 198 TMF Alternative – Mitigation strategies for the MD 198 TMF alternative may include the following:

- Install a left turn stacking lane for eastbound vehicles turning into the storage facility driveway from MD 198. Currently eastbound vehicles on MD 198 would make the turn into the driveway from the center median turn lane but only a single vehicle can do this at a time based on the current roadway configuration. Without the left turn stacking lane, additional vehicles waiting to turn left would have to queue in the left general traffic lane, thus disrupting traffic.
- Widen the right turn radius for vehicles entering the driveway to the TMF entrance from westbound 198. The entrance to the driveway is currently improved and channelized but a wider turning radius for right turning vehicles could allow these vehicles to exit the 198 westbound general traffic lane more quickly, thus minimizing disruptions to westbound through traffic.
- Channelizing improvements in the existing median to separate eastbound traffic making left turns into the driveway from vehicles making the left turn out of the driveway and into the median and eastbound lanes. This improvement should also include storage in the median for left turning vehicles from the driveway to avoid queues intruding on westbound traffic lanes.
- Complete warrant analysis to determine if a signal is warranted at this intersection.

BARC West TMF Alternative – Mitigation strategies for the BARC West TMF alternative may include the following:

- Install a left turn stacking lane for vehicles traveling westbound on Odell Road and making the left turn into the TMF facility. This lane would accommodate queues entering the facility from the east in order to avoid disruptions to westbound general traffic.
- Install a right turn lane on Odell Road separate from the general traffic lane for eastbound vehicles entering the facility. This would allow for vehicles entering the facility to separate from general traffic, thus avoiding disruptions to eastbound through traffic.
- Complete a warrant analysis to determine if a signal is warranted at this new entrance.

BARC Air Strip Alternative – Mitigation strategies for the BARC Air Strip TMF Alternative may include:

- Install a left turn stacking lane for vehicles traveling southbound on Springfield Road and making the left turn into the TMF facility. This lane would accommodate queues entering the facility from the north in order to avoid disruptions to southbound through traffic.
- Install a right turn lane on Springfield Road separate from the general traffic lane for northbound vehicles entering the facility. This would allow for vehicles entering the facility to separate from general traffic, thus avoiding disruptions to northbound through traffic.
- Complete a warrant analysis to determine if a signal is warranted at this new entrance.

4.2.12 Roadway Realignments (Horizontal and Vertical) Resulting from SCMAGLEV Alignment and Facilities

This section evaluates required horizontal and vertical roadway realignments resulting from the SCMAGLEV alignment and facilities. Required roadway realignments are outlined in Appendix D.2A.10

4.2.12.1 Current Conditions

Current conditions for each of the impacted roadways is outlined in Appendix D.2A.10.1.

4.2.12.2 Future No Build

Future No Build conditions for each of the impacted roadways is outlined in Appendix D.2A.10.1.

4.2.12.3 Future Build Alternatives

Future Build conditions for each of the impacted roadways is outlined in Appendix D.2A.10.1.

4.2.12.4 Impacts

Impacts to each roadway requiring realignment due to the SCMAGLEV alignment and facilities are outlined in Appendix D.2A.10.1.

4.2.12.5 Mitigation Strategies

None of the vertical or horizontal realignments outlined in Appendix D.2A.10.1 will lead to a change in roadway cross section or functionality, so no mitigation is proposed.

Ongoing coordination efforts between the Project Sponsor and MDOT-SHA, and either Prince George's County, Anne Arundel County, or Baltimore City should be carried out through the final design process to ensure more detailed design does not result in impacts.

4.2.13 BWI Marshall Airport Access

This section evaluates the transportation network around the proposed SCMAGLEV BWI Marshall Airport Station.

4.2.13.1 Current Conditions

The BWI Marshall Airport is a major U.S. airport located approximately nine miles south of the SCMAGLEV Camden Yards alternative and approximately 32 miles northeast of Washington, D.C. Appendix D.2A.11.1 provides more detail on auto and transit access to the Airport.

4.2.13.2 Future No Build Alternative

FRA and MDOT MTA completed environmental documentation and conceptual engineering for the BWI Marshall Airport Rail Station Improvements and Fourth Track Project in January 2016. The Rail Station and Fourth Track Project includes construction of a new platform, improvements to the current station with possible multi-level transit-oriented development and the addition of nine miles of fourth track along the Northeast Corridor Line. The Rail Station Improvements and Fourth Track Project is not funded for advancement to design and construction phases at this time. However, MDOT MTA includes the MARC BWI Marshall Airport Rail Station Upgrades and Repairs project in the MDOT FY 2019-2024 Consolidated Transportation Program (CTP). This project includes structural improvements to parking garages and station improvements for a more passenger-friendly experience.

The MDOT MAA's Capital Improvement Program also includes widening the terminal access road as it transitions from I-195 to Friendship Road at the airport entrance.

No other transit or road network improvements are programmed in the vicinity of the BWI Marshall Airport Station.

4.2.13.3 Future Build Alternatives

FRA determined that no additional transit or roadway network changes are proposed as a result of the addition of the SCMAGLEV Project to the SCMAGLEV Project Affected Environment transportation network.

The construction of the BWI Marshall Airport Station would result in the demolition of the current hourly garage, but current plans are for MDOT Maryland Aviation Administration to reconstruct the garage in the same vicinity once the station is completed. Ongoing coordination between the Project Sponsor and MDOT MAA will be undertaken in order to communicate any changes in current plans. Specific garage replacement plans would be prepared in the final engineering design.

4.2.13.4 Impacts

Tables D.2-25 and D.2-26 in Appendix D.2A.11.2 contain LOS and delay information for key analysis intersections in the vicinity of BWI Marshall Airport for the 2045 Build and No Build Alternatives. Table D.2-25 contains information for the Camden Yards Station Alternative while Table D.2-26 contains information for the Cherry Hill Station Alternative.

Intersections that show degradation in traffic operations under the Camden Yards Scenario include:

- MD 170 @ MD 176 - This intersection operates at LOS F in both the Build and No Build Alternatives in the AM peak, but delay increases by approximately 58 seconds. In the PM peak, LOS remains at F, but delay increases by 85 seconds.
- MD 170 @ Terminal Road – This intersection remains at LOS F during the AM peak, but delay increases by approximately 148 seconds.
- MD 162 @ Cromwell Park Drive – This intersection degrades from LOS D to LOS F in the PM peak, with an increase in delay of approximately 70 seconds.
- MD 170 @ EB Ramps to I-195 – This intersection degrades from LOS A to LOS F, with an increase in delay of approximately 136 seconds. In the AM peak and 129 seconds in the PM peak.

Intersections that show degradation in traffic operations under the Cherry Hill Scenario include:

- MD 170 @ MD 176 - This intersection operates at LOS F in both the Build and No Build Alternatives in the AM peak, but delay increases by approximately 61 seconds. In the PM peak, LOS remains at F, but delay increases by 97seconds.
- MD 170 @ Terminal Road – This intersection remains at LOS F during the AM peak, but delay increases by approximately 158 seconds.
- MD 162 @ Cromwell Park Drive – This intersection degrades from LOS D to LOS F in the PM peak, with an increase in delay of approximately 95 seconds.

- MD 170 @ EB Ramps to I-195 – This intersection degrades from LOS A to LOS F, with an increase in delay of approximately 129 seconds in the AM peak and 139 seconds in the PM peak.

4.2.13.5 Mitigation Strategies

FRA has identified the following mitigation strategies to be addressed by the Project Sponsor for the degradation of LOS and delay at the intersections noted above. Coordination between the Project Sponsor and MDOT SHA, which has not yet taken place, is an essential first step to confirm these strategies. Note: These mitigation strategies apply to both the Camden Yards and Cherry Hill station alternatives.

MD 170 @ MD 176

- Optimize signal timing to maximize green times for the highest movement volumes through the intersection.
- Add a third through lane on northbound MD 170 at the intersection to increase intersection capacity. Make any required geometry improvements to support this added capacity.

MD 170 @ Terminal Road

- Optimize signal timing to maximize green time times for highest movement volumes through the intersection.
- Extend left turn pocket on southbound MD 170 to accommodate the increase in left turns into the Terminal Road entrance into the Airport;
- Add a second left turn pocket on southbound MD 170 to facilitate higher turning movements within the same signal cycle. Make any required geometry improvements to support this added capacity.

MD 162 @ Cromwell Park Drive

- Optimize signal timing to maximize green times for the highest movement volumes through the intersection.
- Extend length of free right turn lanes from northbound MD 170 onto Cromwell Park Drive and from Cromwell Park Drive onto northbound MD 170 to provide more distance for merges.
- Extend length of left turn stacking lane for turns from southbound MD 170 onto Cromwell Park Drive.

MD 170 @ Eastbound Ramps to MD Interstate 195

- Optimize signal timing to maximize green times for the highest movement volumes through the intersection.

- Add a second left turn lane for cars exiting eastbound I-195 and turning left onto eastbound MD 170 to allow more vehicles to make the left turn during a single signal cycle.

4.2.14 SCMAGLEV Project Station Area Parking

This section evaluates station area parking capacity and assesses whether there will be sufficient parking capacity to meet demand at each SCMAGLEV Project station.

4.2.14.1 Current Conditions

Current parking infrastructure in each of the SCMAGLEV Project station areas is summarized in Appendix D.2A.12.1.

4.2.14.2 Future No Build Alternative

The area around the Washington, D.C. Mount Vernon East Station is undergoing extensive redevelopment, but the District of Columbia is discouraging and limiting parking in new development. Therefore, parking capacity beyond what already exists will likely remain unchanged, or perhaps even experience some decline. In downtown Baltimore, ongoing development and redevelopment will likely result in the addition of parking capacity beyond what currently exists, though given the dense urban nature of downtown, these additions will likely be constrained.

No source was found that indicated there would be parking expansion in the vicinity of the Baltimore Cherry Hill Station.

The Airport Layout Plan for BWI Marshall Airport shows planned expansions of both the hourly and daily garages.

4.2.14.3 Future Build Alternatives

The Project Sponsor has proposed parking at each of the proposed SCMAGLEV Project stations to accommodate at least some of the forecasted demand for people who would drive and park at each station (this mode of access data comes from the Project Sponsor ridership forecasting effort). The additional parking proposed at each station is summarized in **Table 4.2-8**. Also included in the table is a summary of the daily SCMAGLEV Project riders who would arrive at the station via automobile and park at the station, by Baltimore Station Scenario. The final column in the table represents the excess number of daily riders who would have to find parking at a parking facility other than the parking facility at the station. The data in the final column show that there would be excess demand for parking in downtown Baltimore, at BWI Marshall Airport and in Washington, D.C.

Table 4.2-8: Proposed Parking Capacity Added at Each Station Area and Daily Excess Demand for Parking

Station	Proposed Added Parking Spaces	Forecasted Daily SCMAGLEV Riders Arriving at Station and Parking	Excess Demand - SCMAGLEV Daily Riders Required to Find Parking at Facility Other Than at Station
Camden Yards Station Alternatives			
Baltimore Camden Yards	5,000	6,190	1,190
BWI Marshall Airport	5,000	5,868	868
Mount Vernon East	1,000	3,769	2,769
Cherry Hill Station Alternatives			
Cherry Hill	5,000	4,919	0
BWI Marshall Airport	5,000	5,952	952
Mount Vernon East	1,000	3,360	2,360

Source: SCMAGLEV Ridership Forecast, BWRR, Impacts

4.2.14.4 Impacts

Impacts associated with the change in cars accessing/exiting each SCMAGLEV Project station areas between the No Build and Build Alternatives are addressed in the LOS/delay analysis contained in Section 4.2.9.

Excess daily demand for parking at each SCMAGLEV Project station will require a portion of riders accessing SCMAGLEV Project stations to find parking at other facilities in the station area. This requirement may result in shortages of parking at other parking facilities in the station area, though a precise assessment is difficult to complete at this time due to lack of comprehensive data on current parking utilization in facilities around each station, especially in Washington, D.C. and Baltimore.

4.2.14.5 Mitigation Strategies

At this point no plans have been developed by local jurisdictions to respond to potential parking shortages at parking facilities around each SCMAGLEV Project station. The Project Sponsor will coordinate with the appropriate local jurisdictions to evaluate potential impacts prior to the publication of the FEIS and ROD and develop mitigation measures, as appropriate. The first step in this evaluation will be the completion of a parking capacity and utilization study by the Project Sponsor for both downtowns in order to gain a more precise understanding of total parking capacity and available excess parking to accommodate increased SCMAGLEV-related demand. The Project Sponsor may then be required to develop additional mitigation strategies based on the result of the analysis.

4.2.15 Station Area Urban Sidewalk and Pedestrian Networks

This section evaluates the sidewalk network around each station area.

4.2.15.1 Current Conditions

Detail on the sidewalk networks around each of the proposed SCMAGLEV Project stations is provided in Appendix D.2A.13.1.

4.2.15.2 Future No Build Alternative

FRA has not identified specific plans for sidewalk enhancements in the station areas. As development and redevelopment occur, the pedestrian network in each station area will change but FRA cannot assess those changes at this stage.

4.2.15.3 Future Build Alternatives

The Project Sponsor has designed, at a conceptual level, pedestrian improvements in the immediate station area as part of its overall station designs in Baltimore (both station alternatives) and Washington, D.C., but improvements/upgrades for the broader station area sidewalk network have not yet been identified or developed.

At the BWI Marshall Airport SCMAGLEV Project station, coordination between the Project Sponsor and the MDOT MAA regarding pedestrian movements at BWI Marshall Airport has already begun and would continue through the development process.

4.2.15.4 Impacts

To assess the impacts of additional pedestrians accessing, or leaving, each SCMAGLEV station on each station area's sidewalk network under the future Build Alternatives, an estimate of how these pedestrians would be distributed onto the different links within the station area sidewalk network during the AM peak was completed. The estimated results are contained in Appendix D.2A.13.2 for the two station alternatives in Baltimore and the Mount Vernon East station in Washington, D.C. (results under both Baltimore Station scenarios is provided for the Mount Vernon East station).

A summary of the results and impacts for each station are outlined below.

Baltimore Camden Yards Station – The Camden Yards Station will have two entrances, one located on Conway Street and one located along Sharp Street just south of Pratt Street. The heaviest loading of SCMAGLEV Project passengers onto the sidewalk network in the AM peak will occur on the leg of Pratt Street east of Sharp Street (estimated loading of an additional 599 pedestrians in the AM peak hour compared to the future No Build Alternative) and the leg of Conway Street west of Sharp Street (estimated loading of an additional 523 pedestrians in the AM peak hour compared to the future No Build Alternative). A total of an additional 2,217 pedestrians will be added to the Camden Yards Station area sidewalk network in the AM peak hour compared to the No Build Alternative (see Appendix D.2A.13.2).

Baltimore Cherry Hill Station – The Cherry Hill Station has a single entrance on Cherry Hill Road, so all pedestrian loading onto the station area network would occur at this station entrance. It is estimated that a total of 2,636 pedestrians would be loaded onto the Cherry Station area sidewalk network during the AM peak hour beyond the No Build. It is estimated that 1,977 of these passengers would load onto the east leg of Cherry Hill Road while the remainder (659) would load onto the west leg of Cherry Hill Road.

Mount Vernon East Station (Cherry Hill Baltimore Station Alternative) – The Mount Vernon East Station in Washington, D.C. has three entrances; 3rd Street NW at New York Avenue, New York Avenue between 5th and 6th Streets, and New York Avenue at 7th Street. The heaviest pedestrian activity associated with the addition of the SCMAGLEV Project to the SCMAGLEV Project Affected Environment Transportation network is estimated to occur at the 7th Street NW/N.Y. Avenue entrance, which is closest to office, residential, and other activity centers in the station vicinity, as well as to the entrances to the two Metro stations and bus services in the vicinity of the SCMAGLEV Project station.

The heaviest estimated AM peak hour loadings onto the Station area sidewalk network from the SCMAGLEV Project station would be on the north leg of the 7th Street/New York Avenue intersection, with an additional 1,710 pedestrians loaded onto this sidewalk network link beyond future No Build volumes in the AM peak hour.

The next highest estimated pedestrian loadings will occur at the north and west legs of the intersection of 6th Street NW and New York Avenue, based on this intersection's proximity to the station entrance between 5th and 6th Streets at New York Avenue. An estimated additional 419 pedestrians would be loaded onto each of these intersection legs in the AM peak hour under the Build Alternatives, when compared to the No Build Alternative.

Mount Vernon East Station (Camden Yards Baltimore Station Alternatives) – The pedestrian loading patterns at the Mount Vernon East Station under the Camden Yards Station Alternatives would be the same as under the Cherry Hill Station Alternative, though with higher absolute pedestrian volumes based on higher ridership under the Camden Yards Station Alternative.

As with the Cherry Hill Station alternatives, the sidewalk link with the highest AM peak hour additional pedestrian loading under the Build Alternatives would be the north leg of the 7th Street/New York Avenue intersection. Total additional AM peak hour loadings on this sidewalk network link would be 1,888 under the Camden Yards Station Alternative. Estimated additional loadings on the north and west legs of the intersection of 6th Street and New York Avenue would be 463 additional pedestrians in the Build Alternatives when compared to the No Build Alternative.

Pedestrian network upgrades in the immediate station area of the Washington, D.C. Station would be constrained due the dense urban nature of the station area and therefore some sidewalk crowding is to be anticipated during the AM peak hour.

4.2.15.5 Mitigation Strategies

Mitigation strategies would depend on the characteristics of the sidewalk network at the time of the start of revenue service.

In the short-term, the Project Sponsor, in coordination with the appropriate agencies within each local jurisdiction, would increase sidewalk capacity where feasible based on available space. Assessment of opportunities for short-term capacity expansion would be completed through coordination with the appropriate agencies in each city, with the Project Sponsor completing the design for capacity expansion.

In support of long-term capacity expansion, the cities may ask the Project Sponsor to set aside funding to be used as redevelopment opens up opportunities to increase sidewalk capacity.

In the short-term, the Project Sponsor has also identified other mitigation strategies to be applied, including detailed wayfinding signage that would support spreading of pedestrians to different station entrances and hand-held device applications and street-level real-time signage identifying congested pedestrian areas and walk paths to less crowded entrances.

4.2.16 Passenger Pickup and Drop-Off Operations at SCMAGLEV Project Stations

4.2.16.1 Current Conditions

The current conditions for the designated pick-up and drop-off areas at the proposed SCMAGLEV stations are outlined in detail in Appendix D.2A.14.1.

4.2.16.2 Future No Build Alternative

There will be no designated pickup and drop-off areas for SCMAGLEV Project passengers in the Future No Build Alternative transportation network at any of the four station areas being evaluated.

4.2.16.3 Future Build Alternatives

Designated pickup and drop off areas would be added to the transportation network at the four SCMAGLEV Project station areas. Locations and required sidewalk frontage length is outlined in detail in Appendix D.2A.14.2.

4.2.16.4 Impacts

Impacts associated with curb pick-up and drop-off operations by station and location are outlined below.

Camden Yards Station – Approximately 240 feet of curb space will be required for pick-up and drop-off operations on both Pratt Street and Conway Street (both pick up and drop off operations will occur on each street). There is sufficient curb side distance

on both streets to meet this need. Additional considerations associated with these operations include:

- Westbound Conway Street – Conway Street is a busy feeder from downtown Baltimore to I-395, with average daily traffic equaling approximately 37,000 cars per day. Detailed design of the pickup and drop-off facility has not yet been developed by the Project Sponsor, but two general options exist, each with different impacts.

In the first instance, the pickup and drop-off facility could be built into the wide sidewalks east and west of Sharp Street, thus allowing cars to completely pull out of traffic, thus avoiding impacts to general traffic operations. However, this operation would impact sidewalk widths, which in turn would impact pedestrian operations, including the additional pedestrians added to the sidewalk network after the SCMAGLEV Project is in operations. One additional impact related to a full pull-out is the potential difficulty for vehicles to quickly exit the pull out once the pickup or drop-off is completed due to trouble transitioning to a general traffic lane (this is especially true during high traffic times of the day). Delayed exit from the pull out could lead to queues in the general traffic lane waiting to enter the pull-out, which would disrupt general traffic operations.

The second pickup and drop-off operational option is to take the rightmost general traffic lane and complete pickup and drop-off operations from this lane. Currently this rightmost general traffic lane is a right-turn only lane at Howard Street while the other two lanes in the three-lane cross-section are left-turn only lanes to I-395. Operating pickups and drop-offs out of the rightmost Conway Street general traffic lane will impact general traffic operations, especially during the PM peak hours when there are heavy traffic volumes, though this impact is hard to specify without the Project Sponsors detailed design for the pickup/drop-off facility.

- Eastbound Pratt Street – The same options for pick-up/drop-off operations identified for Conway Street, with the same potential impacts, are also applicable for Pratt Street. One additional impact from having operations in the curb lane is that this lane is a dedicated bus only lane and therefore curb operations would impact bus operations.

Mount Vernon East Station – Impacts by each designated pick-up drop off area include:

- Southbound 9th Street NW, n/o Massachusetts Avenue NW – This location would be used for taxi pickup operations. It is estimated that 160 feet of curbside is required to accommodate this. An existing taxi stand of sufficient length is currently located here so no impacts are anticipated.
- Southbound 7th Street NW between M Street NW and Mount Vernon Place NW – This location would be used for TNCs pickups. An estimated 240 feet of curbside is required to support the operation. There is sufficient space in this section of 7th Street NW to accommodate this operation. Other impacts would occur for

Metrobus service, which runs through this area on 7th Street. One bus stop is located in this section, at L Street NW.

Curbside operations would also impact general traffic operations. Parking, which is currently allowed in the mid-day, would also have to be removed to accommodate this operation.

- 6th Street NW between New York Avenue and K Street – This location would be used for Taxi, TNC, and Kiss-and-Ride drop-offs. An estimated 640 feet of curbside would be required to support this operation. There is not sufficient space in this section of 6th Street NW to accommodate this operation so the operation may need to be expanded north to L Street or south toward Massachusetts Avenue to handle all operations. Other potential effects include impacts of general traffic operations from curbside operations, including from queues in general traffic lanes waiting to enter the drop-off area. Mid-day parking would also have to be removed to accommodate this operation.

4.2.16.5 Mitigation Strategies

Mitigation would be required to accommodate conflicts between the SCMAGLEV Project's required curb space for drop-off and pickup operations and other uses such as bus stops along the same curb side. Specific mitigation strategies would be identified as engineering design progresses. This would require close coordination between the Project Sponsor and the appropriate local jurisdictions.

4.2.16.6 Construction Period Impacts

The SCMAGLEV Project Affected Environment transportation network will be temporarily impacted during SCMAGLEV construction in three predominant areas. These are:

- Impacts related to truck and auto arrivals and departures at work sites along the SCMAGLEV Project alignment.
- Impacts to traffic operations due to closed or modified intersections during construction.
- Impacts to transit services operating in areas of construction activity.

Current conditions, impact assessment and mitigation strategies related to each of these impact areas are outlined below.

4.2.17 Transportation Network Impacts Related to Truck and Auto Arrivals at Work Sites

There will be multiple work sites along the SCMAGLEV Project alignment where trucks would deliver equipment and work materials while also carrying away construction debris and tunnel construction spoils. Vehicles carrying workers to and from work sites would also add traffic to the roadway network in the vicinity of each work site.

The impacts of this construction-related vehicle traffic on the roadway network is the subject of this document section.

4.2.17.1 Current Conditions

Current conditions for the roadway network around each of the proposed work sites are outlined in detail in Appendix D.2A.15.1.

4.2.17.2 Future No Build Alternative

In most instances the future No Build Alternative roadway network will be the same as under current conditions. Where there are changes, they are noted in Appendix D.2A.15.1 in the Current Conditions section.

4.2.17.3 Future Build Alternatives

In most instances the future Build Alternatives roadway network will be the same as under the future No Build Alternative. Where there are changes, they are noted in Appendix D.2A.15.1 in the Current Conditions section. There will be changes on Odell Road and Springfield Road to accommodate the BARC West and BARC Airstrip TMF options respectively, but these changes include a modification to roadway alignment but not to roadway capacity or functionality.

4.2.17.4 Impacts

The impacts of truck and auto arrivals and departures at each work site along the alignment will differ at each site based on the number of truck arrivals/departures and the roadway configuration surrounding the site. Detailed impacts for each work site are outlined in Appendix D.2A.15.2 but a summary of potential impacts is summarized here.

- Overall degradation of general traffic operations on roadways leading to the work site based on slow moving traffic impacting roadway operations and traffic throughput.
- Traffic operations degradation occurring because of fewer general traffic vehicles clearing a signalized intersection during each green phase due to trucks operating more slowly than automobiles.
- Degradation of general traffic operations related to trucks entering and exiting the construction sites, including truck queues spilling over into general traffic lanes as they wait to make turns into a work site. This is especially relevant for trucks making left turns across traffic to access a work site.
 - Flag operations at many work sites will be required to allow trucks to enter and exit the site. This type of operation will lead to traffic delays and degraded traffic operations, especially on heavily traveled roadways.
- In some instances, temporary traffic signals will be required at the entrances/exits of work sites. These signals will change roadway capacity and traffic operations, leading to degradation in overall traffic operations.

4.2.17.5 Mitigation Strategies

Mitigation of the impacts of truck and auto arrivals and departures at work sites along the alignment will differ at each site based on the number of truck arrivals/departures and the roadway configuration surrounding the site. Detailed mitigation strategies are outlined in Appendix D.2A.15.2, but a summary of potential mitigation strategies is summarized here.

- Completion of a detailed traffic impact study by the Project Sponsor at each site in order to fully understand the implications of truck arrivals and departures on traffic operations during each phase of construction and during different times of the day. Data used to complete the analysis presented in the DEIS is not yet at this level of detail. Develop detailed mitigation plans based on analysis results.

Potential mitigation strategies may include:

- Staging of truck arrivals and departures to avoid the highest traffic times of the day.
 - Add temporary signals at the entrance/exits of work sites that are located on a heavily traveled road and which are not currently signalized.
 - Construct temporary truck turning lanes and truck only queue jumps where physically possible in order to separate truck traffic from general traffic to the greatest degree possible. This may include temporary left turn stacking lanes or the extension of existing left turn stacking lanes, truck only lanes, and general traffic lane bypasses around work site entrances.
 - Optimize signal timing at intersections through which heavy truck traffic will travel to accommodate truck movements to the greatest degree possible without creating an undue burden for other traffic movements through the network.
 - Assign traffic control flaggers at work site entrances/exits to control truck movements into and out of work sites. Concurrently, provide sufficient space on each construction site to handle long queues of trucks waiting to exit the site and enter the regional roadway network.
 - Maintain access roadways in a state of good repair to ensure vehicle movements are as efficient as possible. This may include increasing the pavement vertical section on access roadways to accommodate increased truck movements and heavier vehicle weights associated with fully loaded trucks.

4.2.18 Transit Service Impacts During Construction

Transit services throughout the SCMAGLEV Project Affected Environment will be impacted by construction activities, with different levels of impacts anticipated depending on the service's interaction with the work site and the level of the activity at the work site.

4.2.18.1 Current Conditions

Outlined in Appendix D.2A.16.1 are transit services operating in the vicinity of each work site.

4.2.18.2 Future No Build Alternative

No changes to the routes described in Appendix D.2A.16.1 have been identified by their respective operators.

4.2.18.3 Future Build Alternatives

No planned changes have been identified in response to the SCMAGLEV Project.

4.2.18.4 Impacts

One route identified in Appendix D.2A.16.1 will have to be rerouted because of construction activity. This is the Metrobus Route 96 which travels across the Mount Vernon Station work site on New Jersey Avenue. New Jersey Avenue will be closed during one stage of the Mount Vernon Station construction, thus necessitating the re-route.

One Metrobus route, the F4, will not have to be rerouted route but reliability and schedule adherence will potentially be impacted by the heavy truck traffic entering and exiting the work site at the intersection of Riverdale Road and MD 410 in Prince George's County. The F4 passes directly by this work site.

Significant issues with schedule adherence and reliability may also be of concern regarding the MDOT MTA routes that pass through the Camden Yards Station work site as well as those that pass-through Cherry Hill on Cherry Hill Road and Waterview Avenue (MDOT MTA Route 26 and MDOT MTA Route 71).

There is a possibility of impacts to each of the other services identified in Appendix D.2A.16.1 based on their passing by a work site that will generate truck traffic. Truck trip generation at these work sites is lower than at sites noted above and therefore it is anticipated impacts will be lower.

4.2.18.5 Mitigation Strategies

The Project Sponsor will coordinate with the appropriate transit operators within the SCMAGLEV Project Affected Environment regarding the anticipated impacts to transit services and develop mitigation measures.

Specific mitigation strategies may include:

- The Project Sponsor will coordinate with WMATA to design a reroute for the 96 that will be impacted by a closed New Jersey Avenue
- The Project Sponsor will coordinate with WMATA to evaluate the routing of the F4 to determine if a rerouting is required. There will likely be a need to make

schedule adjustments to account for slowdowns associated with truck arrivals and departures on Riverdale Road.

- In Baltimore, for the services affected by the Camden Yards Station construction, schedule adjustments to account for slowdowns would be developed by the Project Sponsor through coordination with MDOT MTA. Reroutes of the Green and Silver routes, which run on Charles and Conway Street may be considered.
- Routes that enter BWI Marshall Airport (MDOT MTA 75, RTA 201, Anne Arundel County Connector, and Metrobus B30) may be candidates for re-routes based on final Maintenance of Traffic Plans in the Airport. The Operators will also likely consider schedule adjustments.
- For each of the other identified routes, schedule adjustments will be evaluated in response to potential slowdowns associated with truck traffic.

4.2.19 General Traffic Operations Impacted by Street Closures and Modifications

This section focuses on a quantitative understanding of the impacts of construction activity on general traffic operations in the Baltimore City and Washington, D.C. station areas, where the greatest impacts would occur due to lane and full street closures. Smaller impacts would occur at select locations along the alignment. These are also addressed in Appendix D.2A.17 on a qualitative basis.

4.2.19.1 Current Conditions

Current conditions for the roadway network around each work site is provided in Appendix D.2A.17.

4.2.19.2 Future No Build Alternative

Those roadways that will change from Current Conditions are noted in Appendix D.2A.17.

4.2.19.3 Future Build Alternatives

The Project Sponsor has not identified permanent changes to roadways to accommodate construction activity. Specific temporary roadway changes are included in Appendix D.2A.17.1.

4.2.19.4 Impacts

To understand impacts related to construction period activity, a select group of intersections in station areas in Baltimore and Washington were selected for analysis. Impacts were assessed by comparing the No Build Alternative in 2027 (approximately mid-way through construction) to the 2027 Build Alternatives.

Impacts by station area are outlined in detail in Appendix D.2A.17.1 in Table D.2.34. Intersections during different construction stages with significant degradation in traffic operations are highlighted in yellow in the table. The data in the Table shows significant

degradation in traffic operations during construction, especially for the Camden Yards Station.

4.2.19.5 Mitigation Strategies

The Project Sponsor, in coordination with Baltimore City Department of Transportation or the District Department of Transportation will develop detailed mitigation plans to address traffic impacts during construction. Potential mitigation strategies may include:

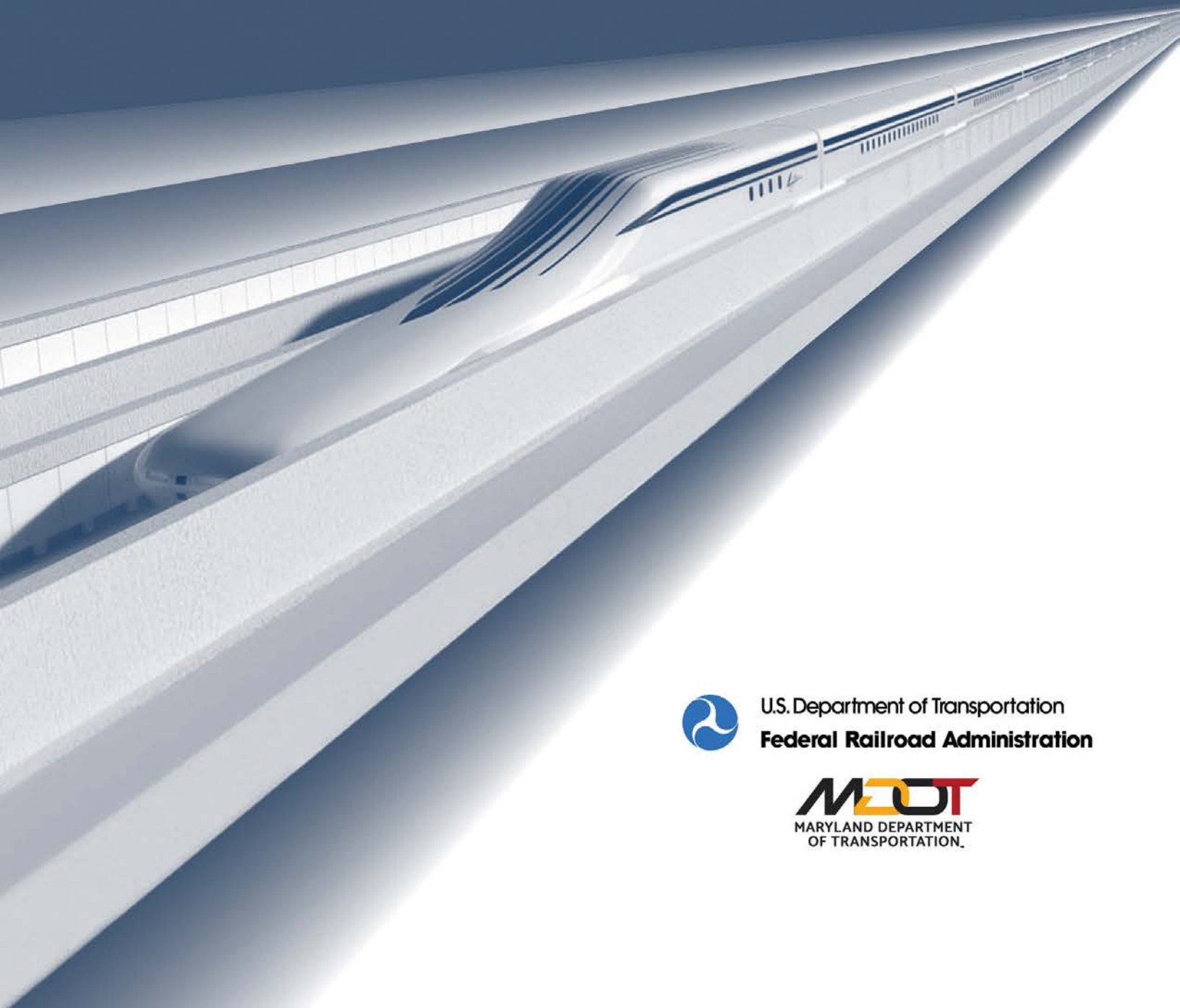
- Completion of a detailed traffic impact study by the Project Sponsor that will build on the analysis presented in the document. This additional analysis would allow the Project Sponsor and the two Departments of Transportation to fully understand the implications of construction activities on traffic operations.
- Staging of construction work and road closures to avoid the highest traffic times of the day to the greatest degree possible.
- In Baltimore, optimize signal timing at intersections of Howard Street and Conway Street, Howard Street and Pratt Street, Conway Street and Sharp Street, Conway Street and Charles Street, and Pratt Street and Sharp Street to accommodate new traffic patterns associated with construction-related closures and street modifications.
- Assign traffic control flagger at key work site intersections to control vehicle movements through the construction area.
- Provide temporary roadway capacity where feasible, with a focus on additional left turn lane capacity and additional through roadway capacity.
- Maintain all roadways in the work area in a state of good repair to ensure vehicle movements are as efficient as possible.

Section 4.3

Land Use and Zoning

BALTIMORE-WASHINGTON SUPERCONDUCTING MAGLEV PROJECT

DRAFT ENVIRONMENTAL IMPACT STATEMENT AND
SECTION 4(f) EVALUATION



U.S. Department of Transportation
Federal Railroad Administration



4.3 Land Use

4.3.1 Introduction

This section evaluates the effects of the No Build and Build Alternatives on land use and zoning along the Superconducting Magnetic Levitation Project (SCMAGLEV Project) corridor. Land use characterizes what can be built on the land and what the land can be used for. It considers the intended use of the land and the general development criteria that exists. This differs from zoning, which specifies design and development guidelines for those intended land uses. This section also considers if the SCMAGLEV Project is consistent with approved comprehensive planning documents (i.e., master plans, transportation plans, etc.) and identifies temporary and permanent property impacts associated with the construction and long-term operation of the SCMAGLEV Project Build Alternatives. For additional information, please see Appendix D.3 Socioeconomic Environment Technical Report (SETR).

4.3.2 Regulatory Context and Methodology

4.3.2.1 Regulatory Context

In accordance with the National Environmental Policy Act (NEPA), 42 U.S.C. § 4321 et seq., the Council on Environmental Quality (CEQ) regulations, 40 C.F.R. Parts 1500 - 1508, and the Federal Rail Administration's (FRA) Procedures for Considering Environmental Impacts, 64 Fed. Reg. 28545 (May 26, 1999), the Federal Railroad Administration (FRA) assessed the impacts on land use both existing and planned.

In addition, FRA considered possible conflicts or inconsistencies between the Project and applicable Federal, state, and local land use policies, plans, and regulations. Plans reviewed were those in effect at the time of the Notice of Intent in 2016 and include:

- The *District of Columbia Comprehensive Plan* (2011)
- Move D.C. Multimodal Long-Range Transportation Plan (2014)
- The Maryland-National Capital Park and Planning Commission's (M-NCPPC) *Plan Prince George's 2035 Approved General Plan (Plan 2035)*
- Regional Transportation Priorities Plan for the National Capital Region (2014)
- The *Anne Arundel County's General Development Plan 2009*
- Visions of the *LIVE EARN PLAY LEARN: The City of Baltimore Comprehensive Master Plan* (2012)
- Maximize 2040: A Performance-Based Transportation Plan (2016)
- 2035 Maryland Transportation Plan (2014)

A list of the comprehensive planning documents that guide development within the SCMAGLEV Project Affected Environment is located in Appendix D.3 Table D.3-1 Plans

will be reviewed and updated, as needed, prior to the Final Environmental Impact Statement.

The SCMAGLEV Project will be subject to the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, as amended (42 U.S.C. 4601-4655) (Uniform Relocation Act), which establishes minimum standards for federally funded programs and projects that require the acquisition of real property (real estate) or displace persons from their homes, businesses, or farms.

4.3.2.2 Methodology

This analysis identifies temporary and permanent changes of land uses to transportation land uses associated with SCMAGLEV Project. The SGMAGLEV Project impact area includes the limits of operational/physical disturbance, as well as the construction related impact area, which includes additional areas of temporary disturbance required for construction activities. These impact areas comprise the overall limit of disturbance (LOD) of the SCMAGLEV Project Build Alternatives. The LOD includes all surface and subsurface elements.

The SCMAGLEV Project Affected Environment for land use is defined as the area within a 500-foot buffer around the proposed alignments and ancillary facilities of the Build Alternatives and within a 1/4-mile buffer around stations and Trainset Maintenance Facility (TMF) locations, as shown on the land use mapping (see Appendix D.3 Figure D.3-5). These buffers were considered to capture potential impacts (i.e., visual/aesthetics, noise/vibration, and changes in access and mobility) that could extend beyond the LOD.

FRA considered changes to land use due to the construction of the Project and operation of above ground elements of the Project. Using Geographic Information System (GIS) data, FRA quantified these land use changes. FRA then considered if the proposed transportation land use is consistent with surrounding land uses, existing zoning designations, and locally and regionally adopted comprehensive planning documents. The land use and zoning data were obtained from various state and local jurisdictions, each with their unique zoning codes and land use category descriptions. In order to normalize this analysis, the Maryland Department of Planning (MDP) Land Use/Land Cover 2010 designations were used to reclassify all land uses within the SCMAGLEV Project Affected Environment into the following categories: Agriculture, Residential, Commercial, Forest, Institutional, Industrial, Open Space, Open Urban Space, Transportation, Mixed Use, and Water. Likewise, all zoning codes were reclassified and reasonably combined into the following zoning categories: Residential, Commercial, Mixed Use, Industrial, Open Space and Other. For example, residential zoning codes allow for dwellings that range from single-family homes to high-rise apartment complexes.

FRA conducted a quantitative impact analysis of individual parcels within the LOD. For this parcel analysis, FRA adjusted the land use designation of parcels within the LOD

that are currently inconsistent with the MDP Land Use/Land Cover 2010 designation to more accurately represent the 2020 conditions. For purposes of this analysis, the quantified impact to individual parcels is equivalent to the quantified changes in land use. FRA categorizes parcel impacts as temporary acquisitions, partial permanent acquisitions, and permanent full acquisition, as further explained below:

- Temporary acquisition (short-term construction) – the parcel will be impacted by the SCMAGLEV Project construction, require construction easements, and be restored to its original use and ownership post construction.
- Partial permanent acquisition – less than 1/3 of a parcel's total area will be impacted by the perpetual operation of the SCMAGLEV Project and will require either perpetual easements or partial property acquisition.
- Full permanent acquisition – greater than 1/3 of a parcel's total area will be impacted by the perpetual operation of the SCMAGLEV Project and will require full property acquisition, which will change the ownership or right to use the parcel indefinitely. Also, some parcels with less than 1/3 of its total area being impacted were determined to be full permanent acquisitions if the property impact will result in any of the following:
 - parcel fragmentation;
 - overlapping of an existing structure on the parcel such that the structure is no longer usable (e.g., residence or business); or
 - restricted access to the property where no alternate access route can be established.

Comprehensive planning documents were reviewed as part of the analysis to determine if the SCMAGLEV Project is compatible with local plans. Comprehensive planning documents are prepared, reviewed, and approved by the governments that have authority over them and provide guidance for future actions in the subject communities. These documents express community goals and priorities as they pertain to issues such as land use, transportation, development, and recreation. The plans range from smaller neighborhood plans that focuses on individual blocks up to larger geographies with plans that focus on the metropolitan areas. Some plans have a narrow focus and provide more detail on a single planning concept (i.e. parks or transportation), while others are more comprehensive and speak to the interrelated planning goals and objectives.

Land use data gathered for this analysis was also used in analyzing impacts on the visual environment and from noise and vibration, the results of which are described in greater detail in Sections 4.9 and 4.17, respectively.

4.3.3 SCMAGLEV Project Affected Environment

4.3.3.1 Land Use

The SCMAGLEV Project spans two major metropolitan areas, Baltimore, MD and Washington, D.C., both with distinct metropolitan planning organizations. Smaller, defined neighborhoods, towns, and cities comprise each of these urbanized areas. Clusters of residential and commercial land uses are also located throughout the SCMAGLEV Project Affected Environment.

The SCMAGLEV Project Affected Environment includes large areas of Federal property including National Park Service (NPS) property associated with the Baltimore-Washington Parkway (BWP), the Patuxent Research Refuge (PRR), and Beltsville Agricultural Research Center (BARC). Additionally, the SCMAGLEV Project Affected Environment includes areas of Federal property associated with Fort George G. Meade, National Aeronautics and Space Administration (NASA) Goddard Space Flight Center (GSFC), National Security Agency (NSA), and the U.S. Secret Service (USSS).

Table-4.3.1 shows property ownership classification within the SCMAGLEV Project Affected Environment and **Table-4.3.2** presents a breakdown of property under the jurisdiction of Federal agencies.

Table 4.3-1: Property Ownership Classification within the SCMAGLEV Project Affected Environment

Ownership	Acreage	Percentage of Study Area
Federal	3,628	36.7%
Public*	3,320	33.6%
Private	2,926	29.6%
Total	9,874	

*Note: Includes Baltimore-Washington Parkway which is considered public right of way under the jurisdiction of NPS

Source: Maryland Land Use Land Cover-County Use Land Cover 2010, IMAP, Maryland Department of Planning; Washington, DC Existing Land Use, Open Data DC, DCGIS

Table 4.3-2: Federally Owned/Managed Land by Federal Agency within the SCMAGLEV Project Affected Environment

Ownership	Acreage
Beltsville Agricultural Research Center (US Department of Agriculture)	2,260
Fort George G. Meade	671
NASA Goddard Space Flight Center	54
National Park Service	831
National Security Agency	55

Ownership	Acreage
Patuxent Research Refuge (US Fish and Wildlife Service)	508
US Secret Service	213.5
United States of America*	29.6
Total	4621.9

*Note: Includes multiple properties occupied by various Federal agencies. The majority are located in Washington, DC and Baltimore City, Maryland.

Source: Maryland Land Use Land Cover-County Use Land Cover 2010, IMAP, Maryland Department of Planning; Washington, DC Existing Land Use, Open Data DC, DCGIS

The land uses identified in **Table 4.3-3** and further described below are present within the SCMAGLEV Project Affected Environment. Additional mapping of land uses present in the SCMAGLEV Project Affected Environment is located in Appendix D.3 Figure D.3-5.

Table 4.3-3: Land Use Classification within the SCMAGLEV Project Affected Environment

Land Use Type	Acreage	Percentage of Study Area
Low Density Residential	18	0.2%
Medium Density Residential	464	4.6%
High Density Residential	450	4.4%
Open Space	21	0.2%
Open Urban Space	318	3.1%
Mixed Use	2	0.0%
Commercial	967	9.6%
Industrial	695	6.9%
Institutional	803	7.9%
Agriculture	979	9.7%
Forest	4,383	43.3%
Water	217	2.1%
Transportation	798	7.9%
Total	10,116	100%

Forest – There is forested land scattered throughout the SCMAGLEV Project Affected Environment, most notably along the BWP within Prince George’s County and south of MD 32 in Anne Arundel County, in the PRR, and surrounding the MD 198 TMF site (see Section 4.12 Ecological Resources).

Agriculture – Agriculture land uses within the SCMAGLEV Project Affected Environment are identified within Prince George’s County, predominately within BARC

and east of I-95 at MD 200 and Konterra Drive. Although the Konterra site is classified as an agricultural land use on the Maryland Department of Planning's (MDP) current land use/land cover mapping, it is an open grass field with roadways and stormwater management facilities and is not currently used for agricultural purposes. Future plans for the area include the development of the Konterra Town Center and do not include agricultural use.

Residential, Commercial & Mixed Use – Clusters of residential and commercial land uses are located throughout the SCMAGLEV Project Affected Environment.

Concentrated (or dense) residential land uses are primarily located in and around Washington, D.C. and Baltimore City. Residential land use is also present along the BWP near the MD 197 and MD 198 interchanges. Commercial uses are dispersed throughout the SCMAGLEV Project Affected Environment including within the Washington D.C. and Baltimore central business districts, the Baltimore-Washington International Thurgood Marshall Airport Station (BWI Marshall Airport Station) and surrounding area in Anne Arundel County, and in areas such as Laurel, Maryland City, and Greenbelt in Prince George's County. Mixed uses are present to a lesser extent than designated residential and commercial uses. Mixed uses are located in Washington, D.C. and include a combination of residential and commercial uses.

Industrial & Institutional – There are concentrations of industrial land uses in the Ivy City neighborhood of Washington, D.C. and around Patapsco Avenue and Annapolis Road in Baltimore City. Scattered industrial land uses also occur within the vicinity of major roadways such as MD 201 in Prince George's County and MD 162, MD 170, MD 176, and MD 198 in Anne Arundel County. Institutional land use includes Federal, state, and local government-owned property. Institutional land uses are present at BARC, the NASA GSFC, and the Secret Service properties in Prince George's County; in dense pockets in Anne Arundel County, including the Fort George G. Meade area; the Mount Vernon Square area of Washington, D.C.; and Camden Yards in Baltimore City. Churches and schools also qualify as institutional land uses and are dispersed throughout the SCMAGLEV Project Affected Environment, generally in proximity to residential and commercial areas that they serve.

Transportation – Transportation land uses exist throughout the SCMAGLEV Project Affected Environment and include interstates, highways, parkways, state roadways, railways, and local roads. The BWP (MD 295) stretches north-south throughout most of the SCMAGLEV Project Affected Environment and is a major roadway that spans from Washington, D.C. to Baltimore City. A major segment of I-495 (Capital Beltway) in Prince George's County and I-695 (Baltimore Beltway) in Anne Arundel and Baltimore Counties interconnect north-south corridors of the SCMAGLEV Project Affected Environment. The Northeast Corridor (NEC) railway runs north-south between Washington, D.C. and Baltimore, MD with passenger rail provided by the Maryland Area Regional Commuter (MARC) Train Camden line and MARC Train Penn line, as well as Amtrak service. Other transportation land uses include portions of the Washington Metro Area Transit Authority (WMATA) Metrorail system, located throughout

Washington, D.C. and Prince George's County, and portions of the Maryland Department of Transportation, Maryland Transit Administration (MDOT MTA) Light RailLink system located in Baltimore City, Baltimore County, and Anne Arundel County.

Open Space, Open Urban Space & Water – Open space and open urban space includes golf courses, parks, recreation areas (except areas associated with schools or other institutions), cemeteries, and undeveloped land. These land uses are dispersed throughout the SCMAGLEV Project Affected Environment. Water is present to a lesser extent than the other land uses within the SCMAGLEV Project Affected Environment. Water includes Anacostia, Patuxent, Little Patuxent, and Patapsco Rivers.

4.3.3.2 Zoning

The SCMAGLEV Project Affected Environment is primarily zoned as residential, open space, and industrial. For purposes of this analysis, areas not specifically zoned by a county were classified as 'other' which often, but not always, pertains to Federal lands. Zoning is used to dictate which uses can and cannot take place within a designated area. Zoning codes sometimes include provisions that regulate the form of the built environment within designated areas. Typically, when a property owner wants to use their land for a purpose outside of the designated zoning for the area, they would have to apply for a special exception. As stated previously, zoning is established and controlled within the Affected Environment by multiple jurisdictions and rules for designating or changing zoning vary. Certain transportation uses (i.e., underground utilities, roads, rail roads, and transit stations) are supported within most zoning designations. Other above-ground public utility uses, or structures would require a special exception. Zoning designations present within the SCMAGLEV Project Affected Environment are summarized below and identified on mapping in Appendix D.3 Figure D.3-6.

Within the SCMAGLEV Project Affected Environment, Anne Arundel County has the highest acreage of residential zoning, which is the most prevalent zoning in the SCMAGLEV Project Affected Environment. Open space zoning, including parks and other undeveloped parcels, is the second most prevalent zoning designation throughout the SCMAGLEV Project Affected Environment. Prince George's County has the highest concentration of open space zoning. Industrial is the third largest zoning designation in the SCMAGLEV Project Affected Environment, primarily concentrated within Baltimore City and the Ivy City neighborhood of Washington, D.C.

Federal lands are not provided a zoning category by the local jurisdictions and are designated as Other on zoning maps located in Appendix D.3. These Federal lands, which are prevalent in Prince George's County and Anne Arundel County, include portions of NPS BWP, NASA GSFC, BARC, USSS, PRR, Fort George G. Meade, and NSA properties.

4.3.4 Environmental Consequences

4.3.4.1 No Build Alternative

Under the No Build Alternative, the SCMAGLEV Project would not be built and therefore no impacts related to the construction or operation of a SCMAGLEV system will occur. However, other planned and funded transportation projects will continue to be implemented in the area and could result in change to land uses and property impacts.

4.3.4.2 Build Alternatives

The Build Alternatives support statewide and regional transportation goals as identified in various approved comprehensive planning documents, including improvements to multi-modal mobility and improved access to commercial and transportation hubs. Additionally, the SCMAGLEV Project would indirectly support many local planning goals in Washington D.C., Anne Arundel County, Baltimore County, and Baltimore City.

The impacts associated with land use and zoning changes would require coordination with local or Federal agencies, and the approval process would vary per agency. Land use and zoning changes occur frequently within developed areas, and changing residential, commercial, and industrial land uses to transportation uses are generally allowed and approved given that the relevant procedures are followed. Additionally, all changes to land use and property impacts on Federal property would require agency-specific coordination, as well as potential updates to agency planning documents to accommodate the SCMAGLEV Project. During interagency scoping, multiple agencies expressed concerns about land use changes and the proximity of the SCMAGLEV facilities and its associated direct and indirect impacts to their property. For instance, Fort Meade indicated that locating SCMAGLEV viaduct and/or supporting facilities on or within close proximity to it may impact development of new supporting facilities, as available real estate on the installation is limited. Likewise, some agencies have noted that property transfer is unprecedented, infrequent, unfavorable, and/or potentially unattainable. Land acquisition from Federal agencies would require agency-specific permitting, transfer agreements, and in some cases, congressional approval.

This land use analysis is based on the LOD of above ground elements of the Build Alternatives. Coordination with property owners during later design phases would be required for impacts to utilities and water wells (discussed in greater detail in Section 4.13 Geology and Section 4.20 Utilities), and any rights to below ground resources. Impacts to land use, zoning, and property would vary between the 12 Build Alternatives. An overview of the impacts is provided below.

Summary of Build Alternatives Impacts

- Linear impacts to land use would be due to the viaduct, its support piers, and new roadways built to supplement access for construction and ongoing maintenance. Large area impacts to land use would be associated with

SCMAGLEV Project related buildings such as substations, fresh air/emergency egress facilities (FA/EEs), TMFs, and systems support buildings; construction laydown areas; and areas for stormwater management.

- The construction of some SCMAGLEV Project features would be in contrast to current and surrounding land uses. The potential sites for the TMFs include large portions of BARC which currently includes open space, forested areas, and agricultural uses or an area of land off of MD 198 east of the BWP that includes forested land and institutional uses. In other areas, SCMAGLEV Project facilities would be located in proximity to residential and commercial uses and forested areas.
- SCMAGLEV Project elements are located in areas zoned with various designations. SCMAGLEV Project elements would be considered transportation and/or public utility use. These uses would be permitted or would require a special exception prior to construction.
- The 12 Build Alternatives would result in property impacts that range from a total of 852 acres to 1,066 acres for permanent acquisition. Temporary property impacts would range from 120 acres to 252 acres. Build Alternatives with the Cherry Hill Station (J-01, J-02, J-03, J1-01, J1-02, J1-03) would result in more affected parcels and larger areas of permanent property acquisition, and would require larger amounts of land use changes compared to Build Alternatives with the Camden Yards Station (J-04, J-05, J-06, J1-04, J1-05, J1-06).
- Agricultural land uses would have the largest amount of land changed to transportation use. Most of the land characterized as agricultural is located on the Konterra site that would be used as a long-term construction laydown area under all Build Alternatives. Although classified as agricultural land use on MDP's current land use/land cover mapping, the Konterra site is an open grass field with a few roadways and stormwater management facilities. The site is not being used for agricultural purposes and is planned for future development. Impacts on farmland (i.e., soils designated as prime farmland, unique farmland, and farmland of statewide or local importance) are described in Section 4.14 Soils and Farmland.
- Build Alternatives J would result in at least one full permanent acquisition of a residential property. Build Alternatives J1 would result in one additional permanent acquisition of a residential property; however, this additional property is part of homeowners' association owned land and is currently forested and undeveloped.
- The BARC Airstrip TMF and the BARC West TMF would be located in the Prince George's County Rural and Agricultural area. The construction and operation of a TMF at either location would not be consistent with Prince George's County

Master Plan as the county intends to limit and discourage growth in the BARC area and keep it as a natural area.

- The SCMAGLEV Project would require temporary property acquisitions and permanent partial (less than 1/3 of the property) property acquisitions from numerous residential properties. As the SCMAGLEV Project design is finalized, these property impacts may be refined.

Permanent and temporary impacts to property are displayed by total acreage and number of parcels within the LOD for above ground elements, and changes in land use and parcel impacts are highlighted on **Table 4.3-4**. The Build Alternatives that would require the lowest and highest numbers of residential parcel property impacts are also identified. Property impacts are displayed by parcel in Appendix D.3 Attachment A. Impacts to land use are displayed by acreage, number of parcels, and land use type for each Build Alternative in Appendix D.3 Attachment B.

Table 4.3-4: Changes in Land Use and Parcel Impacts by Build Alternative

Build Alternative	Acres of Impact		Number of Parcels		Key Impacts and Highlights
	P	T	P	T	
J-01	1,000	203	312	162	• Property impacts to industrial and commercial land uses higher due to Cherry Hill Station in comparison to Alternatives that would use Camden Yards Station • One of the largest acreage of permanent property impacts to Fort Meade and BWP due to MD 198 TMF • Impacts to NASA, NSA, PRR, and USSS properties anticipated
J-02	1,066	239	294	170	• Largest acreage of impacts to forested land use • One of the largest acreage of permanent property impacts to Federal property • Largest acreage of permanent property impacts to BARC, NASA*, and Secret Service due to BARC Airstrip TMF • Impacts to NASA, NSA, PRR, and USSS properties anticipated
J-03	1,019	214	297	167	• Largest total acreage of impacted acres • Impacts to NASA, NSA, PRR, and USSS properties anticipated
J-04	852	216	207	113	• One of the largest acreages of permanent property impacts to Fort Meade and BWP due to MD 198 TMF • One residential parcel would be displaced. • Requires the lowest number of residential parcel property acquisitions (8 permanent, 4 temporary). Eight of the 13 total impacted residential parcels currently include a residential structure

Build Alternative	Acres of Impact		Number of Parcels		Key Impacts and Highlights
	P	T	P	T	
					Impacts to NASA, NSA, PRR, and USSS properties anticipated
J-05	918	252	189	123	- One of the smallest acreages of permanent property impacts - Least number of total parcels permanently impacted - One of the largest acreages of permanent property impacts to Federal property - Largest acreage of permanent property impacts to BARC, NASA*, and Secret Service due to BARC Airstrip TMF - Impacts to NASA, NSA, PRR, and USSS properties anticipated
J-06	871	228	192	120	- Impacts would fall within the range of impacts across Build Alternatives - Impacts to NASA, NSA, PRR, and USSS properties anticipated
J1-01	1,009	120	334	167	- Largest number of total parcels permanently impacted - One of the lowest acreages of permanent property impacts to Federal property - No impacts to NASA, NSA, PRR, or USSS properties anticipated
J1-02	1,053	161	313	183	Impacts would fall within the range of impacts across Build Alternatives
J1-03	1,009	133	314	178	- No impacts to NASA, NSA, PRR, or Secret Service anticipated - Two residential parcels would be displaced. Requires the highest number of residential parcel property acquisitions (11 permanent, 16 temporary). Nineteen of the 29 total impacted residential parcels currently include a residential structure.
J1-04	861	134	229	121	- Least acreage of permanent property impacts to Federal property - No impacts to NASA, NSA, PRR, or Secret Service anticipated
J1-05	905	174	208	134	One of the smallest acreages of permanent property impacts
J1-06	861	147	210	132	No impacts to NASA, NSA, PRR, or USSS property anticipated

Acreage totals reflect impacted parcel acreage. Land use descriptions reflect the Adjusted Land Use designations.

* NASA GSFC occupied parcels on BARC land are counted as NASA property for this analysis.

Source: AECOM, September 2020.

Alignment and Ancillary Facilities

The aboveground structures associated with the alignment include the viaduct substations, fresh air/emergency egress facilities, and systems buildings (ancillary facilities). The viaduct would run only along the central portion of the SCMAGLEV

Project corridor and generally parallels BWP and would impact the land that abuts it. The ancillary facilities would be dispersed throughout the SCMAGLEV Project corridor and would include larger footprints in comparison to the viaduct. Some ancillary facilities are located within and in close proximity to residential, commercial, open space, and forested land uses. The aboveground structures associated with Build Alternatives using the Build Alternatives J would result in permanent changes to land use of between 629 acres and 643 acres. Land use characterized as open space and institutional land uses count for the largest total acreage of land changes to transportation use. Comparatively, the viaduct for Build Alternatives with the Build Alternatives J1, would result in land use changes of between 620 acres and 636 acres from mostly open space and commercial land uses to transportation use.

The alignment and ancillary facilities associated with the Build Alternatives would require full permanent acquisitions from a range of 114 to 120 parcels. The alignment and ancillary facilities of Build Alternatives J1-02 and J1-03 would require the highest number of full permanent acquisitions with 120 parcels.

Build Alternatives J-01 through J-06 would require the full permanent acquisition of one residential property located off of Harmans Road due to a fresh air/emergency egress facility. Build Alternatives J1-01 through J1-06 would require an additional full permanent acquisition of a residential parcel located between Hermosa Drive and BWP. This parcel is currently forested. Changes to residential land use would also be required to areas along BWP in the vicinity of the MD 197 interchange for all Build Alternatives and would result in multiple partial permanent acquisitions. However, the LOD in these areas are in close proximity to residential structures and may eliminate parking and egress in some areas. Therefore, additional properties may warrant a full permanent acquisition.

Federal lands would also be impacted by the SCMAGLEV Project alignments and ancillary facilities. Build Alternatives J-01 through J-06 would permanently impact up to 328 acres and temporarily impact up to 120 acres of Federal lands. Viaduct and ancillary facilities of Build Alternatives J-01 through J-06 would be located east of the BWP and within properties operated by Federal agencies including NPS, NASA Goddard, BARC, USSS, PRR, NSA, and Fort Meade. The viaduct and ancillary facilities would be within the perimeter fence line at the USSS, Fort Meade, and NSA and could limit access to portions of these properties and fragment the properties, potentially affecting future management and use of them.

Build Alternatives J1-01 through J1-06 would permanently impact up to 245 acres and temporarily impact up to 60 acres of Federal lands. Viaduct and ancillary facilities of Build Alternatives J1-01 through J1-06 would be located along the BWP and western boarder of properties operated by Federal agencies including NPS, BARC, and Fort Meade.

Stations

The SCMAGLEV Project would include the construction and operation of three stations. One in Washington, DC, one at BWI Marshall Airport, and one in Baltimore City. Two stations, Cherry Hill Station and Camden Yards Station, are under consideration in Baltimore City. Only one would be constructed as part of the SCMAGLEV Project.

Each proposed station would result in land use changes and property acquisition. The Cherry Hill Station (Build Alternatives J-01, J-02, J-03, J1-01, J1-02, and J1-03) would result in the greatest land use change, with approximately 179 acres and 73 full permanent parcel acquisitions. The Cherry Hill Station is the only station under consideration that would be above ground. The Cherry Hill Station would be built above an existing Light Rail Station. Most of the land use changes will occur to industrial uses (115 acres), followed by commercial uses (20 acres) and forest uses (19 acres). The majority of the commercial land use changes would be associated with the businesses in the northeast quadrant of the intersection of Annapolis and Patapsco Roads and would include the Patapsco Flea Market and Patapsco Arena. There would be multiple full permanent acquisitions in this area, in addition to properties acquired east and west of the proposed station along Annapolis Road, Waterview Road, and Cherry Hill Road. Baltimore City planning documents, such as the *South Baltimore Gateway Master Plan*, acknowledge that consideration should be given to redeveloping this area.

The Camden Yards Station (Build Alternatives J-04, J-05, J-06, J1-04, J1-05, and J1-06) would be located in Downtown Baltimore City and would result in approximately 27 acres of permanent land use changes and four full permanent parcel acquisitions and would include the demolition of the Baltimore Convention Center, the Garmatz US District Court House, Old Otterbein Church, and the Federal Reserve Bank. Camden Yards access points would be along W Conway and Pratt Streets between Howard and Charles Streets.

BWI Marshall Airport Station (all Build Alternatives) would be mostly located under the existing airport and garage facilities but would impact some airport parking, resulting in 21 acres of permanent commercial land use changes.

The Mount Vernon Square East Station (all Build Alternatives) would result in approximately 3 acres of permanent commercial, institutional, open urban space, and transportation land use changes. Mount Vernon Square East Station access points would be southeast of the 6th Street NW and New York Avenue NW intersection, northeast of the 4th Street NW and New York Avenue NW intersection, and northwest of the 1st Street NW and New York Avenue NW intersection within the New York Avenue Playground and Park; this station would have the least permanent changes in land use.

TMF

Build Alternatives J and MD 198 TMF (J-01 and J-04) would require permanent changes to land use of nearly 194 acres and 11 full permanent parcel acquisitions. Land use converted to transportation use would include the following: approximately

140 acres of forest, 30 acres of institutional, 10 acres of industrial, 5 acres of residential, 4 acres of open urban space, and 3 acres of commercial land uses. Build Alternatives J1 and MD 198 TMF (J1-01 and J1-04) would require permanent changes to land use of nearly 216 acres and 12 full permanent parcel acquisitions. Land use changes to transportation use would include the following: approximately 161 acres of forested land use, 31 acres of institutional, 10 acres of industrial, 5 acres of residential, 2 acres of open urban spaces, 3 acres of commercial and 1 acre of agricultural land uses. The MD 198 TMF would alter the character and development intensity in the area. This location is currently identified within the *Anne Arundel County General Development Plan 2009* as part of the Managed Growth Area, which allows for development, and is within the County's Priority Funding Area. The MD 198 TMF would result in the full acquisition of 11 parcels under J-01 and J-04 and 12 parcels under Build Alternatives J1-01 and J1-04 including the Woodlands Job Corps facility. The United States Department of Labor (DOL), which manages and oversees the Woodlands Job Corps facility and program, expressed opposition to any Build Alternatives that would remove the facility. According to DOL, the Woodlands Job Corps facility is only one of two of the kind in the DC area and that relocating the center would be extremely costly.

Build Alternatives J and BARC Airstrip TMF (J-02 and J-05) would require permanent changes to land use of nearly 200 acres. Land use changes to transportation use would include the following: approximately 91 acres of institutional, 87 acres of forest, and 22 acres of agricultural land uses. Build Alternatives J1 and BARC Airstrip TMF (J1-02 and J1-05) would require permanent changes to land use of nearly 193 acres. Land use changes to transportation use would include the following: approximately 90 acres of institutional, 82 acres of forested, and 21 acres of agricultural land uses. The BARC Airstrip TMF would be located in the Prince George's County Rural and Agricultural area. The TMF is not consistent with Prince George's County Master Plan as the county intends to limit and discourage growth in the BARC area to maintain it as a natural area. Permanent partial property acquisition would be required from BARC and PRR. Additionally, portions of a parcel owned by BARC and currently occupied by NASA would be required. The BARC Airstrip TMF would occupy or be in close proximity to land that serves multiple research functions for both BARC and NASA. According to both BARC and NASA, the unique setting of the area cannot be replicated in another location on BARC property, and therefore, if the BARC Airstrip TMF is constructed, the research functions would no longer be available and years of ongoing research may be lost or altered for a very long time.

Build Alternatives J and BARC West TMF (J-03 and J-06) would require the permanent change in land use of nearly 193 acres. Land use changes to transportation use would include the following: approximately 152 acres of forest, 27 acres of agricultural, 13 acres of institutional uses, and under one acre of residential land uses. Build Alternatives J1 and BARC West TMF (J1-03 and J1-06) would require the permanent change in land use of nearly 194 acres. Land use changes to transportation use would include the following: approximately 151 acres of forested, 29 acres of agricultural, 13 acres of institutional, and under one acre of residential land uses. The BARC West

TMF is the only TMF option that would impact residential property. The BARC West TMF would be located in the Prince George's County Rural and Agricultural area. The TMF would not be consistent with Prince George's County Master Plan. Permanent partial property acquisition would be required from BARC. BARC has expressed that the development of either the BARC Airstrip TMF or the BARC West TMF would have a significant impact on BARC research activities and that the changes in land use would affect long-term research that would be permanently lost.

4.3.4.3 Short-term Construction Effects

Construction of the SCMAGLEV Project would include activities such as digging and tunneling using multiple tunnel boring machines, ground clearing, pile driving, excavating, grading, and the stockpiling of soil, muck, and materials. During construction, areas used to stage equipment, stockpile soil, create access roads, and provide access to underground stations construction would be temporarily impacted. Build Alternatives J-01 through J-06 would require between 203 and 239 acres of temporary acquisition affecting up to 170 parcels. Build Alternatives J1-01 through J1-06 would require between 120 and 174 acres of temporary acquisition and would affect up to 183 parcels (see **Table 4.3-4**). These lands would be restored to their original use after construction is complete. However, although some impacts would not be permanent in nature, removal of mature forest cover could take 75-100 years to regenerate to current levels. Additional details on the impacts to land use and property can be found in Section 4.2 Transportation, Section 4.4 Neighborhoods and Community Resources, Section 4.12 Ecological Resources, Section 4.14 Soils and Farmlands, and Section 4.20 Utilities.

4.3.5 Potential Minimization and Mitigation Strategies

The Build Alternatives would result in changes in land use, permanent full and partial property acquisition, and temporary property acquisition. The Project Sponsor incorporated design considerations to avoid and minimize impacts in areas along the corridor. Some examples include:

- The Washington, D.C. Station and the Camden Yards Station in Baltimore City are underground to avoid significant permanent land use changes in urban, highly developed areas.
- The Cherry Hill Station is located above an existing transportation facility (i.e., a Light RailLink Station) with light rail and bus service.
- Tunnel boring machine (TBM) launch sites, storage, and staging areas are consolidated to sites that would ultimately be fresh air and emergency egress facilities, or substations post construction will minimize land use impacts during construction.

In addition, FRA has identified the following measures to mitigate and minimize these impacts.

The Project Sponsor would consider comprehensive master and local land use plans, existing land use and zoning, and property ownership in the preliminary design of the SCMAGLEV Project. In an effort to minimize impacts to surface properties, the Project Sponsor has incorporated tunneling into design of the Build Alternatives.

The Project Sponsor would continue to coordinate with state and local governments, Federal agencies, and private landowners regarding the location and positioning of Build Alternatives including the stations, selected TMF site, and ancillary facilities like the fresh air and emergency egress facilities and substations. At this stage of design, the viaducts, access ramps, and TMF sites are currently being evaluated as large, contiguous tracts of land. However, as design progresses, detailed layouts of the selected TMF site would be developed to reduce land use and parcel impacts and the Project Sponsor would coordinate with state, local, and Federal agencies to continue to evaluate the project's consistency with future land use plans. In addition, the viaducts and access ramps would be further refined to minimize land use impacts under the structures.

As part of the design process, the Project Sponsor would examine ways to reduce or eliminate property acquisitions where feasible. The Project Sponsor and FRA will coordinate with potentially impacted property owners on an individual basis to identify and discuss appropriate mitigation measures. Mitigation measures would follow applicable regulations and procedures and would be in place prior to the start of construction.

To mitigate impacts from forest land use changes, the Project Sponsor would provide reforestation for impacts to forested lands in consultation with Maryland Department of Natural Resources (MDNR), local governments, and Federal agencies (USFWS, NPS, BARC) as warranted, and in compliance with applicable regulations. To minimize the impacts to aesthetics and visual character, the Project Sponsor would ensure the architecture and design of the surface elements conforms to surrounding uses, by considering the form, scale, and materials of the surface elements. The design and placement of above-ground elements would encourage compatibility with adjacent land uses to the extent feasible, such as placing entry areas away from incompatible adjacent land uses. The Project Sponsor would consult with state and local planning approval agencies and Federal agencies during the development of the architecture and design of the surface elements.

The Project Sponsor would comply with the Uniform Relocation Act as part of the property acquisition process. The Project Sponsor would negotiate with property owners for parcel acquisitions on an individual basis, and agreements would be in place prior to the start of construction. Some parcels identified as a full parcel acquisition in this analysis may ultimately qualify as partial parcel acquisitions depending on final design and property owner negotiations. Likewise, some parcels identified as partial parcel or temporary acquisition may ultimately qualify as full parcel acquisitions.

The Project Sponsor would implement a surface settlement monitoring program during construction and tunneling operations. A pre-construction survey of sensitive structures for existing cracks and damages would be conducted. Tolerance levels would be established based on thresholds for buildings, roads, and other sensitive structures to ensure no damage. The monitoring program would include an Alert Notification System that notifies the responsible personnel when tolerances are exceeded.

4.3.5.1 Short-term Construction Strategies

The construction of the SCMAGLEV Project could cause potential short-term impacts to air quality (fugitive dust and construction equipment exhaust), noise and vibration (construction equipment and activities), and transportation (work vehicles, increased congestion, detours, and road closures). These impacts could affect the access and functions of land uses. The Project Sponsor would include the following minimization and mitigation strategies for impacts related to construction.

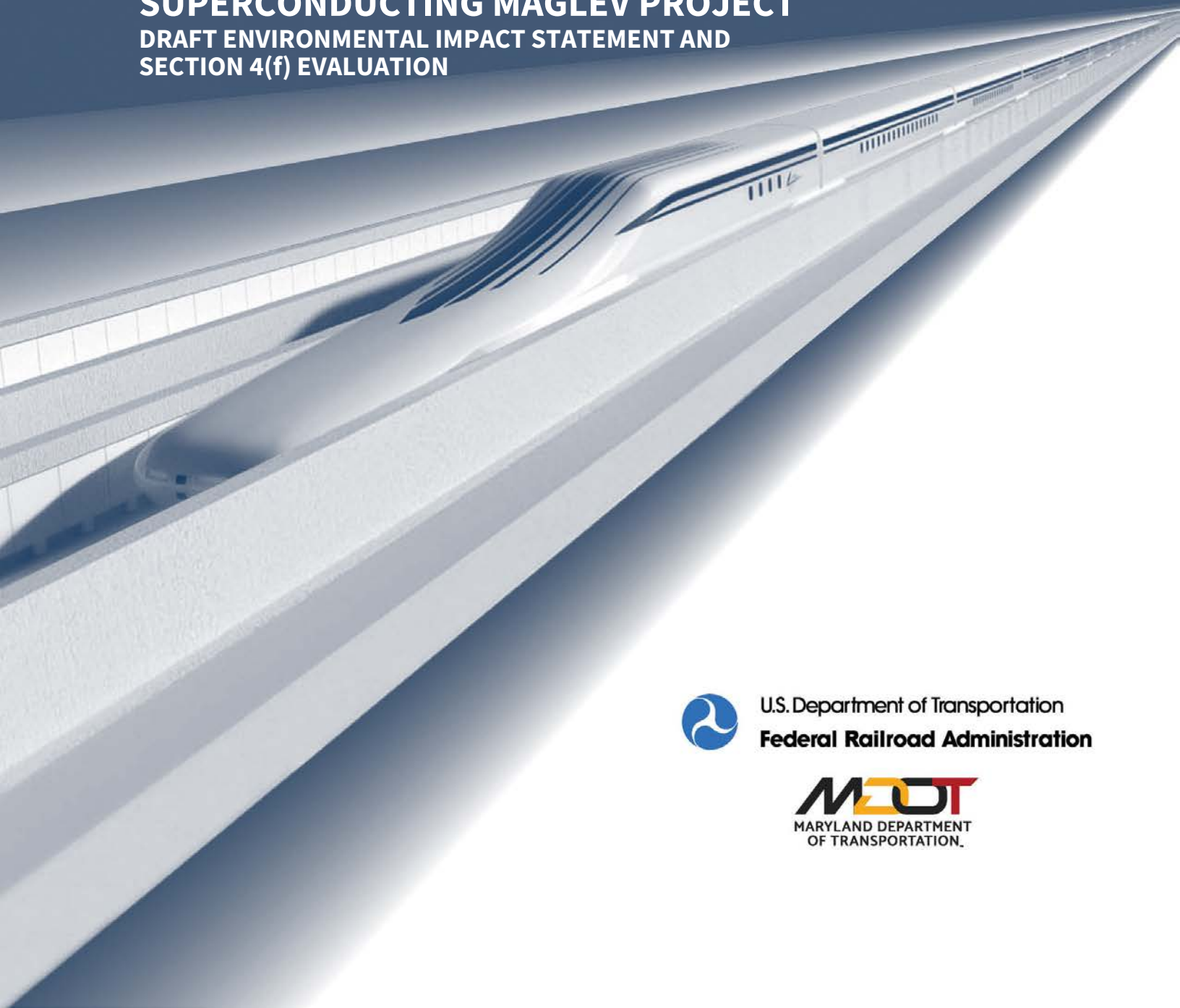
- Develop a construction mitigation plan with community and property owner input to address construction impacts. Public outreach at Public Meetings with impacted neighborhoods and stakeholders would be included as a part of the programmatic mitigation approach. The Project Sponsor would continue to incorporate stakeholder input into design throughout the SCMAGLEV Project to inform their decision-making process;
- Develop a community outreach plan to notify local communities of construction schedules, road and sidewalk closures, and detours. The Project Sponsor would develop the community outreach plan which would ultimately outline how and when communities would be informed of these potential disruptions;
- Determine truck hauling routes and schedules that would minimize impacts on residential and commercial areas;
- Notify property owners, businesses, and residences of upcoming major construction activities (e.g., utility relocation/disruption and milestones; re-routing of delivery trucks);
- Coordinate business outreach programs and implement promotions for businesses most affected by the construction;
- Develop detours for any road or sidewalks to be closed during construction. Develop Worksite Traffic Control Plans in conjunction with the county and municipal departments of transportation to accommodate automobile and pedestrian traffic;
- Maintain access to residences, businesses, and community facilities including community parks affected by construction activities;
- Provide early notification to emergency service providers of any road closures or detours; and

- During construction, provide temporary replacement or shared parking as needed to absorb the loss of parking due to acquisitions. Temporary parking could be added by constructing surface lots on nearby vacant parcel or restriping nearby streets to allow diagonal curb parking.

Section 4.4

Nearby Communities and Community Facilities

BALTIMORE-WASHINGTON SUPERCONDUCTING MAGLEV PROJECT DRAFT ENVIRONMENTAL IMPACT STATEMENT AND SECTION 4(f) EVALUATION



U.S. Department of Transportation
Federal Railroad Administration



4.4 Neighborhoods and Community Facilities

4.4.1 Introduction

This section evaluates the effects of the No Build and Build Alternatives on the residents, neighborhoods, and community facilities along the Superconducting Magnetic Levitation Project (SCMAGLEV Project) corridor.

4.4.2 Regulatory Context and Methodology

4.4.2.1 Regulatory Context

Federal regulations require the evaluation of impacts to socioeconomic resources for all transportation projects that use Federal funds. Per the Federal Railroad Administration (FRA) *Procedures for Considering Environmental Impacts* (64 FR 28545, 28550, May 26, 1999), FRA should consider potential impacts to the socioeconomic environment, including the potential for community disruption and demographic shifts, for proposed actions. Additionally, the assessment of neighborhood and community impacts considers the Uniform Relocation and Real Property Acquisition Policies Act of 1970 (42 U.S.C. 4601), as amended (the Uniform Act), which ensures people displaced because of a Federal action or undertaking involving Federal funds are treated fairly, consistently, and equitably.

4.4.2.2 Methodology

This section considers the potential direct impacts, including permanent effects and short-term construction effects to neighborhoods and community facilities as a result of the SCMAGLEV Project Build Alternatives. Direct impacts include:

- **Property impact(s)** – full (displacement – permanent use of more than 1/3 of the property or removal of structures), partial property acquisition (permanent use of less than 1/3 of the property), or temporary use of property (property only used during construction).
- **Community cohesion effects** – disruption or enhancement of interactions between people and groups within a community
- **Community facility utilization** – displacement of or changes in the utilization of community facilities
- **Aesthetics and visual appearance** – changes in the visual landscape
- **Noise and vibration** – changes in noise and vibration
- **Air quality** – changes to air quality including increases or decreases in pollutants and increases in fugitive dust during construction
- **Health and safety** – threats to public health and safety

- **Changes to access and mobility** – disruption in the ingress and egress to a community or community facility

The SGMAGLEV Project impact area includes the limits of operational/physical disturbance, as well as the construction related impact area, which includes additional areas of temporary disturbance required for construction activities. These impact areas comprise the overall limit of disturbance (LOD) of the SCMAGLEV Project Build Alternatives. The LOD includes all surface and subsurface elements.

The SCMAGLEV Project Affected Environment for neighborhood and community facilities is defined as the area within a 500-foot buffer around the proposed Build Alternatives alignments and within a quarter-mile buffer around stations and trainset maintenance facilities (TMF) locations. These buffers were considered to capture potential impacts (i.e., visual/aesthetics, noise/vibration, and changes in access and mobility) that could extend beyond the limit of disturbance (LOD). After delineating the SCMAGLEV Project Affected Environment, FRA determined that 124 U.S. Census block groups were located within or intersected by the SCMAGLEV Project Affected Environment. The neighborhoods that coincide with the 124 block groups were determined to comprise the SCMAGLEV Project Affected Environment. Appendix D.3 Socioeconomic Environment Technical Report includes a list of the neighborhoods that are within or intersect the boundaries of the 124 block groups.

FRA defined neighborhoods and communities using data from the U.S. Census Bureau, county and city government websites, and various approved planning documents. For Baltimore City and Washington, D.C., FRA used locally designated names and delineations for neighborhoods. Washington, D.C., identifies Neighborhood Clusters for community planning and related purposes. Baltimore City delineates its neighborhoods as Neighborhood Statistical Areas (NSAs). For other areas in Maryland, FRA used borders and names of incorporated municipalities, when applicable, and for unincorporated areas, FRA used Census Designated Places (CDP) boundaries and names from the 2010 Census, in the absence of locally designated names and delineations. Appendix D.3 includes neighborhood names, delineation descriptions, and demographic data including U.S. Census Bureau's 2010 Decennial Census and 2018 American Community Survey 5-year estimate data, and state- and Washington, D.C.-derived population statistics for the jurisdictions within the SCMAGLEV Project Affected Environment.

FRA identified community facilities within the SCMAGLEV Project Affected Environment using various Geographic Information System (GIS) spatial databases and communications with stakeholders, including attendees at public meetings. Community facilities within the LOD for each Build Alternative were field verified. Community facilities include cemeteries, community and recreational centers, correction facilities, day care facilities, educational facilities, emergency shelters, fire stations, health centers/hospitals, public libraries, places of worship, police stations, and post offices.

4.4.3 SCMAGLEV Project Affected Environment

This section describes the SCMAGLEV Project Affected Environment. Appendix B.2 displays the locations of neighborhoods and community facilities, and Appendix D.3 includes a list of the neighborhoods by jurisdiction and community facilities by type and project element.

Washington, D.C.: The SCMAGLEV Project Affected Environment in Washington, D.C., includes a portion of the downtown/central business district, residential areas, and a zone with industrial uses and railyards. Neighborhoods, as defined by the City, include Cluster 7 (Shaw, Logan Circle), Cluster 8 (Downtown, Chinatown, Penn Quarter, Mount Vernon Square, North Capitol Street), Cluster 21 (Edgewood, Bloomingdale, Truxton Circle, Eckington), Cluster 22 (Brookland, Brentwood, Langdon), Cluster 23 (Ivy City, Arboretum, Trinidad, Carver Langston), Cluster 24 (Woodridge, Fort Lincoln, Gateway), and Cluster 25 (Union Station, Stanton Park, Kingman Park).

Prince George's County, Maryland: The SCMAGLEV Project Affected Environment in Prince George's County contains residential areas, major roadways, commercial and industrial areas, and portions of several Federal properties. Residential areas are located near interchanges with Baltimore-Washington Parkway (BWP) at MD 197. Neighborhoods include Bladensburg, Woodlawn, South Laurel, Summerfield, Landover, Glenarden, Konterra, and Laurel. Federal properties include the United States Department of Agriculture (USDA) Beltsville Agricultural Research Center (BARC) property, the Patuxent Research Refuge (PRR), National Aeronautics and Space Administration (NASA) Goddard Space Flight Center (GSFC), and the United States Secret Service (USSS).

Anne Arundel County, Maryland: The SCMAGLEV Project Affected Environment in Anne Arundel County includes residential, commercial, industrial uses, major roadways, the Baltimore-Washington International Thurgood Marshall Airport (BWI Marshall Airport) and Federal properties (Fort George G. Meade and PRR). Neighborhoods include Maryland City, Fort George G. Meade, Jessup, Linthicum, and Severn.

Baltimore County, Maryland: The SCMAGLEV Project Affected Environment in Baltimore County includes industrial, commercial, and single-family residential uses. The area contains railroads and major roads including the BWP, I-895, and Annapolis Road. The Baltimore Highlands and Lansdowne neighborhoods are within the SCMAGLEV Project Affected Environment for Baltimore County.

Baltimore City, Maryland: The SCMAGLEV Project Affected Environment in Baltimore City includes a commercial and industrial corridor with residential land uses along Patapsco Avenue and Annapolis Road, as well as a portion of the downtown/central business district with commercial office, retail, industrial, multiple residential uses, and sports stadiums. The neighborhoods include Cherry Hill, Lakeland, Westport, Stadium Area, Otterbein, and Downtown West.

4.4.4 Environmental Consequences

4.4.4.1 No Build Alternative

Under the No Build Alternative, the SCMAGLEV Project would not be built and, therefore, no impacts related to the construction or operation of a SCMAGLEV system would occur. However, other planned and funded transportation projects will continue to be implemented in the area and could result in impacts to neighborhoods and community facilities. Transportation projects planned within the Project vicinity can be found in Section 4.2 Transportation.

4.4.4.2 Build Alternatives

This section describes and compares the permanent impacts of the Build Alternatives, with specific subsections that identify impacts by alignment and ancillary facilities, stations, and TMFs. Construction and operation of the SCMAGLEV would result in permanent adverse impacts to some neighborhoods and community facilities. Impacts would include one or more of the following: property acquisition (ranging from partial to full acquisitions), disruption to community cohesion or use of community facilities, aesthetics and visual appearance, noise and vibration, air quality, health and safety, and/or changes to access and mobility. Permanent impacts to neighborhoods and communities would occur in the vicinity of above-ground SCMAGLEV Project elements, including the alignment, ancillary facilities, stations, and TMFs, as well as above some underground elements. The above-ground viaduct would not bisect communities; however, it would be in close proximity to communities and homes along the BWP in Prince George's and Anne Arundel Counties. Likewise, above-ground ancillary facilities, TMFs, and stations would not be located within communities but would be placed in close proximity to homes and community facilities in some areas. Where the tunnels are proposed for the Build Alternatives, above-ground uses would remain as they are currently.

If the construction of the SCMAGLEV Project receives Federal funding, all activities related to acquisitions and displacements would be conducted in conformance with the Uniform Act. This statute mandates that certain relocation services and payments be made available to eligible residents, businesses, and nonprofit organizations displaced as a direct result of projects undertaken by a Federal agency or with Federal financial assistance. The Uniform Act provides for uniform and equitable treatment for persons displaced from their homes and businesses, and it establishes uniform and equitable land acquisition policies. If the SCMAGLEV Project is fully privately funded, the Project Sponsor will be responsible for compensating property owners impacted by property acquisitions.

See Section 4.2 Transportation, Section 4.7 Recreational Facilities and Parklands, Section 4.9 Aesthetics, Visual Quality, and Light Emissions, Section 4.16 Air Quality, Section 4.17 Noise and Vibration, Section 4.21 Public Health and Safety for more details regarding those impacts. In addition, Section 4.3 Land Use and Zoning, Section

4.6 Economic Resources, and Section 4.23 Indirect and Cumulative Effects provide additional information describing the effects that result from changing neighborhoods, communities, and land uses.

Table 4.4-1 displays the potentially impacted neighborhoods and community facilities by each Build Alternative and notes the type of permanent or temporary impact(s) for each. Potential indirect effects are discussed in Section 4.23 Indirect and Cumulative Effects.

The current design of the Build Alternatives would avoid and minimize certain impacts to neighborhoods and community facilities by placing many facilities, such as portions of the alignment and three stations, underground, or on viaduct.

Table 4.4-1: Permanent and Temporary Impacts to Neighborhoods and Community Facilities by Build Alternatives

Build Alternatives	Neighborhoods Impacted	Community Facilities Impacted
J-01	- Cluster 8 (PA, AM) - Cluster 21 (PA, AM) - Cluster 22 (D) - Bladensburg (N, VQ, AM) - Woodlawn (PA, N, V, CC, VQ, AM) - Landover (N, V, VQ, AM)	- Adams Place Emergency Shelter (D) - New York Avenue Playground and Park (PA) - Snowden Cemetery (D) - Medmark Treatment Center (D) - Woodland Jobs Corps (D) (<i>J-01 only</i>) - New Beginnings Youth Development Center/Maya Angelou Academy (PA [<i>J-01 only</i>], N, VQ)
J-02	- Glenarden (N, V, VQ, AM) - Summerfield (PA, N, V, VQ, AM) - New Carrollton (V, VQ) - Greenbelt (PA, V, VQ) - South Laurel (PA, N, V, VQ) - Konterra (PA, N, V, VQ, AM)	- Training School Cemetery (N, VQ) - Tabernacle Church and Learning Center (VQ)
J-03	- Maryland City (PA, D, N, VQ) - Fort Meade (V, VQ) - Severn (PA, D, N, V, VQ) - Linthicum (AM) - Baltimore Highlands (N) - Cherry Hill (PA, N, VQ, AM) - Westport (N, VQ) - Lakeland (VQ)	- New Life Christian Center (N, VQ) - Westport Elementary School (VQ) - Auburn Cemetery (VQ) - Arundel Elementary School (VQ) - Kingdom Hall of Jehovah's Witnesses (VQ) - Monarch Global Academy (N) - Resurrection Church (N) - Brock Bridge Elementary School (N)
J-04	- Cluster 8 (PA, AM) - Cluster 21 (PA, AM) - Cluster 22 (D) - Bladensburg (N, VQ, AM) - Woodlawn (PA, N, V, CC, VQ, AM) - Landover (N, V, VQ, AM) - Glenarden (N, V, VQ, AM) - Summerfield (PA, N, V, VQ, AM)	- Adams Place Emergency Shelter (D) - New York Avenue Playground and Park (PA) - Snowden Cemetery (D) - Woodland Jobs Corps (D) (<i>J-04 only</i>) - New Beginnings Youth Development Center/Maya Angelou Academy (PA [<i>J-04 only</i>], N, VQ)

Build Alternatives	Neighborhoods Impacted	Community Facilities Impacted
J-05	- New Carrollton (V, VQ) - Greenbelt (PA, V, VQ) - South Laurel (PA, N, V, VQ) - Konterra (PA, N, V, VQ, AM) - Maryland City (PA, D, N, VQ) - Fort Meade (V, VQ) - Severn (D, N, V, VQ, AM)	- Training School Cemetery (N, VQ) - Tabernacle Church and Learning Center (VQ) - New Life Christian Center (N, VQ) - Monarch Global Academy (N) - Resurrection Church (N) - Brock Bridge Elementary School (N) - Old Otterbein United Methodist Church (D) - Concentra Urgent Care (D)
J-06	- Linthicum (AM) - Baltimore Highlands (N) - Cherry Hill (PA, N, V, VQ) - Westport (N, VQ) - Downtown West (PA, D, AM) - Otterbein (PA, D, AM) - Stadium Area (PA, N, VQ, AM)	
J1-01	- Cluster 8 (PA, AM) - Cluster 21 (PA, AM) - Cluster 22 (D) - Bladensburg (V, N, AM) - Woodlawn (PA, N, V, CC, VQ, AM) - Landover (N, V, VQ, AM)	- Adams Place Emergency Shelter (D) - New York Avenue Playground and Park (PA) - Medmark Treatment Center (D) - Woodland Jobs Corps (D) (<i>J1-01 only</i>) - Montpelier Elementary School (VQ) - Montpelier Post Office (N, VQ) - Brock Bridge Elementary School (N, VQ)
J1-02	- Glenarden (N, V, VQ, AM) - Summerfield (PA, N, V, VQ, AM) - New Carrollton (V, VQ) - Greenbelt (V) - South Laurel (PA, N, V, VQ, AM, CC) - Konterra (PA, N, V, VQ, AM) - Maryland City (PA, D, N, V, VQ) - Fort Meade (V, VQ)	- Monarch Global Academy (N, VQ) - Resurrection Church (N, VQ) - Thomas J.S. Waxter Children's Center (N, VQ) (<i>J1-01 only</i>) - New Beginnings Youth Development Center/Maya Angelou Academy (PA [<i>J1-01 only</i>], N, VQ)
J1-03	- Severn (PA, D, N, VQ) - Linthicum (AM) - Baltimore Highlands (N) - Cherry Hill (PA, N, VQ, AM) - Westport (N, VQ) - Lakeland (VQ)	- Training School Cemetery (N, VQ) (<i>J1-01 only</i>) - Tabernacle Church and Learning Center (VQ) - Westport Elementary School (VQ) - Auburn Cemetery (VQ) - Arundel Elementary School (VQ) - Kingdom Hall of Jehovah's Witnesses (VQ)
J1-04	- Cluster 8 (PA, AM) - Cluster 21 (PA, AM) - Cluster 22 (PA, D) - Bladensburg (V, N, AM) - Woodlawn (PA, N, V, CC, VQ, AM) - Landover (N, V, VQ, AM) - Glenarden (N, V, VQ, AM)	- Adams Place Emergency Shelter (D) - New York Avenue Playground and Park (PA) - Woodland Jobs Corps (D) (<i>J1-04 only</i>) - Montpelier Elementary School (VQ) - Montpelier Post Office (N, VQ)

Build Alternatives	Neighborhoods Impacted	Community Facilities Impacted
J1-05	• Summerfield (PA, N, V, VQ, AM) • New Carrollton (V, VQ) • Greenbelt (V) • South Laurel (PA, N, V, VQ, AM, CC) • Konterra (PA, N, V, VQ, AM) • Maryland City (PA, D, N, V, VQ)	• Brock Bridge Elementary School (N, VQ) • Monarch Global Academy (V) • Resurrection Church (V) • Thomas J.S. Waxter Children's Center (N, VQ) (<i>J1-04 only</i>)
J1-06	• Fort Meade (V, VQ) • Severn (PA, D, N, VQ, AM) • Linthicum (AM) • Baltimore Highlands (N) • Cherry Hill (PA, N, V, VQ) • Westport (N, VQ) • Downtown West (PA, D, AM) • Otterbein (PA, D, AM) • Stadium Area (PA, N, VQ, AM)	• New Beginnings Youth Development Center/Maya Angelou Academy (PA [<i>J1-04 only</i>], N, VQ) • Training School Cemetery (N, VQ) (<i>J1-04 only</i>) • Tabernacle Church and Learning Center (VQ) • Old Otterbein United Methodist Church (D) • Concentra Urgent Care (D)

Impacts: PA = Property Acquisition; D = Displacement; N = Noise; V = Vibration; VQ = Aesthetics/Visual Quality; AM = Access and Mobility; CC = Community Cohesion

Bolded Text = Permanent impacts; Non-bolded Text = Temporary impacts

Source: AECOM 2020

An overview of other SCMAGLEV Project impacts to neighborhoods and community facilities is provided below:

- The Build Alternatives could have an adverse impact on community cohesion by displacing residents, businesses, and community facilities; introducing large transportation structures into residential and forested areas; changing residents' ability to navigate around their community; and disrupting interaction between people and groups within a community. The Build Alternatives could cause community disruption in the following areas due to adverse permanent impacts further described in this section:
 - Riverdale Road, Woodlawn neighborhood in Prince George's County, north of MD 410 (All Build Alternatives): land located behind homes and currently forested would be used for a fresh air and emergency egress (FA/EE) facility. Prior to construction, the area would be used as a construction laydown area and a launch site for tunnel boring machines (TBM). Temporary use of property would be required from five properties. Permanent property acquisition would be required from four properties for Build Alternatives J-01 thru J-06 and two properties for Build Alternatives J1-01 thru J1-06.
 - Elmshorn Way, Hermosa Drive, and Frensham Court in the Montpelier Hills community, as well as Ivory Fashion Court, Blue Moon Court, Sea Pearl Court, and Sumner Grove Drive, South Laurel neighborhood in Prince George's County, (Build Alternatives J1-01 thru J1-06).

- The Villages at Montpelier Apartments, Evergreens at Laurel Apartments, the Applegate Condominiums, and Laurelwood Condominiums, South Laurel neighborhood in Prince George’s County, (Build Alternatives J-01 thru J-06).
- Areas abutting and above the SCMAGLEV Project alignments, Maryland City neighborhood in Anne Arundel County (All Build Alternatives).
- Cherry Hill and Westport neighborhoods in Baltimore City (All Build Alternatives)
- Impacts related to noise, vibration, and visual quality are prevalent throughout the corridor and would occur in neighborhoods and at community facilities within close proximity to the Build Alternatives and ancillary facilities (noise and changes to visual quality) and in areas above tunnel portions (vibration). These impacts could affect community well-being as community members could be exposed to higher than usual noise and vibration levels and notice changes to the visual features in the surrounding environment.
- One residential property in the Severn neighborhood of Anne Arundel County would be displaced under all of the Build Alternatives. However, many residential properties are in close proximity to Project elements or are partially located within the LOD, and partial acquisition may be required.
- Several community facilities would be impacted by the Build Alternatives, including property acquisition, displacements, noise, vibration, and visual quality impacts. Build Alternatives J-01 would impact 17 community facilities; J-02, J-03, J1-01, and J1-04 would impact 16 community facilities; J-04 would impact 15 community facilities; J-05 and J-06 would impact 14, and J1-02, J1-03, J1-05, and J1-06 would impact 13.
 - Cherry Hill Station would require displacement of one community facility (Medmark Treatment Center), while Camden Yards Station would require displacement of at least two (Old Otterbein United Methodist Church and Concentra Urgent Care).
 - The BARC Airstrip and BARC West TMFs would not result in displacement of any community facilities. The MD 198 TMF would displace one (Woodland Jobs Corps) and impact at least two others (Thomas J.S. Waxter Children’s Center and New Beginnings Youth Development Center/Maya Angelou Academy).
- The SCMAGLEV Project would produce electromagnetic fields (EMFs) and has the potential to cause electromagnetic interference (EMI). Impacts to neighborhoods and community facilities due to EMFs and EMI are not anticipated (see Section 4.18 Electromagnetic Fields and Interference for additional details and potential mitigation measures).
- The SCMAGLEV Project has incorporated safety in the planning and design, core systems, facilities, and maintenance practices, including a systemwide state-of-the-art signaling system to avoid collisions, multiple FA/EE facilities,

emergency signage and lighting, and security fencing and monitoring (see Section 4.22 Safety and Security for additional details and potential mitigation measures).

- The SCMAGLEV Project would likely result in an increase to corridor wide criteria pollutant and greenhouse gas emissions, particularly in areas around station locations due to increased traffic, but would reduce overall mobile source emissions regionally. Build Alternatives with the Cherry Hill Station location are predicted to have higher emission increases compared to the No-Build (between 1.5 percent and 1.9 percent increase) than Build Alternatives with the Camden Yards Station location (between 0.6 percent and 0.7 percent) in year 2045 (see Section 4.16 Air Quality for additional details and potential mitigation measures).
- The SCMAGLEV Project could impact resources that have an effect on public health (see Section 4.21 Public Health and Safety). Impacts to groundwater from the Build Alternatives, particularly Build Alternatives J1-01 through J1-06, could occur in locations of tunnel constructed in both the Patapsco aquifer and Patuxent aquifer (i.e., important sources of water supply in Maryland) in Anne Arundel and Prince George's County, particularly in or near wellhead protection areas (WHPA) (see Sections 4.10 Water Resources and 4.13 Geology for additional details and potential mitigation measures). In addition, access to public drinking water could be disrupted if underground public water distribution piping must be re-routed or temporarily shut-off to accommodate construction of the SCMAGLEV Project.
- Health and safety risks from hazardous materials and solid waste could arise as a result of exposure to contaminants and could produce adverse health effects. The quantity and nature of the use and storage of hazardous materials and generation of solid waste during SCMAGLEV Project construction would be greater in areas that require a higher degree of earth-moving, such as tunnel excavation sites, portals, and underground station construction sites. Build Alternatives J1-01 through J1-06 include a longer tunnel portion than Build Alternatives J-01 through J-06. However, excavations conducted for Build Alternatives J may have a slightly greater potential to encounter hazardous materials than Build Alternatives J1 due to the higher number of medium-high risk sites, including National Priority List (NPL) sites, identified along the alignment (see Section 4.15 Hazardous Materials and Solid Waste for additional details and potential mitigation measures).
- The SCMAGLEV Project could spur development and commercial investment in neighborhoods near station locations. This could impact the long-term character of neighborhoods' economic and demographic makeup due to increased property values, changes to commercial and retail offerings, increased employment opportunities, higher wages, and changes to available community facilities. These and other potential indirect effects are discussed in Section 4.23 Indirect and Cumulative Effects.

Alignments

Neighborhood impacts along the Build Alternatives alignments and ancillary facilities are organized and described below by jurisdiction and Build Alternative. Short-term construction effects are discussed in Section 4.4.4.3.

Washington, D.C.

All Build Alternatives would result in the following impact:

- The displacement of the Adam's Place Emergency Shelter in Cluster 22 (Brookland, Brentwood, Langdon) and 17 additional commercial parcels due to the construction of a substation and FA/EE facility. The Adam's Place Emergency Shelter is operated by the Catholic Charities and is a men's emergency shelter open 7pm to 7am that offers a hot dinner, access to case management staff, showers, and a bed on a nightly basis. The New York Avenue Shelter is located approximately a mile away and is the closest men's shelter to Adam's Place Emergency Shelter.
- A public parking lot along New York Avenue, NE would require full property acquisition in Cluster 21 (Edgewood, Bloomingdale, Truxton Circle, Eckington).

Prince George's County

Build Alternatives J-01 through J-06 would result in the following impacts to neighborhoods and communities:

- Multiple residential properties above the tunnel portions of the alignment within and near the Woodlawn, New Carrollton, Greenbelt, and South Laurel neighborhoods would experience vibration impacts. See Section 4.17 Noise and Vibration for additional details and potential mitigation measures.
- A portal location (transition from tunnel to viaduct) would be located approximately 75 feet from the northern most condominium buildings in the Greenbriar Condominiums community in Greenbelt. The tunnel would be as close as 14 feet underground beneath buildings, and residents would experience impacts due to vibration, as well as changes in visual quality with views of the portal and viaduct. In addition, property acquisition from the community would remove portions of a community garden and open space. The removal of the garden and open space would impact views and impact community cohesion as there would be fewer opportunities for community members to gather and use these areas as well as less green space to view.
- A FA/EE north of MD 410 near the Woodlawn neighborhood would require four partial residential property acquisitions. The construction and operation of the FA/EE would introduce a new building and require the removal of trees in a forested area of these properties. This would result in increased noise, changes to aesthetics, and potentially changes to community cohesion for homes on this section of Riverdale Road as the new building may alter how residents interact

and use the land in the area. Impacts due to increased noise and changes to aesthetics would occur at Martins Terrace and impacts due to changes to aesthetics would also occur at Auburn Manor, Lilly Garden, and Chestnut Ridge apartments between Woodlawn and New Carrollton due to construction and operation of the FA/EE facility.

- The viaduct would be located between the BWP and apartment buildings east of the BWP in the Villages at Montpelier Apartments, Evergreens at Laurel Apartments, the Applewalk Condominiums, and Laurelwood Condominiums, all located southeast of the MD 197/BWP interchange in the South Laurel neighborhood. The viaduct would run just west of these communities and as close as 90 feet to apartment buildings in the Villages at Montpelier. The viaduct would require the removal of a forested buffer between these communities and the BWP and would affect the visual quality for the community as it would present a stark change from current views. The viaduct would impact residents due to increased noise and vibration due to proximity to the viaduct.
- Ancillary facilities would be constructed in the South Laurel neighborhood south of the Villages at Montpelier Apartments, Applewalk Condominiums, and Laurelwood Condominiums (systems building) and northwest and adjacent to the Villages at Montpelier Apartment (a substation and systems building). The construction of these buildings would require the use of full permanent acquisition of two commercial parcels and forested areas along BWP. In addition, high tension powerlines would be relocated to accommodate new utilities required for the SCMAGLEV Project. These ancillary facilities and utilities would impact residents of these complexes, as well as the Tabernacle Church and Learning Center, due to acquisition of parking, increased noise and vibration, and changes to visual quality. These impacts, in combination with the impacts associated with the viaduct, could change the community feel and atmosphere.
- Residences west of the BWP on Elmshorn Way, Hermosa Drive, Fairlane Place, and Frensham Court in the Montpelier Hills community in South Laurel would experience impacts due to increased noise from train pass by along the viaduct, as would residences on Ivory Fashion Court, Blue Moon Court, Sea Pearl Court, and Sumner Grove Drive northwest of the BWP/MD 197 interchange.
- Northeast of the BWP/MD 197 interchange, the viaduct would be located between the BWP and the Pheasant Run community in South Laurel. Residences on Pheasant Run Court and Pheasant Run Drive, as well as a church, the New Life Christian Center, would experience impacts due to increased noise and changes to aesthetics due to the presence of the viaduct.

Build Alternatives J1-01 through J1-06 would result in the following impacts to neighborhoods and communities:

- Residential properties above the tunnel portions of the alignment would experience vibration impacts within and near the Bladensburg, Woodlawn, New Carrollton, Greenbelt, and South Laurel neighborhoods.
- A FA/EE directly north of MD 410 near the Woodlawn neighborhood would require two permanent partial residential property acquisitions. The construction and operation of the FA/EE would introduce a new building and require the removal of trees in a forested area of these properties. This would result in increased noise, changes to aesthetics and potentially changes to community cohesion for homes on this section of Riverdale Road as the new building may alter how residents interact and use the land in the area. Impacts due to changes to aesthetics resulting from the construction and operation of the FA/EE would also occur at Auburn Manor, Lilly Garden, Chestnut Ridge apartments and along Martins Terrace between Woodlawn and New Carrollton.
- The viaduct would be located between the BWP and residences west of the BWP on Elmshorn Way, Hermosa Drive, and Frensham Court in the Montpelier Hills community, as well as Ivory Fashion Court, Blue Moon Court, Sea Pearl Court, and Sumner Grove Drive, all located southwest of the BWP/MD 197 interchange in South Laurel. The viaduct would require the removal of a forested buffer between these communities and the BWP and would present a stark change from current views. The viaduct would be as close as 65 feet to residences and would impact residents due to increased noise, vibration, and changes to aesthetics. For Build Alternatives J1-02, J1-03, J1-05, and J1-06, the LOD extends into residential property on Elmshorn Way, Frensham Court, and Ivory Fashion Court and would eliminate parking; alter access to residences from Hermosa Drive and Muirkirk Road; and eliminate open space and picnic tables. Residents in these areas would experience property acquisition, changes to access, and impacts to community cohesion. The Villages at Montpelier Apartments and Evergreens at Laurel Apartments east of the BWP would also experience impacts due to increased noise.
- Under Build Alternatives J1-01 and J1-04, a maintenance of way (MOW) facility would be constructed within 100 feet of residences south of Sumner Grove Drive in South Laurel. The MOW would require the full property acquisition of an area that's currently forested and identified as Springfield Road Park and would result in noise and visual impacts to residents due to loss of trees and the presence of the viaduct and MOW. The loss of Springfield Road Park would reduce community access to green space and preclude the development of recreational facilities in this area. See Section 4.7 Recreational Facilities and Parklands and Appendix F for additional details on potential impacts.
- Three systems buildings would be located off Hermosa Drive in an area currently forested and bordering an electrical powerline right of way. High tension powerlines would be relocated to accommodate new utilities required for the SCMAGLEV Project. Residents along Frensham, Dortmund, and Vanfleet Courts would be within 500 feet of the buildings and would experience increased noise

and changes to aesthetics due to loss of trees and the presence of the viaduct and systems buildings. Montpelier Elementary School would experience changes to views and visual quality due to the presence of the systems buildings. These impacts, in combination with the impacts associated with the viaduct and MOW facility under Build Alternatives J1-01 and J1-04, could change the community feel and atmosphere.

- The viaduct and a system building would be located between the BWP and the Crystal Plaza Shopping Center (north of the BWP/MD 197 interchange). The Crystal Plaza Shopping Center includes multiple retail stores, restaurants, two gas stations, and a hotel. The systems building and viaduct would be as close as 100 feet to a hotel and shopping center stores. The Montpelier Post Office and the businesses within the shopping center would experience increased noise and changes in visual quality.

Anne Arundel County

Neighborhood impacts associated with the Build Alternatives J-01 through J-06 in Anne Arundel County include:

- Two cemeteries would be impacted. The Snowden Cemetery, a private family cemetery, within the Patuxent Research Refuge (PRR), would be acquired and displaced. The cemetery and the remains of those buried there would be relocated outside of the LOD. The Project Sponsor would consult with the Snowden family on the plan for relocation. All state and local laws and applicable United States Fish and Wildlife Service (USFWS) regulations regarding burial transfer would need to be followed. The Training School Cemetery, within the Maryland City neighborhood, is immediately adjacent to the viaduct. The viaduct would impact cemetery visitors due to increased noise and changes to aesthetics.
- The viaduct would impact multiple residences in the Maryland City neighborhood, as well as community facilities including Resurrection Church, Monarch Academy, and Brock Bridge Elementary School, due to increased noise. The New Beginnings Youth Development Center/Maya Angelou Academy, a secure residential treatment facility for young males, would experience increased noise and changes to views and visual quality from the removal of trees and the presence of the viaduct and ancillary facilities.
- A tunnel portal would be located within 250 feet of residences within the Fort Meade neighborhood on Costin Loop. Residents would experience impacts due to changes in visual quality from the removal of trees and presence of the portal. Residences located on Laurel Hill Road, Potters Hill Road, and Baldy Avenue would experience vibration impacts.
- A FA/EE would be located along Harmans Road in the Severn neighborhood. The facility would result in one residential displacement. Residents along Harmans Road, Post Road, Mill Crossing Court, and Harmons Farm Court would

experience increased noise and changes in visual quality due to the presence of the FA/EE and associated removal of trees. Residences on Matthewstown Road, David Victoria Lane, and Hekla Lane would also experience changes in views and visual quality due to the presence of the FA/EE and associated removal of trees.

- A FA/EE would be located in an industrial area between Railroad Avenue and Telegraph Road in the Severn neighborhood. The FA/EE would require the full permanent acquisition of an industrial parcel. The facility would result in noise impacts for residences along Old Coaling Road and to the east of Telegraph Road. However, this would not impact community access as the parcels are zoned for industrial use and not used to gain access to other community features.

Neighborhood impacts associated with the Build Alternatives J1-01 through J1-06 in Anne Arundel County include:

- A viaduct and portal would impact multiple residences in the Maryland City neighborhood, as well as community facilities including Resurrection Church, Monarch Academy, and Brock Bridge Elementary School, due to increased noise and changes in visual quality. The viaduct and portal would require property acquisition from forested areas and portions of Maryland City Park including the removal of two baseball fields, two multi-purpose fields, and a paved trail. Park users would have to access these amenities at Montpelier Park, located a mile away, which includes baseball fields, and Brock Bridge Elementary School, located a mile and a half away, which includes baseball fields, multi-purpose fields, and paved paths and sidewalks.
- Vibration impacts would occur at multiple residential properties above tunnel portions of the alignment within the Maryland City neighborhood and at one residential property in the Fort Meade neighborhood.
- A FA/EE would be located within 500 feet of residences within the Fort Meade neighborhood on Allsworth Court. Residents would experience impacts due to changes to visual quality.
- A FA/EE would be located along Harmans Road in the Severn neighborhood and would result in a residential displacement. In addition, residences to the south along Harmans Road, Post Road, Mill Crossing Court, and Harmons Farm Court would experience noise impacts and changes in visual quality due to the presence of the FA/EE and associated removal of trees. Residences on Matthewstown Road, David Victoria Lane, and Hekla Lane would also experience changes in views and visual quality due to the presence of the FA/EE and associated removal of trees.
- A FA/EE would be sited in an industrial area between Railroad Avenue and Telegraph Road in the Severn neighborhood and would impact residences along Old Coaling Road and to the east of Telegraph Road due to increased noise. The

FA/EE would require the full permanent acquisition of an industrial parcel. However, this would not impact community access as the parcels are zoned for industrial use and not used to gain access to other community features.

Baltimore County

Neighborhood impacts associated with all Build Alternatives in Baltimore County include:

- A FA/EE and two substations in the Baltimore Highlands neighborhood would have noise impacts to residences on Walnut Road, Yarnall Road, and Norten Road. The FA/EE and two substations would require the full permanent property acquisition of four industrial parcels. However, this would not impact community access as the parcels are zoned for industrial use and not used to gain access to other community features.
- There would also be noise impacts resulting from the presence of a tunnel portal to multiple residential properties along Annapolis Road, and Alderwood, Glenrose, Daisy, and Rose Avenues in the Baltimore Highlands neighborhood.

Baltimore City

Neighborhood impacts associated with all Build Alternatives in Baltimore City include:

- A substation would be located within 400 feet of residences along Annapolis Road in the Westport neighborhood. The substation would require the full permanent acquisition of an industrial parcel. Residents along Annapolis Road south of the substation would have increased noise and changes to views and visual quality due to the presence of the substation.
- A MOW facility would be located in the Westport neighborhood as part of Build Alternatives J-04, J-05, J-06, J1-04, J1-05, and J1-06. The MOW facility would require the full permanent property acquisition of two industrial parcels and be located in an open space area north of Middle Branch Park, east of the Westport Light Rail station and west of the Patapsco River. Residents along Cedley, Sidney, Maisel, and Annapolis Roads would experience increased noise and changes in views and visual quality due to the presence of the MOW in an area that is currently open space and offers water views to the Middle Branch of the Patapsco River.

Stations

Neighborhood impacts along the Build Alternatives stations are described below. Short-term construction effects are discussed in Section 4.4.4.3.

The Mount Vernon Square East Station (all Build Alternatives) is located along New York Avenue in Cluster 8 (Downtown, Chinatown, Penn Quarter, Mount Vernon Square, North Capitol Street) and Cluster 21 (Edgewood, Bloomingdale, Truxton Circle,

Eckington) neighborhoods. Mount Vernon Square East Station access points would be southwest and northeast of the 6th Street NW and New York Avenue NW intersection, northeast of the 4th Street NW and New York Avenue NW intersection, and northwest of the 1st Street NW and New York Avenue NW intersection within the New York Avenue Playground and Park. A portion of the park (0.16 acres) that borders New York Avenue would be acquired. The entrance would be located in an area of lawn and trees adjacent to the south side of the outfield of a baseball diamond. The Kennedy Recreation Center, approximately 2,200 feet northwest at 6th and O Streets NW, offers similar space of lawn and trees adjacent to a baseball diamond and other ballfields/courts. The Mount Vernon Square East Station would result in property acquisition of two public parking lots located between 6th and 5th Streets NW and west of 6th Street. These parking lots offer public parking and would be replaced by the Mount Vernon Square East Station Headhouse and Parking Garage. Additional parking lots and garages are located within a two-block radius. The SCMAGLEV Project would increase vehicular traffic at intersections and pedestrian traffic on sidewalks in proximity to the Mount Vernon Square East Station access locations.

The BWI Marshall Airport Station (all Build Alternatives) would be located on BWI Marshall Airport property and would not directly impact neighborhoods; however, it could result in increased traffic in the BWI Marshall Airport vicinity, specifically at the MD 170 and I-195 WB ramps which would affect the Linthicum neighborhood located adjacent to BWI.

The Cherry Hill Station (Build Alternatives J-01, J-02, J-03, J1-01, J-02, and J1-03) would include a viaduct in the Cherry Hill and Westport neighborhoods for that would cause noise and visual impacts for residents in these neighborhoods. There would also be visual impacts to residents in the Lakeland neighborhood, Arundel Elementary School, and the Kingdom Hall of Jehovah Witnesses in Cherry Hill and to Westport Elementary School and Auburn Cemetery in the Westport neighborhood. The Cherry Hill Station would include a parking structure southeast of the Waterview Avenue and Cherry Hill Road intersection and in the area between MD 295 and Annapolis Road. The MedMark Treatment Center would be displaced. The MedMark Treatment Center is an addiction treatment facility that helps people overcome opioid addiction with comprehensive medication-assisted treatment (MAT) programs. The University of Maryland Addiction Treatment Center and the Kolmac Outpatient Recovery are the next closest addiction treatment facilities and are located approximately 3 miles away.

The Cherry Hill Station would require the acquisitions of multiple commercial and industrial properties along Annapolis Road, Patapsco Avenue, Waterview Avenue, and Cherry Hill Road resulting in the displacement of multiple businesses including commercial properties offering groceries and other retail services along Patapsco Avenue. This could impact community cohesion and would reduce the services available to community residents as well as disrupt local businesses. Residents close to this area in the Cherry Hill, Lakeland, Westport, and Baltimore Highlands

neighborhoods would have to find alternative shopping locations. Traffic would increase in the Cherry Hill Station vicinity.

The Camden Yards Station (Build Alternatives J-04, J-05, J-06, J1-04, J1-05, and J1-06) would require the temporary use of property and demolition of multiple buildings in the Downtown West and Otterbein neighborhoods. The Old Otterbein United Methodist Church would require acquisition and demolition which would impact community cohesion and reduce the number of services available to community members. Additionally, the Baltimore Convention Center and the Federal Reserve Bank building on Sharpe Street would also require the temporary use of property and demolition and would disrupt businesses located within these buildings. Access points to the underground station would be on Howard Street near the intersections at Conway Street, and from Conway Street and Pratt Street, Sharpe Street and west of the Sheraton Inner Harbor Hotel in the Downtown West neighborhood.

Parking structures for the station would require the removal of two buildings, one a Federal courthouse and the other an office building, north of Pratt Street on both sides of Hanover in the Downtown West neighborhood. One community facility, Concentra Urgent Care, is located in the office building and would be displaced, reducing the community services available to local residents. These property displacements would disrupt businesses in the area. Additionally, property acquisition would be required from industrial parcels for the MOW and public right of way around the proposed parking garages and station access areas. Traffic would increase in the Camden Yards Station vicinity.

TMFs

Neighborhood impacts along the Build Alternatives TMFs are described below. Short-term construction effects are discussed in Section 4.4.4.3.

Build Alternatives J-01, J-04, J1-01, and J1-04 include the MD 198 TMF, located in the Maryland City neighborhood in Anne Arundel County. The MD 198 TMF would require the acquisition and displacement of the Woodlands Job Corps. This community facility provides a residential career training program and job placement program for low-income individuals. During ongoing outreach with impacted agencies, the US Department of Labor (DOL), which manages and oversees the Woodlands Job Corps facility and program, expressed opposition to any Build Alternatives that would remove the facility. According to DOL, the Woodlands Job Corps facility is only one of two of the kind in the DC area and that relocating the center would be extremely costly. The Potomac Job Corps Center, located in Washington, DC and the Woodstock Job Corps Center located in Woodstock, MD in Baltimore County are the next closest facilities.

Partial property acquisition would also be required from the New Beginnings Youth Development Center/Maya Angelou Academy; however, the property acquisition would occur more about 1,000 feet south of the building in an area that currently contains buildings in ruins and tree cover and therefore, is not anticipated to impact the function

of the New Beginnings Youth Development Center/Maya Angelou Academy. Additionally, there would be increased noise and changes to visual quality in the vicinity of the New Beginnings Youth Development Center/Maya Angelou Academy.

Build Alternatives J1-01 and J1-04 include elevated ramps to access the MD 198 TMF within the Maryland City neighborhood. The ramps would be located just west of the BWP within 150 feet of the Thomas J.S. Waxter Children's Center, residences on Sudlersville Street, and apartments on Andrew Court within the Ashley Apartments complex. The viaduct would require the removal of a forested buffer that currently exists between the BWP and these communities, including the Thomas J.S. Waxter Children's Center, and would present a stark change from current views. These residents and the Thomas J.S. Waxter Children's Center would experience impacts due to increased noise and changes to visual quality. Residents on Bushy Ridge Road, Carriage Walk Court, Carriage Walk Lane, and Sagewood Road would also experience noise impacts.

The BARC West TMF (Build Alternatives J-03, J-06, J1-03, and J1-06) would be located on BARC property but in close proximity to residents along Gross Lane and Odell Road in South Laurel and would require partial property acquisition from a residential yard, as well as result in noise and visual impacts. Residents along Ellington Land would experience impacts due to changes in aesthetics.

Residential areas and community facilities are not present in the general vicinity of the BARC Airstrip TMF. Therefore, impacts associated with the BARC Airstrip TMF are not anticipated to have an effect on neighborhoods and community facilities.

4.4.4.3 Short-term Construction Effects

Construction of the SCMAGLEV Project would include activities such as digging and tunneling using multiple tunnel boring machines, ground clearing, pile driving, excavating, grading, and the stockpiling of soil, muck, and materials. The SCMAGLEV Project could cause potential short-term impacts to air quality (fugitive dust and construction equipment exhaust), noise and vibration (construction equipment and activities), and transportation (work vehicles, increased congestion, detours, and road closures), the impacts to these resource areas are more fully discussed in the individual resource chapters (Section 4.2 Transportation, 4.16 Air Quality, and 4.17 Noise and Vibration). Powder Mill Road, MD 197, MD 198, and MD 32 are potential construction access points during viaduct construction. In some cases, local roads may serve as access points to construction areas. Where possible, haul routes would use public roads in non-residential areas to minimize potential for traffic, noise, and vibration impacts from construction vehicles.

The tunnel portions of the SCMAGLEV Project would be achieved using tunnel boring machine (TBM) technology. The Project Sponsor would require the construction contractor to conduct existing foundation evaluations and implement tunnel vibration and settlement monitoring during construction. The exact TBM type and tunneling plan

and construction sequence would be developed during final design. See Appendix G.7 (Baltimore Washington SCMAGLEV Project Construction Planning Memorandum) for additional details.

Construction of the SCMAGLEV Project would result in short-term adverse impacts to neighborhoods due to temporary use of property, increased noise and vibration, air quality/emissions which may impact community health and well-being, changes in aesthetics and visual quality, changes to access and mobility due to construction and construction staging, and the use of community facilities. Neighborhoods subject to these impacts may also experience community disruption, a population's ability to navigate their way around their community, and adverse effects to community cohesion, the disruption of interaction between people and groups within a community. Community disruption would be due to temporary impacts to traffic, pedestrian access, and neighborhood access during construction. These impacts would disrupt community cohesion and wayfinding by creating longer travel times and rerouting travel pattern. These effects, however, would be temporary and would cease upon Project completion.

Temporary adverse direct impacts would occur at varying locations and for varying durations during the construction period. Temporary construction impacts that would occur in neighborhoods in close proximity to SCMAGLEV Project alignments, ancillary facilities, TMF, and stations. Construction would occur simultaneously at different locations. FRA anticipates construction impacts to be short-term in duration and to cease upon completion of construction. Construction activity would occur up to 24 hours a day at some locations and could last up to three years. See Section 4.1 and Appendix G.7 for additional details.

Construction laydown areas would be required in multiple locations throughout the SCMAGLEV Project corridor. Four long-term laydown areas include:

- Landover Mall Site – in the Summerfield neighborhood in Prince George's County and adjacent to the Landover and Glenarden neighborhoods. The Maple Ridge Apartment Community is across Brightseat Road from and within 225 feet of the Landover Mall Site. Residents would be temporarily impacted due to increased noise, vibration, and changes to aesthetics.
- Konterra Site – in the Konterra neighborhood in Prince George's County and adjacent to the Laurel neighborhood. The Avalon Laurel Apartment community is within 450 feet of the Konterra Site. Residents would be temporarily impacted by to noise, vibration, and changes to aesthetics during construction.
- Suburban Airport Site – in the Maryland City neighborhood in Anne Arundel County. No impacts to neighborhoods or community facilities are anticipated because residential areas and community facilities are not present in the general vicinity.

- Patapsco Avenue Site – in the Cherry Hill neighborhood in Baltimore City. Residences along Round Road, Spelman Road, and Bethune Road north of Patapsco Avenue and existing railroad tracks are as close as 150 feet from the Patapsco Avenue site and would be temporarily impacted due to increased noise and changes to aesthetics.

Other temporary impacts that could impacts residents in neighborhoods and communities in the vicinity of the SCMAGLEV Project are discussed in Section 4.2 Transportation, Section 4.5 Environmental Justice, and Section 4.6 Economic Resources

4.4.5 Mitigation Strategies

4.4.5.1 Long-term Operational Strategies

The Build Alternatives are being designed to avoid or minimize impacts to neighborhoods and community facilities by maximizing the use of underground tunnels where practicable and elevating the above-ground alignment above existing transportation corridors to maintain access and mobility.

Examples of design minimization techniques are consolidating temporary TBM launch sites, storage, and staging areas with permanent fresh air and emergency egress facilities or substations. Noise and vibration impacts would be minimized or eliminated through design changes and mitigation features such as canopies, noise barriers, and vibration remediation measures. The Project Sponsor, in coordination with FRA, will determine the feasibility and reasonableness of such measures where noise and vibration thresholds would be exceeded.

As part of the design process, the Project Sponsor will continue to coordinate with local governments and residents regarding the location, positioning, and exterior design of Build Alternatives including the stations, selected TMF site, and ancillary facilities like the fresh air and emergency egress facilities and substations.

As part of the design process, the Project Sponsor will examine ways to reduce or eliminate property acquisitions where feasible. The Project Sponsor will coordinate with the affected property owners. As previously stated, if the construction of the SCMAGLEV Project receives Federal funding, all activities related to acquisitions and displacements would be conducted in conformance with the Uniform Act. If the SCMAGLEV Project is fully privately funded, the Project Sponsor will be responsible for compensating property owners impacted by property acquisitions. It is anticipated that at least one residential displacement would occur under all the Build Alternatives. The Washington, DC and Baltimore, MD areas single family (detached, attached and condo) housing markets are robust; the historical performance of the housing market suggests that the mix of new and existing homes on the market would allow homeowners to find a replacement dwelling in the same MSA. Additionally, the overall rental vacancy rate, which includes single-family homes and apartments, in Washington, D.C. and Baltimore

City were 7.5 percent and 13.5 percent respectively. Therefore, relocation housing should be available within the SCMAGLEV Project area. See 4.06 Economics for more details on the housing market.

The Project Sponsor will coordinate with Federal (PRR/USFWS), state (Maryland Historical Trust) and local (Anne Arundel County) agencies if impacts to Snowden Cemetery cannot be avoided and graves would need to be relocated. All applicable laws and regulations, including Maryland Burial Law, would be followed.

The Project Sponsor will continue to coordinate with local jurisdictions on forecasted vehicular and pedestrian traffic volumes, predicted level of service at intersections, and mitigation of traffic increases near station locations.

4.4.5.2 Short-term Construction Strategies

Mitigation during construction would include the development and implementation of a construction plan. The plan would consist of an environmental plan for the protection of the natural and human environment that would include a combination of the following measures, the details of which would be determined during construction planning later in design:

- Developing a construction mitigation and public outreach plan with community input to address construction impacts on neighborhoods and community facilities. The plan would detail public construction schedules, road and sidewalk closures, detours, and public notification procedures. Coordinating with local communities during preparation of traffic management plans to minimize potential construction impacts to community resources and special events. Considering limiting construction activities during special events.
- Develop truck hauling routes and schedules that would minimize impacts on sensitive uses in all parts of the SCMAGLEV Project area.
- Develop, fund, and maintain a telephone hotline during construction and one or more SCMAGLEV Field Offices with staff to address community issues and concerns as they arise. Offices could be open from 9am-5pm weekdays and any weekends when work occurs. The full schedule would be developed prior to construction. The office would provide a physical location where information pertaining to construction can be exchanged. As part of this effort, the Project Sponsor would ensure that all potentially affected persons know the name and telephone number(s) of public affairs staff that they can contact if needed.
- Whenever possible, develop detours for any road or sidewalks to be closed during construction. Posting signs (in appropriate languages) alerting pedestrians, bicycles, and vehicles of road and sidewalk closures and detours. Ensuring pedestrian detours are accessible to seniors and disabled persons. Develop Worksite Traffic Control Plans in conjunction with the county and municipal departments of transportation to accommodate automobile and pedestrian traffic.

- Maintain access to residences, businesses, and community facilities including community parks affected by construction activities.
- Provide early notification to emergency service providers of any road closures or detours.
- During construction, provide temporary replacement or shared parking as needed to absorb the loss of parking due to acquisitions. Temporary parking could be added by constructing surface lots on nearby vacant parcel or restriping nearby streets to allow diagonal curb parking.
- Remove construction equipment, excess materials, and debris from construction staging and work areas prior to the end of construction.
- Restore temporarily disturbed areas prior to the end of the construction period.

Section 4.5

Environmental Justice

BALTIMORE-WASHINGTON SUPERCONDUCTING MAGLEV PROJECT

DRAFT ENVIRONMENTAL IMPACT STATEMENT AND
SECTION 4(f) EVALUATION



U.S. Department of Transportation
Federal Railroad Administration



4.5 Environmental Justice

4.5.1 Introduction

This section defines the environmental justice (EJ) populations relevant to the Superconducting Magnetic Levitation Project (SCMAGLEV Project) and defines the regulatory context, methodology and SCMAGLEV Project Affected Environment used in this analysis. For each Build Alternative and the No Build Alternative, this section assesses the potential short-term and long-term effects on EJ populations. This section also discusses proposed avoidance, minimization, and mitigation measures to reduce adverse impacts of the SCMAGLEV Project. Appendix D.3 Socioeconomic Technical Report (SETR) contains additional information.

4.5.2 Regulatory Context and Methodology

4.5.2.1 Regulatory Context

In accordance with the National Environmental Policy Act (NEPA), 42 U.S.C. § 4321 et seq., the Council on Environmental Quality (CEQ) regulations, 40 C.F.R. Parts 1500 - 1508, and the Federal Railroad Administration's (FRA) Procedures for Considering Environmental Impacts, 64 Fed. Reg. 28545 (May 26, 1999), FRA considered the potential impacts to EJ populations. The United States Environmental Protection Agency (USEPA) defines EJ as the equitable treatment and meaningful involvement of all people, with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies¹. This section describes the most pertinent regulatory context for evaluating impacts to EJ populations:

- Title VI of the Civil Rights Act (Title VI) (1964): Title VI prohibits discrimination in programs and activities receiving Federal financial assistance. Title VI specifically states, "no person in the US shall on the ground of race, color, or national origin be excluded from participation in, denied benefits of, or subjected to discrimination under any program or activity receiving Federal financial assistance."
- Executive Order (EO) 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations* (1994): Directs Federal agencies to take appropriate and necessary steps to identify and address disproportionately high and adverse environmental effects of Federal agency actions (including transportation projects) on minority and low-income populations.
- United States Department of Transportation (USDOT) Order 5610.2(a), *Actions to Address Environmental Justice in Minority Populations and Low-*

¹ USEPA. <https://www.epa.gov/environmentaljustice/learn-about-environmental-justice>.

Income Populations (2012): Sets forth the USDOT policy to consider EJ principles in all USDOT programs, policies, and activities. It describes how the objectives of EJ are integrated into planning and programming, rulemaking, and policy formulation. This Order also requires that any activities that will have a disproportionately high and adverse effect on populations protected by Title VI (“protected populations”) will only be carried out if:

1. A substantial need for the activity exists, based on the overall public interest; and
2. Build Alternatives that would have less adverse effects on protected populations (and that still satisfy the need identified in item 1 above), either:
 - Would have other adverse social, economic, environmental, or human health impacts that are severe; or
 - Would involve increased costs of extraordinary magnitude.

USDOT Order 5610.2(a) draws from the framework established by Title VI and the National Environmental Policy Act (NEPA) of 1969 and establishes three principles to ensure nondiscrimination in federally funded activities:

3. Avoid, minimize, or mitigate disproportionately high and adverse human health and environmental effects—including social and economic effects—on minority populations and low-income populations.
4. Ensure full and fair participation by all potentially affected communities in transportation decision-making processes.
5. Prevent the denial of, reduction in, or significant delay in the receipt of benefits by minority and low-income populations.

In addition, the following guidance materials are applicable to the EJ analysis:

- Council on Environmental Quality (CEQ) Environmental Justice Guidance under the National Environmental Policy Act (1997): CEQ oversees Federal agency implementation of NEPA. This guidance is a response to EO 12898, developed by CEQ and other affected agencies to assist agencies with NEPA procedures and effective identification of and response to EJ concerns.
- Federal Highway Administration (FHWA) Technical Advisory 6640.8A, *Guidance for Preparing and Processing Environmental and Section 4(f) Documents* (1987) and Federal Transit Administration (FTA) Circular 4703.1, *Environmental Justice Policy Guidance for FTA Recipients* (2012): FHWA Technical Advisory 6640.8A and FTA Circular C 4703.1 are USDOT agency guidance documents that call for NEPA documentation to include identification of the EJ social groups that maybe benefitted or harmed by the proposed project and an assessment of whether any social group is disproportionately impacted with potentially adverse impacts to populations. These guidance documents provide direction on ways to fully engage EJ populations in the transportation decision-making process; to determine whether EJ populations will be subjected to disproportionately high and adverse human health or environmental effects of a public transportation

project, policy, or activity; and how to avoid, minimize, or mitigate these effects.

4.5.2.2 Methodology

EJ definitions for terms used throughout this section and assessment, are found in the updated USDOT EJ Order 5610.2(a):

- *Disproportionately high and adverse effect.* An adverse effect that (1) is predominantly borne by a minority population and/or a low-income population, or (2) will be suffered by the minority population and/or low-income population and is appreciably more severe or greater in magnitude than the adverse effect that will be suffered by the non-minority population and/or non-low-income population.
- *Low-income.* A person with low income has a “median household income is at or below the United States Department of Health and Human Services poverty guidelines.”
- *Low-income population.* A low-income population is any readily identifiable group of low-income persons who live in geographic proximity, and, if circumstances warrant, geographically dispersed/transient persons who will be similarly affected by a proposed program, policy, or activity.
- *Minority.* A minority individual identifies as Black, Hispanic or Latino, Asian, American Indian, Alaskan Native, Native Hawaiian and other Pacific Islander.
- *Minority population.* A minority population is any readily identifiable groups of minority persons who live in geographic proximity, and if circumstances warrant, geographically dispersed/transient persons who will be similarly affected by a proposed program, policy, or activity.

Initially, FRA used EJSCREEN as a preliminary step to consider environmental justice concerns, as it is an environmental justice mapping and screening tool that provides a nationally consistent dataset and approach for combining environmental and demographic indicators. The EJSCREEN Reports, for multiple project buffers, are located in Appendix D.3 Attachment E.

Then FRA initiated a more detailed environmental justice analysis. FRA used the United States Census Bureau (USCB) 2010 Decennial Census and the American Community Survey (ACS) five-year 2018 estimates (2014-2018) to identify minority and low-income populations. The USCB divides land into various sub-boundaries for statistical analysis, including census tracts, block groups, and blocks. Census tracts divide a county or similar area to offer a stable set of geographic units for the presentation of statistical data. Census tracts generally have a population size between 1,200 and 8,000 people, with an optimum size of 4,000 people; a census tract is made up of block groups that typically contain 600 to 3,000 people in a contiguous geographic location. Blocks are the smallest unit for which basic census data is available. This analysis utilized data at the block group level for consistency with the ACS five-year estimates, which present

data at the block group level. Consistent with the SCMAGLEV Project Affected Environment identified in Section 4.4 Neighborhoods and Community Facilities, the SCMAGLEV Project Affected Environment for EJ assessment is the synthesis of the block groups that are fully or partially within the 500 feet buffer of the proposed Build Alternatives alignments and the 1/4-mile buffer of the stations and TMF locations, as shown in Appendix D.3.

FRA used EJ guidance from the CEQ² to establish thresholds for minority and low-income populations within the SCMAGLEV Project Affected Environment. CEQ defines minority populations as those with a population percentage (a) greater than 50 percent or (b) meaningfully greater than the minority population percentage in the general population. For this assessment, a minority population is present if a block group contains at least 50 percent minority individuals or a minority percentage that is 10 percentage points above the respective jurisdiction's minority percentage. Also, in alignment with CEQ guidance, a low-income population is present in a block group where percentage of the population below the Federal poverty level is 10 percentage points or more in comparison to the respective jurisdiction's population living below poverty. Block groups that meet one or both criteria are referred to throughout this document as EJ population areas. Block groups that do not meet the criteria or fall outside of defined EJ area boundaries are referred to as non-environmental justice (non-EJ) population areas. See **Table 4.5-1** for demographics and EJ thresholds by jurisdiction.

Table 4.5-1: Regional Environmental Justice Demographics

Jurisdiction	Minority Population	Minority Population Threshold	Low-Income Population	Low-Income Population Threshold
Washington, D.C.	63.8%	50%	16.8%	26.8%
Prince George's County	87%	50%	8.9%	18.9%
Anne Arundel County	31%	41%	6%	16%
Baltimore County	41.9%	50%	9.2%	19.2%
Baltimore City	72.5%	50%	19.5%	29.5%

Source: American Community Survey Sample Data (ACS 2018)

The USDOT EJ Order defines disproportionately high and adverse effect on minority and low-income populations means an adverse effect that is: A) predominantly borne by a minority population and/or a low-income population; or B) will be suffered by the minority population and/or low-income population and is appreciably more severe or greater in magnitude than the adverse effect that will be suffered by the non-minority population and/or non-low-income population. Determinations of whether a project will

² https://www.epa.gov/sites/production/files/2015-02/documents/ej_guidance_nepa_ceq1297.pdf

have disproportionately high and adverse effects must consider “mitigation and enhancement measures that will be taken and all offsetting benefits to the affected minority and low-income populations...” (USDOT Order 5610.2[a], Section 8[b]). FRA will continue to analyze and consider adverse effects, related mitigation, benefits, and public input to inform FRA’s determination in its final decision document about whether the SCMAGLEV Project would result in disproportionately high and adverse effects to EJ populations.

FRA considered the location of block groups with EJ and non-EJ populations in relation to impacts of the Build Alternatives, as identified throughout Chapter 4 of this Draft Environmental Impact Statement (DEIS) to identify potentially adverse and beneficial effects of the Build Alternatives. FRA identified impacts associated with multiple environmental resources in relation to the Build Alternatives and population areas. The vast majority of the SCMAGLEV Project impacts would occur in EJ population areas due to the fact that most of the SCMAGLEV Project Affected Environment qualifies as EJ. In order to determine the potential for disproportionately high and adverse impacts to EJ populations, FRA will consider the location of the residential populations within EJ block groups relative to the SCMAGLEV Project direct and indirect impacts; proposed mitigation; SCMAGLEV Project benefits; and community feedback received during the DEIS phase of the SCMAGLEV Project. Prior to the FEIS, FRA will continue public outreach, stakeholder coordination, and mitigation identification efforts needed to refine the EJ analysis. FRA will document the outcome of the disproportionality analysis in the FEIS. In the FEIS, if FRA makes a finding of a disproportionately high and adverse impact, the document will include the appropriate analysis as required by DOT Order 5610.2(a) and Title VI.

4.5.3 SCMAGLEV Project Affected Environment

Table 4.5-2 shows population totals for racial and low-income demographics within the Affected Environment. Minority populations comprise 69.6 percent of the total population and low-income populations make up 12.7 percent of the SCMAGLEV Project Affected Environment.

Table 4.5-2: EJ Demographics in the SCMAGLEV Project Affected Environment

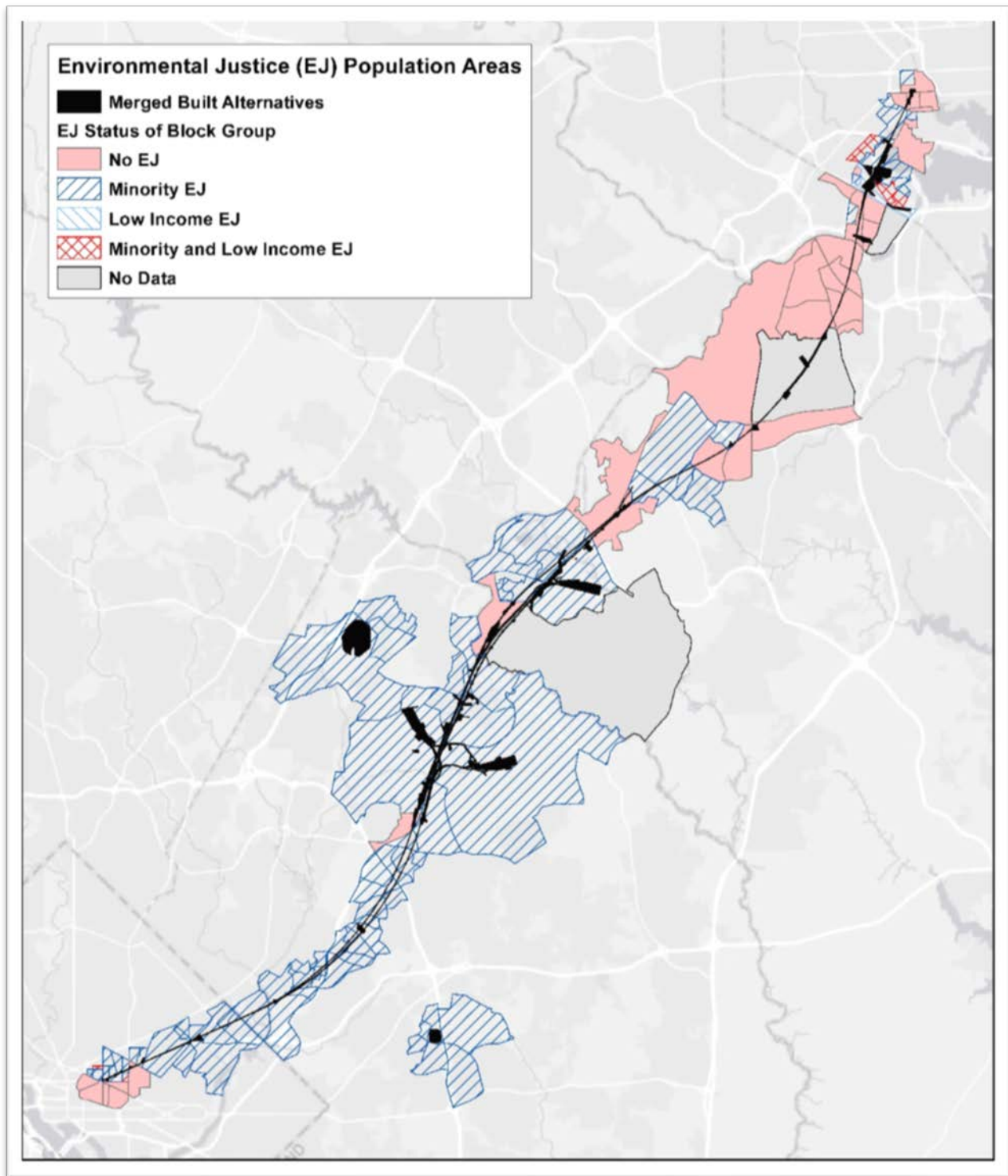
Environmental Justice Identifier	Total Population	Percent of Total Population
Black or African American	105,072	46.6%
American Indian and Alaska Native	620	0.3%
Asian	15,205	6.7%
Native Hawaiian and Pacific Islander	308	0.1%
Some other race	822	0.4%
Two or more races	5,3877	2.4%
Hispanic or Latino	29,505	13.1%
Non-White Hispanic or Latino	15,376	6.8%
Total Population (EJ and non-EJ)	225,635	100%
Total Minority Population	156,919	69.6%
Low-income population	28,165	12.7%

Source: American Community Survey Sample Data (ACS 2018)

Of the 124 block groups within the SCMAGLEV Project Affected Environment, 102 block groups exceed one or more of the EJ thresholds (refer to **Table 4.5-1**). Of the 102 block groups with EJ populations, 59 contain minority groups, ten have low-income residents, and 33 include both minority and low-income groups. EJ block groups identified account for 85 percent of all the block groups potentially affected by the SCMAGLEV Project. See **Figure 4.5-1** for locations of EJ and non-EJ block groups.

Block groups closer to Washington, D.C., Baltimore County, and Baltimore City are geographically smaller and more densely populated, whereas block groups in northern Prince George's County and Anne Arundel County are comparatively larger in size and less densely populated. Some block groups, particularly the larger block groups within the counties, extend far beyond the SCMAGLEV Project limits. In these larger geographic block group areas, the Build Alternatives cross a number of relatively large, publicly owned properties (such as Beltsville Agricultural Research Center [BARC], Patuxent Research Refuge [PRR], and the Baltimore-Washington Parkway [BWP]) that either do not contain residential and/or commercial land uses or have residential and/or commercial land uses farther removed from the alignments.

Figure 4.5-1: Environmental Justice Population Areas



4.5.4 Environmental Consequences

This section discusses the permanent or long-term effects of the No Build Alternative and Build Alternatives on EJ populations within the SCMAGLEV Project Affected Environment. To identify potential adverse and beneficial effects in EJ population areas, FRA considered the location of block groups with EJ and non-EJ populations in relation to effects of the Build Alternatives by environmental resource. **Table 4.5-3** identifies the environmental resource areas considered for the EJ disproportionality analysis and summarizes potential adverse impact thresholds considerations by resource. The referenced DEIS sections discuss the associated direct and indirect impacts, which will only be summarized in this section to highlight whether or not impacts are located within EJ population areas or specifically impacts EJ populations. The general location for each of the direct environmental impacts in relation to the EJ populations areas are shown in Appendix D.3 Attachment F. Due to the prevalence of EJ population areas, impacts to resources along the corridor will predominately be located in EJ population areas. The disproportionality analysis to be conducted in the FEIS will consider the concentration of impacts for the relevant resource areas within EJ populations areas, as well as the context and intensity of the impacts, the associated mitigation and/or benefits.

Table 4.5-3: Impacts Considered in Disproportionality Analysis

Environmental Resource Areas	Type of Impacts Consideration	DEIS Reference Section
Transportation	Impacts that would decrease the Level of Service (LOS) in residential areas; impacts that would change local access or mobility	Section 4.2
Community Facilities	Includes directly impacted community facilities	Section 4.4
Parkland	Includes directly impacted parklands	Section 4.7
Economic	Includes areas with the potential for changes to local economies	Section 4.6
Aesthetics and Visual Quality	Includes Moderate (M) and Higher (H) Levels of visual changes in residential neighborhoods	Section 4.9
Hazardous Materials	Includes directly affected areas with an existing Risk Ranking of 4 or more (Medium to High)	Section 4.15
Noise	Includes areas that will result in a severe noise impact	Section 4.17
Vibration	Includes areas that will result in frequent vibration impact	Section 4.17
Land Use	Includes properties that would have permanent full parcel acquisitions, permanent partial parcel acquisition, and temporary full parcel acquisition	Section 4.3

4.5.4.1 No Build Alternative

Under the No Build Alternative, the SCMAGLEV Project would not be built; therefore, impacts to minority and low-income populations related to the construction or operation of a SCMAGLEV system would not occur. Other planned and funded transportation projects would continue to be implemented in the area and could result in effects to EJ populations.

4.5.4.2 Build Alternatives

Impacts would occur along the length of the SCMAGLEV Project corridor particularly in proximity to the portions of the SCMAGLEV Project that would be constructed aboveground, including stations, viaduct, tunnel portals, TMF sites, and ancillary facilities. Generally, the majority of the SCMAGLEV Project impacts for each Build Alternative, as identified throughout Chapter 4 of this DEIS, would occur within EJ population areas, given that the large majority of the Affected Environment consist of EJ populations. The Environmental Justice Impact Analysis mapping provided in Appendix D.3 Attachment F shows the combined limits of disturbance, the block groups that exceeded the Environmental Justice threshold, and symbology that represents the impacts of the SCMAGLEV Project. The associated table identifies the percentage of each type of impact that occurs within environmental population areas. Notable impacts are summarized below.

Transportation. FRA projects slight decreases in vehicular traffic volumes within the regional roadway network within the SCMAGLEV Project Affected Environment, along with localized traffic volume increases on major roadways surrounding SCMAGLEV Project stations, as discussed in Section 4.2 Transportation. Build Alternatives would generally result in corridor congestion during weekday morning or evening peak periods and additional congestion at several intersections primarily near stations and TMF locations.

Traffic level of service would decline to failing levels for PM peak times at five identified intersections near the Mount Vernon East Station. Each intersection is located within an EJ population area, and EJ populations in the proximity would experience degradation in traffic operations under each Build Alternative:

- New York Avenue @ 6th Street NW
- New York Avenue @ 9th Street NW
- New York Avenue @ 10th Street NW
- L Street NW @ 6th Street NW
- Massachusetts Avenue @ 6th Street NW

The Build Alternatives with the Cherry Hill Station would experience changes to access in mobility. Although traffic increases at the Cherry Hill Station are anticipated to have minimal impacts, roadways in the vicinity have been identified for signal and striping

improvements as part of the roadway upgrade. EJ communities in the area of Cherry Hill Station would experience changes to access and mobility with the upgrades along Annapolis Road and Waterview Avenue. There is also potential for intermittent delays in traffic during AM and PM peak periods for both the BARC Airstrip TMF on Odell Road and BARC West TMF on Springfield Road. Nearby EJ populations may experience an increase in traffic delays in these areas.

In general, the addition of SCMAGLEV Project to the transportation network will change the way in which trips are made within the SCMAGLEV Project Affected Environment, with individual travelers making trip choices based on factors such as changes in cost and total trip time. One impact of the addition of SCMAGLEV Project to the network will be changes in forecasted Build Alternatives aggregate travel times within the SCMAGLEV Project Affected Environment when compared to the No Build Alternative. The SCMAGLEV Project will result in forecasted travel times savings in 2030 and 2045, and for both Baltimore Station scenarios. This decline is a result of the forecasted diversion of trips from modes with longer travel times to the SCMAGLEV system and is a benefit for travelers within the SCMAGLEV Project Affected Environment.

Mitigation. The Project Sponsor would apply mitigation strategies as needed, such as detailed wayfinding signage to disperse pedestrian movement, mobile applications, and street-level, real-time signage to identify crowded areas. FRA and the Project Sponsor would continue to coordinate with Federal, state, county, and local area jurisdictions to identify mitigation strategies for site-specific design elements. Planned mitigation measures and case-by-case mitigation would reduce impacts. The Project Sponsor will develop a detailed mitigation plan to address traffic impacts during construction.

Community facilities. Impacts to community facilities are discussed in Section 4.4 Neighborhoods and Community Resources. Collectively, the Build Alternatives would impact 20 community facilities, 18 of which are located in EJ population areas. SCMAGLEV Project impacts differ by option depending on the alignment, station, and TMF chosen, as identified in Section 4.4, however nearly all of the property acquisitions and disruptions to community facilities would occur in neighborhoods and areas containing EJ populations. Impacted facilities that are not only located within EJ population areas, but also serve EJ population include the Adams Place, the Woodlands Job Corp, and the Medmark Treatment Center.

- The Adams Place would be displaced by each of the Build Alternatives. The Adam's Place Emergency Shelter is operated by the Catholic Charities and is a men's emergency shelter. The next closest men's shelter is the New York Avenue Shelter located approximately a mile away.
- The Woodlands Job Corp. would be displaced by each Build Alternative that includes the MD 198 TMF. This community facility provides a residential career training program and job placement program for low-income individuals. The US Department of Labor (DOL) expressed opposition to any Build Alternatives that would remove the facility, as it is only one of two of

the kind in the DC area and that relocating the center would be extremely costly. The Potomac Job Corps Center, located in Washington, DC and the Woodstock Job Corps Center located in Woodstock, MD in Baltimore County are the next closest facilities.

- The Medmark Treatment Center would be displaced by each Build Alternative that includes the Cherry Hill Station. The MedMark Treatment Center is an addiction treatment facility that helps people overcome opioid addiction with comprehensive medication-assisted treatment (MAT) programs. The University of Maryland Addiction Treatment Center and the Kolmac Outpatient Recovery are the next closest addiction treatment facilities and are located approximately 3 miles away.

Indirect impacts would occur to community facilities in the area of the SCMAGLEV Project, such as increased patronage and nearby land use changes due to operation of the SCMAGLEV. The SCMAGLEV Project could spur development and commercial investment in neighborhoods in the vicinity of station locations. This indirect effect could impact the long-term character of neighborhoods' economic and demographic makeup due to changes in rents and mortgages, changes to commercial and retail offerings, and changes to available community facilities.

Mitigation. Build Alternatives would optimize underground tunnels where practicable and elevate the aboveground alignment above existing transportation corridors to maintain access and mobility. Minimization of facility footprints would also occur, such as consolidation of tunnel boring machine (TBM) launch sites, storage, and staging areas. To reduce or eliminate property acquisitions and displacements, where feasible, the Project Sponsor would coordinate with affected property owners.

Parkland. Impacts to public recreational facilities and parklands, as discussed in Section 4.7 Recreational Facilities and Parklands, primarily result from the aboveground features of the Build Alternatives. The degree of impact differs depending on the alignment, station, and TMF chosen. Collectively, the Build Alternatives would impact 14 parks, 12 of which are located in EJ population areas. The other two parks are large Federal properties that do not have an EJ designation. The majority of the parkland impacts would be to parkland of national significance, which is maintained and administered by Federal agencies including NPS and PRR. Impacts to the Maryland City Park and the Greenbelt Forest Preserve, both of which are located in EJ population areas, would have to greatest impacts to the nearby EJ populations.

Build Alternatives J1 alignment would impact Maryland City Park due to the construction of a tunnel portal, overhead electric lines, viaduct, SCMAGLEV systems, and stormwater management. Build Alternatives J1 would impact two baseball fields, two multi-purpose fields, and a paved trail that joins the two parcels that comprise the park. Anne Arundel County DPR representatives noted that Maryland City Park serves an area of the County less well served than others by ball fields and courts due to the presence of large Federal land areas such as Fort Meade and PRR.

Also, the Greenbelt Forest Preserve would be impacted by the Build Alternatives J1. It is historically significant as the “greenbelt” that surrounds the district, and therefore recreational opportunities offered within the greenbelt cannot be moved elsewhere. While it may be possible to move the public ballfields elsewhere within the forest preserve, the cut/cover tunnel associated with the Build Alternatives J1 would remove access to a large portion of the Greenbelt Forest Preserve to trail users, and lighting associated with the SCMAGLEV system would impede operation of the astronomical observatory.

Mitigation. Throughout preliminary design and DEIS development, FRA and the Project Sponsor discussed mitigation options to offset potential impacts to park properties. FRA coordinated with officials with jurisdiction, such as the National Park Service (NPS) and United States Fish and Wildlife Service (USFWS), to assess the presence of park properties and consider potential impacts and sought input from stakeholders (i.e., persons, groups, government agencies, and organizations with an interest or concern) and the public regarding effects on parks and other properties. In addition to coordination, FRA and Maryland Department of Transportation, Maryland Transit Administration (MDOT MTA) directed alignment options to use existing transportation and utility corridors as feasible to keep additional right-of-way (ROW) needs to a minimum and consider other design refinements to avoid or reduce impacts to park properties (i.e. retaining walls). Where park impacts cannot be avoided, the Project Sponsor would further implement design refinements, as feasible, and offer opportunities for public involvement to develop further mitigation strategies. Access to the Greenbelt Forest Preserve park and the Maryland City Park would be restricted during construction, and the Project Sponsor would consult with the City of Greenbelt and Anne Arundel County to develop mitigation plans to address temporary construction impacts.

Economics. The SCMAGLEV Project would positively affect the labor market. The number of job opportunities would increase, and some workers would find jobs and transition from unemployment to employment. Some workers would find better jobs than they have currently as they now face a large selection of job opportunities. In this instance, underemployed workers would find jobs that better fit their skills with an associated increase in labor productivity and earnings. Also, construction of the SCMAGLEV Project would support the local economy through the hiring of personnel, renting or purchasing equipment, and procurement of materials for the duration of the construction period, as quantified in Section 4.6 Economic Resources. Total construction employment impacts across Build Alternatives would range between 161,000 job-years and 195,000 job-years. Construction earnings for Build Alternatives would range between \$8.8 billion and \$10.6 billion. Average annual direct jobs per year, limited only to the construction industry, range between over 8,700 to over 10,560. These economic benefits would be regional, within a region where the majority of the population lives in areas that meet the environmental justice thresholds identified above. Therefore, a portion of these benefits would be experienced by environmental justice

populations. A full disproportionality analysis will be conducted for the Selected Alternative to be identified in the Final Environmental Impact Statement (FEIS).

Although the SCMAGLEV Project would result in commercial acquisitions, most of the acquisitions are not sufficiently unique in their commercial activity that the business could not find comparable building, resource, and transportation access elsewhere in the same jurisdiction. There would be multiple commercial acquisitions along W. Patapsco Avenue that could be relocated in nearby shopping centers. However, the Patapsco Flea Market, which has provided a long-standing retail space for numerous merchants and entrepreneurs, would be more difficult to relocate and/or attract long-standing consumers, provided the owner would seek relocation options.

The SCMAGLEV Project could potentially have gentrification and displacement impacts. Triggered by the SCMAGLEV investment, the Baltimore and Washington, D.C. economies would be much more accessible to one another, which would allow some workers in Washington D.C. to locate in Baltimore where housing costs are lower. This would increase demand for Baltimore housing in areas readily accessible to the SCMAGLEV stations and drive-up housing costs. There are more renters (53%) than homeowners (47 percent) within the study area, and neither the Washington, D.C. and Baltimore rental markets currently qualify as “tight” rental markets under the Department of US Department of Housing and Urban Development thresholds. The following factors that are now or would be present with the construction of the SCMAGLEV system, including a high rate of renters in some neighborhoods, ease of access to job centers, rising congestion in the Baltimore-Washington metro area, lower housing values in Baltimore neighborhoods, a large rent gap between Baltimore City and Washington D.C., construction of transportation infrastructure, and urban amenities. Thus, it is reasonable to expect that Baltimore neighborhoods would experience gentrification and resident households may feel pressure to relocate.

Aesthetics and visual quality. Changes in aesthetics and visual quality would occur for both Build Alternatives in areas near aboveground and elevated portions of the SCMAGLEV Project, as shown in Section 4.9 Aesthetics and Visual Quality. The degree of impact differs on the alignment, station, and TMF chosen. FRA determined that surface features of both alignments, including the viaduct tunnel portal and ancillary facilities, would result in visual impacts to resources within the Area of Visual Effect (AVE) ranging from *lower level* or *relatively imperceptible* to *higher level* degrees. Collectively, of the 56 locations identified as a moderate or high sensitivity aesthetic impacts, 47 would be located in EJ population areas. The Build Alternatives with the longer Alignment J viaduct results in more visually sensitive resources impacted compared to the shorter viaduct/longer deep tunnel of Build Alternatives J1 alignments. With the exception of PRR, the entire length of the viaduct is located within and adjacent to EJ population areas, and the new aboveground elevated guideway would be visible to those EJ populations.

Mitigation. To address aesthetic and scenic impacts of the Build Alternatives, FRA and the Project Sponsor would meet with impacted neighborhoods and stakeholders. In

addition to the extensive use of tunneling, the Project Sponsor would develop design criteria that adapts to local context and surroundings to help achieve integration into the local setting; adhere to existing utility and transportation corridors to reduce impacts to prime public lands, parklands, and ecological impacts; and employ vegetation management where feasible to maintain coverage and a natural appearance in locations of necessary clearing.

Cultural resources. Impacts to cultural resources are discussed in Section 4.8 Cultural Resources. For aboveground historic and archaeological resources within the area of potential effects (APE) a, adverse effects determinations under Section 106 of the National Historic Preservation Act (NHPA), are based on the permanent introduction of physical project components (for example, tunnels, viaduct, piers, stations and station entrances) into the boundaries of a property, or a property's character-defining setting, in such a way that the components negatively affect the integrity of a historic property. Adverse effects determinations also consider indirect sensory effects such as visual, noise, and vibration. All identified archaeological resources within the SCMAGLEV Project limits of disturbance (LOD) would experience adverse effects. Most cultural resources impacts occur within EJ block groups, except for a small portion of impacts associated with Build Alternatives J south of the MD 198 TMF. FRA will communicate with relevant EJ populations to determine the impacts felt by affected community members.

Hazardous materials. Impacts associated with hazardous materials are discussed in Section 4.15 Hazardous Materials and Solid Waste. Long-term operational effects of the SCMAGLEV Project for either Build Alternatives can include potential spills of hazardous substances or accidents. Incidents would be more likely to occur at stations, substations, maintenance of way (MOW) facilities, or TMFs. Such accidents could include spills and leaks from hazardous material storage equipment that could include fuel storage tanks, storage tanks for lubricants and waste oils; wash racks; storage tanks for degreasing solvents and for waste solvents, paints/coatings, and associated solvents; and compressed gases and solder for welding. Other spills could include chemical products used for cleaning and maintenance, such as acids or caustics. These spills are more likely to occur in EJ communities, as nearly all of the viaduct, ancillary facilities, MOW, and TMFs are within are in EJ population areas. A potential long-term benefit of the SCMAGLEV Project may result if remediation is required and performed at identified and existing hazardous material sites within the SCMAGLEV Project Affected Environment; the resultant cleaned up site may reduce risks to public health and the environment.

Mitigation. To address long-term operational effects, FRA would require establishment of procedures for the proper storage and maintenance of equipment and hazardous materials. Procedures would include training of all SCMAGLEV Project personnel, frequent and routine spill drills, and adequate supply of spill kits. All SCMAGLEV Project personnel would receive the appropriate type and level of hazardous materials

training and Resource Conservation and Recovery Act procedural training that includes:

- Conducting frequent and routine documented inspections of the construction site for violations, to verify consistent implementation of general construction permit conditions and best management practices (BMPs).
- Designating special storage areas for hazardous materials and hazardous waste, containment berms, and coverage from rain.
- Avoiding disturbing contaminated locations, if possible.
- Conducting frequent and routine spill drills.

The Project Sponsor will develop a Construction Management Plan that describes how to avoid and/or mitigate existing contamination and handle discovery of unknown contamination. The plan would also establish roles, responsibilities and procedures for workers to follow in areas with known or suspected soil or groundwater contamination. For sites that require demolition and removal, the plan will address issues such as lead, asbestos, polychlorinated biphenyls (PCBs), and other materials that would require disposal in a Toxic Substances Control Act (TSCA) landfill. The plan will specify how to appropriately contain, remove, and dispose of the asbestos and lead-containing material at licensed disposal facilities. The Project Sponsor will consider the addition of site-specific plans for high-risk sites.

For SCMAGLEV Project operations, the Project Sponsor will develop a Hazardous Materials and Solid Waste Management Plan as a tool for compliance that will address the following:

- Waste characterization (e.g. hazardous) and accumulation (inspections, secondary containment, liners and covers, waste compatibility, selecting the proper container, security, communication, equipment, etc.)
- Green Procurement/Waste Minimization
- HAZMAT safety requirements
- Spill Prevention Control and Countermeasure plan or Spill Prevention Plan for fuels and oils to address tank design (leak detection, overfill protection, double-walled, etc.); drum storage area design/containment system; tank and container inspections; spill prevention techniques; spill response; and spill training and reporting
- Stormwater Pollution Prevention Plan requiring that all persons are trained on the plan and know how to implement all the required BMPs

Noise. Noise impacts are shown in Section 4.17 Noise and Vibration. FRA evaluated the cumulative noise effects from new future sources, including SCMAGLEV train operations and facilities at over 3,600 noise-sensitive receptors. Noise impacts are concentrated along the viaduct. As such, over 99 percent of the impacted noise

receptors are located with EJ population areas. For the SCMAGLEV Project, noise impacts related to the Build Alternatives are similar for each Build Alternative, though each is present in a slightly different area. With only minor differences in the corridor wide impact counts, FRA predicted essentially the same number of impacts at noise-sensitive receptors for each of the Build Alternative alignments.

Mitigation. The Project Sponsor proposed several final design features to minimize potential noise impacts at residential communities within the Affected Environment, such as taller parapet walls along the viaduct, concrete-lined tunnels, and concrete viaducts. In addition, design would include sound attenuation walls, sound attenuation hood and shrouds, aerodynamic design of the nose of the SCMAGLEV trainset, and implementation other tunnel design features. At fresh air/emergency egress facilities, silencers and acoustical louvers would reduce fan noise along ventilation ducts. Substations would employ equipment enclosures and acoustical louvers. At TMF and MOW facilities, attenuation of noise impacts would occur through equipment enclosures, perimeter noise barriers, and relocation of loud maintenance activities to indoor areas.

Vibration. Vibration impacts related to the Build Alternatives are similar, though each is present in a slightly different area, as discussed in Section 4.17 Noise and Vibration. Vibration impacts are concentrated along the viaduct. As such, 100 percent of the severe vibration impacts would be located in EJ population areas. FRA predicted future vibration levels from SCMAGLEV train operations for all Build Alternatives. The primary differences between the Build Alternatives are different paths along the Patuxent Research Refuge and the length of the viaduct through this region. The longer viaduct would have more areas with vibration impacts.

Mitigation. Vibration control measures are not as well understood as other mitigation measures, due to the uniqueness of the magnetic levitation technology for transportation projects. Several final design features, including concrete-lined tunnels and concrete viaducts, would reduce vibration impacts at residential communities within the Affected Environment. Mitigation of vibration impacts would occur through application of experience gained from using successful control measures for other concrete-constructed systems. Controls, including resilient track beds and viaducts, would reduce the vibration produced by the SCMAGLEV system. With the incorporation of design and mitigation measures, the goal is to achieve compliance with FRA vibration impact criteria.

Land use and parcel impacts. Land use and parcel impacts are detailed in Section 4.3 Land Use and Zoning. Property acquisition would range from partial to full property acquisitions. Approximately 80 percent of the parcels that would be impacted are located within EJ population areas. Land use conversions and some rezoning would result from the surface features of the Build Alternatives. All Build Alternatives would generally support statewide and regional transportation goals as identified in various approved comprehensive planning documents. The aboveground SCMAGLEV Project elements for each Build Alternative would require land use changes.

Appendix D.3 shows property acquisitions for the Build Alternatives. Notably, there would be full permanent acquisition that would displace a residential structure in Baltimore City, all other full permanent acquisitions would occur on residential properties owned by an homeowners association or to non-residential properties including the Otterbein Church (for the alternatives that include the Camden Yards Station) and the Woodlands Job Corps facility (for all alternatives that include the MD 198 TMF). Both of those community facilities are located within EJ population areas and serve EJ populations. Two impacted commercial areas have a long history in the South Baltimore area and are integral to the surrounding EJ community, including the Patapsco Village Shopping Center and Patapsco Plaza Shopping Center. The Patapsco Village Shopping Center contains a laundromat and grocery store, and the SCMAGLEV Project design would avoid impacts to these businesses, although a banking business and some parking areas would be adversely impacted. The Patapsco Plaza Shopping Center contains the Patapsco Arena and the Patapsco Flea Market, a staple in the area for over 20 years that offers shopping and international fare every weekend and an affordable place to rent space and sell merchandise. Although only a small portion of the Patapsco Flea Market would be permanently impacted, the SCMAGLEV Project could potentially result in a full take of the Patapsco Flea Market.

Mitigation. SCMAGLEV Project design relied upon incorporation of tunneling in the Build Alternatives to avoid aboveground land use impacts and generally placed the location of viaducts parallel to existing transportation corridors. The Mount Vernon Square (MVS) East Station and Camden Yards Station would be underground to avoid significant permanent land use changes in highly developed, urban areas. The Cherry Hill Station would be located above an existing transportation facility to avoid and minimize land use impacts. The Project Sponsor would continue to coordinate with local and Federal governments regarding the location and positioning of the Build Alternatives to further reduce potential SCMAGLEV Project impacts. During final design, refinement of SCMAGLEV Project elements would further minimize land use impacts under the structures.

The Project Sponsor would provide fair compensation and property relocations to all residences and businesses without discrimination. All station alternatives would provide for intermodal connections with other existing modes of transportation, such as the metro in Washington, D.C., and the LightRail Link at Baltimore-Washington International Thurgood Marshall Airport (BWI Marshall Airport) and in Baltimore City. In addition to mitigation efforts from the Project Sponsor, the SCMAGLEV Project would result in regional benefits for affected populations. For example, transition of land use from industrial and commercial to transportation in the area of Cherry Hill would provide opportunities for local investment in new and infill development.

To reduce or eliminate property acquisitions and displacements, where feasible, the Project Sponsor would coordinate with affected property owners. In the event of federally funding, the Uniform Relocation Assistance and Real Property Acquisition Act

of 1970 (Uniform Act) would be followed to ensure equitable and uniform land acquisition policies.

Economic Considerations. The SCMAGLEV Project would provide short-term and long-term economic benefits for the region (see Section 4.6 Economic Resources). EJ populations in the SCMAGLEV Project Affected Environment would likely experience these economic benefits. Construction would support the local labor and manufacturing markets. As the largest civil works project in the region, residents of Maryland and Washington, D.C., would fill openings for a variety of work activities. Specialized SCMAGLEV support facilities (for example, stations, FA/EE facilities, TMF/MOW) would require a variety of skills and trades, presenting significant opportunities for focused training and apprenticeship programs to ensure a diversified workforce. The Project Sponsor would work with local jurisdictions to ensure residents within the SCMAGLEV Project Affected Environment are afforded special employment opportunities. Each Build Alternative would have a short-term beneficial impact on local employment as total construction employment would provide employment opportunities for up to 7 years.

In the area surrounding SCMAGLEV stations, development is expected to centralize; more compact development would generate benefits such as decreased travel times and improvements to health, safety, and the environment. In addition, compact development would encourage mode shifts (for example, from automobile to pedestrian, bicycle, or transit) for local trips, decreasing auto emissions and improving air quality. Transit-oriented development (TOD) opportunities around station locations, particularly in Baltimore, would potentially include expanded housing and employment opportunities for residents; increased retail, especially supermarkets; improved vehicular and bicycle safety; direct ferry access to downtown Baltimore; enhanced security, lighting, and wayfinding; and added community amenities (for example, recreation, landscaping, waterfront access).

The urban area existing around the MVS East Station is a hub of transportation, offering multiple modes within proximity. The Camden Yards Station is also a densely populated urban center with existing access to multiple transportation modes. The greatest change would occur in the area of the proposed Cherry Hill Station, where the introduction of the SCMAGLEV Project could potentially bring redevelopment and private investment to the area. Construction of the station and associated features would reduce the presence of abandoned properties and industrial space, improve the local aesthetics, and continue to allow waterfront access.

Property values may increase around stations (except in the location of the BWI Marshall Airport Station), generally within a 1/2-mile radius for walkability purposes, because of improved access. Property value increases may potentially outprice existing low-income populations in the future.

The cost of the SCMAGLEV system would be prohibitive for some, notably low-income populations in EJ areas near stations. The SCMAGLEV Project would provide a premium service at a higher fare, estimated at \$60 per one-way trip, or seven times the

cost of an existing MDOT MTA Maryland Area Regional Commuter (MARC) commuter train fare between Washington, D.C. and Baltimore City. The Project Sponsor is investigating opportunities for fare subsidies to provide greater access for low-income populations since the introduction of the SCMAGLEV Project would provide an additional transportation choice between Washington, D.C. and Baltimore. The SCMAGLEV Project also provides improved direct access to BWI Marshall Airport. Low-income populations in EJ areas would likely choose to continue utilizing existing commuter services at the current estimated fare, unless fare equity was provided by the Project Sponsor to affected EJ communities.

Air Quality. The SCMAGLEV Project would likely result in a localized increase to mobile source air emissions throughout the affected environment, particularly in areas around station locations due to increased traffic (see Section 4.16 Air Quality). However, the operations of the SCMAGLEV Project would reduce overall mobile source air emissions regionally.

Safety and Security. The areas of the SCMAGLEV Project with the most notable safety and security concerns are in proximity to the ancillary facilities including the portals, MOW, and FA/EE facilities (see Section 4.22 Safety and Security). The primary concern is for unauthorized entry into these areas that would prohibit public access. Nearly all of the ancillary facilities are located in EJ population areas. Other public concerns include the chance of collision of very high-speed trains and other operational accidents.

Mitigation. The SCMAGLEV Project has incorporated safety in the planning and design, core systems, facilities, and maintenance practices. The SCMAGLEV Project includes a systemwide state-of-the-art signaling system to avoid collisions and implements intrusion detection to avoid unsafe conditions. Open cut tunnel transition portals, maintenance of work, FA/EE, and other ancillary facilities would be strictly controlled to prevent unauthorized entry by using fencing, security cameras, and security lighting.

4.5.4.3 Short-term Construction Effects

The construction of and the associated construction staging and laydown areas and haul routes for the SCMAGLEV Project would predominately occur within Environmental Justice population areas (see Appendix D.3). Construction of the SCMAGLEV Project would include activities such as digging and tunneling using multiple tunnel boring machines, ground clearing, pile driving, excavating, grading, and the stockpiling of soil, muck, and materials. The SCMAGLEV Project would require temporary property acquisition along the alignment and within EJ population areas and could cause potential short-term impacts to air quality (fugitive dust and construction equipment exhaust), noise and vibration (construction equipment and activities), transportation (work vehicles, increased congestion, detours, and road closures), and changes to views and visual quality for EJ populations. Temporary construction impacts would be concentrated around the viaducts, portals, ancillary facilities, TMFs, stations, and

construction staging and laydown areas. Construction would occur simultaneously at different locations.

The underground stations and tunnel portions of the SCMAGLEV Project would be achieved using TBM technology. In order to create the underground stations and tunnels, construction staging areas would be needed for assembly, launch, operation, and retrieval of the TBMs. The TBM launch and retrieval areas would be located along the alignment and would be located at the future station locations and FA/EE facilities. The majority of the underground stations (MVS East Station and Camden Yards Station) and FA/EE facilities would be located in areas with EJ populations so these populations would experience increased noise and vibration due to construction. The BWI Marshal Station and FA/EE facilities located north and south of the BWI Marshall Station, are not in EJ population areas. Additionally, portions of the proposed hauling routes to and from TBM sites would be located within or immediately adjacent to EJ population areas including the Queen Chapel Road, MD 410, Kenilworth Avenue, MD 193, Brock Bridge Road, MD 197, MD 170, and MD 643/Annapolis Road so these communities would experience regular disruption from the added noise and traffic produced by the hauling.

The viaduct would be located in portions of Prince George's and Anne Arundel Counties either just east of the BWP (Build Alternatives J-01 – J-06) or just west of the BWP for (Build Alternatives J1-01 – J1-06), and in Baltimore City for Build Alternatives J-01, J-02, J-03, J1-01, J1-02, and J1-03 that would include the Cherry Hill Station. Elevated viaduct ramp structures would also be constructed to access TMFs. The entirety of the viaduct and viaduct ramp locations would be located in or adjacent to EJ population areas which would experience the construction impacts from these segments. There is a section of unpopulated PRR-owned land adjacent to Build Alternatives J-01 through J-06. Powder Mill Road, MD 197, MD 198, and MD 32 are potential construction access points during viaduct construction. Both local and state roads within these EJ population areas would serve as access points to construction areas and would be subject to associated traffic, noise, and vibration impacts from construction vehicles.

Construction laydown areas would be required in multiple locations throughout the SCMAGLEV Project corridor. All identified construction laydown areas would be located within areas with EJ populations. The four long-term laydown areas include:

- Landover Mall Site (on a vacant site adjacent to commercial and residential areas within an EJ Population Area) – in the Summerfield neighborhood in Prince George's County and adjacent to the Landover and Glenarden neighborhoods. The Maple Ridge Apartment Community is across Brightseat Road from and within 225 feet of the Landover Mall Site. EJ populations would be temporarily impacted due to increased noise, vibration, and changes to aesthetics.
- Konterra Site (on a vacant site within an EJ Population Area largely surrounded by major transportation corridors) – in the Konterra neighborhood

in Prince George's County and adjacent to the Laurel neighborhood. The Avalon Laurel Apartment community is within 450 feet of the Konterra Site. EJ populations would be temporarily impacted by noise, vibration, and changes to aesthetics during construction.

- Suburban Airport Site (within a non-populated section of an EJ Population Area) – in the Maryland City neighborhood in Anne Arundel County. No impacts to EJ populations are anticipated because residential areas and community facilities are not present in the general vicinity.
- Patapsco Avenue Site (with an EJ population Area) – in the Cherry Hill neighborhood in Baltimore City. EJ populations in proximity of Round Road, Spelman Road, and Bethune Road north of Patapsco Avenue would be temporarily impacted due to increased noise and changes to aesthetics.

Construction of the SCMAGLEV Project would result in short-term adverse impacts to EJ populations due to temporary use of property, increased noise and vibration, air quality/emissions, changes in aesthetics and visual quality, changes to access and mobility, changes in current transit service, and the use of community facilities. EJ populations subject to these impacts may also experience community disruption, which is a population's ability to navigate their way around their community, and adverse effects to community cohesion, the disruption of interaction between people and groups within a community. Community disruption would include temporary impacts to traffic (i.e. detours), pedestrian access, and neighborhood access and mobility during construction.

Construction impacts would occur at varying locations and for varying durations during the construction period. Construction operations would occur for up to 24 hours a day in some areas and last from 1 to 7 years. FRA anticipates construction impacts to cease upon completion of construction.

Prior to construction, the Project Sponsor would develop and continually implement a Public Safety Plan for the SCMAGLEV Project. Maintenance of traffic plans would also be developed in accordance with local requirements and in consultation with emergency services to ensure that temporary detours and road closure would not significantly impact emergency response times.

4.5.5 Environmental Justice Outreach

EJ outreach requires full and fair participation by affected communities in the transportation decision making process. Throughout the NEPA process, FRA tailored efforts to provide project awareness, engage communities, and generate opportunities for involvement and feedback from EJ populations. FRA developed an EJ outreach plan prior to performing EJ outreach activities; the plan identified area demographics and targeted strategies for engagement of EJ communities within the SCMAGLEV Project vicinity. A summary of EJ outreach efforts is below. Several tools and techniques are being used to generate continued meaningful public involvement, including public

meetings, a SCMAGLEV Project website, news and print media, social media, fliers, advertisements on public transit and community facilities, briefings to local government officials and stakeholders, and mass emails.

FRA held four rounds of meetings (five meetings per round) prior to the release of this DEIS. Meetings occurred throughout the corridor, with efforts to schedule each at convenient times and accessible (local) locations, and with strategically targeted outreach to nearby populations. Further details on public outreach efforts are available in Chapter 5 Public Involvement and Agency Coordination. FRA and the Project Sponsor prepared and are executing a public outreach plan that includes the following strategies geared toward EJ communities, among others:

- Use of information hubs, including churches and community centers, within EJ neighborhoods to serve as drop-off locations for SCMAGLEV Project materials
- Placement of targeted advertisements on mass transit, at ethnic grocery stores, social service provider offices, and on targeted social media, as well as print media, radio, and websites that target minority populations
- Consultation with social service providers, which include agencies and non-profit organizations that provide education, food, housing, health care, and employment benefits and facilities, regarding population types and organizations they serve within EJ communities
- Consultation with elected officials who serve EJ communities
- Use of clear and concise language in printed materials
- Use of highly visual project displays and renderings
- Translation of SCMAGLEV Project materials into Spanish, Korean, and Russian, with additional translations by request
- Use of bilingual staff and interpreters at SCMAGLEV Project outreach events and public meetings in targeted areas
- Mailings with the SCMAGLEV Project Affected Environment, which is predominately comprised of EJ block groups.

During the public involvement process, FRA and the MDOT MTA received a variety of comments in support of or in opposition to different characteristics of the SCMAGLEV Project, as well as specific concerns about the property impacts and SCMAGLEV Project costs and funding sources (for example, ticket price, taxes, and overall cost).

At the Bowie and Gambrills meetings in October 2017, attendees expressed concerns over direct impacts to historic Bowie, Odenton, and surrounding areas. Commenters also voiced opposition over impacts to the Odenton Volunteer Fire Company and Bowie Assisted Living, facilities that provide one-of-a-kind services for the area. At a later date,

the alternative in question was eliminated. At the Cherry Hill/Patapsco Avenue, Baltimore City Open House in December 2018, FRA generally received positive feedback. Public comments focused on safety, security, hazardous materials, potential negative environmental impacts, transportation connectivity, economic constraints, appropriation of Federal and state funding, station location, ticket pricing, and potential benefits and impacts on Baltimore City.

Several civic organizations local to South Baltimore attended meetings with the Project Sponsor and NEPA team members to discuss the SCMAGLEV Project, including the Lakeland Neighborhood Association, Cherry Hill Development Corporation, Westport Neighborhood Association, and the Westport Community Development Corporation. The Project Sponsor views these organizations as critical in helping define future development opportunities adjacent to the Cherry Hill Station. During these meetings, citizen stakeholders predominately voiced support for the SCMAGLEV Project and the corresponding economic benefits to the area. There were a few citizens who were more cautious about the SCMAGLEV Project and raised concerns about affordable fare pricing, property impacts, and cost of living increases potentially forcing current residents to relocate. See Chapter 5 Public Involvement and Agency Coordination for additional details on comments received.

Correspondences from communities surrounding the proposed Cherry Hill Station, which predominantly contain EJ populations, strongly support a nearby station and acknowledge the associated benefits that would likely be available to their communities. Following SCMAGLEV Project meetings, the Project Sponsor received letters in support of the Cherry Hill Station location. Additionally, the Project Sponsor met twice with the owner of the Patapsco Flea Market and Arena – a major source of small business activity in the area - and they expressed support for the SCMAGLEV Project. The owners also attended the December 2018 Cherry Hill Public Meeting, held at their Arena property, and they again expressed their support for the SCMAGLEV Project to NEPA team members.

The Westport Neighborhood Association's letter in support of the Cherry Hill Station, dated February 2019, is on behalf of residents of the Westport, Mt. Winans, Curtis Bay, Lakeland, and Cherry Hill communities in Baltimore City (all in EJ population block groups). The letter recognizes the value of the proposed SCMAGLEV station in Cherry Hill for increased access to jobs and support of local economic revitalization, and voices opposition to the Camden Yards Station location as a "failure to optimize potential development opportunities in the city's residential neighborhoods." An undated letter from the Westport Community Economic and Development Corporation cites conditional support of the Cherry Hill Station as an opportunity to increase access to jobs and a pathway to overcome "generations of disinvestment." The letter also expresses concerns about potential negative effects of the SCMAGLEV Project on air quality, noise pollution, increased traffic volumes, preservation of the existing sight lines to the waterfront for all residents, adequate station parking, damage to existing structures during SCMAGLEV Project construction, adequate compensation for property

acquisitions, and successful negotiation of a community benefits agreement. Provided abatement of these concerns, the Westport Community Economic and Development Corporation endorses the Cherry Hill Station.

In another demonstration of support for the SCMAGLEV Project, the Cherry Hill Development Corporation stated plans to include SCMAGLEV's Cherry Hill Station in their updated master plan while meeting with the Project Sponsor. In a letter dated January 2019, the Cherry Hill Development Corporation expresses strong support and excitement for the station, noting the potential for growth and creation of "meaningful opportunities" for residents, businesses, and institutions. The letter calls the SCMAGLEV Project a "major win" for the community and an opportunity to "allow [the] community to flourish going into the future, raising the profile of Baltimore as a whole." Furthermore, the Cherry Hill Development Corporation shares concerns over possible selection of the Camden Yards Station, conveying that this choice "would sadly continue the unfortunate past practices of neglecting to optimize potential development opportunities in the city's residential neighborhoods."

During meetings with elected officials, the Project Sponsor received support for the Cherry Hill Station from the councilman for the Cherry Hill/Westport area, area delegates, and the District's State Senator. In a letter from February 2019, the Vice President of the Baltimore City Council shares support and excitement for the Cherry Hill Station, considering it as a way to expand transportation options and TOD and provide construction related and long-term job opportunities for area residents. Also, the Vice Chair of the Land Use and Transportation Committee, the councilwoman sees the Cherry Hill Station in alignment with area strengths and an opportunity for housing improvements, as well as commercial expansion and industrial investments. The President of the Baltimore City Council also conveys support for the Cherry Hill Station and surrounding facilities in South Baltimore, pointing to expansion of TOD potential and characterizing the SCMAGLEV Project as "responsible neighborhood development... key to increasing Baltimore's population, decreasing vacant homes, and improving its local economy." An undated letter from another councilmember and Chair of the Land Use and Transportation Committee discusses the Cherry Hill Station as beneficial in respect to land use, transportation connectivity, and the economy. He writes, "[t]he beneficial economic consequences of locating a station in Cherry Hill will be huge and healthy, resulting in increased development potential for expanded residential, commercial, and industrial opportunities."

In a *Baltimore Sun* article dated June 28, 2019, local leaders of the National Association for the Advancement of Colored People (NAACP) conveyed support for the SCMAGLEV Project. NAACP leaders see the SCMAGLEV Project as an opportunity to offer new construction and permanent job opportunities for area residents. NAACP plans to provide outreach and education to inform minority communities about the SCMAGLEV Project, the lack of residential displacements, and potential for employment, as well as hold town hall meetings to elicit resident feedback. Again, the

owner of the Patapsco Flea Market and Arena, a major source of small business activity in this area, expressed support for the SCMAGLEV Project and the Cherry Hill Station.

Following publication of this DEIS, FRA and MDOT MTA will hold public hearings. The public hearings will include an opportunity for oral testimony, to be recorded by a stenographer. Comments and testimony provided at the public hearings will be addressed in the FEIS. Spanish language translators will be available at the public hearing. FRA and MDOT MTA will also conduct additional outreach in EJ communities to obtain additional information on the scope of impacts to these communities and develop appropriate mitigation. FRA will use this information to make the ultimate determination about whether or not disproportionate impacts to EJ communities exist for this Project in the FEIS.

4.5.6 Potential Mitigation Strategies

This section previously summarized FRA's and the Project Sponsor's specific mitigation initiatives intended to minimize adverse impacts of the Build Alternatives to EJ populations reducing the context and intensity of anticipated impacts. Additionally, there were multiple minimization strategies incorporated into the design process. Prior to the determination to study Build Alternatives J and Build Alternatives J1 in detail, FRA, in coordination with the Project Sponsor, minimized impacts to EJ populations by refining the Build Alternatives in response to public concerns with the goal of avoiding and minimizing the potential for negative impacts identified by the public and the analyses during the NEPA process.

The Project Sponsor identified and incorporated reasonable and feasible design elements in the Build Alternatives with the goal of avoidance or minimization of impacts to the natural and human environment, with targeted considerations for EJ populations. Design elements include optimizing the use of underground guideway and stations and locating the viaduct along or within existing transportation and utility corridors. As examples, the Mount Vernon Square East, BWI Marshall Airport, and Camden Yards Station options would be located underground to avoid significant surface impacts in urban, highly developed areas. The guideway under all Build Alternatives would be in a tunnel in Washington, D.C. and Baltimore City. The guideway viaduct would be parallel to the BWP for part of its alignment. The Cherry Hill Station in Baltimore City would be located above an existing transportation facility. Finally, consolidation of TBM launch sites, storage, staging areas, and fresh air and emergency egress facilities would reduce the geographic extent of facility impacts.

Despite minimization efforts during design, the SCMAGLEV Project would still have impacts to the natural and human environment within EJ population areas. To address these impacts, FRA and the Project Sponsor identified and will continue to identify additional, resource-specific mitigation strategies as discussed above. As the SCMAGLEV Project design progresses, the Project Sponsor will continue to refine the design regarding the location, positioning, and construction methods with the goal of avoiding temporary construction and permanent impacts where reasonably feasible, as

well as minimizing and mitigating impacts as practicable. The Project Sponsor would also continue with public, stakeholder, and agency involvement activities, such as targeted planning for inclusion of EJ populations, engaging metropolitan planning organizations, hosting small group meetings with EJ populations and communities, and incorporating traditional and nontraditional outreach methods to reach potentially affected populations. The Project Sponsor is committed to identifying and implementing adequate mitigations that specifically benefit EJ populations. The Project Sponsor wants local longtime residents, especially those in places like Cherry Hill and Westport who have been subject to years of chronic disinvestment, to benefit from the SCMAGLEV Project, specifically if Cherry Hill is selected as the Baltimore Station.

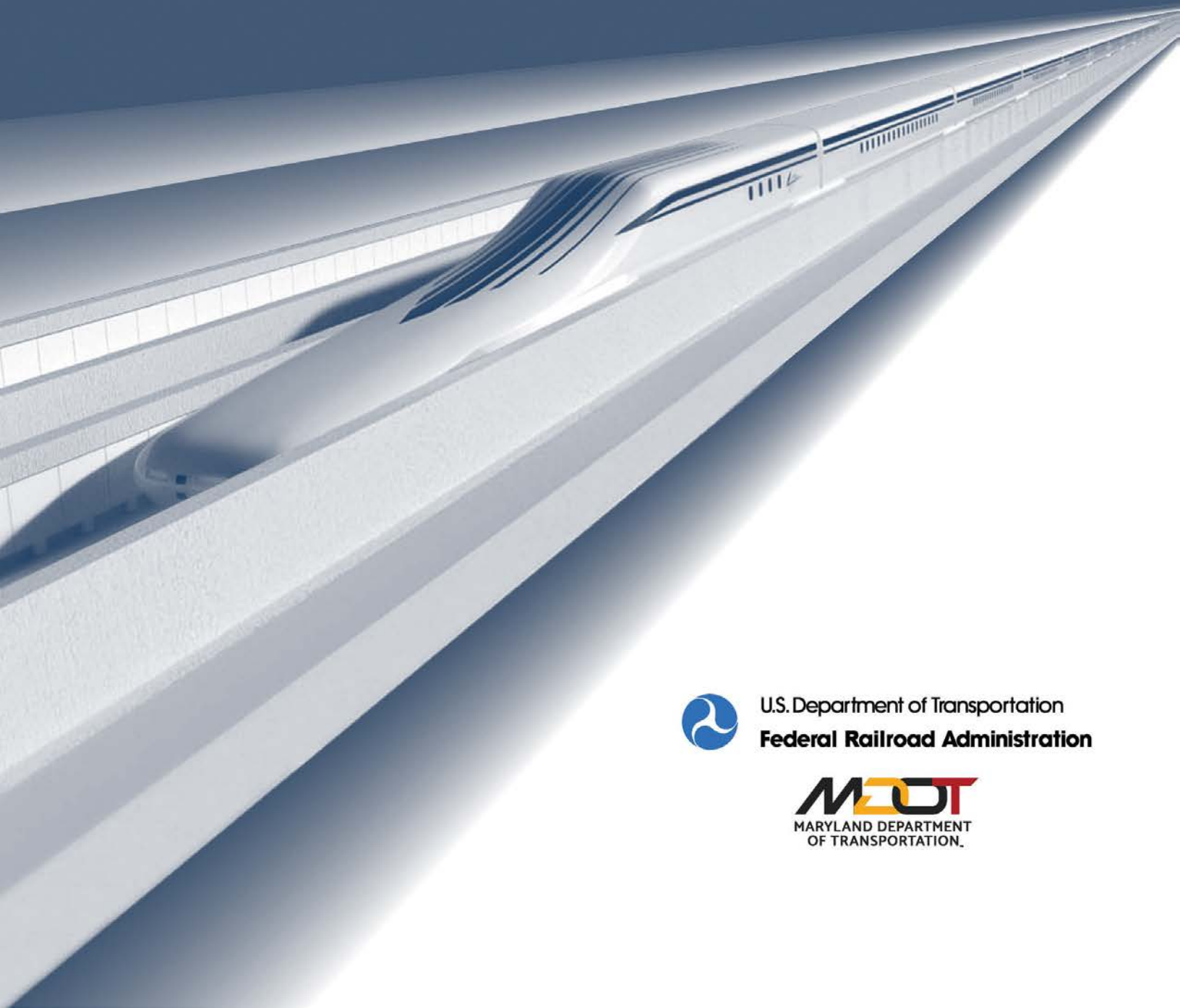
Also, EJ populations would experience some transportation and economic benefits from each Build Alternative. Adverse effects would be reduced by mitigation as outlined throughout this DEIS. Potential impacts would also be partially offset by SCMAGLEV Project benefits.

Section 4.06

Economic Resources

BALTIMORE-WASHINGTON, D.C. SUPERCONDUCTING MAGLEV PROJECT

DRAFT ENVIRONMENTAL IMPACT STATEMENT AND
SECTION 4(f) EVALUATION



U.S. Department of Transportation
Federal Railroad Administration



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4.6 ECONOMIC RESOURCES

This chapter describes the economic impacts that would occur with implementation of the Superconducting Magnetic Levitation Project's (SCMAGLEV Project) Build Alternatives (with respect to the No Build Alternative) within the Washington-Baltimore-Arlington, DC-MD-VA-WV-PA Combined Statistical Area (CSA). The Federal Railroad Administration (FRA) assumes that the first full year of operations would begin in 2030;¹ and economic operations and market response outcomes focus on full build-out conditions in the horizon year 2045. This economic narrative is structured to describe the economic impacts as they occur over the implementation timeline starting with construction of the SCMAGLEV Project, progressing to system operation, and ending with the broader market's reaction to the new transportation investment. Please see Appendix D.4, Economics Technical Report, for additional information.

4.6.1 Regulatory Context and Methodology

4.6.1.1 Regulatory Context

In accordance with the National Environmental Policy Act (NEPA), 42 U.S.C. § 4321 et seq., the Council on Environmental Quality (CEQ) regulations, 40 C.F.R. Parts 1500 - 1508, and the Federal Rail Administration's (FRA) Procedures for Considering Environmental Impacts, 64 Fed. Reg. 28545 (May 26, 1999) FRA assessed the impacts on the socio-economic environment, including the number and kind of available jobs, impacts on commerce, including existing business districts, metropolitan areas, and impacts on local government services and revenues. For a discussion on community impacts, please see Section 4.4 Neighborhoods and Community Resources.

National and local economies are not subject to market regulation by any Federal agency. Rather, investments and policies are set in an effort to influence but not dictate market outcomes indirectly through economic policy decisions, land use regulation, and spatially-targeted incentives to spur and focus growth.

Local agencies consult and apply guidance from multiple Federal agencies on how economic assessments of transportation infrastructure should be conducted when a project is assessed. Appendix D.4 provides the list of applicable guidance documents. As SCMAGLEV is considered a new transportation mode, FRA has not published guidance for SCMAGLEV projects. However, FRA guidance for conventional passenger rail offers some indication of the types of impacts to be considered with SCMAGLEV projects.

¹ The Baltimore-Washington SCMAGLEV Project Construction Planning Memorandum (WSP, Revision 2, May 14, 2020) states that the SCMAGLEV will open at the end of 2029; therefore this chapter assumes that the first full year of operations would be 2030.

4.6.1.2 Methodology

FRA used the Baltimore and Washington, D.C. Metropolitan Statistical Areas (MSAs) to define the SCMAGLEV Project Affected Environment for which this analysis is focused. The Baltimore and Washington, D.C. MSAs are part of the broader Washington-Baltimore-Arlington, DC-MD-VA-WV-PA CSA. FRA's economic analysis describes the following categories of economic impacts for the Build Alternatives:

Short-term construction impacts – Added jobs and earnings during the construction period. Added jobs and earnings would provide a boost to the economy.

Using the Bureau of Economic Analysis (BEA) Regional Input-Output Modeling System (RIMS II) Series 2018 multipliers, FRA estimates jobs and earnings impacts (direct, indirect, and induced) resulting from construction of the Build Alternatives.

The construction activities would also generate negative impacts known as social costs. Two major parties that would incur these costs are the travelers and business community in the affected area. Due to road disruptions, travelers would experience travel delays while businesses are expected to see various levels of revenue losses or even business closures depending on the type of service they offer.

Long-term operation and maintenance impacts, and travel market impacts – Added jobs and earnings associated with SCMAGLEV operations when SCMAGLEV services are implemented.

FRA calculates the direct, indirect, and induced jobs and earnings impacts of the operation and maintenance (O&M) activities for the Washington-Baltimore-Arlington, DC-MD-VA-WV-PA CSA using BEA RIMS II Series 2018 multipliers.

In addition, this section includes travel market impacts that include value of changes in user benefits, reliability, safety, induced ridership, congestion, pavement cost, air quality, and the revenue of publicly-provided rail service (Amtrak and Maryland Area Regional Commuter-MARC). The SCMAGLEV service would provide benefits to users and nonusers that result from increases in mobility and reduced vehicle (auto) miles traveled (VMT), bus passenger miles traveled (PMT) and regional commuter rail PMT. FRA estimates a change in these operational benefits between the No Build Alternative to the Build Alternatives. The impacts (positive and negative) are monetized using outputs from the travel demand model,² values of time, operating costs associated with auto, bus and regional commuter rail travel, and economic values of crashes and emissions consistent with U.S. Department of Transportation (DOT) guidance.

Long-term market response to SCMAGLEV service – Changes in property value as a result of changes in transportation connectivity and accessibility within the

² Results from the travel demand model are summarized in the SCMAGLEV Ridership Data Request Memorandum (WSP. Baltimore-Washington Ridership Data Request, July 27, 2020).

metropolitan area, and minor negative impacts around the selected trainset maintenance facility (TMF). These impacts are measured in terms of a property premium (discount) for parcels around the Build Alternatives' stations and selected TMF. The likelihood of Transit-Oriented Development (TOD) is intensified with the addition of this mode at station locations. There is also the potential for agglomeration³ and labor market impacts.

Construction of the SCMAGLEV requires the acquisition of some existing properties and possible changes in the properties' tax treatment in Baltimore City, Baltimore County, Anne Arundel County, Prince George's County and Washington, D.C. Any sizeable tax revenue loss may impact the ability to provide government services in the affected jurisdictions. Using parcel data from the latest records from the Assessor's Offices for Maryland and District of Columbia, FRA identifies the existing use of the "to be" acquired properties and whether part of each parcel or the full parcel would be acquired to estimate the potential property acquisition impacts. For a discussion on the community impacts, please see the discussion in Section 4.4 Neighborhoods and Community Resources.

The SCMAGLEV would have both a positive and negative impact on revenues, potentially impacting the local government services that rely on them. The increased accessibility of some properties would result in an increase in property values and therefore property taxes, while property acquisitions and losses of revenues by competing systems would result in a reduction of revenues. The net change in revenues would therefore impact the availability and scale of public services.

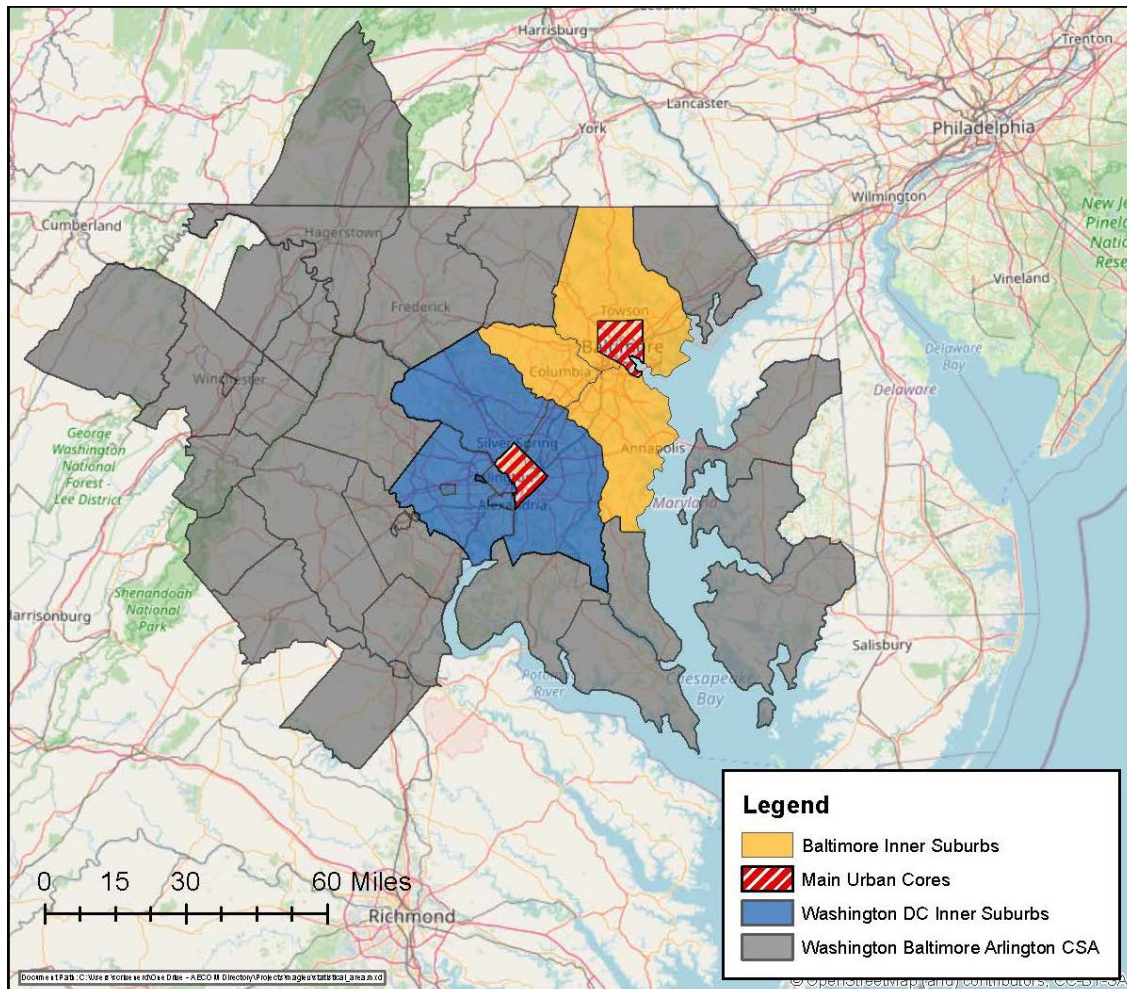
4.6.2 SCMAGLEV Project Affected Environment

The SCMAGLEV Project connects the two largest urban anchors within the Washington-Baltimore-Arlington, DC-MD-VA-WV-PA CSA (referred to as the Washington-Baltimore-Arlington CSA), which is the fourth largest CSA in the United States with nearly 10 million residents as of 2018. The CSA comprises the Washington, D.C. and Baltimore MSAs, as well as five other smaller urban areas including the Hagerstown-Martinsburg, MD-WV MSA, Chambersburg-Waynesboro, PA MSA, Winchester, VA-WV MSA, California-Lexington Park MSA and the Easton, MD micropolitan statistical area (as shown in **Figure 4.6-1**). The Washington-Arlington-Alexandria MSA (referred to as Washington, D.C. MSA) is centered on Washington, D.C. and includes five counties in Maryland; eleven counties and six independent cities in Virginia; and one county in West Virginia. The Baltimore-Columbia-Towson MSA (referred to as Baltimore MSA) is centered on Baltimore City and six nearby counties. The fast and reliable exchange of passengers between the two urban cores,

³ Agglomeration impacts occur when the concentration of firms and employees facilitates the exchange of ideas and knowledge in the host market, fostering growth and productivity. To the degree that the SCMAGLEV reduces the impactive distance between knowledge industries, the potential for agglomeration economies rises. The economic connections between Washington, D.C. and Baltimore would intensify, allowing the two metropolitan economies to increasingly compete in the global economy with a larger footprint.

accommodated by the SCMAGLEV Project, would reinforce the existing economic integration between Washington, D.C. and Baltimore City.

Figure 4.6-1: Washington-Baltimore-Arlington Combined Statistical Area (2012)



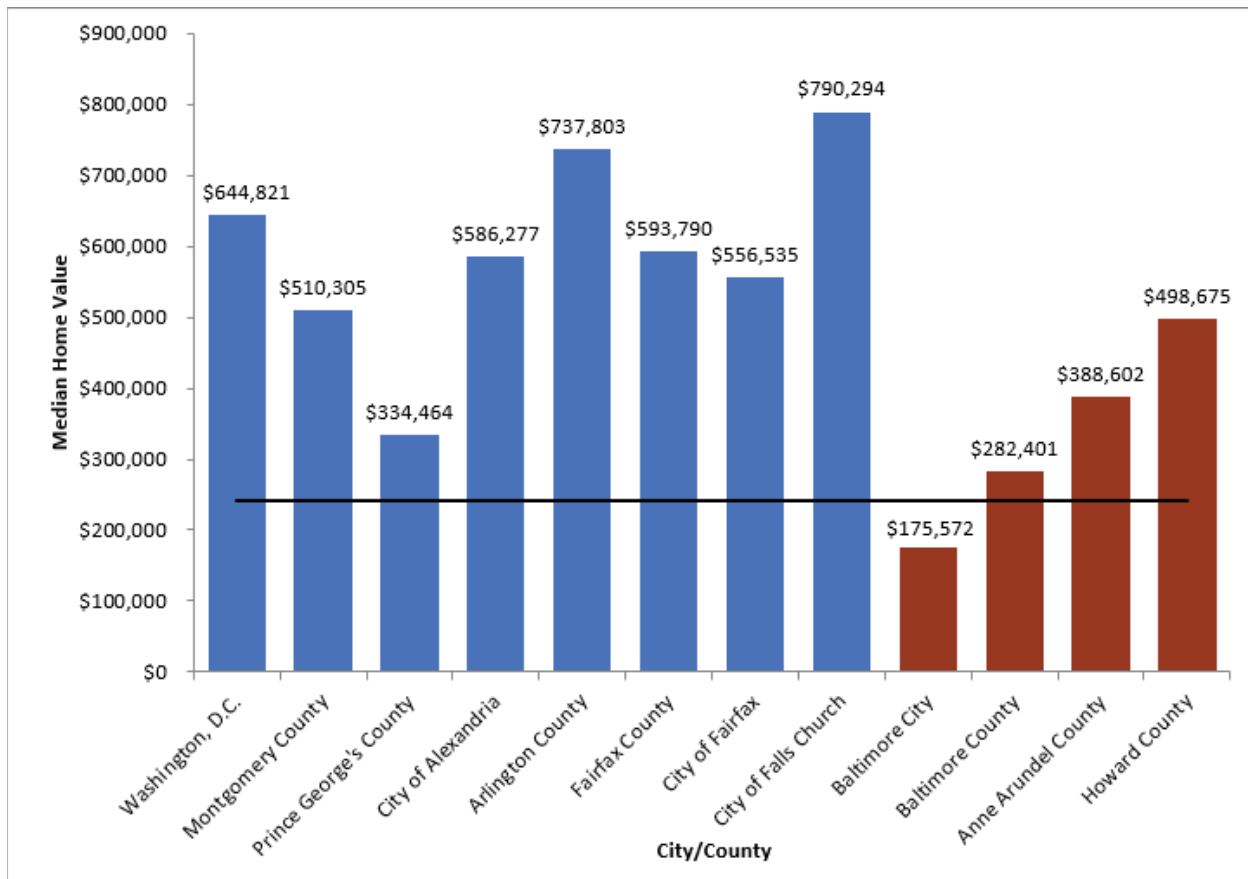
Source: US Department of Commerce Economics and Statistical Administration U.S. Census Bureau, 2012 Economic Census. https://www2.census.gov/geo/maps/econ/ec2012/csa/EC2012_330M200US548M.pdf

The SCMAGLEV Project Affected Environment, for which this analysis is focused, differs from the Project Study Area defined in the Purpose and Need as interconnections in the economy would foster economic impacts beyond the physical dimensions of the corridor.

In addition to several highways, two public transportation agencies provide service connecting Baltimore to Washington, D.C. currently. These are Amtrak and the Maryland Department of Transportation Maryland Transit Administration (MDOT MTA). These services use a different technology than SCMAGLEV and offer travelers a slower but less expensive means to travel between the two urban areas.

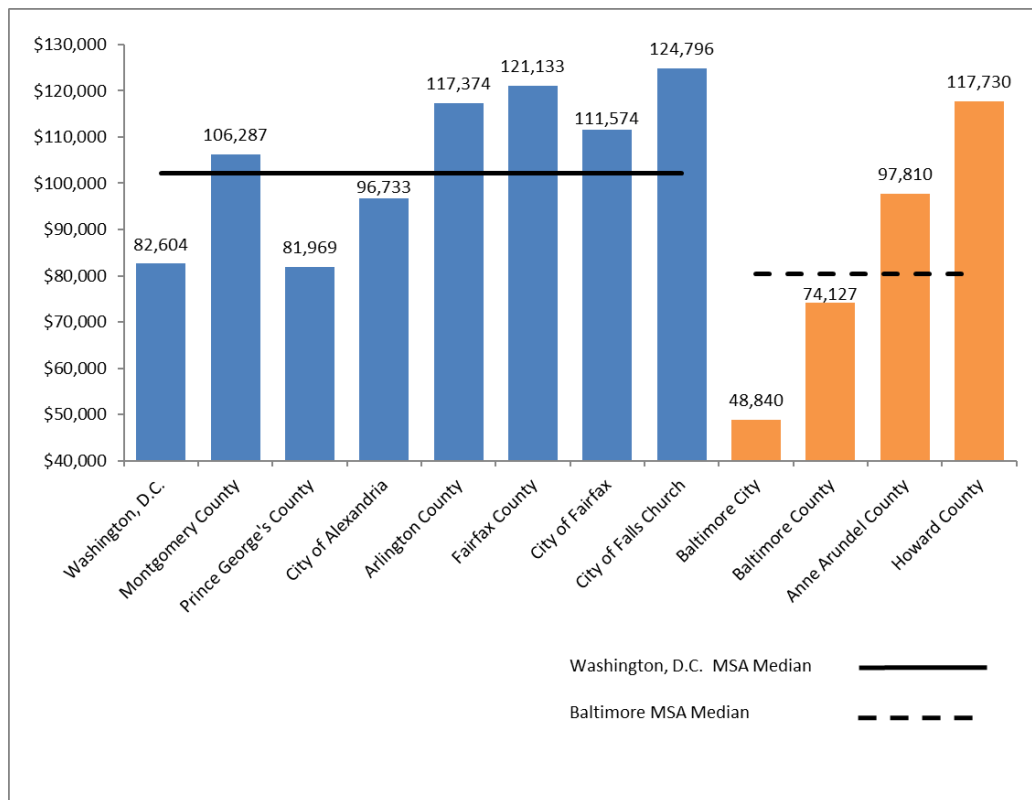
Figures 4.6-2 and 4.6-3 show the median home value and the median household income for counties in the Washington, D.C. and Baltimore metropolitan areas. Median home values and median household incomes are generally higher in the Washington, D.C. MSA compared with the Baltimore MSA. Median household income in the Washington, D.C. MSA is approximately \$102,180, while in the Baltimore MSA median household income is approximately \$80,470. Median house prices are also higher in the Washington, D.C. MSA compared with those in Baltimore MSA by as much as \$600,000 depending on the jurisdictions.

Figure 4.6-2: Median Home Value for Washington, D.C., Baltimore City and Inner Suburbs (2019, Q4)



Source: National Association of Realtors, Median Home Value, Q4, 2019

Figure 4.6-3: Median Household Income for Washington, D.C., Baltimore City and Inner Suburbs (2018)



Source: U.S. Census Bureau

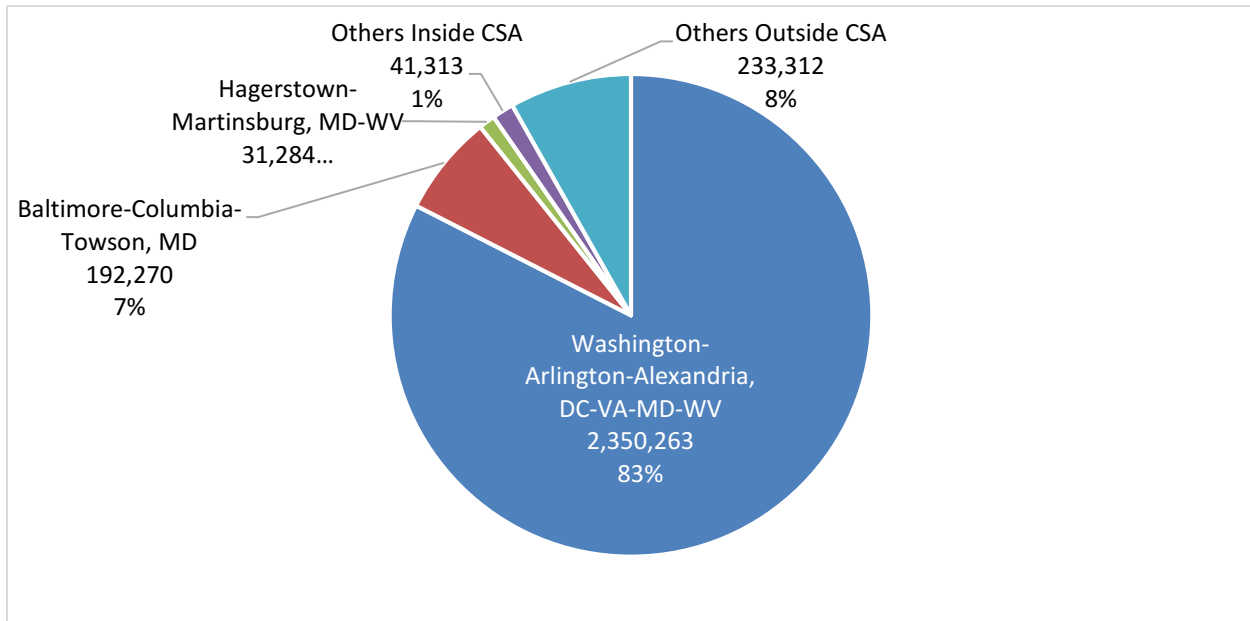
The Washington, D.C. and Baltimore metropolitan areas also differ by size in terms of job opportunities. In 2019, there were nearly 3.4 million jobs in Washington, D.C. MSA compared with nearly 1.4 million jobs in the Baltimore MSA. Comparing just the core areas that would be connected via the Build Alternatives, the District of Columbia has 798,400 jobs compared with 373,400 jobs in Baltimore City.⁴

While lower housing cost exists in the Baltimore MSA, the Washington, D.C. MSA provides generally higher wages and a larger pool of job opportunities. The different economic benefits provided by each market create incentives to live in one market and commute to the other. While the majority of each MSA's commuters live in the same MSA as they work in (83 percent in Washington, D.C. MSA and 78 percent in Baltimore MSA), a significant number of people commute between the two MSAs. Over 192,000 workers, or 7 percent of total commuters to the Washington, D.C. MSA, commute from the Baltimore MSA; and over 160,000 workers, or 13 percent of total commuters to the Baltimore MSA, commute from the Washington, D.C. MSA. These percentages provide the best estimate of the labor exchange between the two markets under the No Build Alternative and underscore the potential for greater economic integration between the

⁴ Bureau of Labor Statistics. Employment statistics shown as 2019 annual average.

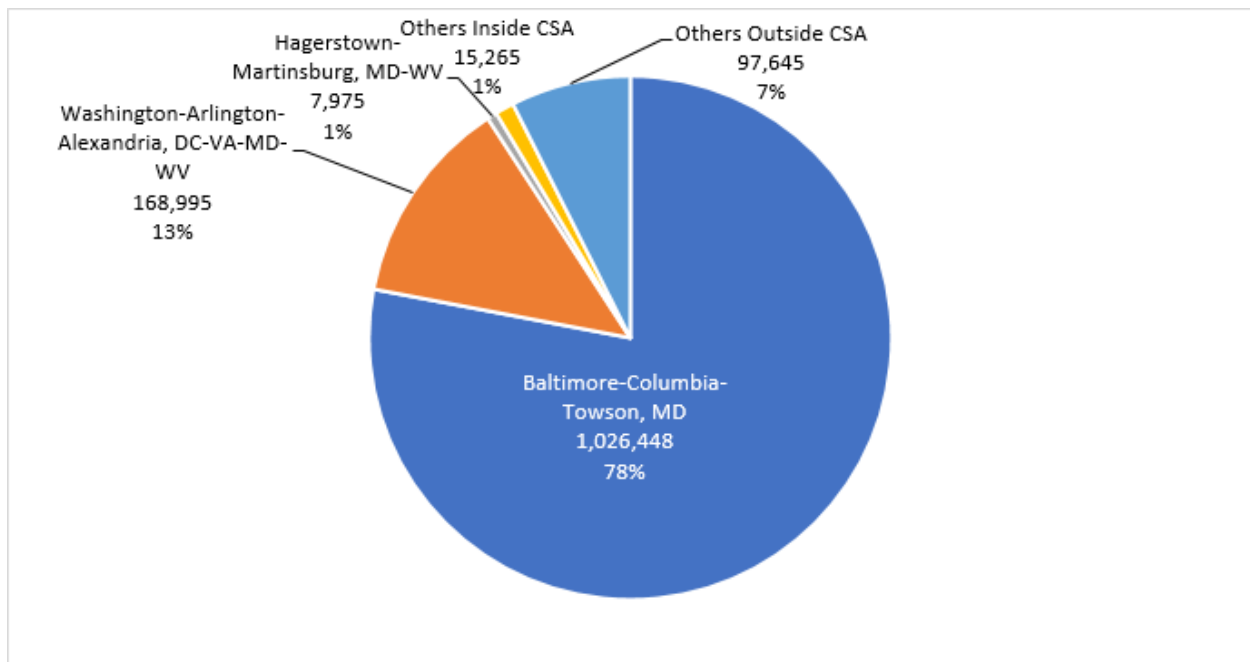
two economies if the travel time between the two were meaningfully reduced.
Figures 4.6-4 and 4.6-5 show the origin of commuters to the Washington, D.C. and Baltimore MSAs.

Figure 4.6-4: Origin of Commuters to Washington, D.C. MSA (2017)



Source: Longitudinal Employer-Household Dynamics (LEHD) database, <https://onthemap.ces.census.gov/>

Figure 4.6-5: Origin of Commuters to Baltimore MSA (2017)



Source: LEHD database, <https://onthemap.ces.census.gov/>

4.6.3 Environmental Consequences

In this section, FRA's analysis compares the environmental consequences of the SCMAGLEV Project's Build Alternatives to the No Build Alternative within the SCMAGLEV Project Affected Environment defined above for long-term impacts for opening year 2030 and future year 2045 as well as short-term impacts during Project construction. Anticipated short-term and long-term impacts to the regional economy, including direct and indirect impacts, were identified. When the analysis cannot quantify the environmental consequences, they are discussed qualitatively. FRA additionally estimates the profitability ratio associated with the SCMAGLEV Project.

Key findings include:

- Construction would have a positive impact on employment for all Build Alternative alignments and options. The Project would employ between 161,000 job-years and 195,000 job-years (i.e. one job year is one job for one person over one year) during the construction period. Additionally, the economic impacts in terms of earnings from the construction of the SCMAGLEV Project would be between \$8.8 billion and \$10.6 billion (2018 dollars).
- Temporary negative construction impacts to business revenues in the affected areas may be significant, ranging from \$18.5 million to \$311.3 million (2018 dollars). This decrease in business revenues is due to lane closures, traffic delays, and limited accessibility that would reduce the number of people frequenting the area and supporting businesses.
- The annual economic impacts from operation and maintenance of the SCMAGLEV Project for the Washington-Baltimore-Arlington CSA would result in between 390 and 440 total jobs annually, and between \$24.3 and \$27.4 million in earnings (2018 dollars) for all Build Alternatives.
- The availability of the SCMAGLEV would change the travel patterns in the CSA; travel pattern changes would take place for all Build Alternatives and might vary by Build Alternative. These changes include the net change in user benefits, increased reliability relative to other modes, increased safety, induced ridership, avoidance of congestion, pavement savings, reduced emissions as drivers divert to SCMAGLEV, and reduced revenue for publicly-provided regional commuter rail service as riders on these modes divert to SCMAGLEV. This analysis distinguishes impact results for riders traveling to Cherry Hill Station and Camden Yards Station.
- Over time, the market would respond to the availability of the SCMAGLEV service. Market responses may include: net change in property premium, negative fiscal impacts from acquisitions, increase in agglomeration economies, and positive labor market impacts.

4.6.3.1 No Build Alternative

Under the No Build Alternative, the SCMAGLEV Project would not be built. Therefore, short-term construction impacts would not occur, neither would long-term operation and maintenance impacts, nor long-term market response impacts. However, other planned and funded transportation projects will continue to be implemented in the area and have economic impacts such as construction and operation and maintenance impacts, and market responses.

4.6.3.2 Build Alternatives

FRA's analysis assumes that transportation network improvements included in the No Build Alternative are also included in the Build Alternatives. Therefore, this section focuses only on the additional incremental economic impacts attributable to the Build Alternatives (i.e., the differences between the future conditions under the No Build Alternative and the future conditions under implementation of the Build Alternatives).

Long-Term (Recurring) Operation and Maintenance Impacts, and Travel Market Impacts

Implementation of the SCMAGLEV service would support jobs and earnings as a result of ongoing O&M expenditures to run the service. Annual O&M costs align with each option's route length. The O&M estimates assume a cost per mile of a SCMAGLEV service between Washington, D.C. and Baltimore sourced from the 2005 Report to Congress - Costs and Benefits of Magnetic Levitation and inflated to 2018 dollars applying the gross domestic product (GDP) deflator.⁵ **Table 4.6-1** shows the positive O&M cost impacts for the Build Alternatives. The employment ranges from 130 to 150 jobs per year across the Build Alternatives.

The SCMAGLEV's operation generates a variety of economic impacts for travelers, competing public and private modes of transportation, and the general public. The travel market impacts summarized in **Table 4.6-2** include the net change in user benefits, greater reliability relative to other modes, increased safety, induced ridership savings, avoidance of congestion, pavement savings, reduced emissions, and revenue loss to publicly-provided commuter rail service as riders divert to SCMAGLEV.⁶

⁵ Federal Railroad Administration. Report to Congress - Costs and Benefits of Magnetic Levitation, FRA, September 2005 <https://www.fra.dot.gov/Elib/Document/1176>

⁶ The SCMAGLEV Socio-Economic Technical Memorandum, available on the project website, provides a more in-depth analysis of these monetized impacts.

Table 4.6-1: Operations and Maintenance Impacts of Build Alternatives (2018\$ million)

Build Alternatives	Employment (job years)	Earnings	Summary of Findings
J-01	130	\$24.3	Option J1-04 has the highest employment and earnings impact All Build Alternatives fall in the range of 130 jobs to 150 jobs annually, and earnings in the range of \$24.3 million to \$27.4 million annually
J-02	130	\$24.7	
J-03	130	\$24.6	
J-04	140	\$25.8	
J-05	140	\$26.2	
J-06	140	\$26.0	
J1-01	140	\$25.9	
J1-02	130	\$25.1	
J1-03	130	\$24.8	
J1-04	150	\$27.4	
J1-05	140	\$26.6	
J1-06	140	\$26.3	

Source: AECOM analysis based on information from the 2005 Report to Congress - Costs and Benefits of Magnetic Levitation.

Table 4.6-2: Summary of Potential Travel Market Impacts of the Build Alternatives (Recurring, 2018\$ million)

Environmental Outcome	Build Alternatives	2030	2045	Summary of Findings
Travel Time Savings (User Benefits, adjusted for travel costs)	J-01, J-02, J-03 J1-01, J1-02, J1-03	\$462.3	\$617.7	Build Alternatives with a station at Camden Yards would have higher user benefits than those with a station at Cherry Hill in both 2030 and 2045
	J-04, J-05, J-06 J1-04, J1-05, J1-06	\$519.7	\$696.6	
Travel Cost Savings (Penalty)	J-01, J-02, J-03 J1-01, J1-02, J1-03	\$(552.6)	\$(704.2)	All Build Alternatives are projected to incur increased travel costs. Build Alternatives with a station at Camden Yards would lead to higher travel costs than those with a station at Cherry Hill in both 2030 and 2045
	J-04, J-05, J-06 J1-04, J1-05, J1-06	\$(607.5)	\$(773.7)	
Emissions	J-01, J-02, J-03 J1-01, J1-02, J1-03	\$1.8	\$2.0	Build Alternatives with a station at Camden Yards would have higher emission savings than those with a station at Cherry Hill in both 2030 and 2045
	J-04, J-05, J-06 J1-04, J1-05, J1-06	\$2.1	\$2.3	
Safety	J-01, J-02, J-03 J1-01, J1-02, J1-03	\$75.2	\$103.7	Build Alternatives with a station at Camden Yards would have higher safety

Environmental Outcome	Build Alternatives	2030	2045	Summary of Findings
	J-04, J-05, J-06 J1-04, J1-05, J1-06	\$83.4	\$115.2	benefits than those with a station at Cherry Hill in both 2030 and 2045
Pavement	J-01, J-02, J-03 J1-01, J1-02, J1-03	\$0.4	\$0.6*	Build Alternatives with a station at Camden Yards would have higher pavement maintenance savings than those with a station at Cherry Hill in both 2030 and 2045
	J-04, J-05, J-06 J1-04, J1-05, J1-06	\$0.5	\$0.6*	
Congestion	J-01, J-02, J-03 J1-01, J1-02, J1-03	\$31.1	\$42.9	Build Alternatives with a station at Camden Yards would have higher congestion savings than those with a station at Cherry Hill in both 2030 and 2045
	J-04, J-05, J-06 J1-04, J1-05, J1-06	\$34.5	\$47.7	
Induced Ridership	J-01, J-02, J-03 J1-01, J1-02, J1-03	\$13.3	\$19.0	Build Alternatives with a station at Camden Yards would have higher induced ridership benefits than those with a station at Cherry Hill in both 2030 and 2045
	J-04, J-05, J-06 J1-04, J1-05, J1-06	\$15.3	\$22.3	
Reliability	J-01, J-02, J-03 J1-01, J1-02, J1-03	\$19.8	\$25.8	Build Alternatives with a station at Camden Yards would have higher reliability savings than those with a station at Cherry Hill in both 2030 and 2045
	J-04, J-05, J-06 J1-04, J1-05, J1-06	\$21.9	\$28.5	
Revenue Impact on Competing Public Transportation Services in the Corridor (Penalty)	J-01, J-02, J-03 J1-01, J1-02, J1-03	\$(23.2)	\$(29.1)	All Build Alternatives are projected to divert revenues given the data available; Build Alternatives with a station at Camden Yards would generate a higher public rail revenue loss than those with a station at Cherry Hill in both 2030 and 2045
	J-04, J-05, J-06 J1-04, J1-05, J1-06	\$(24.8)	\$(31.1)	

Source: AECOM analysis

Note: Pavement Savings are rounded. \$0.57 million in 2030 and \$0.63 million in 2045. Items shown in red text and parenthesis represent cost losses either as increases in costs or lost funds.

Under each Build Alternative, user benefits (which are used to calculate the travel time savings, take into consideration the travel cost estimates under the Build Alternatives) would amount to \$462.3 million in 2030 and \$617.7 million in 2045 if Cherry Hill Station is selected; or , \$519.7 million in 2030 and \$696.6 million in 2045 if Camden Yards is selected. The user benefits of a Build Alternative are based on cost and travel time of modes available under that Build Alternatives. Within these numbers, it is important to

note that SCMAGLEV riders are trading off time savings for higher travel costs. The increased travel costs borne by SCMAGLEV riders are estimated to be \$552.6 million in 2030 and \$704.2 million in 2045 if Cherry Hill Station is selected; or, \$607.5 million in 2030 and \$773.7 million in 2045 if Camden Yards Station is selected. The travel costs take into account the net change in vehicle operating costs, parking fee costs, toll fee costs, and fares for trips diverted to SCMAGLEV from auto, taxi/Transportation Network Company (TNC), bus, and commuter rail. A one-way \$60 average SCMAGLEV fare for each Washington, D.C.-Baltimore trip was applied in the analysis. SCMAGLEV riders are trading off time savings for higher travel costs, meaning, SCMAGLEV riders would pay a high fare for a fast trip.⁷ The travel time savings and travel costs are shown in **Table 4.6-2**. The underlying travel market analysis finds that SCMAGLEV travelers value their time highly; they trade the higher cost of a SCMAGLEV fare (relative to alternative modes) for the faster and more reliable trip time.⁸ The ridership report⁹ assumes that about 70.0 percent of business travelers in the defined catchment area and 67.0 percent of non-business travelers, which includes those making personal trips as well as commuters, between Baltimore and Washington, D.C. would choose the SCMAGLEV service if it were available.

The SCMAGLEV system would likely be more reliable than existing passenger rail services between Washington, D.C. and Baltimore. This is because the SCMAGLEV system operates on dedicated guideway specifically designed for SCMAGLEV operations. The existing passenger rail lines between Washington, D.C. and Baltimore operate on shared use corridors (passenger rail and freight rail) with limited capacity that affects reliability. As a new mode, passengers would need to judge the reliability of the SCMAGLEV system relative to other transportation modes to determine appropriate buffer time for their travel plans. However, based on its performance in other countries, it is anticipated that SCMAGLEV travelers would begin to reduce their buffer time. Buffer time is estimated for travelers diverted from current highway and rail transportation modes. The 2018 JR-Central annual report states that in 2017 their Maglev trains reported an average delayed time of 0.7 minutes per train in service, which is nearly zero delay.¹⁰ The value of reliability impacts from diversions by reducing the travel buffer time would be \$19.8 million in 2030 and \$25.8 million in 2045 if Cherry Hill Station is selected; or, \$21.9 million in 2030 and \$28.5 million in 2045 if Camden Yards Station is selected.

The SMAGLEV Project would also present savings related to improvements in safety. The likelihood of a crash for SCMAGLEV riders (based on the operating experience in Japan) is much lower than for auto, bus and rail. This is due in part to single operations on a dedicated guideway. Safety savings would amount to \$75.2 million in 2030 and

⁷ Louis Berger. Baltimore-Washington SCMAGLEV Ridership Supplement, December 10, 2018

⁸ SCMAGLEV Socio-Economic Technical Report, available on the project website.

⁹ Louis Berger. Baltimore-Washington SCMAGLEV Project Final Ridership Report, November 8, 2018, Page 48

¹⁰ 2018 JR-Central Annual Report. Page 18.

https://global.jr-central.co.jp/en/company/ir/annualreport/_pdf/annualreport2018.pdf

\$103.7 million in 2045 if Cherry Hill Station is selected; or, \$83.4 million in 2030 and \$115.2 million in 2045 if Camden Yards Station is selected. The likelihood of crashes and associated deaths, injuries, and property damage is reduced because SCMAGLEV is a safer mode than auto and bus.¹¹

Because there is economic value to taking a trip, the value of new trips that would not have been made but for the availability of the SCMAGLEV service is assessed. As new riders make trips, they would not have in the absence of the SCMAGLEV system, the value of induced ridership would amount to \$13.3 million in 2030 and \$19.0 million in 2045 if Cherry Hill Station is selected; or, \$15.3 million in 2030 and \$22.3 million in 2045 if Camden Yards Station is selected. Congestion savings¹² would amount to \$31.1 million in 2030 and \$42.9 million in 2045 if Cherry Hill Station is selected; or, \$34.5 million in 2030 and \$47.7 million in 2045 if Camden Yards Station is selected. These benefits accrue to travelers who remain on the roads but face less congestion as some former drivers now take SCMAGLEV. Similarly, as fewer drivers use the roads based on the ridership report estimates, pavement savings would amount to \$0.4 million in 2030 and \$0.6 million in 2045 if Cherry Hill Station is selected; or, \$0.5 million in 2030 and \$0.6 million in 2045 if Camden Yards Station is selected.

Net emissions savings would amount to \$1.8 million in 2030 and \$2.0 million in 2045 if Cherry Hill Station is selected; or, \$2.1 million in 2030 and \$2.3 million in 2045 if Camden Yards Station is selected. This calculation compares the emissions associated with production of electricity to run the SCMAGLEV and the emissions created by vehicles that are removed from corridors roads when travelers divert to SCMAGLEV. While most diverted riders switch from auto to SCMAGLEV, between 2 million to 3 million rail riders are projected to switch to SCMAGLEV, reducing traditional rail ridership and revenue. As existing rail riders divert to SCMAGLEV, rail ridership revenue impact would amount to negative \$23.2 million in 2030 and negative \$29.1 million in 2045 if Cherry Hill Station is selected; or, negative \$24.8 million in 2030 and negative \$31.1 million in 2045 if Camden Yards Station is selected. To the degree that trains in the corridor are expected to be at capacity between 2030 and 2045, these diversions free up capacity for additional travelers without making public investment to add capacity.

Long-Term (Recurring) Market Responses

There are five elements to the long-term market response: property premium¹³, fiscal impacts from acquisitions, agglomeration economies¹⁴, ability to financially sustain

¹¹ Additional details are provided in the SCMAGLEV Socio-Economic Technical Report, available on the project website.

¹² As drivers divert to SCMAGLEV, congestion is reduced for those that remain on the corridor's roads; this marginal reduction of congestion refers as congestion savings.

¹³ Property premium is the percentage of property value that property owners are willing to pay.

¹⁴ Agglomeration economies are the benefits that come when firms and people locate near one another together in cities and industrial clusters. These benefits come from transport cost savings, as well as knowledge spillovers.

SCMAGLEV operations, and labor market impacts (defined in each of the subsections below).

Property Premium

SCMAGLEV would provide the properties surrounding station access points with improved access to Washington, D.C. and Baltimore regional economy. Regional access is affected most for those areas within walking distance of a station, generally approximated as being within ½-mile radius. As many businesses and people often desire to be closer to transportation access, residents and commercial enterprises would be willing to pay a premium for locations proximate to SCMAGLEV. **Table 4.6-3** shows the property tax impacts for the Build Alternatives. Since property values along the SCMAGLEV system Build Alternatives J and J1 do not vary, each Build Alternative option is identical. Note that this analysis assumes no changes in property values in the ½-mile radius around the Baltimore-Washington International Thurgood Marshall Airport Station (BWI Marshall Airport) as it is largely surrounded by airport functions.

Table 4.6-3: Property Premium and Tax Revenue of Build Alternatives (2018\$ million)

Build Alternatives	Property Premium	Tax Revenue	Summary of Findings
J-01	\$1,127.0	\$13.7	Regardless of Build Alternatives J or J1, options 04, 05, 06 outperform options 01, 02, 03 by about the same amount. The difference between Build Alternatives J and J1 is negligible and should not affect the alternative selection decision
J-02	\$1,126.3	\$13.7	
J-03	\$1,126.3	\$13.7	
J-04	\$1,356.3	\$16.5	
J-05	\$1,355.7	\$16.5	
J-06	\$1,355.6	\$16.5	
J1-01	\$1,127.0	\$13.7	
J1-02	\$1,126.3	\$13.7	
J1-03	\$1,126.3	\$13.7	
J1-04	\$1,356.3	\$16.5	
J1-05	\$1,355.7	\$16.5	
J1-06	\$1,355.6	\$16.5	

Source: AECOM analysis

The trainset maintenance facility (TMF) would store the SCMAGLEV rolling stock (i.e. transit vehicle such as SCMAGLEV cars, as well as vehicles used to support the SCMAGLEV services) and would house round the clock operations and maintenance services. Externalities such as noise and vibrations that would be present at this facility would have a negative impact on values of surrounding properties with conflicting land uses (see Section 4.17 Noise and Vibration). All TMF locations have a few residential

E. L. Glaeser (February 2010). Agglomeration Economics. The University of Chicago Press. Accessed at <https://www.nber.org/chapters/c7977.pdf>.

developments nearby minimizing the impact on existing properties. The results from the noise and vibration chapter indicate impacts from the TMF would be minimal given the large distances between the facilities and the closest sensitive receptors. Therefore, the property premium and tax revenue impacts of the properties surrounding the TMFs would be small.

Under each Build Alternative, the total positive tax revenue impact from the property premium would range between \$13.7 million and \$16.5 million annually (see **Table 4.6-3**). Build Alternatives J-04, J-05, J-06, J1-04, J1-05, and J1-06 generate higher tax revenue than Build Alternatives J-01, J-02, J-03, J1-01, J1-02, and J1-03. Build Alternatives J-04 and J1-04 offer the highest property premium and the corresponding highest tax revenue.

There is also the potential for Transit-Oriented Development (TOD) around Cherry Hill Station (in the Westport area) and may be intensified in the Mount Vernon Square and Camden Yards Station areas, which is different from the property premium impact analysis mentioned above. TOD considers the potential for new development, while the property premium impact considers the potential for existing properties to gain value. The new SCMAGLEV stations represent new access points to the larger region transportation network, making them attractive for new or intensified development. Studies of this market response have found that the magnitude of new development varies widely with local conditions such as zoning, mix of business and non-business travelers, ability to assemble parcels, and other neighborhood amenities.^{15,16} While some of the development around the station may be new to the local economy, some of the development around the station could be simply a transfer from another location in the same market attracted by the new station's access. As an example, development that was already slated for the Brooklyn or Westport neighborhoods in Baltimore might shift to Cherry Hill if the SCMAGLEV system were constructed with a terminus there. The development would still be within Baltimore; it is simply moving to the SCMAGLEV station to take advantage of the accessibility provided by the SCMAGLEV station. The magnitude of change in TOD activity attributable to the SCMAGLEV has not been estimated as it depends on many factors beyond the scope of this assessment, such as zoning, ability to assemble land, support infrastructure, among other factors.

Fiscal and Social Impacts from Acquisitions

The SCMAGLEV Project would require some property acquisition but the expected loss in associated tax revenues is less than 0.2 percent of the entire tax base value (see

¹⁵ Center for Transit-Oriented Development, Capturing the Value of Transit, November 2008, page 10. Accessed: <http://www.reconnectingamerica.org/assets/Uploads/ctodvalcapture110508v2.pdf>

¹⁶ Baton Rouge – New Orleans Intercity Passenger Rail Summary Report, December 2010, page 8.27. Accessed: http://www.norpc.org/assets/pdf-documents/studies-and-plans/BR-NO_Pass_Rail-Vol-1_2010.pdf

Tables 4.6-4 and 4.6-5).¹⁷ The magnitude of the tax base loss is less than one year's average annual rate of growth in the tax base. This would not result in any impact to the jurisdictions' abilities to provide public resources and maintain assets.¹⁸ This impact is the same across all Build Alternatives.

**Table 4.6-4: SCMAGLEV Fiscal Acquisition Impacts for Build Alternatives J
(2018\$)**

Build Alternatives	Jurisdiction*	Property Value Impact	Negative Tax Impact	Percent of Tax Revenue (County and City)	Percent of Tax Revenue (MD only)
J-01	Anne Arundel County	\$35,649,000	\$477,000	0.062%	0.013%
	Baltimore City	\$56,563,000	\$1,201,000	0.121%	
	Baltimore County	\$11,729,000	\$142,000	0.013%	
	Prince George's County	\$21,106,000	\$127,000	0.013%	
	Washington, D.C.	\$227,601,000	\$3,568,000	0.133%	-
	Total Impact	\$352,647,000	\$5,517,000		
J-02	Anne Arundel County	\$12,915,000	\$148,000	0.019%	0.011%
	Baltimore City	\$56,563,000	\$1,201,000	0.121%	
	Baltimore County	\$11,729,000	\$142,000	0.013%	
	Prince George's County	\$69,724,000	\$127,000	0.013%	
	Washington, D.C.	\$227,601,000	\$3,568,000	0.133%	-
	Total Impact	\$378,532,000	\$5,187,000		
J-03	Anne Arundel County	\$12,915,000	\$148,000	0.019%	0.011%
	Baltimore City	\$56,563,000	\$1,201,000	0.121%	
	Baltimore County	\$11,729,000	\$142,000	0.013%	
	Prince George's County	\$35,593,000	\$129,000	0.013%	
	Washington, D.C.	\$227,601,000	\$3,568,000	0.133%	-
	Total Impact	\$344,400,000	\$5,188,000		
J-04	Anne Arundel County	\$35,649,000	\$477,000	0.062%	0.008%
	Baltimore City	\$188,012,000	\$230,000	0.023%	
	Baltimore County	\$11,728,000	\$142,000	0.013%	
	Prince George's County	\$20,731,000	\$121,000	0.012%	
	Washington, D.C.	\$227,601,000	\$3,568,000	0.133%	-
	Total Impact	\$483,721,000	\$4,538,000		

¹⁷ Depending on the Build Alternative, the number of residential (including single and multifamily), commercial, and industrial parcels impacted (temporary or permanently) would vary. Under the six options of Build Alternative J, there would be between 15 to 20 residential parcel impacted; 127 to 188 commercial parcels impacted; and 17 to 60 industrial parcels impacted. Under the six options of Build Alternative J1, there would be between 18 and 31 residential parcels impacted; 123 to 185 commercial parcels impacted; and 13 to 56 industrial parcels impacted.

Build Alternatives	Jurisdiction*	Property Value Impact	Negative Tax Impact	Percent of Tax Revenue (County and City)	Percent of Tax Revenue (MD only)
J-05	Anne Arundel County	\$12,915,000	\$148,000	0.019%	0.005%
	Baltimore City	\$188,012,000	\$230,000	0.023%	
	Baltimore County	\$11,728,000	\$142,000	0.013%	
	Prince George's County	\$69,724,000	\$127,000	0.013%	
	Washington, D.C.	\$227,601,000	\$3,568,000	0.133%	-
	Total Impact	\$509,980,000	\$4,215,000		
J-06	Anne Arundel County	\$12,915,000	\$148,000	0.019%	0.005%
	Baltimore City	\$188,012,000	\$230,000	0.023%	
	Baltimore County	\$11,728,000	\$142,000	0.013%	
	Prince George's County	\$35,593,000	\$129,000	0.013%	
	Washington, D.C.	\$227,601,000	\$3,568,000	0.133%	-
	Total Impact	\$475,848,000	\$4,216,000		

Source: AECOM analysis

Note: In Maryland, properties face county/city and state taxes, while in Washington, D.C. properties face only city taxes. Maryland county impacts include tax impacts to city within the county limits, where applicable.

Table 4.6-5: SCMAGLEV Fiscal Acquisition Impacts for Build Alternatives J1 (2018\$)

Build Alternatives	Jurisdiction*	Property Value Impact	Negative Tax Impact	Percent of Tax Revenue (County and City)	Percent of Tax Revenue (MD only)
J1-01	Anne Arundel County	\$56,835,000	\$501,000	0.065%	0.013%
	Baltimore City	\$56,563,000	\$1,201,000	0.121%	
	Baltimore County	\$11,729,000	\$142,000	0.013%	
	Prince George's County	\$15,120,000	\$56,000	0.006%	
	Washington, D.C.	\$227,601,000	\$3,568,000	0.133%	-
	Total Impact	\$367,848,000	\$5,468,000		
J1-02	Anne Arundel County	\$11,935,000	\$144,000	0.019%	0.010%
	Baltimore City	\$56,563,000	\$1,201,000	0.121%	
	Baltimore County	\$11,729,000	\$142,000	0.013%	
	Prince George's County	\$61,472,000	\$41,000	0.004%	
	Washington, D.C.	\$227,601,000	\$3,568,000	0.133%	-
	Total Impact	\$369,301,000	\$5,097,000		
J1-03	Anne Arundel County	\$11,935,000	\$144,000	0.019%	0.010%
	Baltimore City	\$56,563,000	\$1,201,000	0.121%	
	Baltimore County	\$11,729,000	\$142,000	0.013%	

Build Alternatives	Jurisdiction*	Property Value Impact	Negative Tax Impact	Percent of Tax Revenue (County and City)	Percent of Tax Revenue (MD only)
	Prince George's County	\$27,641,000	\$41,000	0.004%	
	Washington, D.C.	\$227,601,000	\$3,568,000	0.133%	-
	Total Impact	\$335,470,000	\$5,097,000		
J1-04	Anne Arundel County	\$56,835,000	\$501,000	0.065%	0.007%
	Baltimore City	\$188,012,000	\$230,000	0.023%	
	Baltimore County	\$11,728,000	\$142,000	0.013%	
	Prince George's County	\$15,120,000	\$56,000	0.006%	
	Washington, D.C.	\$227,601,000	\$3,568,000	0.133%	-
	Total Impact	\$499,296,000	\$4,497,000		
J1-05	Anne Arundel County	\$11,935,000	\$144,000	0.019%	0.004%
	Baltimore City	\$188,012,000	\$230,000	0.023%	
	Baltimore County	\$11,728,000	\$142,000	0.013%	
	Prince George's County	\$61,472,000	\$41,000	0.004%	
	Washington, D.C.	\$227,601,000	\$3,568,000	0.133%	-
	Total Impact	\$500,749,000	\$4,125,000		
J1-06	Anne Arundel County	\$11,935,000	\$144,000	0.019%	0.004%
	Baltimore City	\$188,012,000	\$230,000	0.023%	
	Baltimore County	\$11,728,000	\$142,000	0.013%	
	Prince George's County	\$27,641,000	\$41,000	0.004%	
	Washington, D.C.	\$227,601,000	\$3,568,000	0.133%	-
	Total Impact	\$466,918,000	\$4,125,000		

Source: AECOM analysis

Note: In Maryland, properties face county/city and state taxes, while in Washington, D.C. properties face only city taxes. Maryland county impacts include tax impacts to city within the county limits, where applicable.

If Federal funding is used or the government's power of eminent domain is used to overcome involuntary acquisitions, the right-of-way (ROW) acquisition and relocation assistance program would be conducted in accordance with the Uniform Relocation Assistance and Real Properties Acquisition Policies Act of 1970, as amended (42 USC § 4601 et seq.), commonly known as the Uniform Relocation Act. This act identifies the process, procedures, and timeframe for ROW acquisition and relocation of affected residents or businesses. The requirements of the Uniform Relocation Act apply whenever a project uses Federal dollars in any phase of a project. In addition, the states receiving Federal-aid funding from the Highway Trust Fund are required to maintain (updated every five years) a manual outlining their ROW policies and procedures as outlined in Title 23 CFR.

Although SCMAGLEV would be owned and operated by a private entity, and thus taxed, the tax base loss analysis was completed as there are several uncertainties concerning its taxation. In November 2015, the Project Sponsor, Baltimore-Washington Rapid Rail/The Northeast Maglev (BWRR/TNEM),¹⁹ received a railroad franchise by the Maryland Public Service Commission.²⁰ The franchise tax in Maryland is typically calculated on a percentage of the revenues derived from sales of the utility company to customers in the service area or territory. The franchise tax is applied to public service companies²¹ such as gas, electric, and telephone for the privilege of doing business in Maryland. The franchise tax is calculated in part as a percentage (2 percent) of the gross receipts derived from businesses in Maryland.²² Since Washington, D.C. does not currently have laws that describe how the Project Sponsor would be taxed, the analysis does not include the tax revenue that jurisdictions would receive from the SCMAGLEV.

There are also social impacts from the acquisitions. Residents may require relocation to accommodate the Project. There have been 2,597 listings (single-family and townhomes) in Baltimore City over 24 months ending in July 21, 2020. In the District, the active listings was 803 over the 24 months ending in July 21, 2020.²³ Forecasts are not publicly available. Private property owners could be compensated at market value for land and would be eligible for additional benefits.

As for renters, the Department of Housing and Urban Development (HUD) considers anything under a 6 percent rental vacancy rate as a “tight” rental market (i.e., replacement rental housing may be difficult to locate). The overall rental vacancy rate, which includes single-family homes and apartments, in Washington, D.C. and Baltimore City were 7.5 percent and 13.5 percent respectively.²⁴

The three largest real estate research firms that monitor the Baltimore MSA market, REIS, the United States Commercial Real Estate Services (CBRE), and Costar Group, Inc, project that overall multifamily vacancies will range between 4 percent and 7 percent between 2020 and 2022.²⁵ By contrast, in the Washington, D.C. MSA multifamily market, the vacancy rate is expected to range between 4 percent and 6

¹⁹ The Project Sponsor, BWRR/TNEM, is registered as a Domestic LLC, with Business Code 20 (Entities Other Than Corporations). Accessed: <https://www.marylandtaxes.gov/business/income/tax-information.php>

²⁰ “Baltimore Washington Rapid Rail and The Northeast Maglev Announce Approval of Railroad Franchise Request by the Maryland Public Service Commission” announcement, November 17, 2015. Accessed: <https://bwrail.com/wp-content/uploads/2017/01/20151117-TNEM-BWRR-Baltimore-Washington-Rapid-Rail-and-The-Northeast-Maglev-Announce-Approval-of-Railroad-Franchise-Request-by-the-Maryland-Public-Service-Commission.pdf>

²¹ A “public service company” is an entity engaged in telephone business in the State or engaged in the transmission, distribution, or delivery of electricity or gas in Maryland. Maryland Code Tax-General §8-401-417.

²² State of Maryland, Public Utility Valuation and Franchise Tax Unit. Accessed <https://dat.maryland.gov/businesses/Pages/franchise-and-public-utilities.aspx>

²³ Zillow Homes. researched July 21, 2020. <https://www.zillow.com/homes/>

²⁴ HUD Comprehensive Housing Market Analysis. Washington, D.C. vacancy rate was reported on July 1, 2018; Baltimore City vacancy rate was reported on June 1, 2018.

²⁵ Multifamily Metro Outlook: Baltimore Winter 2019. Fannie Mae 2018. 2022 projection was the latest number reported.

percent over the period between 2020 and 2022, and 4 percent to 7 percent between 2020 and 2023.²⁶ In the year of 2019, there were 4,963 and 1,994 multifamily housing opportunities created in Washington, D.C. and Baltimore City respectively, with 13,900 and 5,373 respectively under construction and more planned over the next three years,²⁷ all looking to accommodate perspective residents in the area.

While residential relocations are sensitive because they may alter households' school and commute patterns, FRA also anticipates commercial acquisitions as a result of the SCMAGLEV Project (see Section 4.3 Land Use and Zoning). None of the acquisitions along the SCMAGLEV alignments are sufficiently unique in its commercial activity that the business could not find comparable building, resource, and transportation access elsewhere in the same jurisdiction. Both the Washington, D.C. MSA and Baltimore MSA markets have active retail, office, and warehouse sectors and could readily accommodate the change in commercial address.

Agglomeration Economies

Agglomeration impacts occur when the concentration of firms and employees facilitates the exchange of ideas and knowledge in the host market, fostering growth and productivity. To the degree that the SCMAGLEV reduces the effective distance between knowledge industries, the potential for agglomeration economies occurs. The economic connections between Washington, D.C. and Baltimore City would intensify, allowing the two metropolitan economies to increasingly compete in the global economy with a larger footprint.

The economy of Washington, D.C. is dominated by professional and technical services and membership associations and organizations categories, which collectively make up 186,000 jobs, or a quarter of all jobs in the city. The Washington, D.C. inner suburbs concentrate mainly on professional and technical services (20.6 percent of total workforce). Once a predominantly industrial town, Baltimore now focuses on providing services. The economy of Baltimore is dominated by educational services and hospitals categories, which make up nearly 30 percent (i.e., 95,000 employees) of all jobs in the city. The inner suburbs concentrate on professional and technical services, food services and drinking places, and administrative and support services, accounting for more than 205,000 employees (i.e., 27.1 percent of the labor force)²⁸ (see Appendix D.4). It is unclear how the SCMAGLEV Project would change or shift the job markets in the Washington, D.C. and Baltimore economies. However, the Project is anticipated to have an overall positive impact on job growth in the region.

As each Build Alternative has the same travel time and trip cost, the potential for agglomeration economies and productivity impacts is positive and equal across all Build

²⁶ Multifamily Metro Outlook: Washington Spring 2019. Fannie Mae 2019.

²⁷ Trends in the Mid-Atlantic Multifamily Market. CBRE 2020

²⁸ U.S. Bureau of Labor Statistics. Employment statistics. Accessed at <https://www.bls.gov/cew/downloadable-data-files.htm>

Alternatives. Agglomeration economies are a beneficial impact; they support the productivity of an economy's firms and thus the region's economic competitiveness. As described by Dr. Larry Summers (Harvard economist and former Chief Economist of the World Bank and former director of the National Economic Council) in the 2017 Brookings Institution symposium, "Infrastructure permits, in substantial part, larger interchange and reduces impactive distances, thereby facilitating trade and agglomeration, ... in a world where private capital, private companies and ideas are increasingly mobile, a nation's infrastructure is "distinctively local and distinctively defining of its strength."²⁹

The impact of telecommuting on agglomeration varies, depending on whether workers telecommute 100 percent of the time or split their time between work and telecommuting. If employees work from home 100 percent of the time, this diminishes the potential for agglomeration economies given the current urban structure. If the urban structure evolves over time such that telecommuting households who no longer incur commuting costs move to the urban center as they can afford a higher cost home (and work) location, the potential for agglomeration may increase as home-based workers meet for informal social and business gatherings where ideas can be exchanged. By contrast, if employees work from home two to three days a week and travel to an office location for the balance of their time, telecommuting may support agglomeration economies as it eases congestion and thereby facilitates the movement of people within the metropolitan area and the associated exchange of ideas and opportunities—supporting trade and agglomeration as outlined in the 2017 Brookings remarks cited.

Labor Market Impacts

The Washington, D.C. and Baltimore metropolitan areas also differ by size in terms of job opportunities. There are nearly 3.4 million jobs in Washington, D.C. MSA compared with nearly 1.4 million jobs in the Baltimore MSA. Comparing just the core areas that would be connected via the Build Alternatives, the District of Columbia has 798,400 jobs compared with 373,400 jobs in Baltimore City.³⁰

Labor market impacts occur when travel improvements increase the number of job opportunities available to workers and workers available to firms. When this occurs, firms and workers are able to select jobs and employees that more closely match the exact job requirements or worker skills than they might in a small market with more limited options. Given the projected travel times associated with the Build Alternatives,

²⁹ Anna Malinovskaya and David Wessel. "Larry Summers v. Edward Glaeser: Two Harvard economists debate increased infrastructure investments," Wednesday, January 18, 2017. Accessed August 6, 2019 <https://www.brookings.edu/blog/up-front/2017/01/18/larry-summers-v-edward-glaeser-two-harvard-economists-debate-increased-infrastructure-investments/>

³⁰ Bureau of Labor Statistics. Employment statistics shown as 2019 annual average. Accessed at <https://www.bls.gov/cew/downloadable-data-files.htm>.

the range of opportunities within a 30-minute travel shed to 45-minute travel shed would increase substantially for many workers.

While the number of job opportunities would increase, the labor market impact is two-fold. Some workers would find jobs and transition from unemployment to employment. Some workers would find better jobs than they have currently as they now face a large selection of job opportunities. In this instance, underemployed workers would find jobs that better fit their skills with an associated increase in labor productivity and earnings. Both impacts are positive and would not require mitigation.

Substantial commuting linkages exist within the Washington-Baltimore-Arlington CSA as described in the SCMAGLEV Project Affected Environment section. The Washington, D.C. MSA and Baltimore MSA are the two largest employment centers in the CSA, attracting a substantial portion of the labor force from adjacent metropolitan and micropolitan statistical areas. However, the largest commuting flows in the CSA occur between the Washington, D.C. MSA and Baltimore MSA.

As each Build Alternative has the same travel time and cost, each Build Alternative has the same propensity to foster labor market impacts. Because trips would be faster and more reliable, it is anticipated that there would be greater commuting between the two markets under each of the Build Alternatives.

The expected average fare for SCMAGLEV would be \$60 per one-way trip; however it could vary between \$27 and \$80³¹ per trip suggesting that higher income workers would be the most likely to use SCMAGLEV for commuting. Workers that do not commute to the office 5 days a week, but rather telecommute due to congestion and travel time could also be potential users of the service. With telecommuting approved for a growing share of Washington, D.C. employers, such policies would reduce the fare's impact on household commute budgets and make SCMAGLEV an option for more commuters.³² Those who telecommute may select SCMAGLEV as their main means of transportation when they have to go to the office as it would be faster and more reliable than other public transportation options.

There is a significant spread in travel costs per mile in the Washington, D.C.- Baltimore corridor. At the lowest cost, a MARC trip costs 19 cents per mile and takes just over an hour. At the highest cost of modes active in the corridor, an Acela trip costs \$1.30 per mile or seven times the cost of a MARC trip. The higher cost saves the travelers about 30 minutes—the Acela trip takes just 32 minutes. Travelers deciding among the various

³¹ One-way fare value would vary by trip length and other variables. Source: WSP. Baltimore-Washington SCMAGLEV Project Ridership Data Request, #6, 7, 18, 19, 20, 21, 22 and 23, May 6, 2020.

³² In the Washington, D.C. MSA, telework continues a steady upward trend observed since 2007, with more than one million regional teleworkers in 2019. Source: CommuterConnections. "2019 State of the Commute Report from the Metropolitan Washington Region." June 2020. Accessed: <https://www.mwcog.org/file.aspx?D=%2b0qv8i2f8F2l1MILGLYfWp1CaYuFIZ5rwb5Ug4gcoTQ%3d&A=%2bkljc%2fnlQigtav9hkV%2b7cN%2fnZ1nVfMkbtPLYAPGMWU%3d>

modes operating in the current Washington, D.C.- Baltimore corridor regularly trade off time for travel cost where the range between the lowest and highest cost is large—the top cost is approximately seven times the lowest fare.

Understanding the estimated average SCMAGLEV fare, the monthly travel cost would be very high for commuting five days a week by SCMAGLEV. However, with the greater prevalence of people working from home, many travelers will select going into the office fewer times per day, reducing the amount of household budget absorbed by commuting.

Short-Term (Temporary) Construction Impacts

Construction of the SCMAGLEV Project would support the local economy through the hiring of personnel, renting or purchasing equipment, and procurement of materials for the duration of the construction period, affecting the local labor and manufacturing markets. **Tables 4.6-6** and **4.6-7** show the construction and professional services impacts for the Build Alternatives. Professional services include architectural engineering, project management, and planning services.

Total construction employment³³ impacts across Build Alternatives would range between 161,000 job-years and 195,000 job-years (i.e. one job year is one job for one person over one year). Construction earnings for Build Alternatives would range between \$8.8 billion and \$10.6 billion. Average annual direct jobs per year, limited only to the construction industry, range between over 8,700 to over 10,560, representing between 2.7 percent and 3.3 percent of the CSA's construction³⁴ employment. This is not enough to cause inflationary pressures in the market. If there are other large infrastructure projects planned for the same time horizon, the region could see increased construction costs or difficulty finding workers. Build Alternatives J1-04 generates the largest employment and earnings impacts, an estimated additional 10,560 direct construction jobs per year during the construction period. These impacts are directly tied to the cost; the greater the cost, the larger the employment impact.

Short-Term (Temporary) Travel and Business Community Impacts from Construction

There are impacts associated with construction in cities that affect the life of the surrounding communities and beyond. These impacts are also known as social costs.³⁵ These costs refer to the monetary equivalent of consumed resources, loss of income

³³ Inclusive of the construction and professional services industries.

³⁴ 2018 ACS 5-yr estimate for total construction employment for the CSA.

³⁵ Tolga Celik, Saeed Kamali, and Yusuf Arayici. 2017. "Social Cost in Construction Projects." *Environmental Impact Assessment Review*, Volume 64, May 2017, pages 77-86.

<https://www.sciencedirect.com/science/article/abs/pii/S0195925516303419>

and loss of enjoyment experienced by parties not engaged in the construction contractual agreement.³⁶

The SCMAGLEV's construction will cause travel disruptions as street lanes and sidewalks are closed, as parking space is reduced, as commercial establishments become less visible from the street, and as noise and dust levels in the vicinity of the building activity rise. There are two main types of construction impacts, defined by the groups who are most directly affected—traveler impacts and business community impacts.

³⁶ Andrew Gilchrist, and Erez N. Allouche. 2005. "Quantification of social costs associated with construction projects: state-of-the-art review." *Tunneling and Underground Space Technology*, Volume 20, Issue 1, January 2005, pages 89-104. <https://www.sciencedirect.com/science/article/abs/pii/S088677980400286X>

Table 4.6-6: Construction and Professional Services Impacts in Terms of Job-Years

Build Alternatives	Construction Cost (\$ million)	Construction Employment Multiplier (job years/\$ million)	Construction Jobs (job years)	Professional Services Costs (\$ million)	Professional Services Employment Multiplier (job years/\$ million)	Professional Services Jobs (job years)	Total Jobs (job years)
J-01	\$10,950	11.5781	127,000	\$3,280	11.9746	39,000	166,000
J-02	\$10,640		123,000	\$3,190		38,000	161,000
J-03	\$10,640		123,000	\$3,190		38,000	161,000
J-04	\$12,370		143,000	\$3,710		44,000	187,000
J-05	\$12,060		140,000	\$3,620		43,000	183,000
J-06	\$12,060		140,000	\$3,620		43,000	183,000
J1-01	\$11,480	11.5781	133,000	\$3,440	11.9746	41,000	174,000
J1-02	\$11,170		129,000	\$3,350		40,000	169,000
J1-03	\$11,170		129,000	\$3,350		40,000	169,000
J1-04	\$12,900		149,000	\$3,870		46,000	195,000
J1-05	\$12,590		146,000	\$3,780		45,000	191,000
J1-06	\$12,590		146,000	\$3,780		45,000	191,000

Source: AECOM analysis 2020; 2018 RIMS Type II multiplier

Note: Costs and impacts rounded. Employment impacts include construction and professional services costs.

Table 4.6-7: Construction and Professional Services Impacts in Terms of Earnings (2018\$ million)

Build Alternatives	Construction Cost (\$ million)	Construction Earnings Multiplier (earnings/\$ million cost)	Construction Earnings (\$ million)	Professional Services Costs (\$ million)	Professional Services Earnings Multiplier (earnings/\$ million cost)	Professional Services Earnings (\$ million)	Total Earnings (\$ million)
J-01	\$10,950	0.605	\$6,620	\$3,280	0.7435	\$2,440	\$9,060
J-02	\$10,640		\$6,440	\$3,190		\$2,370	\$8,810
J-03	\$10,640		\$6,440	\$3,190		\$2,370	\$8,810
J-04	\$12,370		\$7,480	\$3,710		\$2,760	\$10,240
J-05	\$12,060		\$7,300	\$3,620		\$2,690	\$9,990
J-06	\$12,060		\$7,300	\$3,620		\$2,690	\$9,990
J1-01	\$11,480	0.605	\$6,950	\$3,440	0.7435	\$2,560	\$9,510
J1-02	\$11,170		\$6,760	\$3,350		\$2,490	\$9,250
J1-03	\$11,170		\$6,760	\$3,350		\$2,490	\$9,250
J1-04	\$12,900		\$7,810	\$3,870		\$2,880	\$10,680
J1-05	\$12,590		\$7,620	\$3,780		\$2,810	\$10,430
J1-06	\$12,590		\$7,620	\$3,780		\$2,810	\$10,430

Source: AECOM analysis 2020; 2018 RIMS Type II multiplier

Note: Costs and impacts rounded. Earnings impacts include construction and professional services costs.

Traveler Impacts. These are measured in terms of the travel delay cost and loss of reliability experienced by travelers in the corridor as they wait in queues or take detours because available travel lanes and sidewalks are reduced or closed to accommodate construction.³⁷

Business Community Impacts. These are measured in terms of lost sales and/or closures as travelers avoid the area to avoid the travel snarls and difficulty accessing businesses in close proximity to the construction activity. Some businesses may need to re-schedule deliveries if construction activity makes it difficult for trucks to access the facility. For complementary discussion on community impacts, please see Section 4.4 Neighborhoods and Community Resources.

In short, the economic impacts of infrastructure construction and repair projects must consider not only commuters and residents, but also businesses' level of economic activity.³⁸

There is limited literature and no standard methodology that focuses on quantifying the social costs associated with the impacts that results from construction.^{39, 40} For the SCMAGLEV Project, FRA forecasted that during the construction period, the main intersections around the proposed stations⁴¹ would face similar or worse levels of service (i.e. higher seconds of delay per vehicle) than under the No Build Alternative. Around Mount Vernon Square Station, FRA estimated that vehicles could be delayed up to 12 minutes in one intersection due to construction activity for the SCMAGLEV Project. At Camden Yards Station and Cherry Hill Station, delays at intersections could be up to 5 minutes and 4 minutes per vehicle, respectively. These estimated delays would have an impact on commuters and residents by increasing travel times and commutes (see Section 4.2 Transportation).

Additionally, FRA estimated quantitatively the social impacts within a ¼-mile radius of the proposed stations and TMFs associated with construction activities linked to businesses revenue loss.⁴²

³⁷ Social costs take many forms including increased time and travel distance, reduced reliability, noise inconvenience, accelerated deterioration of secondary roads, increased pollutants from idling cars, increased vehicle operating cost, reduced accessibility, increased safety concerns; and under extreme circumstances residents' relocations.

³⁸ Diane Marie Dube. 2013-2014. "Prepare, Survive, and Thrive: A Lawyer's Guide to Advising Business Clients Facing Construction Disruption." 22 J. Affordable Housing & Community Development Law 345.
<https://heinonline.org/HOL/LandingPage?handle=hein.journals/jrlaff22&div=28&id=&page=>

³⁹ Wen-Der Yu, and Shao-Sgun Lo. 2007. "Time-dependent construction social costs model." Construction Management and Economics, 23:3, pages 327-337.
<https://www.tandfonline.com/doi/abs/10.1080/01446190500040281>

⁴⁰ Amir Ibrahim, Omar El-Anwar, and Mohamed Marzouk. 2018. "Socioeconomic impact assessment of highly dense-urban construction projects." Automation in Construction, Volume 92, August 2018, pages 230-241
<https://www.sciencedirect.com/science/article/abs/pii/S0926580516304514>

⁴¹ Travel impacts at BWI Marshall Airport were not estimated.

⁴² Business revenue losses at BWI Marshall Airport due to construction are assumed to be negligible and are therefore not quantitatively estimated.

The potential impacts on business revenues by the North American Industry Classification System (NAICS) code,⁴³ station and TMF are shown in **Table 4.6-8** for the low and high estimates, respectively, deflated to 2018 dollars. These results are on an annual basis and assume the businesses would experience similar revenues to the 2019 revenues in the future. Notably, these impacts on revenues in the affected areas may be canceled out by increased sales outside of the affected area, resulting in no net change to the region in terms of jobs, GDP, and tax revenues. However, the impact on the affected areas may be significant and long-term particularly in the cases of businesses that operate on large volumes and low margins. For some of this type of business, the loss of revenue during construction may result in permanent closure.

Table 4.6-8: Low and High Estimates of Annual Revenue Loss Impact by NAICS
Code and Station/TMF, thousands of 2018 dollars

NAICS	Percentage Applied	Station			TMF		
		Camden Yards	Cherry Hill	Mount Vernon Square	MD 198	BARC West	BARC Airstrip
Low Estimate of Annual Revenue							
44-45	2%	\$420	\$1,430	\$1,790	\$260	NA	NA
71	4%	\$1,910	\$0	\$1,180	\$0		
72	7%	\$5,300	\$130	\$14,010	\$130		
TOTAL		\$7,630	\$1,560	\$16,980	\$390	--	--
High Estimate of Annual Revenue							
44-45	50%	\$35,050	\$35,730	\$44,570	\$6,450	NA	NA
71	40%	\$19,110	\$0	\$11,800	\$0		
72	70%	\$53,000	\$1,280	\$140,090	\$1,320		
TOTAL		\$107,160	\$37,010	\$196,460	\$7,770	--	--

Source: AECOM analysis

Note: NAICS codes are Retail Trade (44 and 45), Arts, Entertainment, and Recreation, (71) and Accommodations and Food Services (72).

⁴³ The North American Industry Classification System is the standard used by Federal statistical agencies in classifying business establishments for the purpose of collecting, analyzing, and publishing statistical data related to the U.S. business economy. NAICS divides the economy into 20 sectors ranging from Sector 11: Agriculture, Forestry, Fishing and Hunting, to Sector 92: Public Administration. Within each sector are subsectors and industries that are grouped into production-oriented classifications. As an example, Sector 72: Accommodation and Food Services contains Subsector 721: Accommodation, and Subsector 722: Food Services and Drinking Places.

The businesses that would be most impacted by construction are assumed to fall into four NAICS codes, including Retail Trade (44 and 45), Arts, Entertainment, and Recreation (71) and Accommodations and Food Services (72). These industries are believed to be most impacted because the ability to make comparable transactions—purchase groceries or a coffee for example—elsewhere in the community is greatest.

The construction impact on business revenue losses around Mount Vernon Square Station would range between \$17 million and \$196 million per year. The accommodation and food services industry accounts for 70-80 percent of the construction impact. This is due the proximity to a large number of restaurants and other retail in the central business district of Washington, D.C. Near the Mount Vernon Square Station, the FRA identified 226 businesses with the potential to be impacted from construction.⁴⁴

At Camden Yards Station, the business revenue losses ranges from nearly \$8 million to \$107 million per year for the 181 potentially impacted businesses.⁴⁵ The accommodation and food services industry accounts for 50-70 percent of the impacts around the Camden Yards Station. The revenue losses around Cherry Hill Station range between \$2 million and \$37 million per year due to a lower concentration of retail activities in the immediate station area; FRA identified only nine businesses in the station area with the potential to be affected during construction with one retail business contributing nearly 90 percent of the impact.⁴⁶

The impacts of construction on the TMF located at MD 198 would result in a loss of business revenues of \$390,000 to \$8 million per year. There are five businesses with the potential to be impacted from construction near the MD 198 TMF.⁴⁷ There are no businesses in the four NAICS categories within a quarter of a mile radius buffer of the TMF BARC West, and no businesses at all within the quarter of a mile radius buffer of the TMF BARC Airstrip. Therefore, there would be no construction impacts on business revenues around TMF BARC West and TMF BARC Airstrip locations.

⁴⁴ At Mount Vernon Square Station, there would be 68 Retail Trade (NAICS 44 and 45), 27 Arts, Entertainment, and Recreation (71), and 131 Accommodations and Food Services (NAICS 72) businesses potentially impacted in the station area.

⁴⁵ At Camden Yards Station, there would be 69 Retail Trade (NAICS 44 and 45), 18 Arts, Entertainment, and Recreation (NAICS 71), and 94 Accommodations and Food Services (NAICS 72) businesses potentially impacted in the station area.

⁴⁶ At Cherry Hill Station, there are four Retail Trade (NAICS 44 and 45), one Arts, Entertainment, and Recreation (NAICS 71), and four Accommodations and Food Services (NAICS 72) businesses potentially impacted in the station area.

⁴⁷ At MD 198 TMF, there would be three Retail Trade (NAICS 44 and 45), zero Arts, Entertainment, and Recreation (NAICS 71), and two Accommodations and Food Services (NAICS 72) businesses potentially impacted in the TMF area.

4.6.4 Potential Mitigation Strategies

4.6.4.1 Short-Term Operational Strategies

Construction Impacts

Construction would have temporary impacts on commercial and industrial businesses, particularly those near or adjacent to construction sites. Sidewalk space might be taken temporarily for station and alignment construction, thereby reducing business access. Business impacts could include reduced visibility of commercial signs and businesses. These construction impacts could in turn produce minor economic impacts to commercial establishments.

There are a number of minimization strategies and mitigation measures the Project Sponsor would undertake to temper these impacts. Some of the strategies include:

- Coordinate with individual businesses to identify business usage, delivery, and shipping patterns, as well as critical times of the day or year for business activities to aid in developing Worksite Traffic Control Plans and to ensure that critical business activities are not disrupted.
- Develop, fund, and maintain a telephone hotline during construction and one or more SCMAGLEV Field Offices with staff to address community issues and concerns as they arise. Office could be open from 9am-5pm weekdays and any weekends when work occurs. Schedule to be developed prior to construction. The office would provide a physical location where information pertaining to construction can be exchanged. Ensure that all potentially affected persons know the name and telephone number(s) of public affairs staff that they can contact if needed.
- Participate in local events to promote awareness of the SCMAGLEV Project.
- Notify property owners, businesses, and residences of major construction activities (e.g., utility relocation/disruption and milestones; re-routing of delivery trucks).
- Provide literature to public and news media, schedule promotional displays, participate in community committees, and make presentations, as needed, about the SCMAGLEV Project.
- Coordinate business outreach programs and implement promotions for businesses most affected by the construction.
- Whenever possible, develop detours for any road or sidewalks to be closed during construction. Post signs (in appropriate languages) alerting pedestrians, bicycles, and vehicles of road and sidewalk closures and detours. Ensure pedestrian detours are accessible to seniors and disabled persons. Develop Worksite Traffic Control Plans in conjunction with the county and municipal departments of transportation to accommodate automobile and pedestrian traffic.

- Maintain access to community facilities affected by construction activities.
- Provide early notification to emergency service providers of any road closures or detours.
- Develop a community outreach plan to notify local communities of construction schedules, road and sidewalk closures, and detours. Coordinate with local communities during preparation of traffic management plans to minimize potential construction impacts to community resources and special events. Consider limiting construction activities during special events.
- Develop a construction mitigation plan with community input to address construction impacts. Determine truck hauling routes and schedules that would minimize impacts on sensitive uses in all parts of the SCMAGLEV Project area.
- Engage with businesses in the Project Study Area, particularly when developing the construction phasing schedules, to ensure accessibility for customers and suppliers in order to reduce revenue losses.
- During construction, provide temporary replacement or shared parking as needed to absorb the loss of parking due to acquisitions. Temporary parking could be added by constructing surface lots on nearby vacant parcel or restriping nearby streets to allow diagonal curb parking.
- Erect barriers and provide security personnel during construction to minimize trespassing and vandalism. Barriers could be enhanced with artwork and attractive design features where possible.
- Forewarn the public of any anticipated road closures or detours due to construction activity.

Additionally, since the SCMAGLEV Project would have the potential to affect construction employment in the region, a thoughtful procurement process and construction schedule needs to be prepared. In the case that there are other ongoing regional projects, the SCMAGLEV Project could be scheduled after coordination with those projects.

Right-of-Way Acquisition Impacts

Relocation resources would be available to all residential and business relocations without discrimination. If the Project is funded with Federal dollars, the Uniform Relocation Act requires that all replacement housing would be decent, safe, and sanitary.⁴⁸ Funded by the Department of Housing and Urban Development (HUD), advisory service, payment for moving expenses and replacement housing assistance will be provided to eligible personnel, for both residents and businesses.

⁴⁸ U.S. Department of Housing and Urban Development, Office of Community Planning and Development. "Relocation Assistance to Tenants Displaced from Their Homes". <https://www.hud.gov/sites/documents/tenadisp.pdf>

Both the Washington, D.C. and Baltimore single-family (detached, attached and condo) housing markets are robust; the historical performance of the housing market suggests that the mix of new and existing homes on the market would allow homeowners to find a replacement dwelling in the same MSA. A key consideration for residential mitigation is providing homeowners who may want to stay in their same neighborhood/school district sufficient time to find a suitable listing within this narrower search area. For those willing to change neighborhoods, multiple options are expected to be available based on the market's recent history. Private residential property owners could be compensated at market value for land to be acquired by the Project and would be eligible for additional benefits.⁴⁹ As discussed in the fiscal and social impact section, overall, the Washington, D.C. and Baltimore rental markets do not qualify as "tight" rental markets under the HUD thresholds.

For businesses, advisory service, along with Payment for Moving and Reestablishment Expenses could be provided.⁵⁰ Depending on individuals' choice, the amount of assistance will vary based on the actual moving expense or a fixed amount of \$1,000-\$40,000. A business may also be eligible for a Payment for Reestablishment Expenses, up to \$25,000, if choosing to be paid the amount of their actual expense. In addition, businesses could be provided with current information on available replacement locations that meet their needs, or the option to discuss their preferred replacement location with their local agency. In Maryland, this assistance is offered through The Maryland Community Development Block Grant Program (CDBG).

4.6.4.2 Long-Term Operational Strategies

Operational Impacts

No negative impacts on the region's economy have been identified in this analysis; no mitigation would be required as a consequence.

Tax Base Impacts

Around the selected stations, property values would increase, and therefore the tax base in Washington, D.C. and Baltimore City would increase. However negative property impacts around the selected TMF would slightly reduce the tax base in Anne Arundel County or Prince George's County. The state of Maryland and Washington, D.C. would experience a net increase in the tax base due to property premium. Parcel acquisitions would also have a negative impact on the affected jurisdictions reducing the entire tax base value less than 0.2 percent.

⁴⁹ The amount of assistance on rental or purchase of housing will be based on the difference in costs of the current and replacement home, and a time period of 42 months.

⁵⁰ U.S. Department of Housing and Urban Development, Office of Community Planning and Development. U.S. Department of Housing. "Relocation Assistance to Displaced Businesses, Non-Profit Organizations and Farms." <https://www.hud.gov/sites/documents/1043CPD.PDF>

- Positive property premium impacts (i.e. property values around the new stations would increase) linked to the new stations would temper the negative tax base impacts due to property acquisitions in Washington, D.C. and Baltimore City. However, there are a number of mitigation measures that Anne Arundel County or Prince George's County would need to undertake to lessen the negative property premium impacts related to the TMF and the reduction of the tax base due to parcel acquisitions. These mitigations could include sound walls and landscaping to buffer the neighborhood from the visual and noise impacts, controlling access to minimize traffic impacts on the surrounding area, and selection of a physical design that minimizes the footprint and its proximity to affected parcels. The Project Sponsor would coordinate with the affected jurisdictions to reduce the negative impacts.

Development Impacts

No negative impacts on the local economy have been identified; potential economic development would be subject to existing or revised land use controls and policies and thus be consistent with local objectives and the vision for the corridor. No mitigation would be required as a consequence.

Section 4.7

Recreational Facilities and Parklands

BALTIMORE-WASHINGTON SUPERCONDUCTING MAGLEV PROJECT

DRAFT ENVIRONMENTAL IMPACT STATEMENT AND
SECTION 4(f) EVALUATION



U.S. Department of Transportation
Federal Railroad Administration



4.7 Recreational Facilities and Parklands

4.7.1 Introduction

This section identifies recreational facilities and parklands within the Superconducting Magnetic Levitation Project (SCMAGLEV Project) Affected Environment and evaluates the effects on those resources resulting from the Build Alternatives, as well as the No Build Alternative. The Federal Railroad Administration (FRA) considers public recreational facilities and parklands to be publicly owned lands officially designated as such by a Federal, state, or local agency, overseen by officials with jurisdiction that have determined that the public land's primary purpose is as a park or recreational facility. Resources funded by the Land and Water Conservation Fund Act (LWCF) and Maryland Department of Natural Resources' (MDNR) Program Open Space (POS) are also discussed in this section. Additional descriptions of recreational facilities and parklands is provided in the Section 4(f) Evaluation (Appendix F).

4.7.2 Regulatory Context and Methodology

4.7.2.1 Regulatory Context

FRA Procedures for Considering Environmental Impacts, (64 Fed. Reg 28545, May 26, 1999) states that the potential environmental impacts of proposed rail projects on recreational uses and parklands, both existing and planned, should be considered in the Environmental Impact Statement (EIS). In addition to FRA's National Environmental Policy Act (NEPA) compliance procedures, three Federal laws and a state law address the treatment of recreational facilities and parklands:

- **Section 4(f) of the United States Department of Transportation (USDOT) Act of 1966, as amended:** Protects publicly owned parks, recreational areas, wildlife and waterfowl refuges, and public and private historical sites from conversion to transportation use by USDOT. Section 4(f) requires transportation projects to avoid use of protected properties unless there is no feasible and prudent alternative to the use of such land, and the program or project includes all possible planning to minimize harm to such park, recreational area, wildlife and waterfowl refuge, or historic site resulting from such use.
- **Section 6(f), Land and Water Conservation Fund (LWCF) of 1965:** The LWCF establishes a funding source for Federal and state acquisition of recreational lands, wildlife and waterfowl refuges, and other similar resources, and development of public recreational facilities. Section 6(f) of the LWCF Act (54 USC 2003-) addresses LWCF assistance to the states and requires that all properties "acquired or developed, either partially or wholly, with the LWCF funds" by states must be maintained as such in perpetuity. If a project requires the conversion of land within a property funded by the LWCF Act to non-recreation use, the National Park Service (NPS) must approve a land conversion

process. NPS will approve a land conversion only if FRA meets the following requirements:

- FRA must evaluate all practical alternatives to the proposed land conversion.
- FRA must establish the fair market value of the property.
- FRA must confirm that the proposed substitute property is at least equal value, and that the proposed replacement property is of reasonably equivalent usefulness and location.
- FRA must have completed all other agency coordination, including compliance with Section 4(f).
- The proposed conversion and replacement must comply with Maryland's Statewide Comprehensive Outdoor Recreation Plan (SCORP).
- In addition, requirements for public review of and comment on proposed Section 6(f) property impacts will be provided as part of the NEPA process. During a request for conversion of Section 6(f) land, if warranted, public review and comment requirements and procedures under NEPA will be followed.

In 2019, the John D. Dingell, Jr. Conservation, Management, and Recreation Act reauthorized the LWCF (Public Law 116-9).

- **NPS Federal Lands to Parks Program (FLP; 40 USC 550 (b) and (e)):** The NPS FLP Program deeds former surplus Federal land to local government entities solely for public parks and recreation use in perpetuity. If transferred lands are not used accordingly or they are needed for another purpose, the lands are subject to reversion back to federal ownership. NPS would determine mitigation measures for impacts to FLP-transferred parks in collaboration with the current owners of the properties and other agencies involved in the Project.
- **Program Open Space, Natural Resources Article, Title 5, Subtitle 9, Annotated Code of Maryland:** Maryland MDNR's Program Open Space (POS) provides funding to acquire land for open space and for outdoor public recreation. Prior approval from the Secretaries of the Departments of Natural Resources, Budget and Management, and State Planning is required before any acquisition or development sites may be converted to any other use.

4.7.2.2 Methodology

FRA identified public recreational facilities and parklands within 800 feet of the centerline of the alignments and ancillary facilities of the twelve Build Alternatives. This area represents the noise-screening distance based on FRA guidelines for SCMAGLEV technology and is based on project setting, proposed technology, and study area characteristics¹. The noise-screening distance represents the outer limits of potential

¹ Federal Railroad Administration, "High-Speed Ground Transportation Noise and Vibration Impact Assessment," Office of Railroad Policy and Development, DOT/FRA/ORD-12/15, Final Report, September 2012, Washington, D.C.

visual, noise, and other effects from the SCMAGLEV Project on parks and recreational facilities and is the geographic limits of the SCMAGLEV Project Affected Environment used to qualitatively evaluate permanent and temporary effects as well as direct and indirect effects.

FRA obtained data and characteristics of recreational facilities and parkland resources from the NPS, the District of Columbia Department of Parks and Recreation (DC DPR), the Maryland-National Capital Parks and Planning Commission (M-NCPPC), the MDNR, the Anne Arundel County Department of Recreation and Parks, the Baltimore County Department of Recreation and Parks, the United States Fish and Wildlife Service (USFWS), and the Baltimore City Department of Recreation and Parks. Geographic Information Systems (GIS) data was not readily available from the City of Greenbelt Parks, and parks data was obtained from the Greenbelt Department of Recreation and Parks website and parcel data. In addition, information on recreational facilities and parklands were obtained from Google Earth™, and comprehensive and parks plans. Sources of data were supplemented by field reconnaissance within the SCMAGLEV Project Affected Environment. Information on planned and proposed recreational facilities and parklands was provided via correspondence with park agencies and review of planning documents.

FRA obtained information on park acquisitions partially or fully funded by Federal and state programs, such as MDNR's Program Open Space and NPS's LWCF Act. FRA identified parklands funded by the LWCF Act by consulting MDNR's list of Section 6(f) acquisitions in Maryland and corresponded with parks agencies to obtain information on parks acquired or improved with Federal and state park acquisition funds.

Using GIS, FRA mapped recreational facilities and parklands within the SCMAGLEV Project Affected Environment and quantitatively assessed potential impacts to recreational facilities and parklands resulting from the Build Alternatives. Direct effects of the Build Alternatives include physical disturbance and permanent incorporation of a property as well as noise and visual changes in proximity to recreational facilities and parklands. Section 4.9 Aesthetics and Visual Quality and Section 4.17 Noise and Vibration provide supporting information on the indirect effects of the Build Alternatives on recreational facilities and parklands.

In addition to assessing potential permanent impacts to recreational facilities and parklands, FRA's analysis identified the potential for short-term construction impacts.

4.7.3 SCMAGLEV Project Affected Environment

This section identifies public recreational facilities and parklands within the SCMAGLEV Project Affected Environment. Nearly 2,000 acres of Federal, state, and local recreational facilities and parklands occur in the SCMAGLEV Project Affected Environment. Within the urbanized areas at either end of the SCMAGLEV Project Affected Environment, parks are generally small and meet local community recreational needs. Parks within the central portion of the SCMAGLEV Project Affected Environment tend to be larger, more regional in focus, and are generally significant for both active

and passive recreation as well as natural resource conservation. Recreational facilities and parklands within the SCMAGLEV Project Affected Environment are summarized in **Table 4.7-1** and presented in the Socioeconomic Environment Technical Report (see Appendix D.3). Maps of recreational facilities and parklands are also included in Attachment C of Appendix D.3.

Table 4.7-1: Recreational Facilities and Parklands in the SCMAGLEV Project Affected Environment

Park Name	Location	Funding or transfer in ownership under LWCF 6(f), POS, or FLP	Governing Body/Owner
Small Park Reservations – L’Enfant Plan (SPR)	Washington, D.C.	No	NPS
New York Avenue Recreation Center (NYARC)	Washington, D.C.	No	DC-DPR
Dunbar Aquatic Center	Washington, D.C.	No	DC-DPR
R.H. Terrell Recreation Center	Washington, D.C.	No	DC-DPR
Butler-Wyatt Clubhouse #2 Boys & Girls Club	Washington, D.C.	No	DC-DPR
Loomis Park	Washington, D.C.	No	DC-DPR
Bladensburg Waterfront Park	Prince George’s Co.	No	M-NCPPC
Anacostia River Trail	Prince George’s Co.	No	M-NCPPC
Bladensburg South Community Park	Prince George’s Co.	No	M-NCPPC
Greenbelt Forest Preserve (GFP)	Greenbelt, MD	Yes - FLP	City of Greenbelt DRP
Patuxent River Park I (PRP)	Prince George’s Co.	No	M-NCPPC
Baltimore-Washington Parkway (BWP)	Prince George’s Co. Anne Arundel Co.	No	NPS
Patuxent Research Refuge (PRR)	Prince George’s Co. Anne Arundel Co.	No	USFWS
South Laurel Park	Prince George’s Co.	No	M-NCPPC
Springfield Road Park	Prince George’s Co.	Yes - FLP	M-NCPPC
Muirkirk Park	Prince George’s Co.	No	M-NCPPC
Montpelier Hills Park (MHP)	Prince George’s Co.	No	Montpelier Hills Homeowners Association
Montpelier Park	Prince George’s Co.	No	M-NCPPC
Brock Bridge Elementary School/ Brockbridge Park (BP)	Anne Arundel Co.	No	Anne Arundel County BOE
Maryland City Park (MCP)	Anne Arundel Co.	Yes – POS, FLP	Anne Arundel County DRP

Park Name	Location	Funding or transfer in ownership under LWCF 6(f), POS, or FLP	Governing Body/Owner
Patapsco Valley State Park	Anne Arundel Co. and Baltimore Co.	Yes – LWCF 6(f)	Maryland Park Service, MDNR
Lakeland Park	Baltimore	Yes - POS	Baltimore DPR
Middle Branch Park	Baltimore	No	Baltimore DPR
Indiana Avenue Park	Baltimore	No	Baltimore DPR

Source: AECOM/Straughan, August 2020

4.7.4 Environmental Consequences

Section 4.7.4 describes the effects of the SCMAGLEV Project Build Alternatives and the No Build Alternative on the public recreational facilities and parklands. **Table 4.7-2** at the end of this section provides a summary of the total temporary and permanent impacts of the Build Alternatives to public recreational facilities and parklands. FRA considers several impacts to public recreational facilities and parklands to be difficult to mitigate due to extensiveness of impact and/or uniqueness of park features. Parks with impacts that are considered difficult to mitigate include Baltimore-Washington Parkway (BWP), Patuxent Research Refuge (PRR), the Greenbelt Forest Preserve, and Patuxent River Park 1:

- The visual prominence of SCMAGLEV System elements would alter the scenic character along and above the BWP. Under all Build Alternatives, the portals, areas of open cut tunnels, and viaduct would generally be screened from BWP by a 50- to 250-foot width strip of trees and vegetation between travel lanes and SCMAGLEV elements. At the Powder Mill Road and Laurel-Bowie Road (MD 197) interchanges, the viaduct proposed under all Build Alternatives would be visually prominent as they would cross open areas with minimal screening. Under Build Alternatives J, the viaduct would also be visually prominent as it crosses the MD 198 and MD 32 interchanges. Viaduct elements would be located up to 144 feet higher than the elevation of the travel lanes of the parkway and would cross over the parkway to access Trainset Maintenance Facilities (TMFs), and options for visual screening at crossing locations or where the viaduct is high above the trees are limited. Screening would also be less effective during winter months when much of the vegetation is leafless.
- The viaduct would cross recreational facilities at Patuxent Research Refuge, including trails, hunting areas, and research and conservation sites in mature woodlands and wetlands. These unique features would be difficult to replicate elsewhere.
- The Greenbelt Forest Preserve is a recreational area associated with the Greenbelt Historic District. It is historically significant as the “greenbelt” that surrounds the district, and therefore recreational opportunities offered within the

greenbelt cannot be moved elsewhere. While it may be possible to move the ballfields elsewhere within the forest preserve, the cut/cover tunnel would remove access to a large portion of the Greenbelt Forest Preserve to trail users, and lighting associated with the SCMAGLEV System would impede operation of the astronomical observatory.

- Patuxent River Park 1 is undeveloped but supports conservation goals along the Patuxent River and recreation uses within Patuxent River Park to the south.

4.7.4.1 No Build Alternative

Under the No Build Alternative, the SCMAGLEV Project would not be built and therefore, no impacts related to the construction or operation of a SCMAGLEV Project would occur. However, other planned and funded transportation projects would continue to be implemented and could result in effects to public recreational facilities and parklands within the SCMAGLEV Project Affected Environment.

4.7.4.2 Build Alternatives

SCMAGLEV Project impacts to public recreational facilities and parklands would primarily result from above ground Project elements, such as the viaduct, stations, and TMF options. Among the Build Alternatives, SCMAGLEV Project impacts would differ because the combination of alignment, station, and TMF elements would differ with each Build Alternative. The following discussion summarizes the potential physical, noise, and visual impacts of each Build Alternative on the public recreational facilities and parklands listed in **Table 4.7-1**. **Tables 4.7-2** and **4.7-3** summarize the impacts of the Build Alternatives on public recreational facilities and parklands in the SCMAGLEV Project Affected Environment. Maps of public recreational facilities and parklands may be found in Appendix D.3 Attachment C. **Tables 4.7-4** and **4.7-5**, at the end of this section, quantify temporary and permanent impacts associated with alignment, station, and TMF features at individual parks.

Summary of Build Alternatives Impacts

- Among the Build Alternatives with the same station and TMF option combinations, those associated with Build Alternatives J1 would have more permanent acreage impacts to public recreational facilities and parklands, generally 10 to 20 acres greater than those options associated with Build Alternatives J.
- Of the three TMF options, the MD 198 TMF would impact more than three times as much parkland as the BARC West and BARC Airstrip TMFs.
- Of the four stations, only the Mount Vernon Square East Station elements would result in parkland impacts. All Build Alternatives include Mount Vernon Square East Station.
- Build Alternatives J would permanently impact three parks (approximately 80 acres, varying by alternative); Build Alternatives J1 would permanently impact seven parks (approximately 95 acres, varying by alternative).

- The alignment associated with Build Alternatives J would have impacts to two parks (BWP and PRR) that would be difficult to mitigate. The alignment associated with Build Alternatives J1 would have impacts to three parks (BWP, Greenbelt Forest Preserve, Patuxent River Park 1) that would be difficult to mitigate.
- Build Alternatives J-03 and J-06 would have the least quantity of permanent parkland impacts (87.95 acres, three parks). Two of these parks/parkways (BWP and PRR) would have impacts considered to be difficult to mitigate. Impacts are considered difficult to mitigate due to the extensiveness of impact and/or uniqueness of park features.
- Build Alternatives J1-01 and J1-04 would have the greatest permanent parkland impacts (132.38 acres, seven parks). Three of these parks/parkways (Greenbelt Forest Preserve, BWP, Patuxent River Park 1) would have impacts considered difficult to mitigate. Impacts are considered difficult to mitigate due to the extensiveness of impact and/or uniqueness of park features.

Alignment

Build Alternatives J

Build Alternatives J alignment impacts are identical regardless of the TMF and station option chosen. Build Alternatives J would permanently impact two park resources, BWP and PRR. Build Alternatives J would impact BWP with construction of the portals, viaduct, roadway realignments, and substation facilities. Impacts would occur within the scenic viewshed of the BWP. The viaduct and ancillary facilities would be close and highly visible from users of the parkway in many areas. In these areas, SCMAGLEV System elements would intrude on the naturalized scenery that enhances the recreational use of the parkway.

Build Alternatives J impacts to PRR would result from the viaduct and ancillary facilities. The entire land area within the North Tract that would be crossed by the viaduct and ancillary facilities is used for hunting and conservation programs. The viaduct would cross over the westernmost bend of Wild Turkey Way, part of the trail system of PRR's North Tract, which also provides fishing access to Blue Heron Pond. Presence of the SCMAGLEV piers, viaduct, and operation of the SCMAGLEV system would intrude on the areas of wildlife research and conservation, limiting the use of the refuge as an area to view and enjoy wildlife, and limiting the amount of land available for hunting. Relocation of the electric transmission lines by means of burial will require safety measures such as fencing. The protrusion of fencing into the refuge will restrict the areas of the refuge available for hunting and other visitor use, and will break habitat connectivity.

Table 4.7-2: Total Permanent (P) and Temporary (T) Property Impacts to Recreational Facilities and Parklands by Build Alternative

Build Alternative	Acres of Permanent (P) and Temporary (T) Construction Impacts on Parklands by Alignment, Station, and TMF																Total Permanent Impact
	Alignment		Stations								TMF						
			Mount Vernon Square East		BWI Marshall Airport		Cherry Hill		Camden Yards		BARC Airstrip		BARC West		MD 198		
	P	T	P	T	P	T	P	T	P	T	P	T	P	T	P	T	
J-01	92.9	48.3	0.2	0.2	--	--	--	--	--		28.7	0.3	--	--	--	--	108.6
J-02	99.1	59.3	0.2	0.2	--	--	--	--	--	--	--	--	23.27	0.7	--	--	96.2
J-03	97.9	53.8	0.2	0.2	--	--	--	--	--	--	--	--	--	--	3.1	3.6	88.0
J-04	92.9	48.3	0.2	0.2	--	--	--	--	--	--	28.7	0.00	--	--	--	--	108.6
J-05	99.1	59.3	0.2	0.2	--	--	--	--	--	--	--	--	23.27	0.7	--	--	96.2
J-06	97.9	53.8	0.2	0.2	--	--	--	--	--	--	--	--	--	--	3.1	3.6	88.0
J1-01	102.4	16.1	0.2	0.2	--	--	--	--	--	--	38.0	7.8	--	--	--	--	140.5
J1-02	94.2	25.1	0.2	0.2	--	--	--	--	--	--	--	--	7.2	3.1	--	--	101.6
J1-03	95.6	22.0	0.2	0.2	--	--	--	--	--	--	--	--	--	--	9.1	3.6	104.5
J1-04	102.4	16.1	0.2	0.2	--	--	--	--	--	--	38.0	7.8	--	--	--	--	140.6
J1-05	94.2	22.0	0.2	0.2	--	--	--	--	--	--	--	--	7.2	3.1	--	--	101.6
J1-06	95.6	21.98	0.2	0.2	--	--	--	--	--	--	--	--	--	--	9.1	3.6	104.8

Source: AECOM/Straughan, August 2020

**Table 4.7-3: Summary of Permanent (P) and Temporary (T) Property Impacts to Recreational Facilities and Parklands by
Build Alternative (in Acres)**

Recreational Facility/Park	Impact	Build Alternative											
		J-01	J-02	J-03	J-04	J-05	J-06	J1-01	J1-02	J1-03	J1-04	J1-05	J1-06
Small Park Reservations	P	0	0	0	0	0	0	0	0	0	0	0	0
	T	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
NYARC	P	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
	T	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Greenbelt Forest Preserve	P	0	0	0	0	0	0	39.7	40.5	41.0	39.7	40.5	42.0
	T	0	0	0	0	0	0	5.8	7.6	5.8	5.8	7.6	5.8
BWP	P	88.9	68.8	67.4	88.9	68.8	67.4	52.7	39.6	41.4	52.7	39.6	41.4
	T	27.6	36.6	36.0	27.6	36.6	36.0	13.6	14.8	14.1	13.6	14.8	14.1
Springfield Road Park	P	0	0	0	0	0	0	0.8	1.7	1.7	0.8	1.7	1.7
	T	0	0	0	0	0	0	0	0.7	0.7	0	0.7	0.7
Patuxent River Park	P	<0.1	0	0	<0.1	0	0	1.8	1.4	1.4	1.8	1.4	1.4
	T	<0.1	0	0	<0.1	0	0	0.6	0.8	0.8	0.6	0.8	0.8
Brockbridge Park	P	0	0	0	0	0	0	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
	T	0	0	0	0	0	0	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Maryland City Park	P	0	0	0	0	0	0	24.4	18.3	18.3	24.4	18.3	18.3
	T	0	0	0	0	0	0	3.8	4.3	4.3	3.8	4.3	4.3
PRR	P	23.8	23.53	23.5	23.8	23.53	23.5	0	0	0	0	0	0
	T	25.9	25.5	25.5	25.9	25.5	25.5	0	0	0	0	0	0
Montpelier Hills Park	P	0	0	0	0	0	0	0.6	0.6	0.6	0.6	0.6	0.6
	T	0	0	0	0	0	0	0.3	0.3	0.3	0.3	0.3	0.3

Source: AECOM/Straughan, August 2020

In addition to the 23.5 acres of permanent physical impact to PRR and 25.5 to 29.9 acres of temporary physical construction impact, construction and operation of the SCMAGLEV system would adversely affect recreation activities in two areas of the PRR; a strip of land between Build Alternative J and the BWP, and an area extending approximately 300 feet southwest of the alignment and ancillary facilities. Land below and adjacent to the viaduct and ancillary facilities, and land between the viaduct infrastructure and the BWP would become unavailable or undesirable for recreational activities. Hunting would be affected for safety reasons, and habitat fragmentation caused by the SCMAGLEV system would impact conservation programs that support wildlife viewing and other recreation such as bird watching or fishing along the North Tract trail system. The areas total approximately 165 acres, but the acreage may change as design refinements are made. Because PRR is funded partially with LWCF Act funds, the permanent impacts to PRR would require the Project Sponsor to receive approval for the conversion of parkland to transportation use from USFWS.

Build Alternatives J and ancillary facilities would be less than 800 feet from the following eight parks and would have the potential to impact these parks in terms of noise and visual changes during SCMAGLEV Project operations. The parks include Loomis Park, Bladensburg Waterfront Park, Bladensburg South Park, Anacostia River Trail, South Laurel Park, Muirkirk Park, Montpelier Hills Park, and the Patapsco Valley State Park. However, FRA does not anticipate adverse noise or visual effects to the following parks:

- **Loomis Park, Bladensburg South Park, Muirkirk Park and Patapsco Valley State Park** are not developed for recreation within 800 feet of proposed SCMAGLEV elements. Therefore, there are no recreational uses sensitive to noise or visual effects.
- **The Anacostia River Trail, Bladensburg Waterfront Park, South Laurel Park, and Montpelier Hills Park** have recreational uses that are not noise sensitive. A fresh air and emergency egress (FA/EE) facility would be visible from the Anacostia River Trail and Bladensburg Waterfront Park, but the facility would be in an already developed industrial area; as a result, the facility would not be visually intrusive to the recreational uses in the parks. The Project Sponsor would relocate existing powerlines within an existing transmission line corridor adjacent to South Laurel Park; however, the noise and visual environment of South Laurel Park would not change. Existing powerlines would be relocated within their existing corridor and would not affect the noise or visual environment at Montpelier Hills Park.

Build Alternatives J1

Build Alternatives J1 alignments impacts are identical regardless of the TMF and station option chosen. Build Alternatives J1 alignments would permanently impact six park resources: BWP, Brock Bridge Elementary School/Brockbridge Park, Greenbelt Forest Preserve, Maryland City Park, Patuxent River Park 1, and Springfield Road Park. Build Alternatives J1 would impact BWP with construction of the portals, viaduct, roadway realignments, and substation facilities. Impacts would occur within the scenic viewshed of the BWP. The viaduct and ancillary facilities would be close and highly visible from

users of the parkway in many areas. In these areas, SC MAGLEV System elements would intrude on the naturalized scenery that enhances the recreational use of the parkway.

Build Alternatives J1 alignments would impact Brock Bridge Elementary School/Brockbridge Park with portal construction immediately south of the property. Minor, linear acquisition of the school/park property would occur in an undeveloped, wooded area of the park and would not affect the ballfields or other recreational activities at the school.

Build Alternatives J1 alignments would impact Greenbelt Forest Preserve with construction of a tunnel portal, SCMAGLEV systems, and stormwater management facilities. Impacts to the Preserve would include construction of open cut tunnel, which would directly impact trails within the SCMAGLEV Project Affected Environment, remove access to the eastern half of the Preserve's trail system, and require removal of two softball fields and the Observatory. Other ballfields are available in Greenbelt, including Braden Field at the Greenbelt Recreation Center. However, Greenbelt Forest Preserve is part of the Greenbelt Historic District's historically significant greenbelt. Some recreational opportunities at Greenbelt Forest Preserve such as hiking and viewing wildlife are replicated nearby at PRR, but the Observatory and location of the Preserve are unique elements of the greenbelt.

Build Alternatives J1 alignment impacts to Maryland City Park would result from construction of a tunnel portal, overhead electric lines, viaduct, SCMAGLEV systems, and stormwater management. Build Alternatives J1 would impact two baseball fields, two multi-purpose fields, and a paved trail that joins the two parcels that comprise the park. Anne Arundel County DPR representatives noted that Maryland City Park serves an area of the County less well served than others by ball fields and courts due to the presence of large federal land areas such as Fort Meade and PRR (Anne Arundel County 2019).

Build Alternatives J1 alignments and ancillary facility impacts to Patuxent River Park 1 would result from construction of overhead electric lines and viaduct. Impacts would occur within an undeveloped wooded area of the park and the Patuxent River. The Patuxent River Park 1 supports Patuxent River conservation efforts and recreational use of the river downstream. Because Patuxent River Park 1 does not support recreational use on site, the effects on the user experience of the placement of viaduct within the park would be minimal.

Build Alternatives J1 alignments impacts to Montpelier Hills Park would result from viaduct construction on the east side of the park. Minor, linear acquisition of the park property would occur in an undeveloped, wooded area of the park and would not affect use of the tennis courts or picnic pavilion.

Build Alternatives J1 alignments impacts to Springfield Road Park would result from construction of SCMAGLEV systems within a wooded, undeveloped portion of the park. The parkland is undeveloped with little impact on user experience at the park.

Build Alternatives J1 alignments and ancillary facilities would be less than 800 feet from the following eight parks and would have the potential to impact these parks in terms of noise and visual changes during SCMAGLEV Project operations. The parks include Loomis Park, Bladensburg Waterfront Park, Bladensburg South Park, Anacostia River Trail, South Laurel Park, Muirkirk Park, Montpelier Park, and the Patapsco Valley State Park. However, FRA does not anticipate adverse noise or visual effects to the following parks:

- **Loomis Park, Bladensburg South Park, Muirkirk Park and Patapsco Valley State Park** are not developed for recreation within 800 feet of proposed SCMAGLEV elements. Therefore, there are no recreational uses sensitive to noise or visual effects.
- The **Anacostia River Trail, Bladensburg Waterfront Park, South Laurel Park, and Montpelier Park** have recreational uses that are not noise sensitive. An FA/EE facility would be visible from the Anacostia River Trail and Bladensburg Waterfront Park, but the facility would be in an already developed industrial area; as a result, the facility would not be visually intrusive to the recreational uses in the parks. The Project Sponsor would relocate existing powerlines within an existing transmission line corridor adjacent to South Laurel Park; however, the noise and visual environment of South Laurel Park would not change. Portions of the viaduct may be visible from Montpelier Park, but the ballfields at the park are not visually sensitive uses.

Stations

Mount Vernon Square East

A station entrance to Mount Vernon Square East Station would impact the New York Avenue Recreation Center (NYARC). The entrance would be located in an area of lawn and trees and would limit the available space available for use of the area as a gathering place for social and passive recreational activities adjacent to the south side of the outfield of the baseball field. The Kennedy Recreation Center, approximately 2,200 feet northwest at 6th and O Streets NW, offers similar space of lawn and trees adjacent to a baseball diamond and other ballfields/courts.

The Mount Vernon Square East Station and station entrances would be located within 800 feet of Small Park Reservations – L'Enfant Plan (SPR) owned and administered by the NPS. These small park reservations include Reservations 71, 72, 73, 74, 183, and 185. These parks, which provide open space, and some of which provide benches and other spaces for rest are adjacent to New York Avenue NW, a major urban arterial roadway. They would not be impacted by nearby station entrances as they do not have noise-sensitive recreational uses and the station entrances would be generally compatible with the urban nature of the surrounding area.

Baltimore-Washington International Thurgood Marshall Airport (BWI Marshall Airport)

No public recreational facilities or parklands would be permanently impacted by the BWI Marshall Airport Station.

Cherry Hill

No public recreational facilities or parklands would be permanently impacted by the Cherry Hill Station.

Cherry Hill Station would be located within 800 feet of three parks owned and administered by the Baltimore City Department of Recreation and Parks – Lakeland Park, Indiana Avenue Park, and Middle Branch Park. The station, construction laydown areas, parking garages, and SCMAGLEV systems associated with the station would be visible from the parks. Recreational uses at these parks are not noise-sensitive and the visibility of SCMAGLEV Project elements would not be intrusive to park uses.

Camden Yards

No public recreational facilities or parklands would be permanently impacted by the Camden Yards Station.

TMFs

MD 198

The MD 198 TMF would impact five park resources: BWP, PRR, Maryland City Park, Patuxent River Park 1, and Springfield Road Park. Potential impacts to BWP would result from the MD 198 TMF and access ramps to be located in an existing wooded area on the east side of the parkway. The ramp access would be a visually prominent element that would cross over the BWP on the south side of the MD 198 interchange and intrude on the naturalized scenery that enhances the recreational use of the parkway.

The MD 198 TMF impacts to PRR would result from the vegetative clearing, habitat fragmentation and interruption of conservation programs, and restriction of access to portions of the facility by hunters and other refuge visitors associated with the MD 198 TMF viaduct ramp within the Baltimore Gas and Electric (BGE) utility corridor.

The MD 198 TMF impacts to Maryland City Park would result from the vegetative clearing associated with ramp access in an area of undeveloped wooded parkland and would have minimal effects on park activities.

The MD 198 TMF impacts to Patuxent River Park 1 would result from the vegetative clearing associated with ramp access within undeveloped wooded parkland and piers located within and adjacent to the Patuxent River. The Patuxent River Park 1 supports Patuxent River conservation efforts and recreational use of the river downstream. Because Patuxent River Park 1 doesn't support recreational use on site, the effects on the user experience of the placement of TMF ramps within the park would be minimal.

The MD 198 TMF impacts to Springfield Road Park would result from the vegetative clearing associated with the maintenance of way (MOW) facility, as well as the vegetative clearing associated with the TMF's access ramps and permanent access road within an area of undeveloped woodland. The construction of the MOW facility would require 12.3 acres within the 26.8-acre park, an impact that would likely prevent future development of the park for recreational uses. The park was transferred to M-NCPPC from NPS under the Federal Lands to Parks Program, and NPS would require mitigation measures for impacts to FLP-transferred lands.

BARC Airstrip

The BARC Airstrip TMF impacts to BWP would result from vegetative clearing associated with the ramp access to the TMF, which would also cross over the BWP in the vicinity of the Parkway overpass of Beaver Dam Road. The access ramps would be a visually prominent element in this location. The ramps above the BWP would be highly visible to users of the Parkway and difficult to screen. In these areas, BARC Airstrip TMF elements would intrude on the naturalized scenery that enhances the recreational use of the parkway.

The BARC Airstrip TMF impacts to the Greenbelt Forest Preserve would result from the vegetative clearing associated with the ramp access and cut/cover tunnel associated with the TMF ramps. Impacts would occur in the wooded area of the preserve north of the Observatory and would require removal of trails within this area of the Preserve, which is part of the Greenbelt Historic District.

The BARC Airstrip TMF is adjacent to PRR property. It would have no physical impacts to PRR, but because it is adjacent to the PRR boundary, FRA applied a 300-foot buffer requested by USFWS to estimate impacts to wildlife and conservation programs, as impacts to these programs affect recreational use of PRR. The area of impact to PRR within the 300-foot buffer would be approximately 13 acres.

BARC West

The BARC West TMF impacts to the BWP would result from the vegetative clearing associated with ramp access. In addition, the ramps would cross the Parkway in the vicinity of the overpass of Beaver Dam Road. The viaduct would be a visually prominent element in this location. The BARC West TMF elements would intrude on the naturalized scenery that enhances the recreational use of the Parkway.

The BARC West TMF impacts to the Greenbelt Forest Preserve would result from the ramp access and cut/cover tunnel. Impacts would occur in the wooded area of the preserve north of the Observatory and would require removal of trails within this area of the Preserve.

**Table 4.7-4: Permanent (P) and Temporary (T) Property Impacts to Recreational Facilities and Parklands, Build Alternative J
[in Acres]**

Build Alternative	Impact	Alignment	Stations				TMF		
			Mount Vernon Square East	BWI Marshall Airport	Cherry Hill	Camden Yards	MD 198	BARC Airstrip	BARC West
J-01	P	BWP: 60.18 PRR: 23.53	SPR: 0 NYARC: 0.16	--	--	--	BWP: 28.70 PRR: 0.29	--	--
	T	BWP: 26.87 PRR: 25.87	SPR: 0.14 NYARC: 0.06	--	--	--	BWP: 0.29	--	--
J-02	P	BWP: 65.47 PRR: 23.53	SPR: 0 NYARC: 0.16	--	--	--	--	BWP: 3.29	--
	T	BWP: 35.90 PRR: 25.46	SPR: 0.14 NYARC: 0.06	--	--	--	--	BWP: 0.72	--
J-03	P	BWP: 64.24 PRR: 23.53	SPR: 0 NYARC: 0.16	--	--	--	--	--	BWP: 3.14
	T	BWP: 32.35 PRR: 25.46	SPR: 0.14 NYARC: 0.06	--	--	--	--	--	BWP: 3.63
J-04	P	BWP: 60.18 PRR: 23.53	SPR: 0 NYARC: 0.16	--	--	--	BWP: 28.70 PRR: 0.29	--	--
	T	BWP: 26.87 PRR: 25.87	SPR: 0.14 NYARC: 0.06	--	--	--	BWP: 0.29	--	--
J-05	P	BWP: 65.47 PRR: 23.53	SPR: 0 NYARC: 0.16	--	--	--	--	BWP: 3.29	--
	T	BWP: 35.90 PRR: 25.46	SPR: 0.14 NYARC: 0.06	--	--	--	--	BWP: 0.72	--
J-06	P	BWP: 64.24 PRR: 23.53	SPR: 0 NYARC: 0.16	--	--	--	--	--	BWP: 3.14
	T	BWP: 32.35 PRR: 25.46	SPR: 0.14 NYARC: 0.06	--	--	--	--	--	BWP: 3.63

SPR: Small Park Reservations

BWP: Baltimore-Washington Parkway

MCP: Maryland City Park

NYARC: New York Avenue Recreation Center

SRP: Springfield Road Park

PRR: Patuxent Research Refuge

GFP: Greenbelt Forest Preserve

PRP: Patuxent River Park 1

MHP: Montpelier Hills Park

Source: AECOM/Straughan, August 2020

Table 4.7-5: Permanent (P) and Temporary (T) Property Impacts to Recreational Facilities and Parklands, Build Alternative J1 [in Acres]

Build Alternative	Impact	Alignment	Stations				TMF		
			Mount Vernon Square East	BWI Marshall Airport	Cherry Hill	Camden Yards	MD 198	BARC Airstrip	BARC West
J1-01	P	BWP: 34.86 BRP: 0.0008 GFP: 39.68 MCP: 17.7 PRP: 1.13 SRP: 0.80 MHP: 0.57	SPR: 0 NYARC: 0.16	--	--	--	BWP: 17.85 MCP: 6.74 PRP: 0.69	--	--
	T	BWP: 7.42 BRP: 0.005 GFP: 5.83 MCP: 2.55 PRP: 0.26 SRP: 0 MHP: 0.3	SPR: 0.14 NYARC: 0.06	--	--	--	BWP: 6.15 MCP: 1.23 PRP: 0.26	--	--
J1-02	P	BWP: 36.96 BRP: 0.0008 GFP: 35.94 MCP: 18.30 PRP: 1.35 SRP: 1.69 MHP: 0.57	SPR: 0 NYARC: 0.16	--	--	--	--	BWP: 2.62 GFP: 4.60	--
	T	BWP: 12.71 BRP: 0.005 GFP: 6.58 MCP: 4.30 PRP: 0.80 SRP: 0.70 MHP: 0.3	SPR: 0.14 NYARC: 0.06	--	--	--	--	BWP: 2.09 GFP: 1.04	--

Build Alternative	Impact	Alignment	Stations				TMF		
			Mount Vernon Square East	BWI Marshall Airport	Cherry Hill	Camden Yards	MD 198	BARC Airstrip	BARC West
J1-03	P	BWP: 36.80 BRP: 0.0008 GFP: 37.46 MCP: 18.30 PRP: 1.35 SRP: 1.69 MHP: 0.57	SPR: 0 NYARC: 0.16	--	--	--	--	--	BWP: 4.57 GFP: 4.51
	T	BWP: 11.70 BRP: 0.005 GFP: 4.48 MCP: 4.30 PRP: 0.80 SRP: 0.70 MHP: 0.3	SPR: 0.14 NYARC: 0.06	--	--	--	--	--	BWP: 2.36 GFP: 1.26
J1-04	P	BWP: 34.86 BRP: 0.0008 PRP: 1.13 GFP: 39.68 MCP: 17.7 PRP: 1.13 SRP: 0.80 MHP: 0.57	SPR: 0 NYARC: 0.16	--	--	--	BWP: 17.85 MCP: 6.74 PRP: 0.69	--	--
	T	BWP: 7.42 BRP: 0.005 PRP: 0.26 GFP: 5.83 MCP: 2.55 PRP: 0.26 SRP: 0 MHP: 0.3	SPR: 0.14 NYARC: 0.06	--	--	--	BWP: 6.15 MCP: 1.23 PRP: 0.26	--	--
J1-05	P	BWP: 36.96 BRP: 0.0008 GFP: 35.94 MCP: 18.30 PRP: 1.35	SPR: 0 NYARC: 0.16	--	--	--	--	BWP: 2.62 GFP: 4.60	--

Build Alternative	Impact	Alignment	Stations				TMF		
			Mount Vernon Square East	BWI Marshall Airport	Cherry Hill	Camden Yards	MD 198	BARC Airstrip	BARC West
		SRP: 1.69 MHP: 0.57							
	T	BWP: 12.71 BRP: 0.005 GFP: 6.58 MCP: 4.30 PRP: 0.80 SRP: 0.70 MHP: 00.3	SPR: 0.14 NYARC: 0.06	--	--	--	--	BWP: 2.09 GFP: 1.04	--
J1-06	P	BWP: 36.80 BRP: 0.0008 GFP: 37.46 MCP: 18.30 PRP: 1.35 SRP: 1.69 MHP: 0.57	SPR: 0 NYARC: 0.16	--	--	--	--	--	BWP: 4.57 GFP: 4.51
	T	BWP: 11.7 BRP: 0.005 GFP: 4.48 MCP: 4.30 PRP: 0.80 SRP: 0.70 MHP: 0.3	SPR: 0.14 NYARC: 0.06	--	--	--	--	--	BWP: 2.36 GFP: 1.26

SPR: Small Park Reservations

BWP: Baltimore-Washington Parkway

MCP: Maryland City Park

NYARC: New York Avenue Recreation Center

SRP: Springfield Road Par

PRR: Patuxent Research Refuge

GFP: Greenbelt Forest Preserve

PRP: Patuxent River Park 1

MHP: Montpelier Hills Park

Source: AECOM/Straughan, August 2020

4.7.5 Short-term Construction Effects

Construction of each Build Alternative would result in temporary impacts to public recreational facilities and parklands:

Alignment

Build Alternatives J

Build Alternatives J alignments short-term construction effects are identical regardless of the TMF and station option chosen.

Build Alternatives J alignments would result in short-term construction impacts at five NPS Small Park Reservations (176, 177A, 179, 180, 181, 182, 183, and 185) due to the construction LOD associated with cut and cover tunnel construction. All small park reservations would be returned to their existing condition following construction.

Build Alternatives J alignments would result short-term construction impacts at the New York Avenue Recreation Center due to the construction LOD associated with cut and cover tunnel and station construction.

Build Alternatives J alignments short-term construction effects to BWP would include clearing and grubbing of vegetation, and excavation that would result from construction associated with relocation and construction of powerlines, tunnel laydown areas, operation of a tunnel boring machine (TBM) Launch-Retrieval site, and construction of the viaduct and ancillary facilities. Construction may result in temporary visual impacts, and in lane shifts and temporary lane closures, but the BWP would remain open during construction. Areas of cleared vegetation would occur in areas of mature forest and habitat, with impacts lasting 75-100 years.

Build Alternatives J short-term construction effects to the PRR would include clearing and grubbing of vegetation, and excavation that would result from constructing the viaduct and relocating the powerlines within the BGE transmission corridor at the northwest boundary of the refuge. Short-term construction effects would include temporary noise and visual impacts at PRR. Areas of cleared vegetation would occur in areas of mature forest and habitat, with impacts lasting 75-100 years.

Build Alternatives J1

Build Alternatives J1 alignments short-term construction effects are identical regardless of the TMF and station option chosen. Construction of Build Alternatives J1 alignments would result in short-term effects to six park resources: BWP, Greenbelt Forest Preserve, Maryland City Park, Patuxent River Park 1, Springfield Road Park, and Brock Bridge Elementary School/Brockbridge Park.

Build Alternatives J1 alignments short-term construction effects to BWP would include clearing and grubbing of vegetation, and excavation that would result from the construction associated with relocation and construction of powerlines, tunnel laydown

areas, operation of a TBM Launch-Retrieval site, and construction of the viaduct and ancillary facilities. Construction may result in temporary visual impacts, and in lane shifts and temporary lane closures, but the BWP would remain open during construction. Areas of cleared vegetation would occur in areas of mature forest and habitat, with impacts lasting 75-100 years.

Build Alternatives J1 alignments short-term construction effects to Greenbelt Forest Preserve would include clearing and grubbing of vegetation, and excavation that would result from the construction at tunnel laydown areas. Access to the park would be restricted due to construction activity in the eastern portion of the Greenbelt Forest Preserve, and construction would result in noise and visual impacts. The Project Sponsor will consult with the City of Greenbelt to develop mitigation plans to address temporary construction impacts. Areas of cleared vegetation would occur in areas of mature forest and habitat, with impacts lasting 75 to 100 years.

Build Alternatives J1 alignments short-term construction effects to Maryland City Park would include clearing and grubbing of vegetation, and excavation that would result from construction for powerlines and other system elements and tunnel laydown areas. Access to the park would be restricted due to construction activity and the park would be temporarily impacted by construction noise. The Project Sponsor will consult with the Anne Arundel County to develop mitigation plans to address temporary construction impacts.

Build Alternatives J1 alignments short-term construction effects to Patuxent River Park 1 would include clearing and grubbing of vegetation, and excavation that would result from construction for the viaduct and tunnel laydown areas. Access to the park would be restricted due to construction activity in the southern portion of Patuxent River Park 1, and construction activity would result in temporary visual and noise impacts. The Project Sponsor will consult with the M-NCPPC to develop mitigation plans to address temporary construction impacts.

Build Alternatives J1 alignments short-term construction effects to Springfield Road Park would include clearing and grubbing of vegetation, and excavation that would result from construction for the viaduct for Build Alternatives J1-01 and J1-04, and the construction for new powerlines for Build Alternatives J1-02, J1-03, J1-05, and J1-06. Access to the park would be restricted during construction due to activity in the southern portion of Springfield Road Park. The Project Sponsor will consult with the M-NCPPC to develop mitigation plans to address temporary construction impacts.

Build Alternatives J1 alignments short-term construction effects to Brock Bridge Elementary School/Brockbridge Park would include clearing and grubbing of vegetation, and excavation that would result from construction associated with the portal and would occur in a wooded, undeveloped area of the property. Access to the school and recreational fields would not be restricted during construction, although the park would be temporarily impacted by construction noise. The Project Sponsor will consult with the Anne Arundel County BOE to develop mitigation plans to address temporary construction impacts.

Stations

Construction impacts to public recreational facilities and parklands would not occur at the BWI Marshall Airport, Cherry Hill, or Camden Yards Stations.

Mount Vernon Square East

Mount Vernon Square East Station would have short-term construction effects to seven NPS Small Park Reservations, and construction would require removal of sidewalks, curbs, landscaped beds and lawn resulting from the cut/cover tunnel construction. The Project Sponsor will restore all small park reservations to their existing condition following construction.

Mount Vernon Square short-term construction effects to the New York Avenue Recreation Center would include clearing and grubbing of vegetation, and excavation that would result from the construction associated with a station entrance. The temporary impacts would require clearing of vegetation in an area of trees and lawn south of the ballfield. The construction area surrounds the proposed station entrance and construction would result in temporary noise impacts. The Project Sponsor will restore areas of temporary impact in the station area to its existing condition following construction.

TMF

MD 198

The MD 198 TMF short-term construction effects to BWP, Maryland City Park, Patuxent River Park 1, and Springfield Road Park would result from the construction associated with the TMF viaduct. At each park, construction would include clearing of vegetation within undeveloped woodlands and areas of lawn.

BARC Airstrip

The BARC Airstrip TMF short-term construction effects to BWP would include clearing and grubbing of vegetation, and excavation that would result from the construction of new powerlines and other system elements within the Powder Mill Road/BWP interchange in an area of lawn and on both sides of Powder Mill Road. Construction activities may result in lane shifts and temporary lane closures, but the BWP would remain open during construction. Areas disturbed by construction would be restored and replanted following construction.

The BARC Airstrip TMF short-term construction effects to the Greenbelt Forest Preserve would include clearing and grubbing of vegetation, and excavation that would result from the construction associated with various elements of the TMF ramps. Construction would require tree removal and access to the park would be restricted due to construction activity in the eastern portion of the Greenbelt Forest Preserve. The Project Sponsor will consult with the City of Greenbelt to develop mitigation plans to address temporary construction effects.

BARC West

The BARC West TMF short-term construction effects to BWP would include clearing and grubbing of vegetation, and excavation that would result from the construction associated with the BARC West TMF ramps. Construction effects may result in clearing of vegetation and would result in lane shifts and temporary lane closures, but the BWP would remain open during construction.

The BARC West TMF short-term construction effects to the Greenbelt Forest Preserve would include clearing and grubbing of vegetation, and excavation that would result from the viaduct and cut/cover tunnel associated with the BARC West TMF ramps. Construction would require tree removal and access to the park would be restricted due to construction activity in the eastern portion of the Greenbelt Forest Preserve. The Project Sponsor will consult with the City of Greenbelt to develop mitigation plans to address temporary construction effects.

4.7.6 Potential Minimization and Mitigation Strategies

The Project Sponsor seeks input from stakeholders and the public regarding the effects of the Build Alternatives on public recreational facilities and parklands and steps that can be taken to minimize impacts. Mitigation for each park and refuge will be determined based on the unique characteristics of each resource and the nature of the impacts. The Project Sponsor anticipates applying the following strategies to avoid, minimize or mitigate impacts to public recreational facilities and parklands:

- Use existing transportation and utility corridors as reasonably feasible to minimize additional right-of-way needs
- Coordinate construction planning with parks agencies to address short-term noise and vibration impacts, property access, fencing, safety and security, and restoration of disturbed land.
- Complying with applicable local laws for construction activity including noise producing activities.
- Use tunnels or viaduct to avoid or minimize the physical impact of the project on public recreational facilities and parklands, to the extent feasible.
- Avoid or reduce impacts to public recreational facilities and parklands using design refinements.
- Place above-ground facilities such as substations, FA/EE facilities, and MOW facilities in industrially or commercially zoned areas to the extent feasible.
- Provide advanced public notice of planned activities and temporary changes in access to public recreational facilities and parklands.
- Avoid the need to remove existing vegetation on public recreational facilities and parklands where reasonably feasible.
- Provide screening of system elements from public recreational facilities and parklands, where feasible.

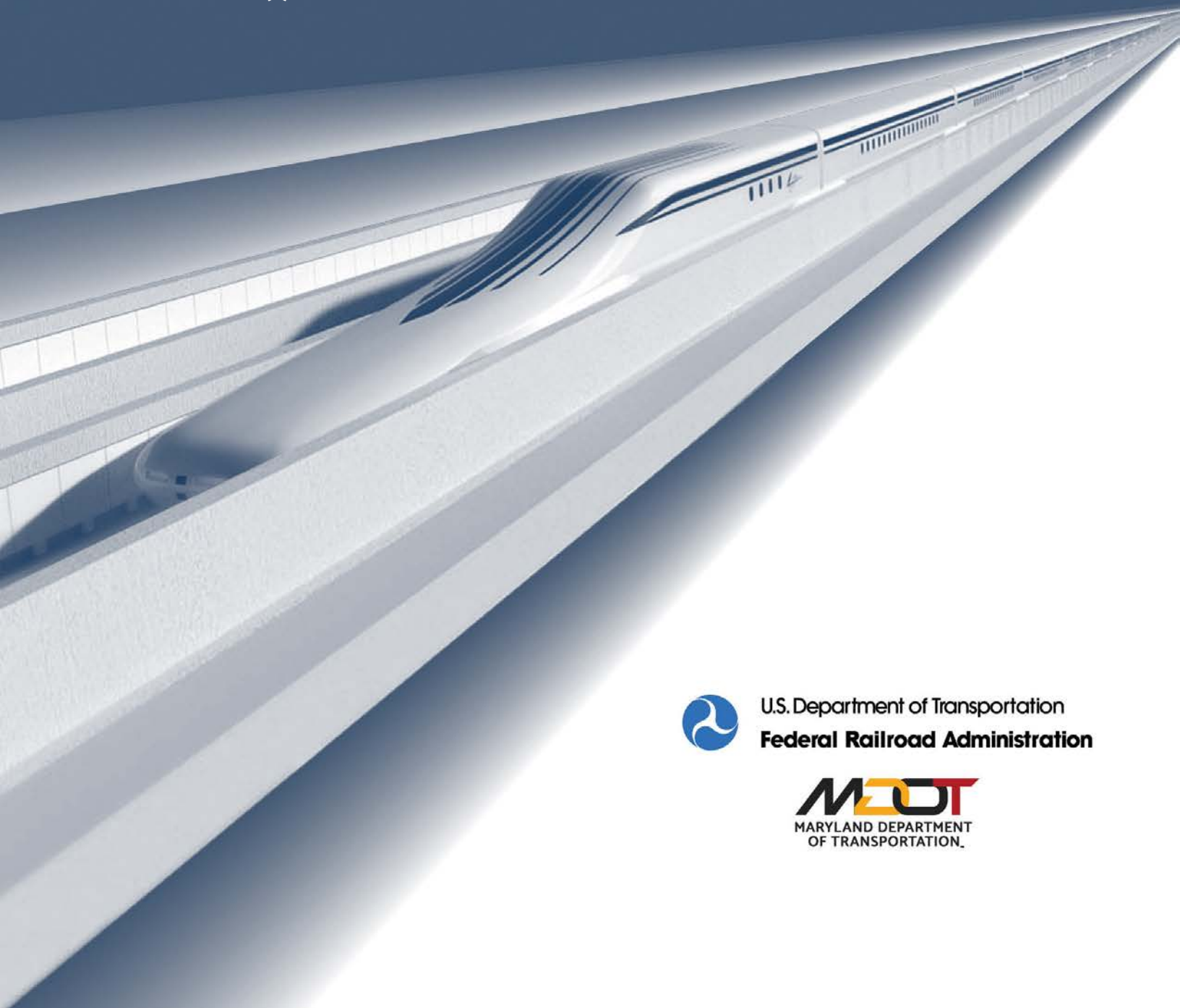
- Identify suitable replacement property for public recreational facilities and parklands that cannot be avoided.

Section 4.8

Cultural Resources

BALTIMORE-WASHINGTON SUPERCONDUCTING MAGLEV PROJECT

DRAFT ENVIRONMENTAL IMPACT STATEMENT AND
SECTION 4(f) EVALUATION



U.S. Department of Transportation
Federal Railroad Administration



4.8 Cultural Resources

4.8.1 Introduction

This section describes cultural resources in the Superconducting Magnetic Levitation Project (SCMAGLEV Project) Project Affected Environment and identifies the potential impacts to these resources for the No Build and Build Alternatives. Chapter 3 Alternatives Considered, provides descriptions of the No Build and Build Alternatives.

“Cultural resources” includes any prehistoric or historic structures, buildings, objects, sites, districts (a collection of related structures, building, objects, and/or sites), landscapes, natural features, traditional cultural properties (TCPs) and cemeteries. This assessment organizes cultural resources into two categories: above-ground resources (such as historic structures, buildings, objects, districts, landscapes, natural features, TCPs, cemeteries, and local government-designated landmarks and historic districts) and archaeological resources (such as prehistoric or historic, sites, TCPs, cemeteries, and local government-designated sites).

Cultural resources that meet the National Register of Historic Places (NRHP) significance criteria qualify for consideration under the National Historic Preservation Act (NHPA) (54 U.S.C. § 300101 et seq.) and its implementing regulations (36 C.F.R. Part 800), including National Historic Landmarks (NHL). For cultural resources designated as a National Historic Landmark (NHL), Section 110(f) of the NHPA requires that prior to the approval of any Federal undertaking which may directly and adversely affect an NHL, the Federal agency shall, to the maximum extent possible, undertake such planning and actions necessary to minimize harm to the NHL, and afford the Advisory Council on Historic Preservation (ACHP) an opportunity to comment. Additionally, 36 CFR § 800.10(c) requires the Federal agency to notify the Secretary of the Interior (Secretary) and invite the Secretary to participate in consultation.

Both cultural resources, as defined above, and historic properties, as defined by NHPA, are addressed in this section.

4.8.2 Regulatory Context and Methodology

4.8.2.1 Regulatory Context

The Federal Railroad Administration (FRA) *Procedures for Considering Environmental Impacts* (64 FR 28545, May 26, 1999, as updated by 78 FR 2713, Jan. 14, 2013) require that Environmental Impact Statements (EIS) evaluate the impacts to cultural resources consistent with NHPA Section 106 (54 U.S.C. § 306108) (Section 106). The NHPA sets the Federal policy for preserving our nation’s heritage. Section 106 of NHPA requires Federal agencies to consider the effects of their actions on historic properties

by identifying and evaluating historic properties, assessing effects to those properties, and resolving any adverse effects. The process is initiated by the Federal agency and includes comment and input from stakeholders at the local, state, and Federal levels, Native American tribes, as well as the Advisory Council on Historic Preservation (ACHP). The ACHP published regulations (36 CFR Part 800) that guide Federal agencies and other participants in the Section 106 process. FRA is coordinating compliance with Section 106 with the NEPA process consistent with the general principles outlined in 36 CFR § 800.8(a).

Additionally, several other laws that are intended to protect cultural resources may be applicable to portions of the Project:

- The Archaeological and Historic Preservation Act of 1960 (54 USC 312501-312508) as amended provides for the preservation of significant scientific, prehistoric, historic and archaeological materials and data that might be lost or destroyed during construction.
- The Archaeological Resources Protection Act of 1974 (16 USC 470aa-mm) defines archaeological resources as any material remains of past human life or activities that are of archaeological interest and at least 100 years old, requires Federal permits for their excavation or removal.
- The Native American Graves Protection and Repatriation Act of 1990 (25 USC 3001 et seq.) gives ownership and control of Native American human remains, funerary objects, sacred objects and objects of cultural patrimony that are excavated or discovered on Federal land to federally recognized Native American tribes or Native Hawaiian organizations.
- The Annotated Code of Maryland, including Criminal Law Title 10, Subtitle 4; Health-General Title 4, Subtitle 2, § 4-215; Land Use Division I, Title 5, Subtitle 1; Real Property Title 14, Subtitle 1, § 14-121; State Finance and Procurement Division I, Title 10, Subtitle 3, § 10-309; and Property Title 9, Subtitle 2, § 9-261 as well as Maryland Court Rules Title 14, Chapter 400, all of which pertain to the protection of cemeteries and human burials in Maryland.

4.8.2.2 Programmatic Agreement

A project Programmatic Agreement (PA) is typically executed when the effects on historic properties cannot be fully determined before a Federal agency approves an undertaking. For the SCMAGLEV Project, FRA is developing a project PA pursuant to 36 CFR § 800.14(b) to satisfy its Section 106 responsibilities. The Project PA outlines the on-going responsibilities of the Federal agencies with regards to Section 106 consultation after issuance of the Record of Decision (ROD), including:

- Area of Potential Effects revision,

- identification and evaluation of historic properties,
- assessment of adverse effects,
- resolution of adverse effects,
- reviews and expedited consultation processes, and
- dispute resolution.

The draft project PA is provided in Appendix D.5 Attachment A.

4.8.2.3 Methodology

The cultural resources methodology follows the steps of the NHPA Section 106 process as identified in 36 CFR § 800.

Consultation – Consultation, defined as the process of seeking, discussing, and considering the view of participants, is an important component of the Section 106 process. FRA has and will continue to conduct consultation throughout the Section 106 process with:

- **Section 106 Consulting Parties** - Beginning in 2017, FRA identified and initiated consultation with consulting parties, defined in 36 CFR § 800.2(c) as the SHPOs; Federally recognized Native American tribes; representatives of local governments; applicants for Federal assistance, permits, licenses, and other approvals; and certain individuals and organizations with a demonstrated interest in the SCMAGLEV Project (See Appendix D.5.1 for Table D.5-1 that lists FRA-invited consulting parties who accepted the invitation to participate as consulting parties and a summary of consulting party communications to date). Consistent with Section 106, consulting parties will have the opportunity to comment on historic properties, impacts to them, as well as resolution of those impacts through Section 106 consultation and opportunities afforded to the public.
- **ACHP** - FRA notified the ACHP of the Project and ACHP elected to participate in the Section 106 consulting process, pursuant to 36 CFR § 800.6(a)(1)(iii) (See Appendix D.5.1). Consistent with Section 106, the ACHP will have the opportunity to comment on historic properties, impacts to them, as well as resolution of those impacts through Section 106 consultation and opportunities afforded to the public.
- **Public** - FRA is coordinating public participation for Section 106 with NEPA. Consistent with Section 106, the public and all consulting parties will continue to have the opportunity to comment on historic properties, impacts to them, as well as resolution of those impacts through Section 106 via attendance at public

meetings where they can submit comments on the information presented, as well as review of NEPA documents on the Project website (See Appendix D.5.1 and Section 5.7.2, Public Involvement and Agency Coordination).

APE Delineation – The SCMAGLEV Project Affected Environment for this analysis is the Area of Potential Effects (APE), defined as “the geographic area within which an undertaking may directly or indirectly cause alteration in the character or use of historic properties, if any such properties exist. The APE is influenced by the scale and nature of an undertaking and may be different for different kinds of effects caused by the undertaking” (36 C.F.R. § 800.16(d)). There can be multiple APEs and the APE can have both vertical and horizontal dimensions. The FRA consulted with the SHPOs and coordinated with the ACHP and other consulting parties regarding delineation of the APE for both above-ground and archaeological resources.

APEs were defined for above-ground resources, including buildings, structures, districts, and objects (above-ground APE), and for archaeological resources (archaeological APE). Through consultation with the MD SHPO and DC SHPO, and coordination with the ACHP and other consulting parties, FRA delineated the APEs in July 2018 and updated them in January 2019 as more detailed engineering became available. The SHPOs concurred with the APEs in January 2019; however, additional changes to the engineering have required APE updates. FRA is currently consulting with the SHPOs regarding proposed updates to the APEs described below. Additionally, FRA will continue to consult with the SHPOs regarding any future engineering changes and associated changes in the APE. The SCMAGLEV Project PA will contain stipulations for revising the APE if designs continue to be refined after the ROD.

The above-ground APE takes into account impacts resulting from construction and operation of the Build Alternatives and is defined as follows:

- In Maryland, the above-ground APE includes the geographic area within 150 feet of the Limits of Disturbance (LOD), defined as the construction footprint of the Build Alternatives, including any permanent and temporary easements, access roads, all locations of ancillary facilities, and any other Project-specific locations.
- In the District of Columbia, the above-ground APE includes the geographic area within an irregular, multi-sided polygon that was drawn to account for Project effects (visual, noise, vibration, and traffic) from above-ground elements of the Mount Vernon Square East Station (cut/cover, station entrances, construction laydown, and parking garage) as well as additional construction laydown areas, cut/cover for underground electrical, and a substation, to contributing elements (reservations, streets/avenues, and vistas) of the NRHP-listed L’Enfant Plan of the City of Washington, as well as other known historic buildings and districts.

The potential for construction of the deep tunnel portions of the SCMAGLEV system to result in impacts on above-ground resources is low based on the extremely low probability of collapse of a deep tunnel to such an extent that the ground surface is

breached, or that vibration or noise from the deep tunnel reaches the surface, as addressed in Appendix D.10 Noise and Vibration and Appendix G.7. As such, the above-ground APE does not include the deep tunnel portions of the project.

The archaeological APE is defined as the LOD to focus on potential ground-disturbing activities associated with the construction of the Build Alternatives. The potential for construction of the deep tunnel portions of the SCMAGLEV system to result in adverse impacts on archaeological sites located near the surface (i.e., above 6 feet) was evaluated and determined to be low. This is based on the extremely low probability of collapse of a deep tunnel to such an extent that the ground surface is breached. As such, the archaeological APE does not include the deep tunnel portions of the Project, and no recommendations for archaeological field investigations are provided for areas above the deep tunnel portions that do not intersect with the archaeological APE.

Both APEs may include historic properties of religious and cultural significance to Native American tribes. FRA continues to consult with Federally recognized Native American tribes known by FRA to have an interest in the geographic region that encompasses the Project to identify such properties.

The APEs are depicted on maps in Appendix B.4.

Identification and Evaluation of Historic Properties – FRA is identifying historic properties through consultation as noted above and by conducting background research, preparing an archeological sensitivity model, performing field surveys, categorizing the identified historic properties and determining the eligibility of previously unevaluated resources.

- **Background Research** - FRA conducted background research to identify previously surveyed and evaluated cultural resources in the APEs (resources identified in past, unrelated projects). FRA's research sources included the National Register of Historic Places and SHPO records for previous documentation of NRHP-listed historic properties, NRHP-eligible historic properties, NHLs and eligibility determinations provided by Federal agencies for properties under their jurisdiction; the D.C. Inventory of Historic Sites for landmarks listed in D.C.; and the City of Baltimore Landmark List for landmarks and historic districts listed in Baltimore. This effort also included researching archival materials to develop historic contexts for evaluating the significance of newly identified resources and their eligibility for listing in the NRHP. The archival data contributed to a contextual understanding of the built environment and patterns of development, land use, spatial organization, and cultural landscapes within the APEs.
- **Archaeological Sensitivity Model and Phase Ia Assessments** – FRA prepared an archaeological sensitivity model and an archaeological Phase Ia assessment, through desktop research, to further refine this model. The model and the more detailed Phase Ia assessment use environmental data, historic

maps, and modern land use/land cover data to determine if a given location in the archaeological APE has a high, moderate, or low sensitivity to contain archaeological resources. Refer to Appendix D.5.2 for more information on the model and Phase 1a Assessments.

- **Field Survey** – FRA conducted field surveys to identify cultural resources in the APE that were not identified through past projects. Field survey for cultural resources in the above-ground APE occurred between November 2018 and August 2019 (2018-2019 survey), and June 2020 and September 2020 (2020 survey). Only above-ground resources more than forty-five (45) years old or older (pre-1974) located within the APE were documented, evaluated, and assessed as part of the above-ground field survey. The identification of properties is focused on those 45 years or older, rather than the standard 50 years or older, to account for the delay between identification and evaluation and the start of construction. The results of 2020 survey are being evaluated and will be updated in the Final Environmental Impact Statement (FEIS).

Archaeological field survey has not begun. Additional identification of undocumented archaeological sites, as well as, evaluation of archaeological resources not yet evaluated for NRHP significance, will commence with Phase I archaeological surveys. A Phase II archaeological evaluation will occur at any sites that are determined potentially eligible for inclusion in the NRHP. If avoidance is not possible, Phase III data recovery excavations may take place at these sites. Archaeological field investigations will follow the stipulations of the Project PA currently under development.

- **Categorize Historic Properties** – Based on the background research and field surveys, FRA categorized the identified historic properties within the APEs as follows:
 - National Historic Landmark (NHL) - a historic property that illustrates the heritage of the United States and holds national significance;
 - NRHP-listed - a historic property listed in the NRHP;
 - NRHP-eligible - a historic property determined eligible for listing in the NRHP;
 - Not evaluated - a resource not yet evaluated for the NRHP eligibility but that will be treated as NRHP-eligible until such time as FRA makes a formal NRHP eligibility determination in consultation with the appropriate SHPO. This includes resources such as locally designated landmarks and historic districts and archaeological sites that have been included in municipal databases, SHPO databases, and Federal agency-supplied information, but have not yet been evaluated for NRHP eligibility.

- **Determinations of Eligibility for Previously Unevaluated Resources** - FRA is evaluating the properties categorized as not evaluated according to the relevant criteria for NRHP eligibility and seeking SHPO concurrence with the resulting NRHP determinations. For a property (district, site, structure, building, or object) to be listed or eligible for listing in the NRHP, and thus subject to Section 106, it must be:
 - A) Associated with events that have made a significant contribution to the broad patterns of our history; or
 - B) Associated with the lives of significant persons in our past; or
 - C) Embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or
 - D) Yielded or may be likely to yield, information important in history or prehistory.

The property must also possess sufficient integrity of location, design, setting, materials, workmanship, feeling, and association to be listed or eligible for listing in the NRHP.

Effects Assessment - FRA will assess effects on historic properties (both previously known and those identified in the studies underway for this project) in the APE according to the Criteria of Adverse Effect. The FRA will also identify the effects as temporary or permanent.

- **Criteria of Adverse Effect**

The Criteria of Adverse Effect are defined in 36 CFR § 800.5(a) as “An adverse effect is found when an undertaking may alter, directly or indirectly, any of the characteristics of a historic property that qualify the property for inclusion in the National Register in a manner that would diminish the integrity of the property's location, design, setting, materials, workmanship, feeling, or association. Consideration shall be given to all qualifying characteristics of a historic property, including those that may have been identified subsequent to the original evaluation of the property's eligibility for the National Register. Adverse effects may include reasonably foreseeable effects caused by the undertaking that may occur later in time, be farther removed in distance or be cumulative.” Examples of adverse effects include:

- Physical destruction or damage;
- Alterations that are inconsistent with the Secretary's Standards for the Treatment of Historic Properties, including restoration, rehabilitation, repair, maintenance, stabilization, hazardous material remediation, and provision of handicapped access;

- Removal of the property from its historic location;
- Change of the character of the property's use or of contributing physical features within the property's setting;
- Introduction of visual, atmospheric, or audible elements that diminish the integrity of the property's significant historic features;
- Neglect or deterioration (except in certain religious or cultural cases); and
- Transfer, lease, or sale of property out of Federal ownership or control without adequate preservation controls.

- **Temporary or Permanent Impacts**

Impacts can be temporary or permanent. Temporary impacts, for example, could be caused by construction cut-and-cover for stations and underground powerlines, and construction laydown after which the ground surface will be returned to its pre-construction state. They could also include noise, vibration, and lighting from construction activities, including street closures and traffic diversions, that will cease once construction is complete; and removal of character-defining vegetation or other features that are replanted or reinstalled that can be reasonably expected to be returned to their pre-construction state.

Permanent impacts, for example, could include demolition of a historic property for cut-and-cover construction or a station entrance. They could also include introduction of project components that could diminish any aspects of integrity that contribute to a property's historic significance, such as above-ground stations and above-ground entrances to below-ground stations; station parking garages; tunnel boring machine (TBM) launch-retrieval sites/fresh air/emergency egress (FA/EE) locations; tunnel portals and hoods; viaducts with piers, etc. Permanent effects could also include noise, vibration, and lighting changes.

If FRA determines the impacts would diminish any aspects of integrity that contribute to a historic property's significance, FRA would make a finding of adverse effect. This assessment will be informed by the analyses for construction impacts (Section 4.1), aesthetics and visual quality (Section 4.9), noise and vibration (Section 4.17), and traffic (Section 4.2) as well as a photographic simulations study that visualizes the appearance of the Build Alternatives compared to existing conditions (see Appendix D.6).

FRA is continuing to assess effects to historic properties in consultation with DC SHPO, MD SHPO, Native American tribes, and other consulting parties. Therefore, this EIS identifies the potential impacts the SCMAGLEV Project may have on historic properties by applying the Criterion of Adverse Effect but does not provide a conclusion regarding effect under Section 106. Additional information will be provided in the FEIS after the assessment of adverse effects consultation process is completed.

FRA will document the effects assessment results in reports submitted to the DC SHPO, MD SHPO, Native American tribes, and other consulting parties for review and comment. The reports will include the results of the literature reviews, background research, field survey, and effects assessment.

Resolution of Adverse Effects and Programmatic Agreement Development –

The final step of the Section 106 process is to resolve adverse effects. During this step, the FRA will consult with consulting parties to avoid, minimize, and mitigate adverse effects on historic properties. Once FRA, SHPOs, and ACHP agree, the measures to resolve adverse effects will be memorialized in the PA (prior to PA execution) or in accordance with the PA (after PA executed).

As explained above, FRA is developing a Project PA in consultation with the ACHP, SHPOs, Baltimore-Washington Rapid Rail (BWRR), federally recognized Native American tribes, and other consulting parties to govern phased identification, evaluation, and assessment of effects, and the resolution of adverse effects.

4.8.3 SCMAGLEV Project Affected Environment

Area of Potential Effects

FRA currently identified 42 above-ground resources considered historic properties per the NHPA in the above-ground APE and 21 archaeological resources considered historic properties per the NHPA in the archaeological APE. Only one of these archaeological resources (51NW121) has been formally determined NRHP-eligible; the other 20 archaeological resources are currently not evaluated for the NRHP. FRA will make determinations of eligibility for these resources and seek the appropriate SHPO's concurrence. FRA also identified the sensitivity of areas within the APE to potentially contain archaeological resources as high, moderate, or low.

Appendix D.5.3 provides descriptions of each of the above-ground historic properties. Maps showing the locations of the above-ground historic properties are in Appendix B.4. Archaeological site locations are confidential.

Table 4.8-1 summarizes the cultural resources within the above-ground APE by Build Alternative, and **Table 4.8-2** lists known resources in the archaeological APE by Build Alternative. **Table 4.8-3** shows the archeological sensitivity by Project element.

Table 4.8-1: Resources in the Above-ground APE by Build Alternative

Resource Name	Type	Location	NRHP Status	Build Alternatives (X indicates resource is within Above-ground APE for a Build Alternative)											
				J-01	J-02	J-03	J-04	J-05	J-06	J1-01	J1-02	J1-03	J1-04	J1-05	J1-06
L'Enfant Plan of the City of Washington	Public lands	D.C.	NRHP-listed	X	X	X	X	X	X	X	X	X	X	X	X
Central Public Library (Carnegie Library)	Public building	D.C.	NRHP-listed	X	X	X	X	X	X	X	X	X	X	X	X
Seventh St NW, E Side 1000 Block	Commercial buildings	D.C.	NRHP-listed	X	X	X	X	X	X	X	X	X	X	X	X
Mount Vernon Square Historic District and Addition	Historic district	D.C.	NRHP-listed/ eligible (Addition)	X	X	X	X	X	X	X	X	X	X	X	X
Yale Steam Laundry (including Garage and Stable)	Commercial building	D.C.	NRHP-listed	X	X	X	X	X	X	X	X	X	X	X	X
Fletcher Chapel (Church of God & Saints of Christ)	Religious building	D.C.	NRHP-listed	X	X	X	X	X	X	X	X	X	X	X	X
(Former) Peoples Congregational Church	Religious building	D.C.	NRHP-eligible	X	X	X	X	X	X	X	X	X	X	X	X
The New York Apartments	Multiple-family residential building	D.C.	NRHP-eligible	X	X	X	X	X	X	X	X	X	X	X	X
M Street High School (Perry School)	Educational building	D.C.	NRHP-listed	X	X	X	X	X	X	X	X	X	X	X	X
Augusta & Louisa Apartment Buildings	Multiple-family residential building	D.C.	NRHP-listed	X	X	X	X	X	X	X	X	X	X	X	X
Holy Redeemer Catholic Church and School	Religious and Educational buildings	D.C.	NRHP-eligible	X	X	X	X	X	X	X	X	X	X	X	X
Southern Baptist Church	Religious building	D.C.	NRHP-eligible	X	X	X	X	X	X	X	X	X	X	X	X

Resource Name	Type	Location	NRHP Status	Build Alternatives (X indicates resource is within Above-ground APE for a Build Alternative)											
				J-01	J-02	J-03	J-04	J-05	J-06	J1-01	J1-02	J1-03	J1-04	J1-05	J1-06
Mount Vernon Triangle Historic District	Historic district	D.C.	NRHP-listed	X	X	X	X	X	X	X	X	X	X	X	X
Downtown (Washington, D.C.) Historic District	Historic district	D.C.	NRHP-listed	X	X	X	X	X	X	X	X	X	X	X	X
Downtown (Washington, D.C.) Historic District Addition	Historic district	D.C.	Not Evaluated (proposed D.C. Landmark)	X	X	X	X	X	X	X	X	X	X	X	X
Bible Way Church and Temple	Religious building	D.C.	NRHP-eligible	X	X	X	X	X	X	X	X	X	X	X	X
John Fox Slater School	Educational building	D.C.	NRHP-listed	X	X	X	X	X	X	X	X	X	X	X	X
John Mercer Langston School	Educational building	D.C.	NRHP-listed	X	X	X	X	X	X	X	X	X	X	X	X
Margaret Murray Washington School	Educational building	D.C.	NRHP-listed	X	X	X	X	X	X	X	X	X	X	X	X
Hecht Company Warehouse	Warehouse	D.C.	NRHP-listed	X	X	X	X	X	X	X	X	X	X	X	X
Baltimore & Ohio (B&O) Railroad Bridge over Montana Avenue NE	Transportation infrastructure	D.C.	NRHP-eligible	X	X	X	X	X	X	X	X	X	X	X	X
F.P. May Hardware Company Warehouse and Office	Warehouse	D.C.	NRHP-eligible	X	X	X	X	X	X	X	X	X	X	X	X
Pennsylvania Railroad Bridge over Montana Avenue NE	Transportation infrastructure	D.C.	NRHP-eligible	X	X	X	X	X	X	X	X	X	X	X	X
Martins Woods (PG:72-68)	Residential district	MD	NRHP-eligible	X	X	X	X	X	X	X	X	X	X	X	X
Greenbelt Historic District (PG: 67-4)	Historic district and cultural landscape	MD	NHRP listed/ NHL	X	X	X	X	X	X	X	X	X	X	X	X

Resource Name	Type	Location	NRHP Status	Build Alternatives (X indicates resource is within Above-ground APE for a Build Alternative)											
				J-01	J-02	J-03	J-04	J-05	J-06	J1-01	J1-02	J1-03	J1-04	J1-05	J1-06
Goddard Space Flight Center (PG:64-19)	Research campus	MD	NRHP-eligible	X	X	X	X	X	X	X	X	X	X	X	X
Beltsville Agricultural Research Center (PG:62-14)	Research facility and cultural landscape	MD	NRHP-eligible	X	X	X	X	X	X	X	X	X	X	X	X
Baltimore-Washington Parkway (AA-5, PG:69-26)	Transportation infrastructure, cultural landscape, and landscape architecture	MD	NRHP-listed	X	X	X	X	X	X	X	X	X	X	X	X
D.C. Children's Center-Forest Haven District (AA-2364)	Hospital campus with cemetery	MD	NRHP-eligible	X	X	X	X	X	X	X	X	X	X	X	X
Westport Historic District (B-1342)	Historic district	MD	NRHP-eligible	X	X	X	X	X	X	X	X	X	X	X	X
Cherry Hill Homes Historic District (B-5080)	Historic district	MD	NRHP-eligible	X	X	X	X	X	X	X	X	X	X	X	X
Cherry Hill Homes Extension 1 (B-5321)	Historic district	MD	NRHP-eligible	X	X	X	X	X	X	X	X	X	X	X	X
Mount Auburn Cemetery (B-5060)	Cemetery	MD	NRHP-listed	X	X	X	-	-	-	X	X	X	-	-	-
Spring Garden Bridge (B-3668)	Transportation infrastructure	MD	NRHP-eligible	X	X	X	X	X	X	X	X	X	X	X	X
Howard St Tunnel & Power House (B-79)	Transportation infrastructure	MD	NRHP-listed	-	-	-	X	X	X	-	-	-	X	X	X
Baltimore and Ohio (B&O) Railroad Baltimore Belt Line (B-5287)	Transportation infrastructure	MD	NRHP-eligible	-	-	-	X	X	X	-	-	-	X	X	X

Resource Name	Type	Location	NRHP Status	Build Alternatives (X indicates resource is within Above-ground APE for a Build Alternative)											
				J-01	J-02	J-03	J-04	J-05	J-06	J1-01	J1-02	J1-03	J1-04	J1-05	J1-06
Pratt Furniture Company (B-2387)	Commercial building	MD	NRHP-eligible	-	-	-	X	X	X	-	-	-	X	X	X
George H. Fallon Federal Building (B-5286)	Government building	MD	NRHP-eligible	-	-	-	X	X	X	-	-	-	X	X	X
(Downtown Baltimore) Business and Government Historic District (B-3935)	Historic district	MD	NRHP-listed	-	-	-	X	X	X	-	-	-	X	X	X
Otterbein Church (B-11)	Religious building	MD	NRHP-listed	-	-	-	X	X	X	-	-	-	X	X	X
Otterbein Historic District (B-3934)	Historic district	MD	NRHP-eligible	-	-	-	X	X	X	-	-	-	X	X	X
U.S. Fidelity and Guaranty (USF&G) Building (B-5318)	Commercial building	MD	NRHP-eligible	-	-	-	X	X	X	-	-	-	X	X	X
Total Number of Resources in Above-ground APE				34	34	34	41	41	41	34	34	34	41	41	41

Table 4.8-2: Resources in the Archaeological APE by Build Alternative

Resource Name	Type	Location	NRHP Status	Build Alternatives (X indicates resource is within Archaeological APE for a Build Alternative)											
				J-01	J-02	J-03	J-04	J-05	J-06	J1-01	J1-02	J1-03	J1-04	J1-05	J1-06
18AN0191	Prehistoric and Historic, Late Archaic lithic scatter and 18 th -19 th century iron furnace	MD	Not Evaluated	-	-	-	-	-	-	X	X	X	X	X	X
18AN0208	18 th -19 th century plantation house site	MD	Not Evaluated	X	X	X	X	X	X	X	-	-	X	-	-
18AN0557	Prehistoric, Late Archaic, Late Woodland short-term resource procurement camp	MD	Not Evaluated	X	X	X	X	X	X	X	X	X	X	X	X
18AN0558	Prehistoric, Late Archaic short-term resource procurement camp	MD	Not Evaluated	X	X	X	X	X	X	-	-	-	-	-	-
18AN0559	Prehistoric, Lithic scatter	MD	Not Evaluated	X	X	X	X	X	X	-	-	-	-	-	-
18AN0912	Historic, Early 20 th -century domestic	MD	Not Evaluated	X	X	X	X	X	X	-	-	-	-	-	-
18AN1231	Prehistoric, Lithic scatter	MD	Not Evaluated	X	X	X	X	X	X	X	X	X	X	X	X
18AN1408	Prehistoric, Lithic scatter	MD	Not Evaluated	X	-	-	X	-	-	X	-	-	X	-	-
18AN1647	Historic cemetery	MD	Not Evaluated	X	X	X	X	X	X	-	-	-	-	-	-
18BA0088	Prehistoric, Shell midden	MD	Not Evaluated	X	X	X	X	X	X	X	X	X	X	X	X
18BA0089	Prehistoric, Lithic scatter	MD	Not Evaluated	X	X	X	X	X	X	X	X	X	X	X	X
18BC0025	Historic, Early-late 19 th century privies and well	MD	Not Evaluated	-	-	-	X	X	X	-	-	-	X	X	X
18BC0027	Historic, Early 19 th -late 20 th century domestic and commercial	MD	Not Evaluated	-	-	-	X	X	X	-	-	-	X	X	X
18PR0083	Prehistoric, Archaic short-term resource procurement camp	MD	Not Evaluated	-	-	-	-	-	-	X	X	X	X	X	X
18PR0084	Prehistoric, Archaic short-term resource procurement camp	MD	Not Evaluated	X	X	X	X	X	X	-	-	-	-	-	-
18PR0209	Prehistoric, Lithic scatter	MD	Not Evaluated	-	-	-	-	-	-	X	-	-	X	-	-

18PR0440	Historic, 19th-early 20th century domestic site	MD	Not Evaluated	X	X	X	X	X	X	-	-	-	-	-	-
18PR1127	Prehistoric isolated find & 18-19th century domestic site	MD	Not Evaluated	X	X	X	X	X	X	-	-	-	-	-	-
18PR1128	Historic artifact scatter	MD	Not Evaluated	-	-	-	-	-	-	X	X	X	X	X	X
51NW121	Historic, 19th-20th century site	D.C.	Eligible	X	X	X	X	X	X	X	X	X	X	X	X
51NW244	Historic, No information	D.C.	Recommend Not Eligible*	X	X	X	X	X	X	X	X	X	X	X	X
Total Number of Resources in Archaeological APE				15	14	14	17	16	16	12	9	9	14	11	11

Table 4.8-3: Archaeological Sensitivity by Project Element

Project Element	High		Medium		Low	
	Acreage	Percent of Total	Acreage	Percent of Total	Acreage	Percent of Total
Alignment J	158.3	17.10%	358.57	38.72%	409.09	44.18%
Alignment J1	130.97	16.65%	284.01	36.11%	371.63	47.24%
Mount Vernon Square East Station	20.73	53.66%	16.40	42.46%	1.50	3.88%
BWI Marshall Airport Station	0.00	0.00%	0.00	0.00%	20.93	100.00%
Alignment J	9.5	21.3%	4.5	10.1%	30.7	68.7%
Alignment J1	9.5	21.5%	4.5	10.2%	30.1	68.3%
Camden Yards Station	52.31	71.39%	0.00	0.00%	20.97	28.61%
BARC Airstrip TMF						
Alignment J	44.61	19.38%	155.27	67.46%	30.30	13.16%
Alignment J1	43.64	18.82%	158.49	68.35%	29.76	12.83%
BARC West TMF						
Alignment J	44.29	15.83%	174.78	62.46%	60.76	21.71%
Alignment J1	45.86	14.72%	193.11	61.99%	72.53	23.28%
MD 198 TMF						
Alignment J	12.55	6.22%	87.44	43.31%	101.89	50.47%
Alignment J1	17.97	7.83%	99.25	43.25%	112.25	48.92%

4.8.4 Environmental Consequences

FRA identified the potential impacts of each Build Alternative on cultural resources.

4.8.4.1 No Build Alternative

Under the No Build Alternative, the SCMAGLEV Project will not be built and, therefore, no impacts related to the construction or operation of a SCMAGLEV system will occur to cultural resources. Consistent with 36 CFR Part 800.3(a), there would be no undertaking subject to Section 106. However, other planned and funded transportation projects will be implemented in the area and could result in effects to cultural resources. For instance, the planned widening of the Baltimore-Washington Parkway (BWP) will cause an impact to the NRHP-listed BWP.

4.8.4.2 Build Alternatives

The 12 Build Alternatives are based on the two alignments J and J1. Build Alternatives J include 25 percent viaduct and 75 percent tunnel whereas, Build Alternatives J1 include 14 percent viaduct and 86 percent tunnel.

Alignments

Both Build Alternatives J and J1 alignments would impact the following above-ground resources in similar ways: Martins Woods, Beltsville Agricultural Research Complex (BARC), and BWP. However, due to the different locations at which the alignments emerge from and descend to deep tunnel, the Build Alternatives J alignments would also impact the D.C. Children's Center-Forest Haven District, while the Build Alternatives J1 alignments would also impact the Greenbelt Historic District, an NHL. Since the Greenbelt Historic District is an NHL, FRA will consult with the ACHP and Department of the Interior to minimize harm to the maximum extent possible. **Tables 4.8-4 and 4.8-5** provide additional information on impacts to above-ground resources from the alignments.

The Build Alternatives J alignments would result in higher amounts of impacts to known archaeological resources as compared to the Build Alternatives J1 alignments as identified in **Tables 4.8-6 and 4.8-7**. The Build Alternatives J alignments would impact 516.87 acres of High-Moderate archaeological sensitivity (55.8 percent of the LOD), while the Build Alternatives J1 alignments would impact 414.98 acres of High-Moderate archaeological sensitivity (52.8 percent of the LOD). It is anticipated that the greater the acreage of High-Moderate archaeological sensitivity, the greater the potential for adverse effects to unknown NRHP-eligible archaeological resources.

Table 4.8-4: Alignment J – Potential Impacts to Above-ground Resources

Resource Name	Temporary or Permanent	Impact Description
L'Enfant Plan of the City of Washington	Temporary	Possible visual, noise, and vibration impacts on the setting, feeling, and materials of New York Avenue; setting and feeling of contributing reservations; and the integrity of the New York Avenue vista between Mount Vernon Square and Florida Avenue due to construction LOD for new powerlines and cut-and-cover for underground utilities along New York Avenue NW and NE.
	Permanent	Possible visual, noise, and vibration impacts on the setting and feeling of New York and Florida Avenues and North Capitol Street; setting and feeling of contributing reservations; and the integrity of the New York Avenue vista between Mount Vernon Square and Florida Avenue, NW due to long-term construction laydown area at North Capitol Street and New York Avenue NW and NE. ¹
Mount Vernon Square Historic District and Addition	Temporary	Possible visual, noise, and vibration impacts on the setting and feeling, and the materials and workmanship of character-defining architectural features of contributing buildings along New York Avenue and Seventh Street, NW due to construction LOD for new powerlines and cut-and-cover for underground utilities along New York Avenue NW.
	Permanent	Possible visual impacts on the setting and feeling of contributing buildings along New York Avenue due to long-term construction laydown area at North Capitol Street and New York Avenue NE. ¹
Central Public Library (Carnegie Library)	Temporary	Possible visual, noise, and vibration impacts on the setting and feeling, and the materials and workmanship of character-defining architectural features of Central Public Library and its landscaping due to construction LOD for cut-and-cover for underground utilities along New York Avenue NW
	Permanent	None
People's Congregational Church	Temporary	None
	Permanent	None
Downtown Historic District	Temporary	None
	Permanent	None
Downtown Historic District Addition	Temporary	None
	Permanent	None
Seventh Street NW, E Side 1000 Block	Temporary	Possible visual and noise impacts on the setting and feeling, and vibration impacts on the materials and workmanship of character-defining architectural features due to construction LOD for cut-and-cover for underground utilities along New York Avenue NW.
	Permanent	None

Resource Name	Temporary or Permanent	Impact Description
Yale Steam Laundry	Temporary	Possible visual and noise impacts on the setting and feeling, and vibration impacts on the materials and workmanship of character-defining architectural features due to construction LOD for cut-and-cover for underground utilities along New York Avenue NW.
	Permanent	None
Fletcher Chapel	Temporary	Possible visual and noise impacts on the setting and feeling, and vibration impacts on the materials and workmanship of character-defining architectural features due to construction LOD for cut-and-cover for underground utilities along New York Avenue NW.
	Permanent	None
M Street High School	Temporary	Possible visual and noise impacts on the setting and feeling, and vibration impacts on the materials and workmanship of character-defining architectural features due to construction LOD for cut-and-cover for underground utilities along New York Avenue NW.
	Permanent	None
New York Apartments	Temporary	Possible visual and noise impacts on the setting and feeling, and vibration impacts on the materials and workmanship of character-defining architectural features due to construction LOD for cut-and-cover for underground utilities along New York Avenue NW.
	Permanent	None
Augusta and Louisa Apartments	Temporary	Possible visual and noise impacts on the setting and feeling, and vibration impacts on the materials and workmanship of character-defining architectural features due to construction LOD for cut-and-cover for underground utilities along New York Avenue NW.
	Permanent	None
Southern Baptist Church	Temporary	None
	Permanent	None
Bible Way Church and Temple	Temporary	Possible visual and noise impacts on the setting and feeling, and vibration impacts on the materials and workmanship of character-defining architectural features due to construction LOD for cut-and-cover for underground utilities along New York Avenue NW.
	Permanent	None
Holy Redeemer Catholic Church and School	Temporary	Possible visual and noise impacts on the setting and feeling, and vibration impacts on the materials and workmanship of character-defining architectural features due to construction LOD for cut-and-cover for underground utilities along New York Avenue NW.
	Permanent	None

Resource Name	Temporary or Permanent	Impact Description
John Fox Slater School	Temporary	None
	Permanent	None
John Mercer Langston School	Temporary	None
	Permanent	None
Margaret Murray Washington School	Temporary	None
	Permanent	None
Hecht Company Warehouse	Temporary	Possible visual, noise, and vibration impacts on the surrounding industrial and warehouse setting due to construction LOD for new powerlines and cut-and-cover for underground utilities along New York Avenue NE.
	Permanent	None
Baltimore & Ohio (B&O) Railroad Bridge over Montana Avenue NE	Temporary	Possible visual, noise, and vibration impacts on the surrounding industrial and warehouse setting due to construction LOD for new powerlines and cut-and-cover for underground utilities along New York Avenue NE.
	Permanent	Possible visual, noise, and vibration impacts on the surrounding industrial and warehouse setting due to FA/EE and substation at Ivy City.
F.P. May Hardware Company Warehouse and Office	Temporary	Possible visual, noise, and vibration impacts on the surrounding industrial and warehouse setting due to construction LOD for new powerlines and cut-and-cover for underground utilities along New York Avenue NE.
	Permanent	Possible noise, and vibration impacts on the surrounding industrial setting, association, and feeling due to FA/EE and substation at Ivy City. Railroad berm and ROW to the north blocks visual sight lines to FA/EE and substation site.
Pennsylvania Railroad Bridge over Montana Avenue NE	Temporary	Possible visual, noise, and vibration impacts on the surrounding industrial and warehouse setting due to construction LOD for new powerlines and cut-and-cover for underground utilities along New York Avenue NE.
	Permanent	Possible visual, noise, and vibration impacts on the surrounding industrial and warehouse setting, association, and feeling due to FA/EE and substation at Ivy City.
Martins Woods (PG:72-68)	Temporary	Direct impacts on the tree cover and property and visual impacts on the character-defining landscape elements and setting; noise and vibration impacts due to tunnel laydown and cut-and-cover for tunnel and TBM launch-retrieval site.

Resource Name	Temporary or Permanent	Impact Description
	Permanent	Visual, noise, and vibration impacts on setting from permanent access road and FA/EE at Riverdale Road, as well as direct impacts on tree cover and property due to removal of portion of character-defining woods for FA/EE.
Greenbelt Historic District (PG:67-4)	Temporary	Only a sliver of the historic district is within APE. Possible visual impacts on the setting, noise, and vibration impacts due to tunnel laydown, cut-and-cover for tunnel and TBM launch-retrieval site, and construction LOD (miscellaneous).
	Permanent	Only a sliver of the historic district is within APE. Possible visual impacts on the setting; noise and vibration impacts due to stormwater management, portal and transition portal hood, viaduct, and SCMAGLEV systems.
Goddard Space Flight Center (PG:64-19)	Temporary	Possible visual impacts on the setting; noise and vibration impacts due to tunnel laydown, cut-and-cover for tunnel and TBM launch-retrieval site, and construction LOD (miscellaneous).
	Permanent	Possible visual impacts on the setting; noise, vibration, and physical impacts due to stormwater management, road relocation and reconstruction, and portal and transition portal hood.
Beltsville Agricultural Research Center (PG:62-14)	Temporary	Direct impact on setting, design, and materials of the contributing landscape and historic plan. Visual impacts on the setting; noise and vibration impacts due to tunnel laydown, cut-and-cover for tunnel and TBM launch-retrieval site, construction LOD (miscellaneous), viaduct laydown, viaduct work zone access road, and construction LOD for new powerlines.
	Permanent	Direct impact on setting, design, and materials of the contributing landscape and historic plan. Visual impacts on the setting; noise and vibration impacts due to portal and transition portal hood, road relocation and reconstruction, viaduct, SCMAGLEV systems, and stormwater management.
Baltimore-Washington Parkway (AA-5, PG:69-26)	Temporary	Visual impact on setting, feeling, design, and materials of contributing landscape design; noise and vibration impacts due to tunnel laydown, cut-and-cover for tunnel and TBM launch-retrieval site, construction LOD (miscellaneous), viaduct laydown, viaduct work zone access road, and LOD for relocation of existing powerlines.
	Permanent	Direct impact on contributing landscape elements from viaduct due to high visibility and limited screening options. Visual impact on setting, feeling, design, and materials of contributing landscape design, culverts and bridges; noise and vibration impacts due to portal and transition portal hood, road relocation and reconstruction, permanent access road, viaduct, SCMAGLEV systems, and stormwater management.
DC Children's Center-Forest Haven District (AA-2364)	Temporary	Visual impacts on contributing buildings and surrounding landscape; noise and vibration impacts due to construction LOD (miscellaneous), viaduct laydown, viaduct work zone access road, and LOD for relocation of existing powerlines adjacent and within property boundary.
	Permanent	Direct impacts on land within district boundaries. Visual impacts on contributing buildings and landscape; noise and vibration impacts due to bridge reconstruction, viaduct, and SCMAGLEV systems.

Resource Name	Temporary or Permanent	Impact Description
Westport Historic District (B-1342)	Temporary	Possible visual, noise, vibration, and physical impacts due to cut-and-cover for tunnel and TBM launch-retrieval site.
	Permanent	None.
Cherry Hill Homes District (B-5080)	Temporary	None
	Permanent	Only small fragment of district is within APE. Possible visual, noise, and vibration impacts due to long-term construction laydown area.
Cherry Hill Homes Extension 1 (B-5321)	Temporary	None
	Permanent	Only small fragment of district is within APE. Possible visual, noise, and vibration impacts due to long-term construction laydown area.
Mount Auburn Cemetery (B-5060)	Temporary	Possible minimal visual impact on the setting; noise and vibration impacts due to construction LOD (miscellaneous).
	Permanent	Possible minimal visual impact on the setting; noise and vibration impacts due to construction LOD.
Spring Garden Bridge (B-3668)	Temporary	Possible visual impact on the setting; noise and vibration impacts due to construction LOD.
	Permanent	Possible visual impact on the setting; noise and vibration impacts due to construction LOD.

¹ Due to length of time (approximately 7 years) the construction area would be used, the associated impacts are considered permanent as opposed to temporary.

Table 4.8-5: Alignment J1 – Potential Impacts to Above-ground Resources

Resource Name	Temporary or Permanent	Impact Description
L'Enfant Plan of the City of Washington	Temporary	Possible visual, noise, and vibration impacts on the setting, feeling, and materials of New York Avenue; setting and feeling of contributing reservations; and the integrity of the New York Avenue vista between Mount Vernon Square and Florida Avenue due to construction LOD for new powerlines and cut-and-cover for underground utilities along New York Avenue NW and NE.
	Permanent	Possible visual, noise, and vibration impacts on the setting and feeling of New York and Florida Avenues and North Capitol Street; setting and feeling of contributing reservations; and the integrity of the New York Avenue vista between Mount Vernon Square and Florida Avenue, NW due to long-term construction laydown area at North Capitol Street and New York Avenue NW and NE. ¹
Mount Vernon Square Historic District and Addition	Temporary	Possible visual, noise, and vibration impacts on the setting and feeling, and the materials and workmanship of character-defining architectural features of contributing buildings along New York Avenue and Seventh Street, NW due to construction LOD for new powerlines and cut-and-cover for underground utilities along New York Avenue NW.
	Permanent	Possible visual impacts on the setting and feeling of contributing buildings along New York Avenue due to long-term construction laydown area at North Capitol Street and New York Avenue NE. ¹
Central Public Library (Carnegie Library)	Temporary	Possible visual, noise, and vibration impacts on the setting and feeling, and the materials and workmanship of character-defining architectural features of Central Public Library and its landscaping due to construction LOD for cut-and-cover for underground utilities along New York Avenue NW.
	Permanent	None
People's Congregational Church	Temporary	None
	Permanent	None
Downtown Historic District	Temporary	None
	Permanent	None
Downtown Historic District Addition	Temporary	None
	Permanent	None
Seventh Street NW, 1000 Block	Temporary	Possible visual and noise impacts on the setting and feeling, and vibration impacts on the materials and workmanship of character-defining architectural features due to construction LOD for cut-and-cover for underground utilities along New York Avenue NW.
	Permanent	None

Resource Name	Temporary or Permanent	Impact Description
Yale Steam Laundry	Temporary	Possible visual and noise impacts on the setting and feeling, and vibration impacts on the materials and workmanship of character-defining architectural features due to construction LOD for cut-and-cover for underground utilities along New York Avenue NW.
	Permanent	None
Fletcher Chapel	Temporary	Possible visual and noise impacts on the setting and feeling, and vibration impacts on the materials and workmanship of character-defining architectural features due to construction LOD for cut-and-cover for underground utilities along New York Avenue NW.
	Permanent	None
M Street High School	Temporary	Possible visual and noise impacts on the setting and feeling, and vibration impacts on the materials and workmanship of character-defining architectural features due to construction LOD for cut-and-cover for underground utilities along New York Avenue NW.
	Permanent	None
New York Apartments	Temporary	Possible visual and noise impacts on the setting and feeling, and vibration impacts on the materials and workmanship of character-defining architectural features due to construction LOD for cut-and-cover for underground utilities along New York Avenue NW.
	Permanent	None
Augusta and Louisa Apartments	Temporary	Possible visual and noise impacts on the setting and feeling, and vibration impacts on the materials and workmanship of character-defining architectural features due to construction LOD for cut-and-cover for underground utilities along New York Avenue NW.
	Permanent	None
Southern Baptist Church	Temporary	None
	Permanent	None
Bible Way Church and Temple	Temporary	Possible visual and noise impacts on the setting and feeling, and vibration impacts on the materials and workmanship of character-defining architectural features due to construction LOD for cut-and-cover for underground utilities along New York Avenue NW.
	Permanent	None
Holy Redeemer Catholic Church and School	Temporary	Possible visual and noise impacts on the setting and feeling, and vibration impacts on the materials and workmanship of character-defining architectural features due to construction LOD for cut-and-cover for underground utilities along New York Avenue NW.
	Permanent	None

Resource Name	Temporary or Permanent	Impact Description
John Fox Slater School	Temporary	None
	Permanent	None
John Mercer Langston School	Temporary	None
	Permanent	None
Margaret Murray Washington School	Temporary	None
	Permanent	None ¹
Hecht Company Warehouse	Temporary	Possible visual, noise, and vibration impacts on the surrounding industrial and warehouse setting due to construction LOD for new powerlines and cut-and-cover for underground utilities along New York Avenue NE.
	Permanent	None
Baltimore & Ohio (B&O) Railroad Bridge over Montana Avenue NE	Temporary	Possible visual, noise, and vibration impacts on the surrounding industrial and warehouse setting due to construction LOD for new powerlines and cut-and-cover for underground utilities along New York Avenue NE.
	Permanent	Possible visual, noise, and vibration impacts on the surrounding industrial and warehouse setting due to FA/EE and substation at Ivy City.
F.P. May Hardware Company Warehouse and Office	Temporary	Possible visual, noise, and vibration impacts on the surrounding industrial and warehouse setting due to construction LOD for new powerlines and cut-and-cover for underground utilities along New York Avenue NE.
	Permanent	Possible noise, and vibration impacts on the surrounding industrial setting, association, and feeling due to FA/EE and substation at Ivy City. Railroad berm and ROW to the north blocks visual sight lines to FA/EE and substation site.
Pennsylvania Railroad Bridge over Montana Avenue NE	Temporary	Possible visual, noise, and vibration impacts on the surrounding industrial and warehouse setting due to construction LOD for new powerlines and cut-and-cover for underground utilities along New York Avenue NE.
	Permanent	Possible visual, noise, and vibration impacts on the surrounding industrial and warehouse setting, association, and feeling due to FA/EE and substation at Ivy City.
Martins Woods (PG:72-68)	Temporary	Direct impacts on the tree cover and property and visual impacts on the character-defining landscape elements and setting; noise and vibration impacts due to tunnel laydown and cut-and-cover for tunnel and TBM launch-retrieval site.

Resource Name	Temporary or Permanent	Impact Description
	Permanent	Visual, noise, and vibration impacts on setting from permanent access road and FA/EE at Riverdale Road, as well as direct impacts on tree cover and property due to removal of portion of character-defining woods for FA/EE.
Greenbelt Historic District	Temporary	Only a sliver of the historic district is within APE. Possible visual impacts on the setting, noise, and vibration impacts due to tunnel laydown, cut-and-cover for tunnel and TBM launch-retrieval site, and construction LOD (miscellaneous).
	Permanent	Only a sliver of the historic district is within APE. Possible visual impacts on the setting; noise and vibration impacts due to stormwater management, portal and transition portal hood, viaduct, and SCMAGLEV systems.
Goddard Space Flight Center (PG:64-19)	Temporary	Possible visual impacts on the setting; noise and vibration impacts due to tunnel laydown, cut-and-cover for tunnel and TBM launch-retrieval site, and construction LOD (miscellaneous).
	Permanent	Possible visual impacts on the setting; noise, vibration, and physical impacts due to stormwater management, road relocation and reconstruction, and portal and transition portal hood.
Beltsville Agricultural Research Center (PG:62-14)	Temporary	Direct impact on setting, design, and materials of the contributing landscape and historic plan. Visual impacts on the setting; noise and vibration impacts due to tunnel laydown, cut-and-cover for tunnel and TBM launch-retrieval site, construction LOD (miscellaneous), viaduct laydown, viaduct work zone access road, and construction LOD for new powerlines.
	Permanent	Direct impact on setting, design, and materials of the contributing landscape and historic plan. Visual impacts on the setting; noise and vibration impacts due to portal and transition portal hood, road relocation and reconstruction, viaduct, SCMAGLEV systems, and stormwater management.
Baltimore-Washington Parkway (AA-5, PG:69-26)	Temporary	Visual impact on setting, feeling, design, and materials of contributing landscape design; noise and vibration impacts due to tunnel laydown, cut-and-cover for tunnel and TBM launch-retrieval site, construction LOD (miscellaneous), viaduct laydown, viaduct work zone access road, and LOD for relocation of existing powerlines.
	Permanent	Direct impact on contributing landscape elements from viaduct due to high visibility and limited screening options. Visual impact on setting, feeling, design, and materials of contributing landscape design, culverts and bridges; noise and vibration impact due to portal and transition portal hood, road relocation and reconstruction, permanent access road, viaduct, SCMAGLEV systems, and stormwater management.
DC Children's Center-Forest Haven District (AA-2364)	Temporary	Visual impacts on contributing buildings and surrounding landscape; noise and vibration impacts due to construction LOD (miscellaneous), viaduct laydown, viaduct work zone access road, and LOD for relocation of existing powerlines adjacent and within property boundary.
	Permanent	Direct impacts on land within district boundaries. Visual impacts on contributing buildings and landscape; noise and vibration impacts due to bridge reconstruction, viaduct, and SCMAGLEV systems.

Resource Name	Temporary or Permanent	Impact Description
Westport Historic District (B-1342)	Temporary	Possible visual, noise, vibration, and physical impacts due to cut-and-cover for tunnel and TBM launch-retrieval site.
	Permanent	None
Cherry Hill Homes District (B-5080)	Temporary	None
	Permanent	Only small fragment of district is within APE. Possible visual, noise, and vibration impacts due to long-term construction laydown area.
Cherry Hill Homes Extension 1 (B-5321)	Temporary	None
	Permanent	Only small fragment of district is within APE. Possible visual, noise, and vibration impacts due to long-term construction laydown area.
Mount Auburn Cemetery (B-5060)	Temporary	Possible minimal visual impact on the setting; noise and vibration impacts due to construction LOD (miscellaneous).
	Permanent	Possible minimal visual impact on the setting; noise and vibration impacts due to construction LOD.
Spring Garden Bridge (B-3668)	Temporary	Possible visual impact on the setting; noise and vibration impacts due to construction LOD (miscellaneous).
	Permanent	Possible visual impact on the setting; noise and vibration impacts due to construction LOD.

¹ Due to length of time (approximately 7 years) the construction area would be used, the associated impacts are considered permanent as opposed to temporary.

Table 4.8-6: Alignment J – Potential Impacts to Archaeological Resources

Resource Name	Temporary or Permanent	Impact Description
18AN208	Temporary	None
	Permanent	Partially or fully destroyed by construction
18AN557	Temporary	None
	Permanent	Partially or fully destroyed by construction
18AN558	Temporary	None
	Permanent	Partially or fully destroyed by construction
18AN559	Temporary	None
	Permanent	Partially or fully destroyed by construction
18AN912	Temporary	None
	Permanent	Partially or fully destroyed by construction
18AN1231	Temporary	None
	Permanent	Partially or fully destroyed by construction
18AN1647	Temporary	None
	Permanent	Partially or fully destroyed by construction
18BA88	Temporary	None
	Permanent	Partially or fully destroyed by construction
18BA89	Temporary	None
	Permanent	Partially or fully destroyed by construction
18PR440	Temporary	None
	Permanent	Partially or fully destroyed by construction
18PR1127	Temporary	None
	Permanent	Partially or fully destroyed by construction

Table 4.8-7: Alignment J1 – Potential Impacts to Archaeological Resources

Resource Name	Temporary or Permanent	Impact Description
18AN191	Temporary	None
	Permanent	Partially or fully destroyed by construction
18AN557	Temporary	None
	Permanent	Partially or fully destroyed by construction
18AN1231	Temporary	None
	Permanent	Partially or fully destroyed by construction
18BA88	Temporary	None
	Permanent	Partially or fully destroyed by construction
18BA89	Temporary	None
	Permanent	Partially or fully destroyed by construction
18PR1128	Temporary	None
	Permanent	Partially or fully destroyed by construction

Stations

Tables 4.8-8 through 4.8-10 present the details of the possible impacts of the stations to each historic property within the above-ground and archaeological APEs. For archaeological resources, it is anticipated that the greater the acreage of High-Moderate archaeological sensitivity, the greater the potential for adverse impacts to unknown NRHP-eligible archaeological resources.

Construction of the Mount Vernon Square East Station would impact two above-ground resources: Mount Vernon Square Historic District and Addition and The New York Apartments in Washington, D.C. It would also permanently partially or fully destroy archaeological resources 51NW121 and 51NW244 and would impact 37.13 acres of High-Moderate archaeological sensitivity (96.12 percent of the LOD).

Construction of the Baltimore-Washington International Thurgood Marshall Airport (BWI Marshall Airport) Station would not impact any above-ground resources in the APE. It would not impact known archaeological historic properties and would not impact any acres of High-Moderate archaeological potential.

Construction of the Cherry Hill Station would impact the Westport Historic District by introducing new construction into the district; however, the district would remain largely intact. With the Build Alternatives J alignments, the Cherry Hill Station would potentially impact 14.0 acres of High-Moderate archaeological sensitivity (31.4 percent of the LOD), and with the Build Alternatives J1 alignments, it would impact 14.0 acres of High-Moderate archaeological sensitivity (31.7 percent of the LOD).

Construction of the Camden Yards Station would impact the Otterbein Church since it would be demolished to construct the station. The Camden Yards Station would permanently partially or fully destroy archaeological resources 18BC25 and 18BC27 and would potentially impact an additional 52.31 acres of High-Moderate archaeological sensitivity (71.39 percent of the LOD).

Table 4.8-8: Mount Vernon Square East Station – Potential Impacts to Above-ground Resources (District of Columbia)

Resource Name	Temporary or Permanent	Impact Description
L'Enfant Plan	Temporary	Possible visual, noise, and vibration impacts on the setting, feeling, and materials of New York Avenue; setting and feeling of contributing reservations; and integrity of the New York Avenue vista between Mount Vernon Square and Florida Avenue due to cut-and-cover for station cavern construction and construction LOD.
	Permanent	Possible visual, noise, and vibration impacts on the setting, feeling, and materials of New York Avenue and integrity of the New York Avenue vista between Mount Vernon Square and Florida Avenue due to three station entrances, parking garage and station headhouse.
Central Public Library (Carnegie Library)	Temporary	Possible visual impacts on the setting and feeling of surrounding Mount Vernon Square landscaping; noise and vibration impacts on the materials and workmanship of the building due to cut-and-cover for station cavern construction and construction LOD.
	Permanent	Possible visual impacts on the setting and feeling of surrounding Mount Vernon Square landscaping due to convention center station entrance and parking garage and station headhouse.
Seventh St NW, East Side of 1000 Block	Temporary	Possible visual impacts on the setting and feeling; noise and vibration impacts on the materials and workmanship of buildings due to cut-and-cover for station cavern construction and construction LOD.
	Permanent	Possible visual impacts on the setting and feeling due to convention center station entrance and parking garage and station headhouse.
Mount Vernon Square Historic District and Addition	Temporary	Possible visual impacts on the setting and feeling; noise and vibration impacts on the materials and workmanship of buildings due to cut-and-cover for station cavern construction and construction LOD (miscellaneous).
	Permanent	Possible visual impacts on the setting and feeling; noise and vibration impacts on the materials and workmanship of buildings due to three station entrances and parking garage and station headhouse. Direct physical impact due to the two station entrances within the boundaries of the district.
Yale Steam Laundry and Stable	Temporary	Possible visual impacts on the setting and feeling; noise and vibration impacts on the materials and workmanship of buildings due to cut-and-cover for station cavern construction.
	Permanent	Possible visual impacts on the setting and feeling due to parking garage and station headhouse.
Fletcher Chapel (Church of God & Saints of Christ)	Temporary	Possible visual impacts on the setting and feeling; noise and vibration impacts on the materials and workmanship of buildings due to cut-and-cover for station cavern construction and construction LOD (miscellaneous).
	Permanent	Possible visual impacts on the setting and feeling of the building due to parking garage and station headhouse and station entrance.
	Temporary	None

Resource Name	Temporary or Permanent	Impact Description
Peoples Congregational Church	Permanent	None
The New York Apartments	Temporary	Possible visual, noise, and vibration impacts due to cut-and-cover for station cavern construction.
	Permanent	Possible visual impacts on the setting and feeling of building due to station entrances.
M Street High School (Perry School)	Temporary	Due to distance, minimal visual, noise, and vibration impacts due to cut-and-cover for station cavern construction and construction LOD.
	Permanent	Possible visual impacts on the setting and feeling due to station entrances.
Augusta & Louisa Apartment Buildings	Temporary	Possible visual, noise, and vibration impacts due to cut-and-cover for station cavern construction and construction LOD.
	Permanent	Possible visual impacts on the setting and feeling due to two station entrances.
Holy Redeemer Catholic Church and School	Temporary	Possible visual, noise, and vibration impacts due to cut-and-cover for station cavern construction and construction LOD.
	Permanent	Possible visual impacts on the setting and feeling due to two station entrances.
Southern Baptist Church	Temporary	None
	Permanent	None
Mount Vernon Triangle Historic District	Temporary	Possible visual, noise, and vibration impacts due to cut-and-cover for station cavern construction and construction LOD.
	Permanent	Possible visual, noise, and vibration impacts due to parking garage and station headhouse.
Downtown (Washington, DC) Historic District	Temporary	None
	Permanent	None
Downtown (Washington, DC) Historic District Addition	Temporary	Possible visual, noise, and vibration impacts due to cut-and-cover for station cavern construction and construction LOD.
	Permanent	Possible visual, noise, and vibration impacts due to convention center station entrance and parking garage and station headhouse.

Resource Name	Temporary or Permanent	Impact Description
Bible Way Church and Temple	Temporary	Possible visual impacts on setting, noise, vibration, and physical impacts to materials of building due to cut-and-cover for station cavern construction and construction LOD (miscellaneous) (construction LOD is within the property boundary).
	Permanent	Possible visual impacts on the setting and feeling due to two station entrances.

Table 4.8-9: Cherry Hill Station – Potential Impacts to Above-ground Resources (Maryland)

Resource Name	Temporary or Permanent	Impact Description
Westport Historic District (B-1342)	Temporary	Possible visual impact on setting; noise, vibration impacts to buildings, and physical impacts due to construction LOD for new powerlines and construction LOD.
	Permanent	Possible visual impact on setting; noise, vibration impacts to buildings due to Cherry Hill station, viaduct, substation, long term construction laydown area, and overhead electric, SCMAGLEV Operations permanent LOD adjacent to and within district.
Cherry Hill Homes District (B-5080)	Temporary	Possible visual, noise, and vibration impacts due to construction LOD.
	Permanent	Possible visual, noise, and vibration impacts due to SCMAGLEV Operations permanent LOD and MOW facility.
Mount Auburn Cemetery	Temporary	Possible visual impact on setting; noise, and vibration impacts due to construction LOD (miscellaneous) and LOD for relocation of existing powerlines.
	Permanent	Possible visual impact on setting; noise, and vibration impacts due to SCMAGLEV Operations permanent LOD, Cherry Hill parking garages, overhead electric permanent LOD, and Cherry Hill Station.
Spring Garden Bridge (B-3668)	Temporary	Possible visual, noise, and vibration impacts due to construction LOW for new powerlines and construction LOD.
	Permanent	Possible visual, noise, and vibration impacts due to long-term construction laydown area, viaduct, substation, and overhead electric permanent LOD.

Table 4.8-10: Camden Yards Station – Potential Impacts to Above-ground Resources (Maryland)

Resource Name	Temporary or Permanent	Impact Description
Howard St Tunnel & Power House (B-79)	Temporary	Possible visual impact on setting; noise, vibration, and direct impacts on the power house due to cut-and-cover for Camden Station, cavern and laydown area and construction LOD.
	Permanent	Possible visual impact on setting; noise, vibration, and direct impacts on the power house due to station entrance.
Baltimore and Ohio (B&O) Railroad Baltimore Belt Line (B-5287)	Temporary	Possible vibration, and direct impacts on tunnels and below-grade section due to cut-and-cover for Camden Station cavern and laydown area and construction LOD.
	Permanent	None
Pratt Furniture Company (B-2387)	Temporary	Possible visual impact on setting; noise and vibration impacts due to cut-and-cover for Camden Station cavern and laydown area and construction LOD.
	Permanent	Possible visual impact on setting; noise and vibration due to station entrance.
George H. Fallon Federal Building	Temporary	Possible visual impact on setting; noise and vibration impacts due to cut-and-cover for Camden Station cavern and laydown area and construction LOD.
	Permanent	Possible visual impact on setting, noise, and vibration due to station entrance.
(Downtown Baltimore) Business and Government Historic District (B-3935)	Temporary	Possible visual impact on setting; noise and vibration impacts due to cut-and-cover for Camden Station cavern and laydown area and construction LOD.
	Permanent	Possible visual impact on setting, noise, and vibration due to station entrance.
Otterbein Church (B-11)	Temporary	Direct physical impact because of the demolition of a contributing building and cemetery on the property due to cut-and-cover for Camden Station cavern and laydown.
	Permanent	Direct physical impact because of the demolition of a contributing building and cemetery on the property due to cut-and-cover for Camden Station cavern and laydown.
Otterbein Historic District (B-3934)	Temporary	Possible visual impact on setting; noise and vibration impacts due to cut-and-cover for Camden Station cavern and laydown area and construction LOD.
	Permanent	None
U.S. Fidelity and Guaranty (USF&G) Building (B-5318)	Temporary	Possible visual impact on setting; noise and vibration impacts due to cut-and-cover for Camden Station cavern and construction LOD.
	Permanent	Possible visual impact on setting; noise and vibration due to station entrance.

TMFs

Tables 4.8-11 through 4.8-13 present the details of the possible impacts to each historic property within the above-ground and archaeological APEs of the TMFs. For archaeological resources, it is anticipated that the greater the acreage of High-Moderate archaeological sensitivity, the greater the potential for adverse effects to unknown NRHP-eligible archaeological resources.

The BARC Airstrip TMF would impact the following above-ground resources: Beltsville Agricultural Research Center, BWP, and GSFC. Under Build Alternatives J1, this BARC TMF (specifically, the viaduct ramps to the TMF) would also impact the Greenbelt Historic District, which is an NHL. The BARC Airstrip TMF with Build Alternatives J (Build Alternatives J-02 and J-05) would permanently partially or fully destroy archaeological resource 18PR84; there are no currently known archaeological historic properties with the Build Alternatives J1. Build Alternatives J would impact 199.88 acres of High-Moderate archaeological sensitivity (86.84 percent of the LOD) and Build Alternatives J1 would impact 202.13 acres of High-Moderate archaeological sensitivity (87.17 percent of the LOD).

The BARC West TMF would impact the following above-ground resources: Beltsville Agricultural Research Center and BWP. Under Build Alternatives J1, this BARC TMF (specifically, the viaduct ramps to the TMF) would also impact the Greenbelt Historic District, which is an NHL. The BARC West TMF with the Build Alternatives J would permanently partially or fully destroy archaeological resource 18PR84 and with the Build Alternatives J1 would permanently partially or fully destroy archaeological resource 18PR83. Build Alternatives J would impact 219.07 acres of High-Moderate archaeological sensitivity (78.29 percent of the LOD) and Build Alternatives J1 would impact 238.97 acres of High-Moderate archaeological potential (76.71 percent of the LOD).

The MD 198 TMF would impact two resources: the BWP and the D.C. Children's Center-Forest Haven District. The MD 198 TMF would permanently partially or fully destroy archaeological resource 18AN1408 with Build Alternatives J and J1. In addition, with Build Alternatives J, impacts to 18AN558 would also occur, and with Build Alternatives J1, impacts to 18AN208, 18PR83, and 18PR209 would also occur. Build Alternatives J would impact 99.99 acres of High—Moderate archaeological sensitivity (49.53 percent of the LOD), and Build Alternatives J1 would impact 117.22 acres of High-Moderate archaeological sensitivity (51.08 percent of the LOD).

Table 4.8-11: BARC Airfield TMF – Potential Impacts to Above-ground Resources (Maryland)

Resource Name	Temporary or Permanent	Impact Description
Greenbelt Historic District (PG:67-4)	Temporary	Possible visual impacts on setting; noise and vibration impacts due to cut-and-cover tunnel TBM launch-retrieval site and construction LOD. Direct physical impact on character-defining landscape elements with Alternatives J1.
	Permanent	Possible visual impacts on setting; noise and vibration due to TMF ramps (viaduct) to BARC Airfield TMF. Direct physical impacts on character-defining landscape elements with Alternatives J1.
Beltsville Agricultural Research Center (PG:62-14)	Temporary	Visual, noise, vibration, and physical impacts on character-defining elements and design due to the construction LOD for new powerlines and construction LOD (miscellaneous).
	Permanent	Visual, noise, vibration, and physical impacts on character-defining elements and design due to the TMF ramps (viaduct), MOW facility, overhead electric permanent, road relocation and reconstruction, TMF footprint, surface parking, two substations, and permanent access road.
Goddard Space Flight Center (PG:64-19)	Temporary	Visual, noise, vibration, and physical impacts due to the construction LOD for new powerlines and construction LOD (miscellaneous).
	Permanent	Visual, noise, vibration impacts due to the TMF ramps (viaduct), MOW facility, overhead electric permanent, road relocation and reconstruction, TMF footprint, surface parking, and two substations. Physical impacts within the district boundary due to the permanent access road in the property boundary.
Baltimore-Washington Parkway (AA-5, PG:69-26)	Temporary	Visual impacts on setting; noise, vibration, and physical impacts on character-defining landscape elements without screening due to construction LOD.
	Permanent	Visual impacts on setting; noise, vibration, and physical impacts on character-defining landscape elements without screening due to the TMF ramps.

Table 4.8-12: BARC West TMF – Potential Impacts to Above-ground Resources (Maryland)

Resource Name	Temporary or Permanent	Impact Description
Greenbelt Historic District (J1 only)	Temporary	Possible visual impacts on setting; noise and vibration impacts due to cut-and-cover tunnel TBM launch-retrieval site and construction LOD. Direct physical impact on character-defining landscape elements with Alternatives J1.
	Permanent	Possible visual impacts on setting; noise and vibration due to TMF ramps (viaduct) to BARC Airfield TMF. Direct physical impacts on character-defining landscape elements with Alternatives J1.
Beltsville Agricultural Research Center (PG:62-14)	Temporary	Visual impact on setting; noise, vibration, and physical impacts on character-defining building and landscape elements and design due to the construction LOD for new powerlines and construction LOD (miscellaneous).
	Permanent	Visual impact on setting; noise, vibration, and physical impacts on character-defining building and landscape elements and design due to the TMF ramps (viaduct), MOW facility, overhead electric permanent, road relocation and reconstruction, TMF footprint, surface parking, two substations, and permanent access road.
Baltimore-Washington Parkway (AA-5, PG:69-26)	Temporary	Visual impacts on setting; noise, vibration, and physical impacts on character-defining landscape elements without screening due to construction LOD.
	Permanent	Visual impacts on setting; noise, vibration, and physical impacts on character-defining landscape elements without screening due to the TMF ramps.

Table 4.8-13: MD 198 TMF – Potential Impacts to Above-ground Resources

Resource Name	Temporary or Permanent	Impact Description
Baltimore-Washington Parkway (AA-5, PG:69-26)	Temporary	Visual impacts on setting; noise, vibration, and physical impacts on character-defining landscape elements without screening due to construction LOD.
	Permanent	Visual impacts on setting; noise, vibration, and physical impacts on character-defining landscape elements without screening due to the TMF ramps.
DC Children's Center-Forest Haven District (AA-2364)	Temporary	Visual impacts on setting; noise, vibration, and physical impacts on character-defining buildings due to the construction LOD for new powerlines and construction LOD (miscellaneous).
	Permanent	Visual impacts on setting; noise, vibration, and physical impacts on character-defining buildings because of TMF ramps (viaduct), overhead electric permanent, road relocation and reconstruction, power interconnection switchyard, TMF footprint, surface parking, two substations, and permanent access road.

Summary

Table 4.8-14 includes a summary of impacts to cultural resources from the Build Alternatives. **Tables 4.8-15** and **4.8-16** summarize the above-ground and archaeological historic properties that FRA anticipates will be adversely affected pursuant to Section 106 by Build Alternative. A formal assessment of effects is currently underway.

Table 4.8-14: Summary of Impacts to Above-Ground and Archaeological Cultural Resources

Build Alternatives	Number of Resources Impacted	Archaeological Sensitivity
J-01	49	High: 240.76 ac. (17.5%) Moderate: 470.26 ac. (34.2%) Low: 662.57 ac. (48.2%)
J-02	48	High: 276.66 ac. (19.6%) Moderate: 544.72 ac. (38.6%) Low: 588.10 ac. (41.7%)
J-03	48	High: 264.39 ac. (19.0%) Moderate: 538.67 ac. (38.7%) Low: 589.24 ac. (42.3%)
J-04	58	High: 236.55 ac. (19.0%) Moderate: 452.93 ac. (37.1%) Low: 532.46 ac. (43.6%)
J-05	57	High: 272.45 ac. (21.6%) Moderate: 528.50 ac. (41.9%) Low: 459.81 ac. (36.5%)
J-06	57	High: 260.18 ac. (20.9%) Moderate: 522.04 ac. (42.0%) Low: 460.95 ac. (37.1%)
J1-01	46	High: 219.33 ac. (17.5%) Moderate: 407.84 ac. (32.6%) Low: 624.87 ac. (49.9%)
J1-02	43	High: 247.28 ac. (19.0%) Moderate: 465.91 ac. (36.6%) Low: 558.67 ac. (43.9%)
J1-03	43	High: 236.37 ac. (19.0%) Moderate: 459.77 ac. (36.9%) Low: 548.99 ac. (44.1%)
J1-04	55	High: 215.12 ac. (19.5%) Moderate: 391.23 ac. (35.5%) Low: 496.57 ac. (45.0%)
J1-05	52	High: 243.07 ac. (21.6%) Moderate: 449.29 ac. (40.0%) Low: 430.38 ac. (38.3%)
J1-06	52	High: 232.16 ac. (21.2%) Moderate: 443.16 ac. (40.4%) Low: 420.70 ac. (38.4%)

Table 4.8-15: Potential Adverse Effects on Above-Ground Historic Properties by Build Alternative

Resource Name	Type	Location	NRHP Status	Build Alternatives (X indicates resource has Potential Adverse Effect From the Build Alternative)											
				J-01	J-02	J-03	J-04	J-05	J-06	J1-01	J1-02	J1-03	J1-04	J1-05	J1-06
L'Enfant Plan of the City of Washington	Public lands	D.C.	NRHP-listed	-	-	-	-	-	-	-	-	-	-	-	-
Central Public Library (Carnegie Library)	Public building	D.C.	NRHP-listed	-	-	-	-	-	-	-	-	-	-	-	-
Seventh St NW, E Side 1000 Block	Commercial buildings	D.C.	NRHP-listed	-	-	-	-	-	-	-	-	-	-	-	-
Mount Vernon Square Historic District and Addition	Historic district	D.C.	NRHP-listed/ eligible (Addition)	X	X	X	X	X	X	X	X	X	X	X	X
Yale Steam Laundry (including Garage and Stable)	Commercial building	D.C.	NRHP-listed	-	-	-	-	-	-	-	-	-	-	-	-
Fletcher Chapel (Church of God & Saints of Christ)	Religious building	D.C.	NRHP-listed	-	-	-	-	-	-	-	-	-	-	-	-
(Former) Peoples Congregational Church	Religious building	D.C.	NRHP-eligible	-	-	-	-	-	-	-	-	-	-	-	-
The New York Apartments	Multiple-family residential building	D.C.	NRHP-eligible	X	X	X	X	X	X	X	X	X	X	X	X
M Street High School (Perry School)	Educational building	D.C.	NRHP-listed	-	-	-	-	-	-	-	-	-	-	-	-
Augusta & Louisa Apartment Buildings	Multiple-family residential building	D.C.	NRHP-listed	-	-	-	-	-	-	-	-	-	-	-	-
Holy Redeemer Catholic Church and School)	Religious and Educational buildings	D.C.	NRHP-eligible	-	-	-	-	-	-	-	-	-	-	-	-
Southern Baptist Church	Religious building	D.C.	NRHP-eligible	-	-	-	-	-	-	-	-	-	-	-	-

Resource Name	Type	Location	NRHP Status	Build Alternatives (X indicates resource has Potential Adverse Effect From the Build Alternative)											
				J-01	J-02	J-03	J-04	J-05	J-06	J1-01	J1-02	J1-03	J1-04	J1-05	J1-06
Mount Vernon Triangle Historic District	Historic district	D.C.	NRHP-listed	-	-	-	-	-	-	-	-	-	-	-	-
Downtown (Washington, D.C.) Historic District	Historic district	D.C.	NRHP-listed	-	-	-	-	-	-	-	-	-	-	-	-
Downtown (Washington, D.C.) Historic District Addition	Historic district	D.C.	Not Evaluated (proposed D.C. Landmark)	-	-	-	-	-	-	-	-	-	-	-	-
Bible Way Church and Temple	Religious building	D.C.	NRHP-eligible	-	-	-	-	-	-	-	-	-	-	-	-
John Fox Slater School	Educational building	D.C.	NRHP-listed	-	-	-	-	-	-	-	-	-	-	-	-
John Mercer Langston School	Educational building	D.C.	NRHP-listed	-	-	-	-	-	-	-	-	-	-	-	-
Margaret Murray Washington School	Educational building	D.C.	NRHP-listed	-	-	-	-	-	-	-	-	-	-	-	-
Hecht Company Warehouse	Warehouse	D.C.	NRHP-listed	-	-	-	-	-	-	-	-	-	-	-	-
Baltimore & Ohio (B&O) Railroad Bridge over Montana Avenue NE	Transportation infrastructure	D.C.	NRHP-eligible	-	-	-	-	-	-	-	-	-	-	-	-
F.P. May Hardware Company Warehouse and Office	Warehouse	D.C.	NRHP-eligible	-	-	-	-	-	-	-	-	-	-	-	-
Pennsylvania Railroad Bridge over Montana Avenue NE	Transportation infrastructure	D.C.	NRHP-eligible	-	-	-	-	-	-	-	-	-	-	-	-
Martins Woods (PG:72-68)	Residential district	MD	NRHP-eligible	X	X	X	X	X	X	X	X	X	X	X	X
Greenbelt Historic District	Historic district and cultural landscape	MD	NHRP listed/ NHL	-	-	-	-	-	-	X	X	X	X	X	X

Resource Name	Type	Location	NRHP Status	Build Alternatives (X indicates resource has Potential Adverse Effect From the Build Alternative)											
				J-01	J-02	J-03	J-04	J-05	J-06	J1-01	J1-02	J1-03	J1-04	J1-05	J1-06
Goddard Space Flight Center (PG:64-19)	Research campus	MD	NRHP-eligible	X	X	X	X	X	X	X	X	X	X	X	X
Beltsville Agricultural Research Center (PG:62-14)	Research facility and cultural landscape	MD	NRHP-eligible	X	X	X	X	X	X	X	X	X	X	X	X
Baltimore-Washington Parkway (AA-5, PG:69-26)	Transportation infrastructure, cultural landscape, and landscape architecture	MD	NRHP-listed	X	X	X	X	X	X	X	X	X	X	X	X
D.C. Children's Center-Forest Haven District (AA-2364)	Hospital campus with cemetery	MD	NRHP-eligible	X	X	X	X	X	X	X	X	X	X	X	X
Westport Historic District (B-1342)	Historic district	MD	NRHP-eligible	X	X	X	X	X	X	X	X	X	X	X	X
Cherry Hill Homes Historic District (B-5080)	Historic district	MD	NRHP-eligible	-	-	-	-	-	-	-	-	-	-	-	-
Cherry Hill Homes Extension 1 (B-5321)	Historic district	MD	NRHP-eligible	-	-	-	-	-	-	-	-	-	-	-	-
Mount Auburn Cemetery	Cemetery	MD	NRHP-listed	-	-	-	-	-	-	-	-	-	-	-	-
Spring Garden Bridge (B-3668)	Transportation infrastructure	MD	NRHP-eligible	-	-	-	-	-	-	-	-	-	-	-	-
Howard St Tunnel & Power House (B 79)	Transportation infrastructure	MD	NRHP-listed	-	-	-	-	-	-	-	-	-	-	-	-
Baltimore and Ohio (B&O) Railroad Baltimore Belt Line (B-5287)	Transportation infrastructure	MD	NRHP-eligible	-	-	-	-	-	-	-	-	-	-	-	-
Pratt Furniture Company (B-2387)	Commercial building	MD	NRHP-eligible	-	-	-	-	-	-	-	-	-	-	-	-

Resource Name	Type	Location	NRHP Status	Build Alternatives (X indicates resource has Potential Adverse Effect From the Build Alternative)											
				J-01	J-02	J-03	J-04	J-05	J-06	J1-01	J1-02	J1-03	J1-04	J1-05	J1-06
George H. Fallon Federal Building	Government building	MD	NRHP-eligible	-	-	-	-	-	-	-	-	-	-	-	-
(Downtown Baltimore) Business and Government Historic District (B-3935)	Historic district	MD	NRHP-listed	-	-	-	-	-	-	-	-	-	-	-	-
Otterbein Church (B-11)	Religious building	MD	NRHP-listed	-	-	-	X	X	X	-	-	-	X	X	X
Otterbein Historic District (B-3934)	Historic district	MD	NRHP-eligible	-	-	-	-	-	-	-	-	-	-	-	-
U.S. Fidelity and Guaranty (USF&G) Building (B-5318)	Commercial building	MD	NRHP-eligible	-	-	-	-	-	-	-	-	-	-	-	-
Total Number of Above-Ground Historic Properties Potentially Adversely Affected				8	8	8	8	8	8	9	9	9	9	9	9

Table 4.8-16: Potential Adverse Effects to Archaeological Historic Properties by Build Alternative

Resource Name	Type	Location	NRHP Status	Build Alternatives (X indicates resource is within Archaeological APE for a Build Alternative)											
				J-01	J-02	J-03	J-04	J-05	J-06	J1-01	J1-02	J1-03	J1-04	J1-05	J1-06
18AN0191	Prehistoric and Historic, Late Archaic lithic scatter and 18th-19th century iron furnace	MD	Not Evaluated	-	-	-	-	-	-	X	X	X	X	X	X
18AN0208	18th-19th century plantation house site	MD	Not Evaluated	X	X	X	X	X	X	X	-	-	X	-	-
18AN0557	Prehistoric, Late Archaic, Late Woodland short-term resource procurement camp	MD	Not Evaluated	X	X	X	X	X	X	X	X	X	X	X	X
18AN0558	Prehistoric, Late Archaic short-term resource procurement camp	MD	Not Evaluated	X	X	X	X	X	X	-	-	-	-	-	-
18AN0559	Prehistoric, Lithic scatter	MD	Not Evaluated	X	X	X	X	X	X	-	-	-	-	-	-
18AN0912	Historic, Early 20th-century domestic	MD	Not Evaluated	X	X	X	X	X	X	-	-	-	-	-	-
18AN1231	Prehistoric, Lithic scatter	MD	Not Evaluated	X	X	X	X	X	X	X	X	X	X	X	X
18AN1408	Prehistoric, Lithic scatter	MD	Not Evaluated	X	-	-	X	-	-	X	-	-	X	-	-
18AN1647	Historic cemetery	MD	Not Evaluated	X	X	X	X	X	X	-	-	-	-	-	-
18BA0088	Prehistoric, Shell midden	MD	Not Evaluated	X	X	X	X	X	X	X	X	X	X	X	X
18BA0089	Prehistoric, Lithic scatter	MD	Not Evaluated	X	X	X	X	X	X	X	X	X	X	X	X
18BC0025	Historic, Early-late 19th century privies and well	MD	Not Evaluated	-	-	-	X	X	X	-	-	-	X	X	X
18BC0027	Historic, Early 19th-late 20th century domestic and commercial	MD	Not Evaluated	-	-	-	X	X	X	-	-	-	X	X	X

Resource Name	Type	Location	NRHP Status	Build Alternatives (X indicates resource is within Archaeological APE for a Build Alternative)											
				J-01	J-02	J-03	J-04	J-05	J-06	J1-01	J1-02	J1-03	J1-04	J1-05	J1-06
18PR0083	Prehistoric, Archaic short-term resource procurement camp	MD	Not Evaluated	-	-	-	-	-	-	X	X	X	X	X	X
18PR0084	Prehistoric, Archaic short-term resource procurement camp	MD	Not Evaluated	X	X	X	X	X	X	-	-	-	-	-	-
18PR0209	Prehistoric, Lithic scatter	MD	Not Evaluated	-	-	-	-	-	-	X	-	-	X	-	-
18PR0440	Historic, 19th-early 20th century domestic site	MD	Not Evaluated	X	X	X	X	X	X	-	-	-	-	-	-
18PR1127	Prehistoric isolated find & 18-19th century domestic site	MD	Not Evaluated	X	X	X	X	X	X	-	-	-	-	-	-
18PR1128	Historic artifact scatter	MD	Not Evaluated	-	-	-	-	-	-	X	X	X	X	X	X
51NW121	Historic, 19th-20th century site	D.C.	Eligible	X	X	X	X	X	X	X	X	X	X	X	X
51NW244	Historic, No information	D.C.	Recommend Not Eligible	X	X	X	X	X	X	X	X	X	X	X	X
Total Number of Archaeological Historic Properties Potentially Adversely Affected				15	14	14	17	16	16	12	9	9	14	11	11

4.8.5 Potential minimization and mitigation strategies

Potential avoidance, minimization, and mitigation strategies (or treatment measures) to address adverse impacts are documented in the Project PA that is being developed through the Section 106 consultation process. The treatment measures applied to a particular resource will depend on the type of cultural resource impacted and the resulting effect(s). Implementation of the terms and conditions of the SCMAGLEV Project PA will occur after execution by all signatories and will guide the continuation of the Section 106 process after completion of the FEIS/ROD, including the resolution of adverse effects.

Currently, Signatories¹ to the Project PA are the FRA, MD SHPO, DC SHPO, and the ACHP and the Invited Signatories² are Baltimore-Washington Rapid Rail (BWRR), the National Park Service (NPS)-National Capital Region, the U.S. Fish and Wildlife Service, and the National Capital Planning Commission.

¹ Signatory: The lead federal agency (FRA), SHPO, and ACHP whose signature is required for the Project PA to go into effect. Signatories have the sole authority to execute, amend, and/or terminate the Project PA.

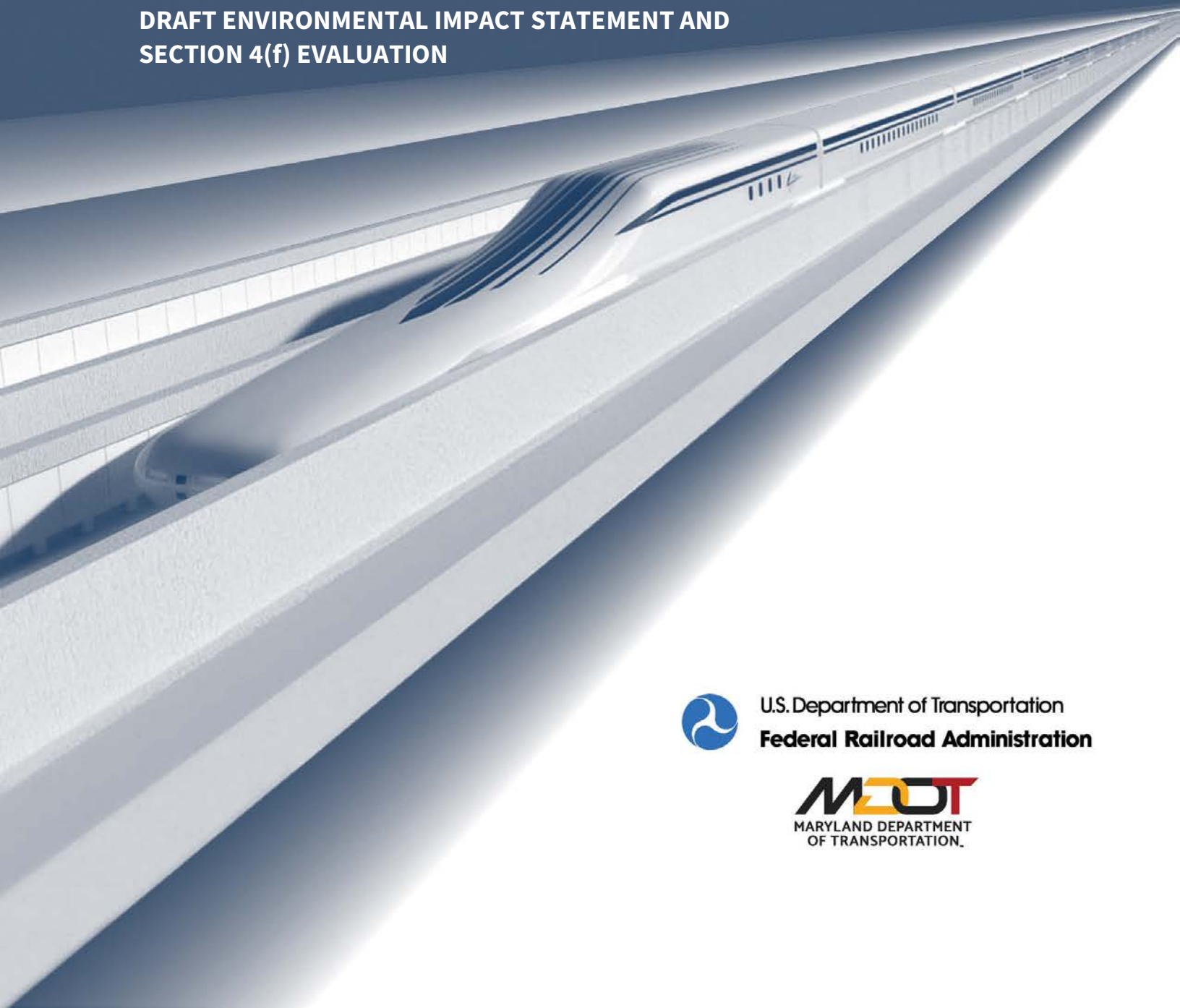
² Invited Signatory: A consulting party that has the authority to amend and/or terminate the Project PA. The refusal of an invited signatory to sign the agreement does not prevent the Project PA from being executed.

Section 4.9

Aesthetics, Visual Quality, and Light Emissions

BALTIMORE-WASHINGTON SUPERCONDUCTING MAGLEV PROJECT

DRAFT ENVIRONMENTAL IMPACT STATEMENT AND
SECTION 4(f) EVALUATION



U.S. Department of Transportation
Federal Railroad Administration



4.9 Aesthetics, Visual Quality, and Light Emissions

4.9.1 Introduction

This section identifies resources or elements that are sensitive to visual changes and/or light emissions and the effects of the Superconducting Magnetic Levitation Project (SCMAGLEV Project) on those resources. Visual changes result from the introduction of new features or facilities into the existing environment by the SCMAGLEV Project and include new infrastructure, SCMAGLEV operations, and safety features such as fencing and lighting. For more detailed information related to regulations, assessment methodology, potential impacts, and to see additional illustrative renderings, please see Appendix D.6.

4.9.2 Regulatory Context and Methodology

4.9.2.1 Regulatory Context

In accordance with the National Environmental Policy Act (NEPA), 42 U.S.C. § 4321 et seq., the Council on Environmental Quality (CEQ) regulations, 40 C.F.R. Parts 1500 - 1508, and the Federal Rail Administration's (FRA) Procedures for Considering Environmental Impacts, 64 Fed. Reg. 28545 (May 26, 1999) FRA assessed visual quality and aesthetic impacts from implementation of the SCMAGLEV Project. In addition, the following Federal, state and local laws, regulations and guidance were used to complete this assessment:

- National Scenic Byways program (23 U.S.C. § 162)
- U.S. Department of Transportation Act (Section 4(f)) (49 U.S.C. § 303)
- Lands and Water Conservation Fund Act (Section 6(f)) (54 U.S.C. § 20031 et seq)
- U.S. Commission of Fine Arts Executive Order (EO) 1862
- National Historic Preservation Act (NHPA) (54 U.S.C. § 300101 et seq)
- Antiquities Act of 1906 (16 U.S.C. § 431 et seq.)
- Federal Land Policy and Management Act (43 U.S.C. § 1701 et seq)
- Executive Order 11593, Protection and Enhancement of the Cultural Environment (May 13, 1971)
- National Capital Planning Act of 1952
- The Height of Buildings Act of 1910
- Approved local area planning documents (for more details on plans see Appendix D.3).

4.9.2.2 Methodology

FRA assessed the visual effects of the alignment (viaduct and deep tunnel), stations, and miscellaneous fixed support facilities on adjacent and nearby communities, general public areas, sensitive viewsheds, historic sites, and other special features considered to be visually sensitive.

FRA considered a 2,000-foot viewshed as an Area of Visual Effects (AVE) from all proposed facilities and contributing elements required for the long-term safety and operations of the SCMAGLEV system. For this resource assessment, the AVE is synonymous with the SCMAGLEV Project Affected Environment defined for other resources and additional details are provided in Appendix D.6. For above-ground resources (buildings, structures, districts, and objects) in Maryland, the AVE includes the geographic area within 2,000 feet of the Limits of Disturbance (LOD), defined as the construction footprint of the Build Alternatives, including any permanent and temporary easements, access roads, all locations of ancillary facilities, and any other SCMAGLEV Project-specific locations. The AVE is inclusive of the Area of Potential Effects (APE) for the assessment of cultural and archaeological resources identified in Section 4.8 Cultural Resources and Appendix D.5 for Maryland and Washington, D.C.

Due to the substantial size of the SCMAGLEV Project, FRA established Common Aesthetic Areas (CAAs), similar to a traditional Landscape Unit (LU), defined as select areas within the AVE that have contiguous, consistent visual features and/or homogeneous visual character. Due to the numerous and varied geographical areas that needed to be evaluated for this Project, FRA is utilizing the more concise CAA as the spatial element to give greater attention to those locations with cohesive community features. FRA identified twenty CAAs for which existing conditions and impacts are evaluated. Additional information regarding CAAs provided in Appendix D.6.

FRA collected data for aesthetic and scenic resources using desktop research, topographic maps to identify resources within the AVE, and a review of draft conceptual engineering to identify the location of the Build Alternatives in relation to key viewpoints. Desktop research identified Maryland Scenic Byways, scenic vistas, historical and cultural sites, and other specific views along the Build Alternatives. These views could include residential areas or farmlands, areas of scenic beauty, parks and recreational areas, historically and/or culturally significant features, urban landmarks, water bodies, public facilities, and protected public lands.

FRA used a multi-step process to identify and assess impacts to visually sensitive resources. The first step focused on identifying resources and the visual quality of the resource. FRA ranked visual resources in one of five categories: low, moderately low, moderate, moderately high, and high. Following, FRA evaluated the visual quality impacts resulting from the Build Alternatives based on compatibility, viewer sensitivity, and degree of impact. The ranking of visual resources, viewer sensitivity, and impacts are defined below in **Table 4.9-1**. For additional detail regarding FRA's multi-step process, see Appendix D.6.

Table 4.9-1: Visual Resource Ranking

Category	Ranking
Visual Resource Ranking	Low refers to areas having degraded or lower quality visual resources with no aesthetically pleasing composition or lacking any cohesive visual identity. An example would be a disjointed, abandoned industrial area adjacent to a heavily trafficked highway or railroad. Moderately low refers to areas containing some visual resources but lacking a coherent and aesthetically pleasing composition and some disruptive visual detractors. An example would be poorly maintained commercial area adjacent to a well maintained or newer community center or park. Moderate refers to areas primarily of visual resources combined in an aesthetically pleasing composition with few disruptive visual detractors. An example would be a cohesive, well-maintained development. This could be urban, suburban or protected lands. Moderately high refers to areas of visual resources combined in an aesthetically pleasing composition, expressing a sense of place and lacking prominent disruptive visual detractors. An example would be a planned development that includes open space and trails, or well-maintained protected public lands with open vistas. High refers to areas comprising visual resources free of disruptive visual detractors and with a strong sense of place. An example would be federally protected, undeveloped land with unique, scenic vistas.
Viewer Sensitivity	Low sensitivity may exist when there are few viewers who experience a defined view, when potential views of the project are screened or filtered by intervening terrain, structures or landscaping, or where viewers are not particularly concerned about the quality of views due to their activity type, such as a commuter on the highway. Moderate sensitivity may occur where views of a project are distant enough that the project does not dominate the view or where viewer activity is not focused on visual quality and expectations are moderate, such as office workers, field laborers or an organized sporting event. High sensitivity occurs where a project is highly prominent, open to view, and seen by relatively high numbers of viewers and where viewer concern and expectations of visual quality is also high, as in a rural park where scenery is a primary focus, or in a residential neighborhood.
Degree of impact	Relatively imperceptible – no effect Lower – minimal to very little effect Moderate – average but mostly insignificant effect Higher – substantial to detrimental effect

4.9.3 SCMAGLEV Project Affected Environment

The AVE is densely developed in the metropolitan areas of Washington, D.C. and Baltimore, all of which are surrounded by large, relatively densely populated suburban areas. Large areas of Forest/Shrub and Wetlands land covers occur in Anne Arundel, and Prince George's Counties, MD. Twenty CAAs are within the AVE for the SCMAGLEV Project (see **Figure 4.9-1**).

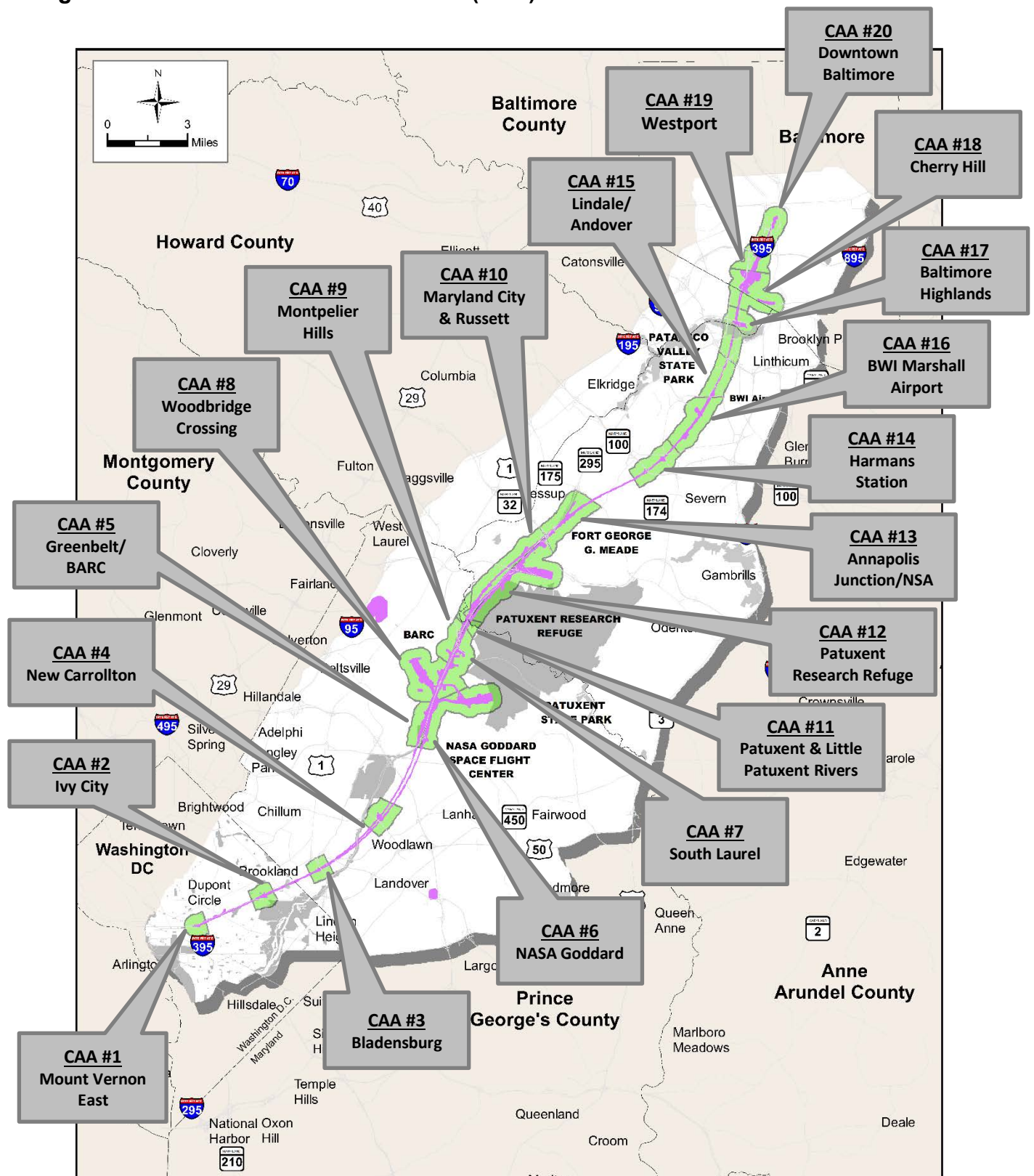
Visual and aesthetic resources vary, consisting of cultural resources, developed park settings, and natural settings consisting of either water, wooded, or open views. Smaller, developed park resources are more prevalent in the Washington, D.C. and Baltimore City areas, as well as scattered throughout the suburban cities and towns in central Maryland. Undeveloped resources like the Patuxent Research Refuge (PRR) in Maryland are located within tributaries to larger watersheds or ecosystems such as the Chesapeake Bay. Larger, undeveloped resources can also be found around Beltsville, MD in the Beltsville Agricultural Research Center (BARC) property as well as the National Park Service (NPS)-owned Baltimore-Washington Parkway (BWP). The greatest numbers of cultural sites are typically found in municipalities that date from the 18th to early 20th centuries and therefore contain older buildings and structures. Municipalities with many cultural sites include Baltimore City, MD, Washington, D.C., and the central Maryland suburban towns of Bladensburg, Greenbelt, and Linthicum. Appendix B.4 Cultural Resources Mapping shows the locations of many of these resources.

4.9.4 Environmental Consequences

4.9.4.1 No-Build Alternative

Under the No Build Alternative, the SCMAGLEV Project will not be built and therefore no impacts related to the construction or operation of a SCMAGLEV system will occur. However, other planned and funded transportation projects will continue to be implemented in the area and could result in changes to the visual and aesthetic qualities of the SCMAGLEV Project Affected Environment.

Figure 4.9-1: Common Aesthetic Areas (CAA) within the AVE



4.9.4.2 Build Alternatives

Visual impacts occur where elements related to the Build Alternatives are near or within sight of a visually sensitive resource. Potential impacts could also occur where the Build Alternatives would require the removal of an existing visual feature (such as clearing an existing forested area) and changes in existing topography (which would occur through land acquisitions or construction). Potential changes to visually sensitive areas, areas where the proposed SCMAGLEV infrastructure would have unique aesthetic qualities (such as graded embankments, aerial structures, and tunnel portals), and support facilities (such as stations, parking structures, maintenance facilities), would introduce new elements into the existing visual settings. Lighting associated with infrastructure proposed as part of the Build Alternatives may also result in visual impacts in the form of light emissions.

This section presents an overview of visual impacts identified as moderate or high through the impact analysis. Detailed information for each CAA identified and impacts assessments are provided in Appendix D.6. Design details and profiles of the Build Alternatives are provided in Appendix G.2. Visualizations for various SCMAGLEV Project elements are provided in this section. These artistic renderings are based upon preliminary designs and are provided for illustrative purposes. These figures are draft and subject to change and will continue to be revised and refined as the project development process continues. Before and After visualizations are provided in Appendix D.6

Table 4.9-2 provides a summary of the number of visually sensitive resources impacted by each proposed Build Alternative. The narrative that follows provides a more detailed breakdown of the impacts by major SCMAGLEV system features (alignments, stations, and trainset maintenance facilities (TMF)).

Table 4.9-2: Number of Visually Sensitive Resources Impacted by Build Alternatives

Build Alternative	Number of State/Local/Community Resources	Number of Federal Resources	Total
J-01	43	8	51
J-02	41	8	49
J-03	44	8	52
J-04	41	11	52
J-05	39	11	50
J-06	42	11	53
J1-01	41	7	48
J1-02	37	6	43
J1-03	40	6	46
J1-04	39	10	49
J1-05	35	9	44
J1-06	38	9	47

Alignments

The alignment of the Build Alternatives is primarily located in tunnel, but includes a portion of viaduct (elevated structure), as well as surface features such as fresh air and emergency egress facilities and power substations, which will introduce a new visual element into the existing landscape. Alignment J would have a longer viaduct segment, which would result in impacts to additional visually sensitive resources, compared to the shorter viaduct segment of Alignment J1. FRA does not anticipate any visual impacts from the guideway within tunnel segments of either Build Alternatives J or J1 alignments, as this segment of the guideway would be located within a deep tunnel beyond the viewshed of resources within the AVE. Build Alternatives J includes 25 percent viaduct and 75 percent tunnel whereas Build Alternatives J1 includes 14 percent viaduct and 86 percent tunnel. However, FRA determined that surface features of both alignments, including the viaduct tunnel portal and ancillary facilities, would result in visual impacts to resources within the AVE ranging from *relatively imperceptible* to *higher level* degrees.

According to the Project Sponsor, because revenue service operations would not occur throughout the night, the viaducts would not have a need for permanent lighting illuminating the guideway. Rather, lighting on the viaduct sections will only be required for maintenance of the guideway, would be temporary, and transported by maintenance crews to active work zones and removed at the conclusion of maintenance activities. If permanent lighting is required due to Federal, state, or local requirements, impacts from permanent lighting would be avoided, minimized, and mitigated during final engineering design, to the extent feasible.

Visually sensitive resources identified as having a moderate to high visual impact from the Build Alternatives alignments features are summarized below in **Table 4.9-3**.

Build Alternatives J and J1 alignments in Prince George's County

In Prince George's County, as the Build Alternatives J and J1 alignments run north towards Baltimore in deep tunnel from Washington, D.C., a proposed Fresh Air and Emergency Egress (FA/EE) facility is proposed in the New Carrollton area of Prince George's County in the vicinity of the Martins Woods Historic District, Patterson Park, and the Wildercroft-Riverdale Road residential communities. Proposed construction of a building approximately 50 feet tall to house ventilation systems and emergency egress access from the tunnel in an existing forested area and would result in a visual impact to the surrounding area. Under the Build Alternatives J alignments, FRA determined the resources in the CAA #4 viewshed would experience *moderate to higher level* degrees of visual impact, due to the relatively undisturbed existing forested landscape and encroachment of construction activities towards the Martins Woods Historic District. Under the Build Alternatives J1 alignments, FRA has determined the resources in the viewshed would experience *lower level to moderate level* degrees of visual impact, due to the partially disturbed nature of the existing developed and forested landscape.

Figure 4.9-2 provides an illustrative rendering of the proposed FA/EE in New Carrollton.



Figure 4.9-2: CAA #4 – Illustrative Rendering of FA/EE Proposed in New Carrollton, Looking East

The Build Alternatives J and J1 alignments transition from tunnel to viaduct in the vicinity of the National Aeronautics and Space Administration (NASA) Goddard Space Flight Center's (GSFC) Explorer Road interchange with the BWP. They run through the City of Greenbelt Historic District and they pass over BARC, Beaver Dam Road, Powder Mill Road, past the US Secret Service James J. Rowley Training Center and head north through South Laurel and past Woodbridge Crossing and Montpelier Hills. These resources in the CAAs #5, #6, #7, #8, #9 viewsheds would experience moderate to higher level degrees of visual impact. See **Figures 4.9-3 and 4.9-4** .



Figure 4.9-3: CAAs #5, #6, #7, #8, #9 – Illustrative Rendering of Alignment J Tunnel Portal at Explorer Road Interchange with Ramps to BARC West TMF, Looking North

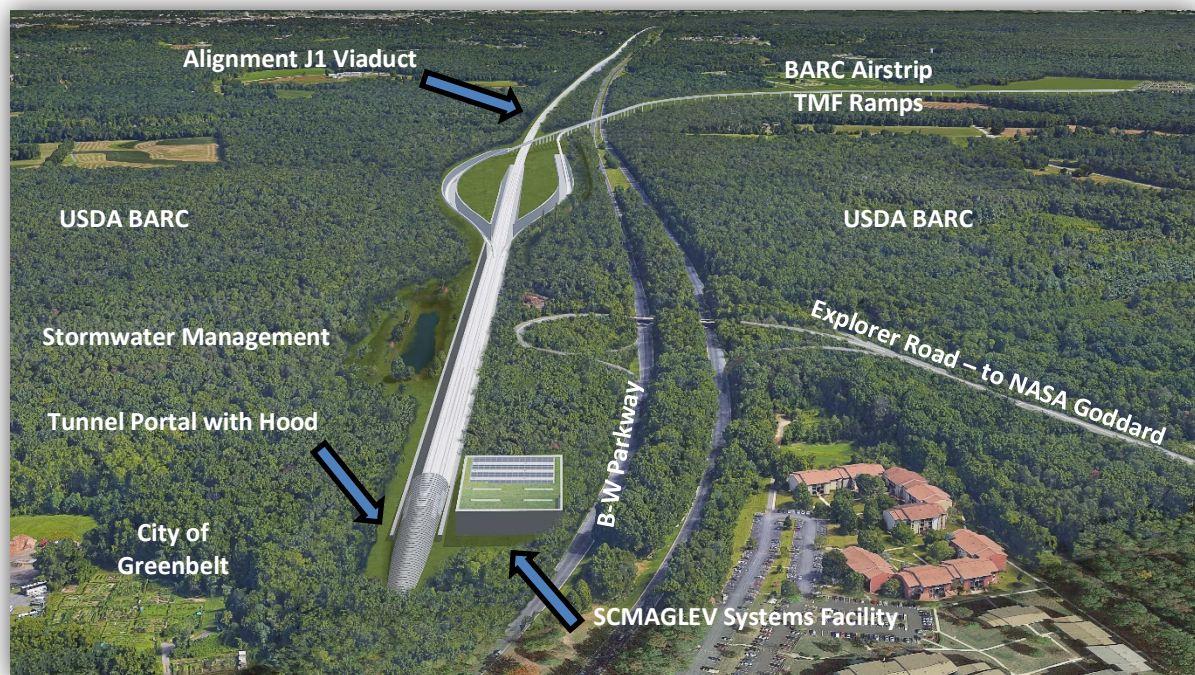


Figure 4.9-4: CAAs #5, #6, #7, #8, #9 – Illustrative Rendering of Alignment J1 Tunnel Portal at Explorer Road Interchange with Ramps to BARC Airstrip TMF, Looking North

Build Alternatives J and J1 alignments in Anne Arundel County

In Anne Arundel County, the Build Alternatives viaducts would continue to be carried at high elevations (between 30 feet and 130 feet high, depending upon the existing topography) adjacent to the BWP and would present potential visual impacts to surrounding resources like Maryland City Park, the Patuxent River and Patuxent River Park, and PRR. Through Anne Arundel County the Build Alternatives J alignments continue to the east of the BWP at higher elevations and transitions back to deep tunnel at Fort Meade. Similarly, the Build Alternatives J1 alignments continue to the west of the BWP and transitions back to deep tunnel at Maryland City Park adjacent to Brock Bridge Elementary School. Under the Build Alternatives J alignments, FRA determined the resources in CAAs #10, #11, and #12, specific to Patuxent River and Patuxent River Park, PRR, and BWP would experience a *higher-level* degree of visual impact, due to the undisturbed and natural landscape. Under Build Alternatives J1 alignments, FRA determined these same resources for Patuxent River, PRR, Maryland City Park, and BWP would experience *moderate to higher level* degrees of visual impact, due to the location of the viaduct through park-like and neighborhood resources. **Figure 4.9-5** provides an illustrative rendering of the proposed Build Alternative J1 viaduct crossing the Patuxent River.



Figure 4.9-5: CAA #11 and #12- Illustrative Rendering of Proposed Build Alternative J1 Parallel to Southbound BWP Crossing the Patuxent River, Looking Southwest

In addition, other sensitive resources, such as Maryland City Park, Patuxent River Park, Brock Bridge Elementary School, and Thomas J.S. Waxters Children's Center near the Maryland City, Sudlersville South and Barbersville communities fall within the viewshed for the Build Alternatives J and J1 alignments; however, these resources are at a distance where existing topography and vegetation would only partially shield/block the Build Alternative structures and lights. For Build Alternatives J1 alignments in this area, FRA determined impacts to these resources in CAAs #10, #11, and #12 would experience *higher level* degrees of visual impacts, depending upon relative distance and elevation of existing and proposed features. For these same CAAs, Build Alternatives J alignments would have *relatively imperceptible* visual impacts.

Figure 4.9-6 provides an illustrative rendering of the proposed Build Alternatives J1 tunnel portal and contributing elements.

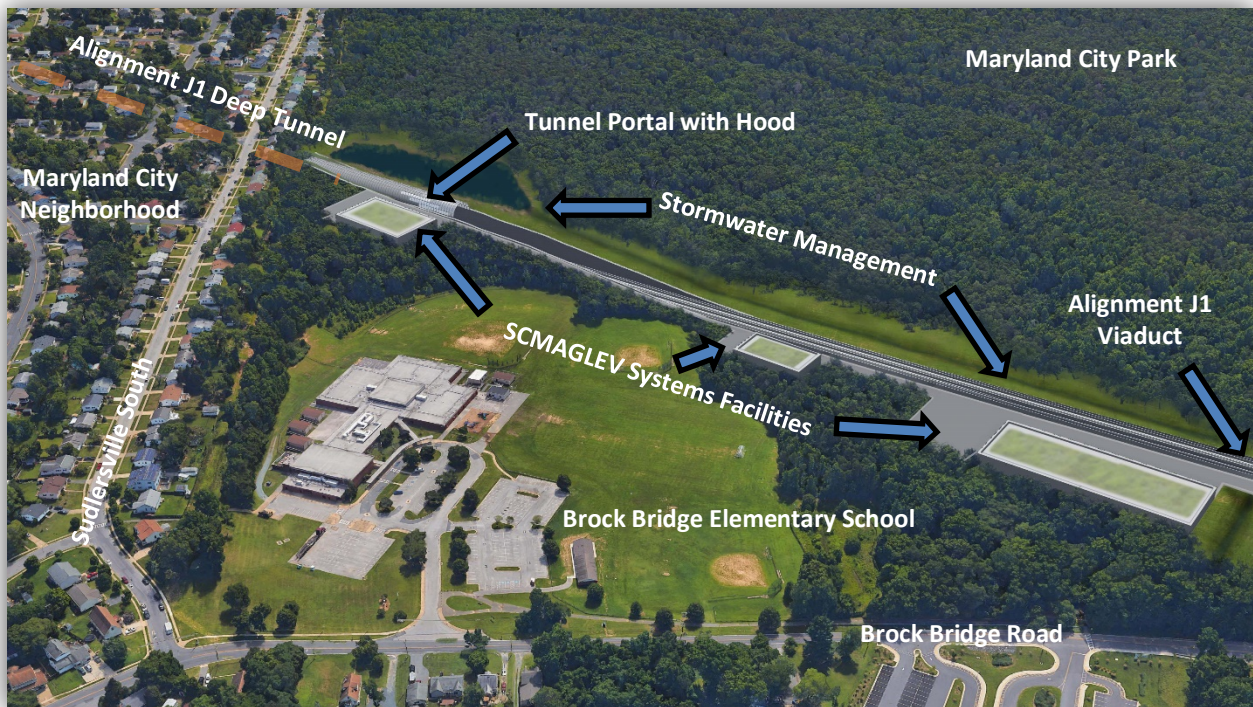


Figure 4.9-6: CAA #10 - Illustrative Rendering of Proposed Build Alternative J1 Tunnel Portal near Brock Bridge Elementary School and Maryland City, Looking East

A short distance to the north, and inside the northern boundary of Maryland City Park, prior to the Sudlersville South neighborhood within the CAA #10 viewshed, Build Alternatives J1 alignments transition from viaduct to deep tunnel via a tunnel portal. FRA determined that the viaduct and tunnel portal would have *higher levels* of impact on the surrounding properties due to the proximity of the Build Alternatives (within the Maryland City Park and within 50 feet of the Sudlersville South neighborhood).

East of the Russett Community in Anne Arundel County, the viaduct on the Build Alternatives J alignments would be built at high elevations (60 to 100 feet above the existing surface in some locations) above and over the MD 198 interchange through the

northwestern portion of the PRR and adjacent to the BWP. FRA determined the viaduct would result in a *higher-level* degree of visual impact to those resources in CAAs #10 and #12. The viaduct would comply with Federal Aviation Administration (FAA) Notice of Proposed Construction or Alteration (FAA-7460), Maryland Department of Transportation/Maryland Aviation Administration (MDOT MAA) regulations for safe operations due to its close proximity to Tipton Airport. **Figure 4.9-7** provides an illustrative rendering of the proposed FA/EE near Fort George G. Meade.



Figure 4.9-7: CAA #13 - Illustrative Rendering of Proposed Alignment J1 FA/EE near Fort George G. Meade and Baltimore-Washington Parkway, Looking North

Heading north from the portal, Build Alternatives J1 alignments would be in underground tunnel up to Baltimore City; however, a proposed SCMAGLEV FA/EE, approximately 50-feet tall, would be installed on Fort George G. Meade (U.S. Army) property. This facility would be built in an area that is currently forested, adding a structure and lighting in an area currently undeveloped. This facility would have visual impacts to BWP and Fort Meade. FRA determined that the proposed facility within the CAA #13 viewshed would result in a *higher-level* degree of visual impact resulting from disturbances to the surrounding natural features and undeveloped land.

The Build Alternatives J alignments continue adjacent to the east side of BWP, over the Little Patuxent River, and over the Patuxent Freeway (MD 32) interchange where it would pass by the Annapolis Junction, National Security Agency (NSA) and the U.S. Army Fort George G. Meade properties before re-entering a tunnel portal north of the Connector Road interchange. FRA determined that due to the proposed height of this segment of viaduct (up to 50 feet) and surrounding park-like aesthetics of the existing

landscape, the viaduct and tunnel portal would have *moderate to higher level* degrees of visual and light emission impacts on the Little Patuxent River, as well as on the NSA and Fort George G. Meade properties within CAAs #12 and #13. Efforts would be made by the Project Sponsor to minimize and mitigate potential impacts to these resources using walls and/or other barriers or vegetative screens. North of Fort George G. Meade, the guideway would be in underground tunnel up to Baltimore City.

North of the portal, FRA does not anticipate any visual impacts for this segment in underground tunnel; however, a proposed FA/EE facility on a parcel located adjacent to MD 100 and Harmans Road would have potential visual impacts to the surrounding residential neighborhoods along Matthewstown Road, Post Road, David Victoria Road, and Hekla Lane. This facility would be built in an area that is currently forested, adding a structure and lighting in an area currently undeveloped. FRA determined that the proposed facility within the CAA #14 viewshed would result in *moderate to higher level* degrees of visual impact resulting from disturbances to the surrounding natural features and undeveloped land.

Build Alternatives J and J1 alignments in Baltimore County and Baltimore City

FRA does not anticipate any visual impacts associated with the Build Alternatives J and J1 alignments through Baltimore County and City since the majority of the mainline guideway in this area is in deep tunnel. The only exception would be in Cherry Hill, where if the Cherry Hill Station were to be constructed, there would be a length of above ground viaduct and tail track that would introduce a visual impact. There are additional FA/EE facilities proposed in Baltimore County and City; however, the facilities conform to the surrounding land uses. Therefore, no alignment-related visual or light emissions impacts are anticipated. There are; however, visual and light emission impacts anticipated within Baltimore County and City related to proposed stations, as documented in the section below.

Stations

FRA determined that visual and aesthetic resources within the immediate vicinity of SCMAGLEV stations would be impacted within the viewsheds of CAAs #1, #16, #18, #19, and #20. Elements associated with new stations might include buildings, platforms, guideway, parking, elevated roadways and ramps, and other supporting structures. Mount Vernon Square East, Baltimore-Washington International Thurgood Marshall (BWI Marshall) Airport and Camden Yard Stations are proposed to be underground. Proposed underground stations would result in minimal effects to visual and aesthetic resources since the majority of the station infrastructure would be underground. Underground stations may include above-ground features such as entrances and parking structures. The Cherry Hill Station is the only above-ground station proposed.

The stations (Mount Vernon Square East Station, BWI Marshall Airport Station, Cherry Hill Station, Camden Yards Station) would feature permanent lighting roughly equivalent to those currently experienced at train stations like Union Station in Washington, D.C., and Penn Station in Baltimore.

Visually sensitive resources identified as having a moderate to high visual impact from the proposed stations are summarized below in **Table 4.9-3**.

Mount Vernon Square East Station

Head house entrance structures would introduce new visual elements to the existing area. The new buildings will be designed to be architecturally cohesive with the surrounding neighborhood, with contemporary accents and facility lighting that could be built separately and/or integrated into neighboring structures. The introduction of these conforming structures into the existing visual landscape would not introduce disproportional visual impacts or light emissions within the CAA #1 viewshed as the proposed buildings would merge with the existing surroundings and not disrupt any sensitive views. Therefore, the degree of visual and light emission impacts is categorized by FRA as *lower to moderate*. **Figure 4.9-8** provides an illustrative rendering of the proposed Mount Vernon Square East Station Entrance.



Figure 4.9-8: CAA #1 - Illustrative Rendering of Possible Entrance to Proposed Mount Vernon Station, Looking Northeast

BWI Marshall Airport Station

The proposed station at BWI Marshall Airport would be built directly underneath the existing short-term parking structure near the passenger arrival/departure area of the BWI Marshall Airport Station terminals. In order to build the station, the existing short-term parking structure would be demolished and re-built. The new parking structure and station terminal would be designed to closely match the existing visual character of the surrounding airport. All exterior lighting proposed as part of the BWI Marshall Airport Station would comply with FAA Notice of Proposed Construction or Alteration (FAA-

7460), MDOT MAA and BWI Marshall Airport lighting policies and will receive agency approvals prior to construction. Therefore, FRA has determined that the proposed station within the CAA #16 viewshed would have a *relatively imperceptible to lower level* degree of visual impact. **Figure 4.9-9** provides an illustrative rendering of the proposed BWI Marshall Airport station and contributing elements.



Figure 4.9-9: CAA #16 - Illustrative Rendering of Proposed Station at BWI Marshall Airport – Parking Garage and Terminal, Looking East

Cherry Hill Station

Within the neighborhoods of Cherry Hill and Westport in Baltimore City, and directly adjacent to the existing Cherry Hill Light Rail Station, an aboveground SCMAGLEV station is proposed. Associated with the proposed Cherry Hill Station is a tunnel portal located to the north of Patapsco Avenue and east of BWP (MD 295). This portal would transition the underground guideway to a viaduct that would span over the adjacent/existing CSX railroad tracks to the proposed elevated Cherry Hill Station. The elevated station concept also allows for potential elevated terminal facilities, known as tail tracks. Potential terminal facilities would be located on nearby property and property just east of the Kloman Street between Waterview Avenue and I-95 and would be approximately 50 feet high. A new electrical substation is also proposed just south of I-95 and north of Clare Street. In addition to the tail tracks and Power Substation, a Maintenance of Way (MOW) facility, garage parking, systems operation center, and other support facilities have been proposed. **Figure 4.9-10** provides an illustrative rendering of the proposed Cherry Hill Station, MOW, and contributing elements.



Figure 4.9-10: CAAs #18 and #19 - Illustrative Rendering of Proposed Cherry Hill Station, Tunnel Portal, Maintenance of Way Facility, and Parking Structures, Looking North

The elevated Cherry Hill Station would provide vertical access to the Light Rail station directly below it, as well as to a proposed parking garage along Cherry Hill Road. The optimum anticipated height of these proposed station elements is 90 feet above the existing surface topography. The entire combined surface area for this station and support facilities is estimated to be approximately 235 acres. Within the viewshed buffer of the proposed station are several visually sensitive resources, including Northeast Highlands Park/Ungers Field, Lakeland Park, Middle Branch Park and Trail, and the Westport Historic District, Indiana Avenue Park, The Gwynns Falls Trail, the Middle Branch Patapsco River, The Gwynns Falls River, Arundel Elementary School, Westport Elementary School, and Mt. Auburn Cemetery. The area is characterized by industrial, light industrial, commercial, and residential land uses. The area is also bisected and bound by a series of major transportation corridors, including interstates, highways, and rail lines. Given the context of the area and surrounding existing land uses, FRA determined that the proposed station and its related elements within the CAA #18 viewshed would result in *moderate to high level* degrees of visual impact and light emissions to the existing landscape. In addition, FRA determined that visually sensitive resources located close to the proposed station within CAA #19 viewshed (including Middle Branch Park and Trail, Indian Avenue Park, the Gwynns Falls Trail, the Gwynns Falls River, Westport HDC, and the Middle Branch Patapsco River) would experience *moderate to high level* degrees of visual and light emission impacts. FRA determined that other visually sensitive resources located within the CAA #18 viewshed (Northeast

Highlands Park/Ungers Field, Lakeland Park, and Middle Branch Park), would have *lower to moderate level* degrees of visual and light emissions impact.

Camden Yards Station

Located in downtown Baltimore, the proposed Camden Yards Station would be an underground station adjacent to Camden Yards below the Baltimore Convention Center. The station cavern would extend underground on a diagonal from approximately Martin Luther King, Jr. Boulevard to just north of Pratt Street. Station entrances would be at three possible locations: the corner of Howard and Camden Streets; the Camden Maryland Area Regional Commuter (MARC) Station; or adjacent to the Convention Center along Conway Street. The proposed station would be constructed using similar methods to those used for the Washington, D.C. Mount Vernon Square East Station, utilizing temporary top-down construction methods. However, unlike in D.C. where primarily only New York Avenue would be disturbed during construction, the Camden Yards Station would require substantial demolition of surrounding buildings. Uniquely recognizable buildings and historic cultural resources like the Baltimore Convention Center, the Federal Reserve Bank-Richmond, the historic Old Otterbein United Methodist Church and Otterbein Historic District would be demolished. In addition, the Edward A. Garmatz United States Courthouse and Federal Services building, and the Bank of America Financial Center building would also be demolished to build the proposed station. FRA determined that the razing of these buildings and sensitive resources within CAA #20 viewshed would result in a *moderate to higher level* degree of visual impact to the sensitive resources that would remain.

The remaining visually sensitive resources potentially affected include McKeldin Square, Solo Gibbs Park, the Business and Government HDC, the George H. Fallon Federal Service Building, the Patapsco River, and various other potential community and cultural resources noted above that would be demolished and replaced with the new structure. FRA determined these resources within CAA #20 viewshed would potentially be subjected to *moderate to higher level* degrees of visual and light emissions impact resulting from the changes proposed within the viewshed buffer.

Figure 4.9-11 provides an illustrative rendering of the proposed Camden Yards Station entrance.



Figure 4.9-11: CAA #20 - Illustrative Rendering of Proposed Station near Camden Yards in Downtown Baltimore on Pratt Street, Looking East

Trainset Maintenance Facilities (TMFs)

FRA determined that visual and aesthetic resources located within the immediate vicinity of TMF sites and contributing elements within CAAs #5, #6, #7, #8, #10, #11, and #12 would be impacted. The BARC West, BARC Airstrip, and MD 198 TMF sites would feature permanent lighting equivalent to those found at current Amtrak and MDOT MTA light rail maintenance facilities.

Visually sensitive resources identified as having a moderate to high visual impact from the proposed TMF sites are summarized in **Table 4.9-3**.

BARC Airstrip TMF

The BARC Airstrip TMF is an approximate 180-acre site located on the east side of BWP on US Department of Agriculture's (USDA) BARC property and is comprised of various maintenance and repair buildings which are joined by a maintenance of way facility, substations, staff parking, access roads and viaduct ramps. More specifically, 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 and crosses over Springfield Road (Springfield Road would be realigned to the west to accommodate the TMF footprint). The facility would be on an existing airfield surrounded by relatively undeveloped land that is mostly used for agricultural research. The surface of the BARC Airstrip TMF would be at approximately the same elevation as the existing ground surface at the airstrip. BARC land adjacent to the south of the airstrip is leased to NASA Goddard

Geophysical and Astronomical Observatory (GGAO) which contains highly sensitive scientific equipment.

For access to and from the guideway, two viaduct ramps would branch off from the main line Alignments J and J1 and run parallel to the respective 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 BARC Airstrip TMF, the ramps to Alignment J1 would cross over the BWP property via viaduct, presenting a visual impact. FRA determined that the BARC Airstrip TMF and ramps within CAA's #5 and #6 would result in a *higher-level* degree of visual and light emission impacts to the BARC, BWP, and City of Greenbelt properties. NASA Goddard is forcefully vocal regarding their concerns about light emission impacts to their GGAO facility, noting that their instruments are highly sensitive to light and vibrations. While the overall light emissions that would come from the TMF are not fully known at this time, the relatively short distance between the TMF and GGAO suggests there is the potential for substantial light emission impacts. The Project Sponsor would work with NASA Goddard to avoid, minimize and/or mitigate the impacts once the design is further refined. **Figure 4.9-12** provides an illustrative rendering of the proposed BARC Airstrip TMF.

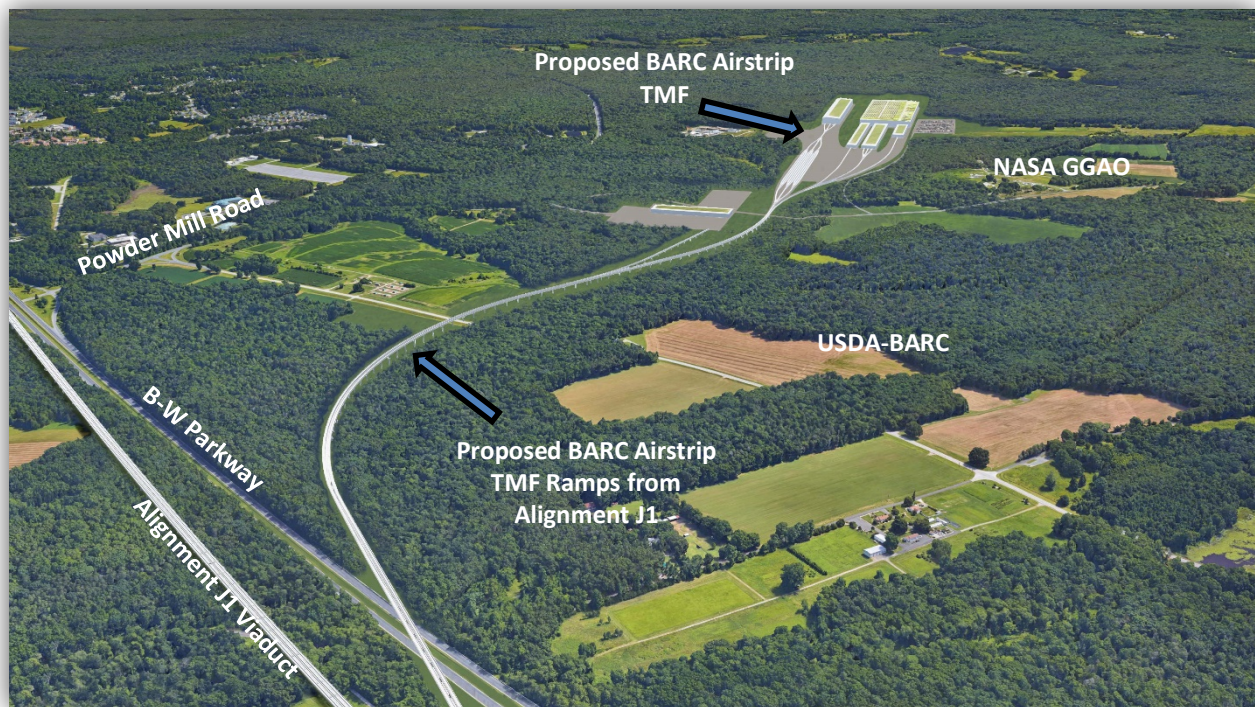


Figure 4.9-12: CAAs #5 and #6 - Illustrative Rendering of Proposed BARC Airstrip TMF and Corresponding Ramps with Alignment J1, Looking East

BARC West TMF

The BARC West TMF is an approximate 180-acre site located on the west side of BWP on USDA's BARC property and comprised of various maintenance and repair buildings which are joined by a MOW facility, substations, staff parking, access roads and viaduct ramps. 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. For access to and from the guideway, two viaduct ramps would branch off from the main line Alignments J and J1 and run parallel to the respective alignment on BWP property before turning toward the TMF. The distances of the ramps along the mainline alignment and BWP property would be 1.4 miles. In making the turn toward the BARC West TMF, the two ramps would cross over the BWP property via viaduct, presenting a visual impact. FRA determined that the BARC West TMF and ramps within CAAs #5, #6, and #8 would result in a higher-level degree of visual and light emission impacts to the BARC, BWP, and City of Greenbelt properties. In addition, FRA determined that the BARC West TMF would result in a higher-level degree of visual and light emissions impact to the adjacent residential properties and neighborhoods along Odell Road, Gross Lane, and Ellington Drive within CAA #8. **Figure 4.9-13** provides an illustrative rendering of the proposed BARC West TMF.

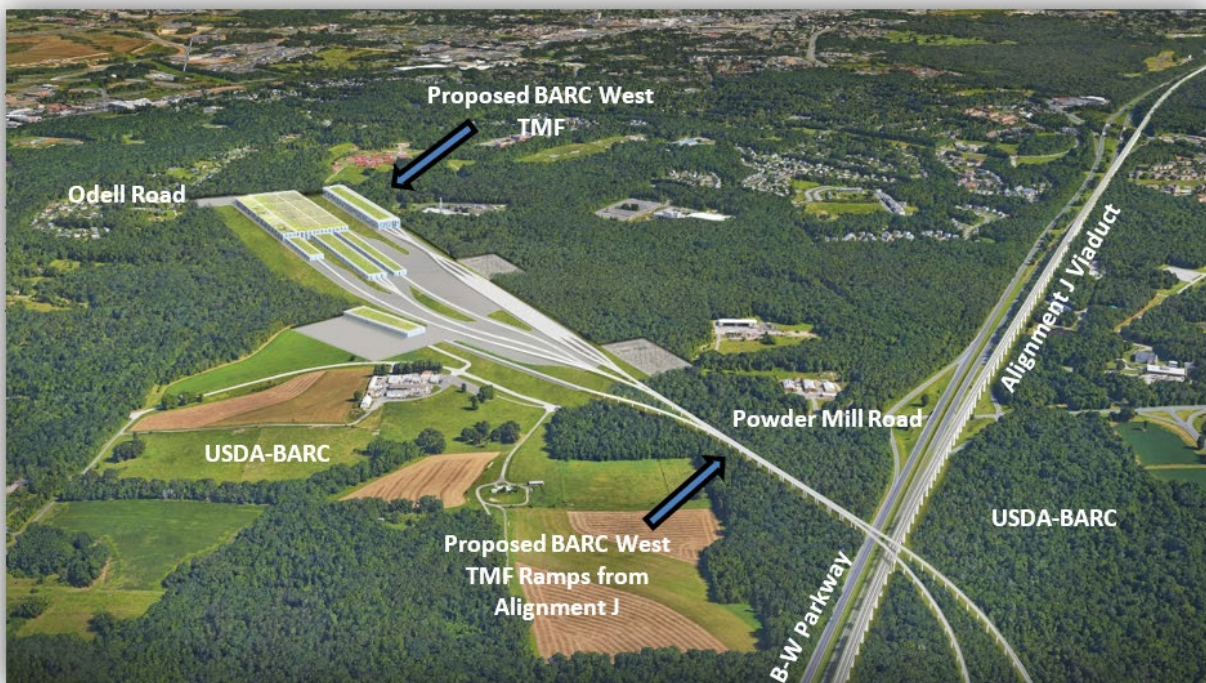


Figure 4.9-13: CAAs #5, #6, and #8 - Illustrative Rendering of Proposed BARC West TMF and Corresponding Ramps with Alignment J, Looking North

MD 198 TMF

Access ramps associated with Build Alternatives J alignments run parallel along the east side of the BWP through the PRR property. FRA determined that these ramps would within CAA's #10, #11, and #12, result in a *high-level* degree of visual impact to the BWP and the PRR. Similarly, the ramps associated with the Build Alternatives J1 alignments run parallel along the west side of BWP and cross over the BWP at MD 198 to reach the TMF. The TMF and associated ramps would also cause *higher level* degrees of visual and light emission impacts on the adjacent DC Children's Center-Forest Haven District, Tipton Airport, PRR, Fort George G. Meade, and residential communities of Sudlersville South, Maryland City, Watershed and Welchs Court within CAAs #10 and #12. The MD 198 TMF would also be highly noticeable to the motoring public travelling on MD 198 and the BWP. **Figures 4.9-14** and **4.9-15** below provide illustrative renderings of the proposed MD 198 TMF and contributing elements.

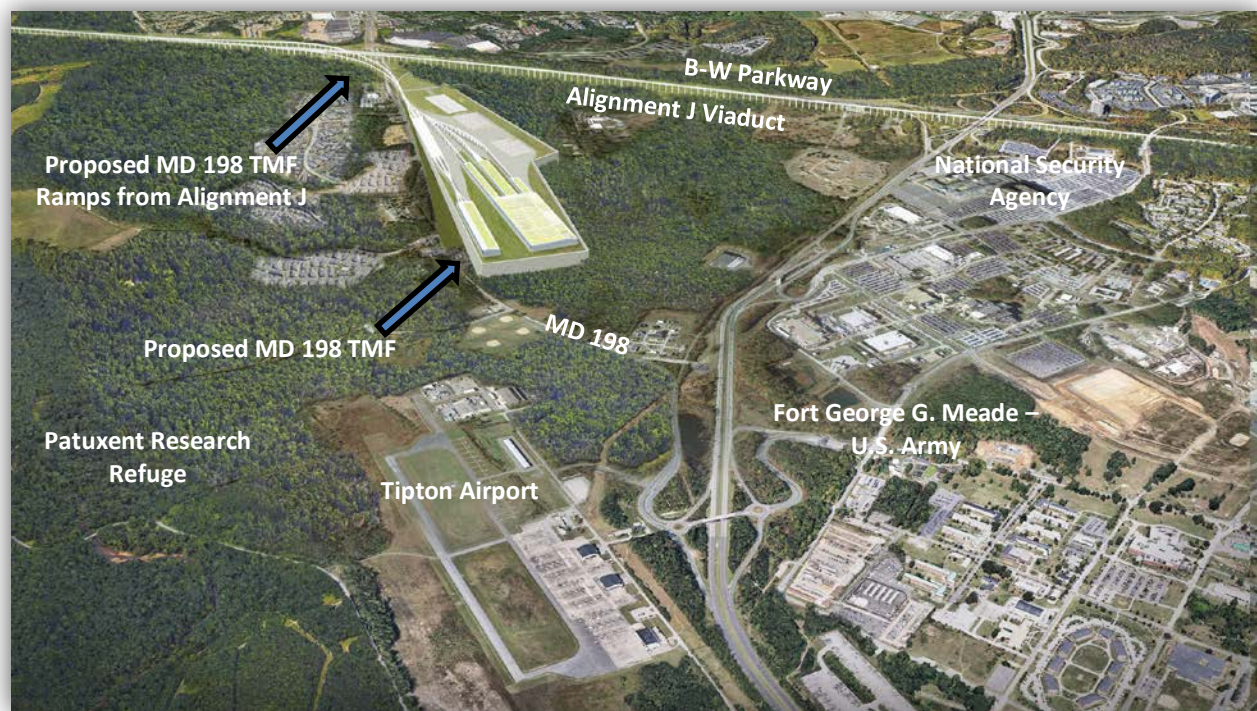


Figure 4.9-14: CAAs #10, #11, and #12 - Illustrative Rendering of Proposed MD 198 TMF and Corresponding Ramps with Alignment J near Tipton Airport, Fort George G. Meade, and NSA, Looking West



Figure 4.9-15: CAAs #10 and #12 - Illustrative Rendering of Proposed MD 198 TMF and Corresponding Ramps with Alignment J near Patuxent Research Refuge, Fort George G. Meade, and NSA, Looking North

Table 4.9-3: Detailed Summary of Visually Sensitive Resources Impacted by Build Alternatives

Resource Name	Type of Resource & Visual Sensitivity of Existing Resource	Build Alternatives <i>(X indicates resource is present in a Build Alternatives)</i>												Degree of Anticipated Visual Impact*	
		J-01	J-02	J-03	J-04	J-05	J-06	J1 01	J1 02	J1 03	J1 04	J1 05	J1 06	Build Alternatives J Alignments	Build Alternatives J1 Alignments
Prince George’s County, MD (CAA #4, #5 #6 #7, #8, #9 Viewsheds)															
Martins Woods / Patterson Park	Public Lands - Moderate	X	X	X	X	X	X	X	X	X	X	X	X	M to H	L to M
Wildercroft-Riverdale Road	Residential communities - Moderate	X	X	X	X	X	X	X	X	X	X	X	X	M to H	L to M
NASA Goddard Space Flight Center	Research facility – High	X	X	X	X	X	X	X	X	X	X	X	X	M	M
Beltsville Agricultural Research Center	Research facility – High	X	X	X	X	X	X	X	X	X	X	X	X	H	H
NASA GGAO	Research and Operations Facility - High	-	X	-	X	-	-	-	X	-	X	-	-	H	H
Odell Road / Gross Ln / Ellington Dr Neighborhoods	Residential District – Moderately-High	-	-	X	-	-	X	-	-	X	-	-	X	RI to H	RI to H
Baltimore-Washington Parkway	Public Lands/Historic Cultural Landscape/Transportation Infrastructure/Park Resource – High	X	X	X	X	X	X	X	X	X	X	X	X	H	H
Greenbelt Historic District	Historic District – High	X	X	X	X	X	X	X	X	X	X	X	X	L to M	H

Resource Name	Type of Resource & Visual Sensitivity of Existing Resource	Build Alternatives (X indicates resource is present in a Build Alternatives)												Degree of Anticipated Visual Impact*	
		J-01	J-02	J-03	J-04	J-05	J-06	J1 01	J1 02	J1 03	J1 04	J1 05	J1 06	Build Alternatives J Alignments	Build Alternatives J1 Alignments
City of Greenbelt Observatory and Northway Field/James N. Wolfe Field	Recreational Resource – Moderate	X	X	X	X	X	X	X	X	X	X	X	X	M	H
United States Secret Service James J. Rowley Training Center	Public Lands - High	X	X	X	X	X	X	X	X	X	X	X	X	H	M
Montpelier Hills and Woodbridge Crossing Neighborhoods	Residential Communities – Moderately-Low	X	X	X	X	X	X	X	X	X	X	X	X	RI to L	M to H
Montpelier Elementary School and Montpelier Park	Public Lands - Low	X	X	X	X	X	X	X	X	X	X	X	X	RI to L	M to H
Evergreens at Laurel Apartments and Villages at Montpelier	Residential Communities – Moderately-Low	X	X	X	X	X	X	X	X	X	X	X	X	M to H	M to H
Pheasant Run Dr / Snowden Rd	Residential Communities - Moderate	X	X	X	X	X	X	-	-	-	-	-	-	L to M	N/A
Anne Arundel County, MD (CAA #7, #8, #9, #10, #11, #12, #13 Viewsheds)															
Patuxent River	Ecological Resource – High	X	X	X	X	X	X	X	X	X	X	X	X	H	H
Patuxent Research Refuge	Public Lands – High	X	X	X	X	X	X	X	X	X	X	X	X	M to H	M
Little Patuxent River	Ecological Resource – High	X	X	X	X	X	X	-	-	-	-	-	-	H	N/A
Maryland City Park	Park Resource-High	-	-	-	-	-	-	X	X	X	X	X	X	RI	H

Resource Name	Type of Resource & Visual Sensitivity of Existing Resource	Build Alternatives (X indicates resource is present in a Build Alternatives)												Degree of Anticipated Visual Impact*	
		J-01	J-02	J-03	J-04	J-05	J-06	J1 01	J1 02	J1 03	J1 04	J1 05	J1 06	Build Alternatives J Alignments	Build Alternatives J1 Alignments
Brock Bridge Elementary School	Public Lands – Moderate	X	X	X	X	X	X	X	X	X	X	X	X	RI	H
Thomas J.S. Waxters Children's Center	Public Lands – High	X	X	X	X	X	X	X	-	-	X	-	-	RI	M to H
Maryland City, Sudlersville South, Barbersville, Russett Neighborhoods	Residential Communities – Moderately-High	X	X	X	X	X	X	X	X	X	X	X	X	RI	M to H
DC Children's Center	Hospital Campus - High	X	X	X	X	X	X	X	-	-	X	-	-	L to H	RI to H
Tipton Airport	Transportation infrastructure – High	X	X	X	X	X	X	X	-	-	X	-	-	L to H	RI to H
Watershed and Welchs, Ct Neighborhoods	Residential Communities – Moderately-Low	X	-	-	X	-	-	X	-	-	X	-	-	L to H	RI to H
National Security Agency	Public Lands – Moderately High	X	X	X	X	X	X	-	-	-	-	-	-	H	N/A
Annapolis Junction	Commercial District – High	X	X	X	X	X	X	-	-	-	-	-	-	H	N/A
Fort George G. Meade (U.S. Army)	Public Lands – Moderately-High	X	X	X	X	X	X	X	X	X	X	X	X	L to M	H
Matthewstown Rd/Post Rd / David Victoria Ln / Hekla Ln Neighborhoods	Residential Communities – Moderate	X	X	X	X	X	X	X	X	X	X	X	X	M to H	M to H

Resource Name	Type of Resource & Visual Sensitivity of Existing Resource	Build Alternatives (X indicates resource is present in a Build Alternatives)												Degree of Anticipated Visual Impact*	
		J-01	J-02	J-03	J-04	J-05	J-06	J1 01	J1 02	J1 03	J1 04	J1 05	J1 06	Build Alternatives J Alignments	Build Alternatives J1 Alignments
Baltimore County and Baltimore City (CAA #18, #19, #20 Viewsheds)															
Cherry Hill, Westport Neighborhoods	Residential communities – Moderate	X	X	X	-	-	-	X	X	X	-	-	-	L	H
Middle Branch Patapsco River, Gwynns Falls, Gwynns Falls Trail, Middle Branch Park and Trail	Ecological, Park, and Recreational Resources – Moderately-High	X	X	X	-	-	-	X	X	X	-	-	-	H	M to H
Westport Historic District	Historic District – Moderately-High	X	X	X	-	-	-	X	X	X	-	-	-	H	H
Arundel Elementary School, Westport Elementary School	Public Lands – Moderate	X	X	X	-	-	-	X	X	X	-	-	-	M to H	M to H
Baltimore Convention Center, Edward A. Garmatz US District Courthouse, Bank of America Financial Center, Federal Reserve Bank-Richmond	Commercial buildings and Public Lands - Moderate	-	-	-	X	X	X	-	-	-	X	X	X	M to H	H
McKeldin Square, Solo Gibbs Park, Patapsco River	Park and Ecological Resources – Moderate	-	-	-	X	X	X	-	-	-	X	X	X	H	H

Resource Name	Type of Resource & Visual Sensitivity of Existing Resource	Build Alternatives (X indicates resource is present in a Build Alternatives)												Degree of Anticipated Visual Impact*	
		J-01	J-02	J-03	J-04	J-05	J-06	J1 01	J1 02	J1 03	J1 04	J1 05	J1 06	Build Alternatives J Alignments	Build Alternatives J1 Alignments
Camden Station and B&O Warehouse / Baggage Depot	Transportation Building – Moderately-Low	-	-	-	X	X	X	-	-	-	X	X	X	M to H	M to H
Wilkins-Robins Building	Cast-iron Commercial Building – Moderately-Low	-	-	-	X	X	X	-	-	-	X	X	X	M to H	M to H
George H. Fallon Federal Building	Government Building - Moderate	-	-	-	X	X	X	-	-	-	X	X	X	M to H	M to H
Business and Government Historic District	Historic District - Moderate	-	-	-	X	X	X	-	-	-	X	X	X	M to H	M to H
Otterbein Church	Religious Building - Moderate	-	-	-	X	X	X	-	-	-	X	X	X	M to H	M to H
Otterbein Historic District	Historic District – Moderately-High	-	-	-	X	X	X	-	-	-	X	X	X	H to H	M to H
Northeast Highlands Park / Ungers Field, Lakeland Park, Indiana Avenue Park	Park Resources – Moderately-High	X	X	X	-	-	-	X	X	X	-	-	-	L to M	L to M
Mt. Auburn Cemetery	Cemetery – Moderate	X	X	X	-	-	-	X	X	X	-	-	-	M to H	M to H

Source: AECOM, 2020.

**X" indicates resource applicability to an alternative; Degree of Visual Impacts = RI – Relatively imperceptible, L – Lower levels, M – Moderate levels, H – Higher levels

4.9.4.3 Short-Term Construction Effects

Each CAA would experience variable levels of temporary impacts to the visual environment from construction activities associated with each Build Alternatives and its options. Tunneling efforts, such as cut/cover work, site clearing for buildings/facilities, grading, staging and work areas. At the end of construction, these elements would be removed and temporarily disturbed areas would be restored to the extent practicable. The location of the temporary construction staging, and work areas are shown in the Build Alternatives Mapping in Appendix B.1.

4.9.4.4 Mitigation Strategies

As engineering design progresses, the Project Sponsor, Baltimore-Washington Rapid Rail (BWRR), will continue to identify opportunities to avoid, minimize, and mitigate potential visual impacts to the extent practicable. This may include blending proposed SCMAGLEV system elements and support facilities with existing transportation, industrial, and utility corridors to optimize compatibility with existing aesthetic and scenic views. Preliminary station, TMF, and support facility designs would be developed to be compatible with the surrounding natural and cultural environment in order to minimize visual impacts.

Programmatic mitigation measures may be used for visual and aesthetic resources including development of context-sensitive design measures of more visually prominent facilities, such as stations, viaducts and support facilities, to improve the aesthetic characteristics. In areas where cultural resources, parks, and/or residences are located, design of structural elements, retaining walls, and other buildings the Project Sponsor will consider aesthetic treatments that are consistent with the context of the surrounding landscape and environment. These may include development of visual barriers, creative landscaping to screen or enhance views or innovative design features on ancillary facilities. Context-sensitive design measures will also be important for resources where new features related to the Build Alternatives would be introduced to the visual environment. Consultation with agencies having jurisdiction over the cultural resources and parks, as well as area residents, will be performed, as appropriate, to obtain input into the development of project design and mitigation concepts.

The following mitigation measures would potentially minimize the aesthetic and scenic impacts of the Build Alternatives.

1. **Public Outreach:** Public Meetings with Impacted Neighborhoods and Stakeholders. As part of the programmatic mitigation approach, BWRR would continue to incorporate stakeholder input into design throughout the SCMAGLEV Project to inform their decision-making process. Prior to construction, BWRR or its contractors would present visual impact mitigation strategies to the following neighborhoods (additional neighborhoods may be identified as the SCMAGLEV Project proceeds): Mount Vernon Square District, Ivy City, Langdon, Gateway, Brentwood, Bladensburg, Wildercroft, Woodlawn, West Lanham Hills, Montpelier, South Laurel, Woodbridge Crossing, Montpelier Hills, Evergreens at Laurel

Apartments, Maryland City, Sudlersville South, Barbersville, Harmons Station, Baltimore Highlands, Lansdowne, Dorchester Heights, Cherry Hill, Westport, Otterbein, Downtown Baltimore Business District.

In addition, public comments from the DEIS will be incorporated into the Final Environmental Impact Statement (FEIS) to allow all other communities, neighborhoods and concerned stakeholders the opportunity to provide testimony for the official record. The responses and comments will be used to guide mitigation measures implemented during construction and operation of the SCMAGLEV system.

2. Design Criteria: Incorporate design criteria for viaduct, station, TMF, and support facility elements that can adapt to local context and surroundings. During final design, BWRR would implement the following, to the extent feasible:

- Integrate hardscape and landscape elements into the station, TMF, and operational/support facility streetscapes along with street trees and vegetation where possible to soften and screen the appearance of proposed contributing elements.
- Design SCMAGLEV Project stations and associated structures such as passenger support facilities, head houses, elevator shaft/escalator shafts and other supporting access and pedestrian facilities to be attractive architectural elements or features that add visual interest to the streetscapes near them.
- Design SCMAGLEV Project station parking structures and adjacent departure/arrival/taxi stand/kiss-and-ride areas to integrate visually into Washington, D.C., Baltimore City, and BWI Marshall Airport.

3. Vegetation Management/Preservation: During construction, in areas which require clearing for temporary or permanent use, BWRR would minimize the clearing of forested areas and existing groundcover vegetation. Minimizing forest and vegetated area disturbances helps reduce adverse visual quality impacts because of the removal of existing vegetative screens and buffers. Preserving existing forested areas and groundcover vegetation also provides indirect visual benefits by minimizing runoff infiltration, soil erosion and reduces the introduction of invasive vegetation, two effects which can ultimately lead to future adverse visual contrasts. In some instances, it may be necessary to completely remove vegetation that would present a technical and safety concern.

Where design and safety requirements do not necessitate removal of forested areas and groundcover vegetation, efforts should be made to trim trees instead of truncate and truncate instead of clear. Additionally, vegetation should be mowed, covered with protective surface matting, or temporarily beaten-down, rather than removed. Where areas do not have to be regraded, the crowns and roots from cut and/or remaining forested and groundcover vegetation should be left undisturbed in order to allow for re-growth.

4. Vegetation Management/Partial Clearings and Feather Edges of right of way (ROW).

Prior to construction, BWRR would incorporate partial ROW clearing where feasible, including topping or truncating rather than removing trees that exceed the allowable height and leaving irregular edges within the ROW. Trees that would not present a safety or engineering hazard or otherwise interfere with operations should be left on the ROW.

This would include feathering ROW edges where feasible (i.e., the progressive and selective thinning of trees and groundcover vegetation) combined with varying tree heights to create an irregular vegetation outline. Cutting forested areas and groundcover vegetation only at the edge of the ROW can create a strong line contrast between vegetation and the cleared ROW that can be visible for many miles. Partial ROW clearing and feathering of ROW edges creates a more natural appearance.

5. Apply minimum lighting standards:

- Limit artificial outdoor lighting to safety and security requirements and designed using Illuminating Engineering Society's design guidelines and in compliance with approved fixtures.
- Lighting should provide minimum impact to the surrounding environment by utilizing downcast, cut-off type fixtures that are shielded and direct the light only towards objects requiring illumination.
- Install lights at the lowest allowable height and cast low-angle illumination while minimizing incidental light spill onto adjacent properties, open spaces, or backscatter into the nighttime sky.
- Utilize the lowest allowable wattage for all lighted areas and minimize the amount of nighttime lights needed to light an area as much as possible.
- Light fixtures will have non-glare finishes that will not cause reflective daytime glare.
- Design all lighting to optimize energy efficiency, safety and security, and to be aesthetically pleasing.
- All lighting proposed within specified distances of BWI Marshall Airport and Tipton Airport would be designed to comply with FAA Notice of Proposed Construction or Alteration (FAA-7460) and Runway Protection Zone requirements. Lighting will also need to meet MAA and airport lighting standards so that there would be no negative impacts to airport safety.

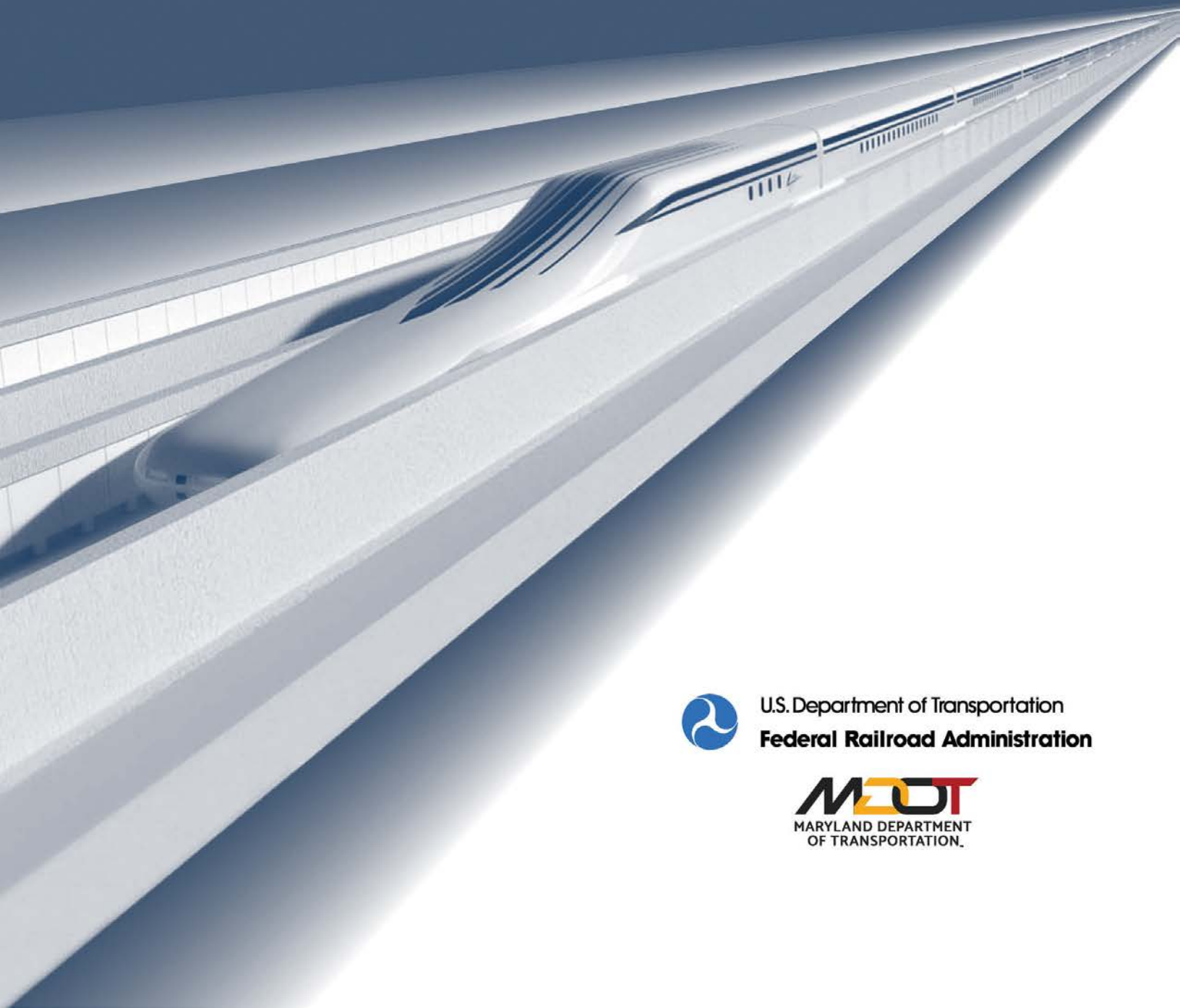
Additional illustrative renderings provided in Appendix D.6.

Section 4.10

Water Resources

BALTIMORE-WASHINGTON SUPERCONDUCTING MAGLEV PROJECT

DRAFT ENVIRONMENTAL IMPACT STATEMENT AND
SECTION 4(f) EVALUATION



U.S. Department of Transportation
Federal Railroad Administration



4.10 Water Resources

4.10.1 Introduction

This section discusses watersheds, water quality, groundwater, floodplains, Scenic and Wild Rivers, and the Chesapeake Bay Critical Areas that could be physically affected by the Superconducting Magnetic Levitation Project (SCMAGLEV Project). Refer to Section 4.11 for additional details regarding wetlands and waterways and Section 4.12 for ecological resources. Additional details about these resources can also be found in Appendix D.7 Natural Environment Technical Report (NETR).

- **Watersheds** - As defined by the National Oceanic and Atmospheric Administration (NOAA), a watershed, or drainage basin, is defined as “a land area that channels rainfall and snowmelt to creeks, streams, and rivers, and eventually to outflow points such as reservoirs, bays, and the ocean.”¹
- **Water Quality** - As defined by the United States Environmental Protection Agency (USEPA), water quality standards “form a legal basis for controlling pollutants entering the waters of the United States... Water quality standards consist of three core components. These include designated uses of a water body, criteria to protect designated uses, and antidegradation requirements to protect existing uses and high quality/high value waters.”²
- **Groundwater Resources, including wells and aquifers** - Groundwater resources consist of water beneath the ground surface in soil pore spaces and in the fractures of rock formations. A unit of rock or soil deposit is called an aquifer when it can yield a usable quantity of water.
- **Floodplains** - Floodplains refer to the lowland and relatively flat areas adjoining inland and coastal waters including, at a regulatory minimum, that area subject to a one percent or greater chance of flooding in any given year (100-year floodplain).
- **Scenic and Wild Rivers** - The Maryland State Scenic and Wild Rivers System was created by the Scenic and Wild Rivers Act of 1968 to preserve certain rivers with outstanding natural, cultural, and recreational values. No National Wild and Scenic Rivers are designated in Maryland or Washington, D.C.
- **Chesapeake Bay Critical Area** - The Chesapeake Bay Critical Area (Critical Area) includes all land within 1,000 feet of Maryland’s tidal waters and tidal wetlands. This includes the waters of the Chesapeake Bay, the Atlantic Coastal Bays, their tidal tributaries, and the lands underneath these tidal areas.

¹<https://oceanservice.noaa.gov/facts/watershed.html>

²<https://www.epa.gov/standards-water-body-health/what-are-water-quality-standards>

4.10.2 Regulatory Context and Methodology

4.10.2.1 Regulatory Context

Water resources are protected and regulated under various Federal, state, and local laws, regulations, and Executive Orders (EO), including but not limited to:

- The Clean Water Act (CWA) – Section 401 Water Quality Certification and Section 402 National Pollution Discharge Elimination System (NPDES)
- Safe Drinking Water Act (SDWA) (42 U.S.C. 330f-330j)
- Section 10 of the Rivers and Harbors Act of 1899
- EO 11988 Floodplain Management
- The District of Columbia Municipal Regulations (DCMR) – Title 21 Section 5 Stormwater Management Rule; Title 8 Section 1 Water Pollution Control Act; and Title 20 Section 31 Floodplain Regulations
- Code of Maryland Regulations (COMAR) Title 27 Natural Resources Article, Title 8, Subtitle 18 Critical Area Law, Chesapeake Bay Critical Area Protection Program
- State Scenic and Wild Rivers Act of 1968 (Maryland)
- Executive Order (EO) 11990, Protection of Wetlands, 1977
- Coastal Zone Management Act (CZMA), Section 307 of the Coastal Zone Management Act of 1972, as amended
- Executive Order establishing Patuxent Research Refuge, 1936
- National Wild and Scenic Rivers Act, 1968 (Public Law 90-542; 16 U.S.C. 1271 et seq.)
- Executive Order (EO) 13508: Chesapeake Bay Protection and Restoration

The National Coastal Zone Management Program (CZMP) is authorized by the Coastal Zone Management Act (CZMA) of 1972, amended by the Coastal Zone Act Reauthorizations Amendments of 1990 (CZARA) and is administered by NOAA (15 CFR Part 930). Under the CZMA, direct Federal actions, Federal license or permit projects, and Federal assistance activities with reasonably foreseeable coastal effects must be consistent with the enforceable policies of a state's approved CZMP. The process by which a state decides if a Federal action meets its enforceable policies is called Federal consistency. The Federal Railroad Administration (FRA) initiated coordination with the Maryland Department of the Environment (MDE) and the Maryland Department of Natural Resources (MDNR) during the development of the Draft Environmental Impact Statement (DEIS) and at this stage of the SCMAGLEV Project a consistency determination has not been provided. MDE and MDNR have indicated that they will review the consistency documentation as part of the wetlands permit or license process and provide a determination through that process. A permit would be required

for nontidal wetland and waterway impacts, whereas a tidal wetland license would be required for tidal wetland and waterway impacts. Vegetated tidal wetland impacts are not anticipated based on the current design, and the only tidal waters within the SCMAGLEV Affected Environment will be tunneled under. Additional coordination among FRA, the Project Sponsor, MDE, and MDNR will occur prior to the issuance of the Final Environmental Impact Statement to complete the Federal consistency review for the SCMAGLEV Project. Maryland participates in the National CZMP, but Washington, D.C. does not. Therefore, consistency with the CZMP is required for Maryland only.

4.10.2.2 Methodology

FRA gathered publicly available information, including Geographic Information System (GIS) data, for the SCMAGLEV Project, from the MDE, MDNR, Maryland Department of Planning (MDP), the U.S. Geological Survey (USGS), and the USEPA. Additional site-specific information regarding existing water resources and permitting requirements was gained through field visits with the U.S. Army Corps of Engineers (USACE), the U.S. Fish and Wildlife Service (USFWS), and MDE. FRA evaluated existing conditions, overlaid existing resources on SCMAGLEV Project mapping, and assessed the potential for direct and indirect impacts as well as temporary and permanent impacts to water resources.

FRA defined the geographic limit of the SCMAGLEV Project Affected Environment for water resources on both a regional level as well as the SCMAGLEV Project impact area, plus an additional 30-foot buffer. The impact area includes the limits of operational/physical disturbance, as well as the construction related impact area, which includes additional areas of temporary disturbance required for construction activities. These impact areas comprise the overall limit of disturbance (LOD) of the SCMAGLEV Project Build Alternatives. The LOD includes all surface and subsurface elements. FRA considered a qualitative analysis of watersheds, water quality and groundwater, supported by a quantitative analysis of floodplain, Critical Area, and impervious surfaces within each watershed in the SCMAGLEV Project Affected Environment. Variability of water quality is highly correlated with the quality of and impacts to surrounding vegetated habitats including wetlands. Refer to Sections 4.11 and 4.12 for additional discussion related to these resources.

4.10.3 SCMAGLEV Project Affected Environment

4.10.3.1 Watersheds

All land areas within the SCMAGLEV Project Affected Environment occur within the greater Chesapeake Bay watershed, which is divided into smaller watersheds and sub-watersheds associated with major contributing waterways. Four watersheds and eight sub-watersheds are traversed as listed in **Table 4.10-1**. **Figure 4.10-1** illustrates the location of the affected sub-watersheds: Anacostia River, Patuxent River Upper,

Little Patuxent River, Severn River, Patapsco River Lower North Branch, Baltimore Harbor, Gwynns Falls, and Jones Falls.

MDE designates Stronghold Watersheds, which are “watersheds around the State that are the most important for the protection of Maryland’s aquatic biodiversity. These locations are the places where rare, threatened, or endangered species of fish, amphibians, reptiles or mussels have the highest numbers.”³ The Little Patuxent River Watershed is a Stronghold Watershed.

Upper Beaverdam Creek is the least developed sub-watershed within the Maryland portion of the Anacostia Watershed. As such, it has been used by MDE and other agencies as a reference stream for the Coastal Plain portion of the Anacostia. The Anacostia Watershed is also a designated location by the Urban Waters Federal Partnership, which aims to improve interagency collaboration to restore the Anacostia. The USEPA studies of the Anacostia indicate that it has lost 6,500 acres of wetlands and 70 percent of its forest cover, resulting in impervious surfaces covering more than 25 percent of the watershed as a result of urbanization. It is however indicated as ecologically steadily improving.⁴

These watersheds consist of surface waters and associated floodplains, existing wetlands, and underlying groundwater. Major receiving waters within these watersheds include the Anacostia River, Beaverdam Creek, Patuxent River, the Patapsco River, and the Middle Branch Patapsco River. Appendix D.7 NETR and Section 4.11 Wetlands and Waterways include a more detailed representation of the major receiving waters. As illustrated in Table 4.10-1, the Anacostia River Watershed has the most significant acreage of proposed SCMAGLEV Project.

³ <https://dnr.maryland.gov/streams/Pages/streamhealth/Maryland-Stronghold-Watersheds.aspx>

⁴ <https://www.epa.gov/urbanwaterspartners/urban-waters-and-anacostia-watershed-washington-dcm Maryland>

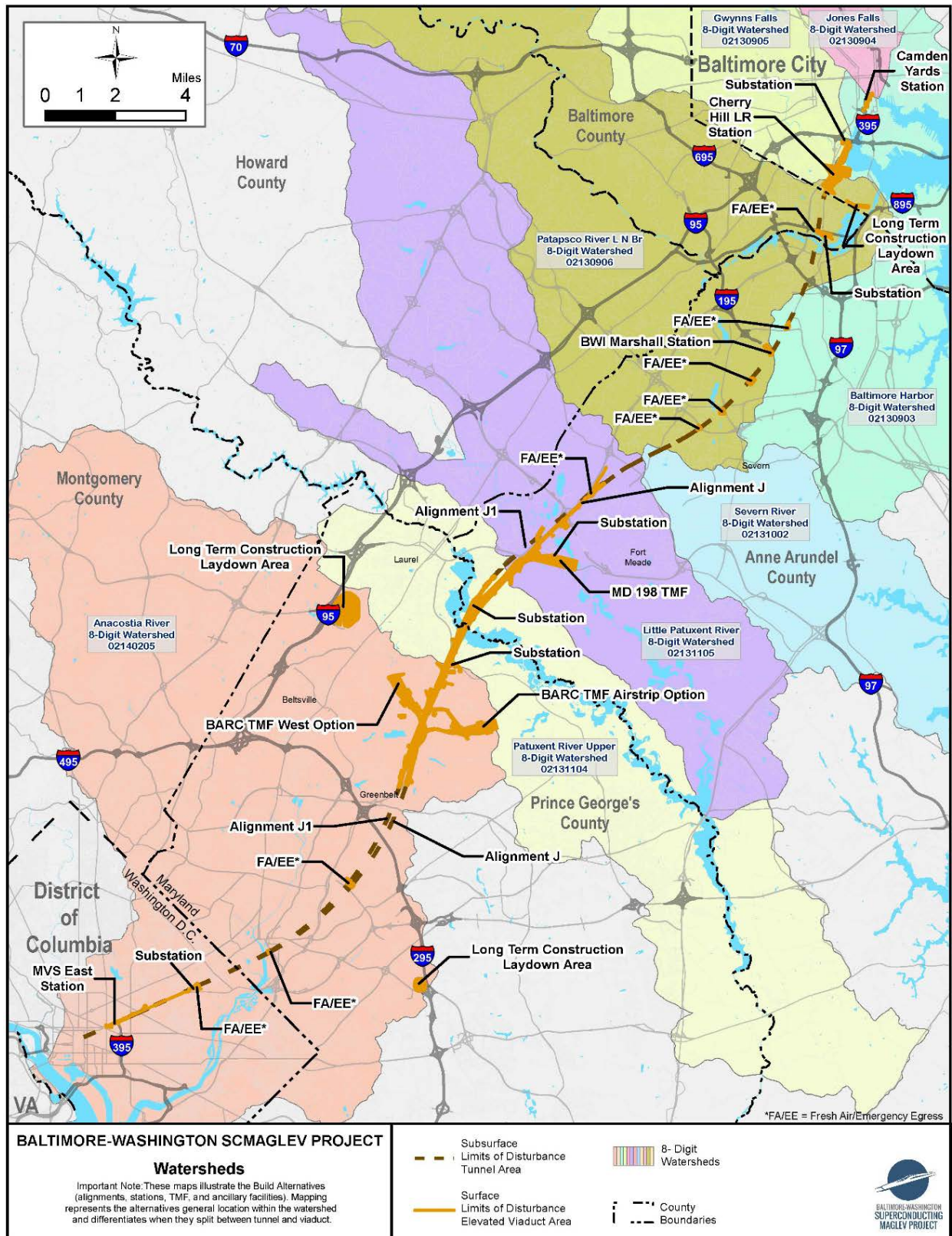
Table 4.10-1: Existing Watersheds within the SCMAGLEV Project Affected Environment

Sub-Watershed Name	Geographic/Land Use Description	Watershed 8-digit Hydrologic Unit Code	MDNR Watershed Name	MDNR Watershed 6-digit Code	Overall Watershed Size (acres)	Watershed Area within SCMAGLEV Project Affected Environment* (acres)
Anacostia River	Urbanized developed areas in Washington, D.C. to rural or undeveloped areas in Prince George's County	02140205	Middle Potomac	021402	116,511	820-1,067
Patuxent River Upper	Forested, urban, and agricultural development. Within Anne Arundel County and Prince George's County	02131104	Patuxent	021311	56,446	114-157
Little Patuxent River	Forested, industrial/ commercial, and residential, and drains much of the urbanized areas of Howard County	02131105	Patuxent	021311	66,214	82-421
Severn River	Single family residential and forest being the most prevalent land use	02131002	Lower Western Shore	021310	51,744	10
Patapsco River Lower North Branch	Densely populated and urbanized watersheds within and surrounding Baltimore County and Baltimore City	02130906	Patapsco Back River	021309	75,755	231-346
Baltimore Harbor	Densely populated and urbanized watersheds within and surrounding Baltimore County and Baltimore City	2130903	Patapsco/ Back River	021309	74,899	117-125
Gwynns Falls	Densely populated and urbanized watersheds within and surrounding Baltimore County and Baltimore City	2130905	Patapsco/ Back River	021309	41,711	23-45
Jones Falls	Densely populated and urbanized watersheds within and surrounding Baltimore County and Baltimore City	2130904	Patapsco/ Back River	021309	37,282	0-7

Source: University of Maryland Center for Environmental Science. Eco Health Report Cards, <https://ecoreportcard.org/report-cards/chesapeake-bay/regions/patuxent-river/>

*Acreage within the SCMAGLEV Project Affected Environment is presented as a range for some watersheds based upon the varying Build Alternatives located in the watershed.

Figure 4.10-1: Watershed Boundaries



4.10.3.2 Water Quality

Pollutants can enter the waterways within the SCMAGLEV Project Affected Environment by atmospheric deposition, soil erosion, seepage, runoff, or direct discharge. If the pollution can be attributed to a single source, such as a sewage outfall, it is considered point source pollution. Non-point source pollution originates from dispersed locations and not one specific source. Examples of pollutants that impact water quality within the SCMAGLEV Project Affected Environment due to the existing roadway network and developed landscape include sediment, oil and grease from motor vehicles, road salts, pesticides and nutrients from lawns, and thermal pollution from dark impervious surfaces. Regulatory agencies directly associate water quality with the amount of impervious surface and vegetated areas within a waterway's drainage area (or watershed). Pervious surfaces, such as forests and fields, absorb rain and snow, slow and cool stormwater runoff, and allow pollutants to settle before entering waterways. For a full discussion of the vegetated habitats in the SCMAGLEV Project Affected Environment, refer to Sections 4.11 Wetlands and Waterways and Section 4.12 Ecological Resources. In contrast, impervious surfaces, such as roads and rooftops, prevent precipitation from being absorbed into the soil. Instead, stormwater runoff carries high volumes of pollutants, such as heavy metals and bacteria, over impervious surfaces and directly into waterways.

The USACE's Public Interest Review (PIR) provides a framework of 21 factors used to evaluate projects that have submitted a permit application for review and approval. Water quality, water supply and conservation, and floodplain values and flood hazards are all factors included in this review. These factors and others related to water resources have been evaluated in the Environmental Consequences section (4.10.4).

Washington, D.C. and Maryland regulate water quality based on standards set by the D.C. Department of Energy and Environment (DOEE) and MDE, respectively, and the USEPA. States can choose to adopt national water quality standards or revise and adopt state specific standards. Water Quality Standards (WQS) establish the environmental baselines used for measuring the success of the CWA, to protect aquatic life and wildlife, recreational uses, and sources of drinking water. WQS include:

- Designated use or uses such as "supporting aquatic life" or "recreation;"
- Criteria necessary to protect the designated uses;
- Antidegradation requirements; and
- General policies affecting the application and implementation of WQS that states and 79 authorized tribes may include at their discretion.

In compliance with Sections 303(d), 305(b), and 314 of the CWA and the SDWA, states develop a prioritized list of water bodies that currently do not meet water quality standards. MDE has several designations to assign to a watershed or waterbody that

identify current water quality standards, goals, and existing conditions. These “Use Classes” designate uses by humans and/or aquatic life based on state goals for water quality. FRA identified all waterways within the SCMAGLEV Project Affected Environment as Use I, Use I-P, or Use II. A Use I waterbody is designated for Water Contact Recreation and Protection of Nontidal Warmwater Aquatic Life. A Use I-P waterbody is designated for public water supply in addition to the Use I uses. A Use II waterbody is designated for support of estuarine and marine aquatic life and shellfish harvesting, although all Use II waterbodies do not necessarily support shellfish harvesting as some waters may be tidal but too fresh to support viable populations of shellfish. Refer to Appendix D.7 NETR for designated Use Classes within each watershed present within the SCMAGLEV Project Affected Environment.

The MDE designates certain waterbodies as Tier II High Quality Waters, which are “waters that have water quality that is better than the minimum standard necessary to meet designated uses.”⁵ FRA identified Tier II waters in the Anacostia River Watershed and the Patuxent River Upper Watershed.

FRA conducted a cursory review of Maryland Biological Stream Survey (MBSS) data and Section 303(d) of the CWA listed impaired waters. In general, all major waterways were indicated as having fair to poor water quality, except for Beaverdam Creek (part of the Anacostia watershed), which is identified as having good health with the presence of sensitive macroinvertebrates and fish. Additional detail regarding aquatic biota present within the waterways is addressed in Section 4.12 Ecological Resources. Additional details and a summary of the watersheds with 303(d) listed waters, Tier II Waters, and Stronghold Watersheds is included in Appendix D.7 NETR.

4.10.3.3 Groundwater Resources

Groundwater is water that is held underground in the soil or in pores and crevices in rock. Groundwater characteristics can be directly correlated with the surrounding natural environment such as forests, wetlands and waterways, as well as the surrounding human environment. Land uses and thus landowners use and/or affect groundwater, whether it is for local residential or community activities, or adjacent Federal or state activities such as the BARC facilities or Goddard Geophysical or Astronomical Observatory (GGAO). Aquifers form in geologic formations, which are distinct rock units consisting of either single or interrelated rock layers. The geologic formations of the Potomac Group that would be encountered by the proposed Build Alternatives are (from shallowest to deepest) the Patapsco Formation, the Arundel Formation, and the Patuxent Formation. Refer to Section 4.13 Geology for additional details regarding geologic formations. The Patuxent and Patapsco Formations represent important regional aquifers. The Arundel Formation acts as a confining unit between the two aquifers. Regional groundwater studies indicate a shallow groundwater table within the

⁵ https://mde.maryland.gov/programs/Water/TMDL/WaterQualityStandards/Pages/Antidegradation_Policy.aspx

SCMAGLEV Project Affected Environment.⁶ The depth to groundwater ranges from approximately 10 to 15 feet below ground level however, local variations in the groundwater are expected. FRA has identified the areas where these aquifers overlap with the Build Alternatives guideway tunnels as primary locations where effects to groundwater could occur.

FRA used published data to identify existing well-head protection areas (WHPAs) in the vicinity of the Build Alternatives. Local governments and water suppliers establish WHPAs to improve the safety of water supply to public supply wells. Factors such as flow rate, direction, and groundwater levels, as well as existing sources of nearby contamination can all affect the selection of a WHPA and/or how it is anticipated to function. Portions of the proposed tunnel are located within or adjacent to several WHPAs in Anne Arundel and Prince George's Counties. Groundwater in Washington, D.C. is not currently being used as a potable water source; therefore, there are no WHPAs in this jurisdiction. However, groundwater in Washington, D.C. is protected for beneficial uses, including surface water recharge, drinking water in other jurisdictions, and potential future use as a drinking water source. With further detailed design and selection of a preferred alternative, additional research will be conducted to evaluate what contaminants may be the most prominent in the vicinity of the WHPAs.

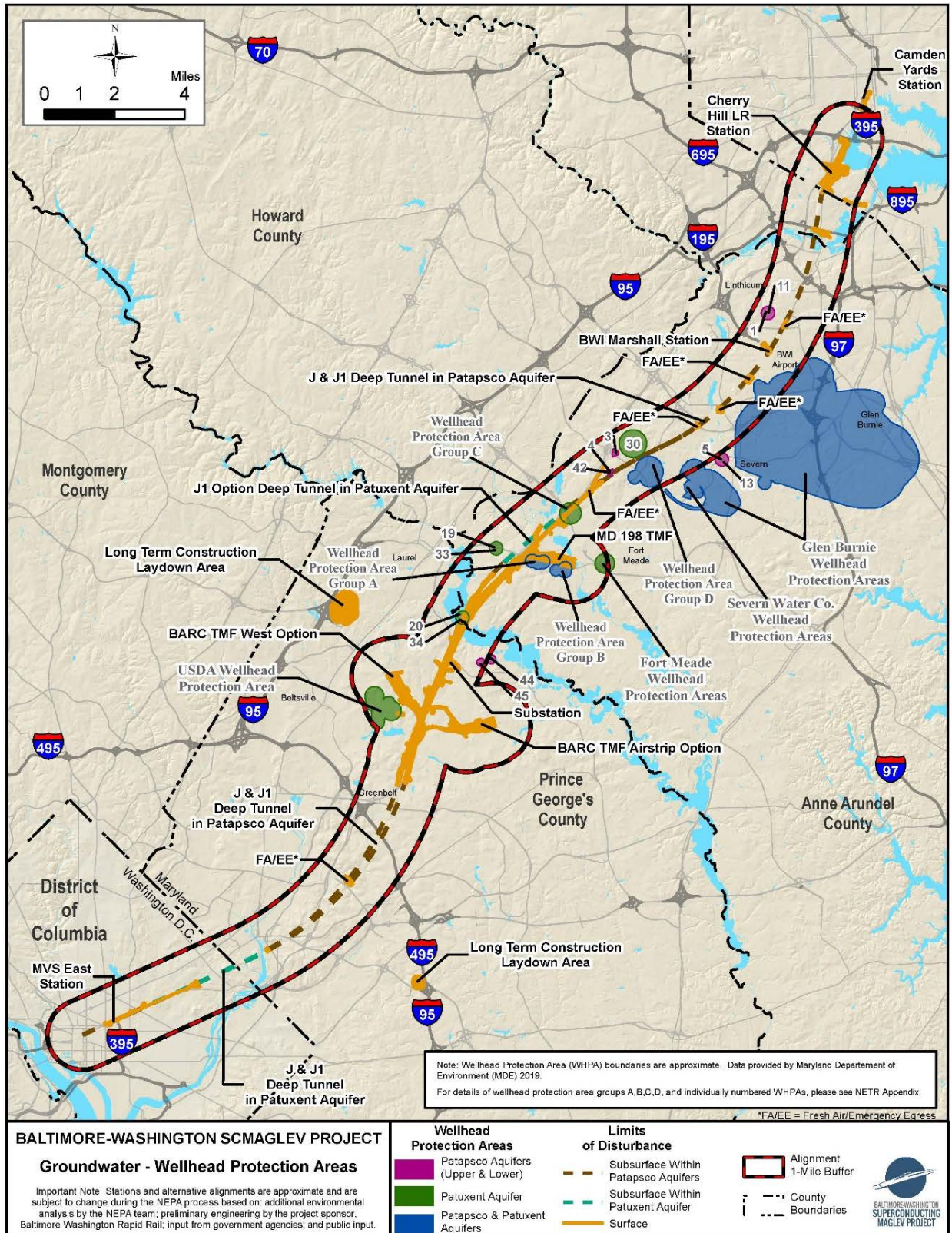
Figure 4.10-2 illustrates data on WHPAs in aquifers within a one-mile radius of the Build Alternatives. Additional information regarding sites of potential contamination is provided in Section 4.15 Hazardous Materials and Solid Waste. Identified sites within the SCMAGLEV Project Affected Environment with potential for hazardous materials concerns are illustrated in Appendix B.3, Natural Resource Map Atlas. FRA has not identified existing hazardous materials sites of concern within the location of WHPAs. Additional details describing the aquifers and water supply well owner(s) present in the WHPAs shown in **Figure 4.10-2** are included in Appendix D.7 NETR.

4.10.3.4 Floodplains

Floodplains perform important natural functions, including temporary storage of floodwaters, moderation of peak flows, maintenance of water quality, groundwater recharge, and prevention of erosion. FRA focused this analysis on areas designated by the Federal Emergency Management Agency (FEMA) as "special flood hazard areas," which is the area that would be inundated by the one percent annual chance flood, also known as a 100-year flood. FRA conducted an analysis based on readily available desktop information including FEMA's National Flood Hazard Layer (NFHL).

⁶ Andreason, David C.; Staley, Andrew W.; & Achmad, Grufron. (2013). Maryland Coastal Plain Aquifer Information System: Hydrogeologic Framework. Maryland Department of Natural Resources. Open File Report No. 12-02-20. Retrieved from http://www.mgs.md.gov/reports/OFR_12-02-20.pdf

Figure 4.10-2: Groundwater Wellhead Protection Areas



Within the SCMAGLEV Project Affected Environment, areas of 100-year floodplain are associated with several surface waters and waterbodies within the previously identified watersheds: the Anacostia River and tributaries, an unnamed tributary to Brier Ditch, Beck Branch, Beaverdam Creek and tributaries, Patuxent River and tributaries, Little Patuxent River and tributaries, Stony Run and tributaries, Dorsey Run, Patapsco River and tributaries, Middle Branch Patapsco River, and Gwynn Falls.

4.10.3.5 Scenic and Wild Rivers

There are no nationally recognized rivers in Maryland under the National Wild and Scenic Rivers Program; however, there are nine state-designated Scenic Rivers under the Maryland Scenic and Wild Rivers System regulated under the MDNR. Scenic Rivers are rivers whose shorelines are dominated by forest, agricultural land, grasslands, marshland, or swampland with a minimum distance for development of at least two miles for the length of the river and have been given such status by MDNR. FRA identified two state Scenic Rivers located within the SCMAGLEV Project Affected Environment: the Anacostia River and the Patuxent River.

The Anacostia and Patuxent Rivers have an existing undeveloped corridor surrounded by urban lands. They are both bounded by forest, wetlands and grasslands for extensive sections of the rivers. These corridors provide important wildlife habitat and protect water quality and are the reason the rivers are considered scenic. The surrounding lands are part of a MDNR Green Infrastructure system, which is a mapped network of large blocks of intact forest and wetlands linked together by linear forested stream valleys, ridgelines, and other natural corridors. These rivers are shown in in Appendix B.3 Natural Resource Map Atlas, Sheet 2 (Anacostia River) and Sheet 7 (Patuxent River).

4.10.3.6 Chesapeake Bay Critical Area

The Chesapeake Bay Critical Area Protection Program serves to help control future development in the Chesapeake Bay watershed. The Critical Area includes all land within 1,000 feet of the mean high-water line of tidal waters, their tributaries, and any adjacent tidal wetlands to the Chesapeake Bay and Atlantic Coastal Bays. The first 100 feet landward of the mean high-water line has been established as the Critical Area Buffer (Buffer). The Buffer is considered the most significant land within the Critical Area because it acts as a water quality filter that removes or reduces sediment, nutrients, and toxic substances found in runoff.

Land within the Critical Area is assigned one of three land classifications based on predominant land use and the intensity of development. These classifications include Intensely Developed Areas (IDAs), which is categorized in Baltimore City into two subdistricts, Waterfront Industrial Areas (WIAs) and Waterfront Revitalization Areas (WRAs); Limited Development Areas (LDAs); and Resource Conservation Areas (RCAs). Each land use classification is subject to development guidelines, which are focused on improving water quality, managing development activities, and conserving

habitat. Any proposed development within the Critical Area is subject to additional regulations and required mitigation to protect existing natural resources and to account for increased impervious surfaces. The Critical Area is associated with three major rivers and one water body within the SCMAGLEV Project Affected Environment: the Anacostia River, the Patapsco River, the Middle Branch Patapsco River, and the Baltimore Harbor. Designated Critical Area Buffer occurs in the vicinity of Gwynns Falls and Middle Branch Patapsco River in Baltimore.

4.10.4 Environmental Consequences

FRA evaluated the environmental consequences of the No Build Alternative and Build Alternatives. Anticipated permanent and temporary impacts to water resources, including direct and indirect impacts, were identified. FRA provided a qualitative and quantitative analysis when applicable.

4.10.4.1 No Build Alternative

Under the No Build Alternative, the SCMAGLEV Project would not be built and therefore no impacts related to the construction or operation of a SCMAGLEV system would occur. However, other planned and funded transportation projects would continue to be implemented in the Project Study Area and could affect water resources by increasing impervious surfaces or adding additional pollutant load to the area's water resources.

4.10.4.2 Build Alternatives

Permanent, temporary, direct, and indirect impacts would result from the construction of any Build Alternative. Permanent impacts would include the removal of vegetation to allow for the construction of fresh air and emergency egress (FA/EE) facilities, substations, maintenance of way (MOW) facilities, viaduct piers, and train maintenance facilities (TMF), resulting in an increase in impervious surfaces and an associated increase in runoff and pollutant transport. FRA anticipates temporary stream relocations or diversions necessary within the watersheds during construction of the SCMAGLEV Project as well as permanent stream relocations for structural elements noted above. In general, areas with above-ground Project elements would likely experience greater overall impacts to water resources than areas with below-ground station or tunnel locations. Temporary impacts would include areas of cut/cover, entrances for tunnel boring machines, and miscellaneous construction LOD area including disturbed areas surrounding bridge crossings over rivers that require a greater expanse for construction. Additional details regarding ancillary facilities, roadway and utility line relocations, and placement of spoil material would be accounted for in permit documents and final design.

Summary of Build Alternatives Impacts

- Build Alternatives J-01 and J-04 would have a water resources impact to the Little Patuxent River Watershed, river, and its surrounding natural habitat within the watershed. Due to proposed viaduct piers, SCMAGLEV systems, and TMF

located within two locations of this resource, these Build Alternatives would directly affect floodplain functions, riparian habitat, NTWSSC, water quality, surface hydrology, and wildlife and aquatic species (including rare, threatened or endangered species or species of concern).

- Both the Camden Yards Station and Cherry Hill Station would result in permanent impacts within the Critical Area Buffer and floodplain of the Patapsco River located near the Inner Harbor.
- Build Alternatives J-01 through J-06 would largely impact greater water resources than Build Alternatives J1-01 through J1-06, such as watershed acreage, floodplain, surface waters, and groundwater, due to its greater proposed elevated alignment.

Watersheds

FRA has considered several characteristics of the watersheds in the SCMAGLEV Project Affected Environment, including its overall size, land use, geology, and existing vegetation and presence of waterways, into the analysis of watershed effects from the SCMAGLEV Project. Each Build Alternative would directly and permanently impact watersheds as a result of grading, vegetation clearing, new structures, and conversion of pervious to impervious surfaces. These impacts may have the potential to alter watershed functions such as storage of rainfall and habitat for wildlife and aquatic species.

Permanent watershed impacts range from approximately 900 acres to 1,100 acres of overall watershed disturbance as identified in Appendix D.7 NETR. FRA quantified the approximate total acreage of permanent impacts from the surface features associated with each proposed Build Alternative, which provides a conservative estimate, as the viaduct would potentially only cause permanent fill at pier locations. Beyond the LOD in each watershed, these permanent changes to the landscape have the potential to affect the watershed downstream of the Project. Watershed impacts were further defined by estimated new impervious surface. FRA evaluated areas of existing impervious surfaces in the landscape with consideration of existing urbanized and developed environments. Areas with no change in impervious surfaces are not anticipated to result in a change to the function of the watershed. The water quality subsection specifically discusses new impervious surface impacts associated with the Build Alternatives.

Alignment

Permanent watershed impacts associated with Build Alternative alignments would be more evident in the Little Patuxent River Watershed, Anacostia River Watershed, and the Patuxent River Watershed. Permanent impacts would be greater for alignments associated with J-01 through J-06 due to the greater proposed above ground features. This difference between Build Alternatives is most significantly found within the Little Patuxent River watershed, where the Build Alternatives J alignments are proposed largely above ground and Build Alternatives J1 alignments are in deep tunnel

(Figure 4.10-1). Direct and indirect impacts as a result of the alignments in this location specifically includes removal of vegetation within wetlands and riparian forest, construction within the floodplain, and potential affect to water quality (identified in greater detail below). Due to these proposed impacts to water resources and the indirect effects to the surrounding natural environment, the Build Alternatives associated with the Build Alternatives J alignments may have an adverse effect to the Little Patuxent River Watershed. Strict adherence to stormwater and waterway best management practices (BMPs), erosion and sediment controls (ESC), and expedited mitigation of resources to the greatest extent possible would be necessary within this watershed to protect biodiversity and its designation as a Stronghold Watershed. FRA has proposed design techniques called “straddle bents” to aid in spanning large sinuous river systems, such as the Little Patuxent River, with the goal to avoid instream pier construction. These techniques and additional BMPs for waterway protections are outlined in Section 4.11 Wetlands and Waterways.

The greatest total acreage of impact for any alignment (Build Alternatives J or J1) occurs in the Anacostia River Watershed, as this watershed has the longest segment of proposed tunnel and viaduct. Build Alternatives J and J1 alignments within this watershed have similar impacts because they generally represent similar areas of proposed tunnel, proposed SCMAGLEV elements, and viaduct. As an example, the maintenance of way (MOW) proposed to support Build Alternatives J-01 through J-04 would result in approximately 12.5 acres of new impervious surface within the watershed and within NPS property. The MOW supporting J1-01 through J1-04 would result in the same new impervious surface but on Maryland City Park property. The property impacts differ but would result in similar disturbance within the overall watershed.

The Build Alternatives J and J1 alignments would also have similar impacts within the Patuxent River Watershed, as all alignments are largely proposed as viaduct through this area. Impacts associated with the alignments in this watershed are consistent with that of the Build Alternatives J alignments within the Little Patuxent River Watershed noted above, with proposed construction in the floodplain, removal of vegetation, and potential affects to water quality. Although direct, indirect, permanent and temporary impacts are proposed within these watersheds and may pose an adverse effect to resources within the watershed, with BMPs and mitigation in place, it is anticipated that the overall function of these watersheds would not be adverse as a result of the alignments alone (surface viaduct, subsurface tunnel, and ancillary features). The alignments are largely located along the existing transportation corridor where risks to runoff and pollutants currently exist.

Stations

The Cherry Hill Station and associated project features would have far more permanent impacts (approximately 180 acres) located in the Patapsco River, Gwynns Falls, and Baltimore Harbor Watersheds than the Camden Yards Station (with approximately 27 acres) because the Cherry Hill Station would be primarily above ground. However,

despite the greater acreage of impact proposed, the permanent impacts at the Cherry Hill Station would occur largely on previously developed land, as it is situated in a largely commercial and industrial area of Baltimore City. Therefore, the functions of these watersheds are not anticipated to change.

TMF

FRA anticipates that the TMFs would have the greatest impact on watersheds due to their size and the conversion of primarily natural areas with multiple habitat types, to impervious surfaces resulting in a direct and permanent long-term impact within the watershed. These impacts are based on significant increases to impervious surfaces, grading, and vegetation clearing resulting from the presence of the structures and the associated increase in runoff. The BARC Airstrip TMF would have approximately 193 to 200 total acres of permanent watershed impacts, BARC West TMF would have approximately 192 to 194 acres of impact, and the MD 198 TMF would have 194 to 216 acres of impact. The BARC West and BARC Airstrip TMFs would have the greatest impact on the Anacostia River Watershed (Tier II Watershed), including Beaverdam Creek tributaries and headwaters.

The MD 198 TMF would have the greatest impact on the Little Patuxent River Watershed. Due to the significant new impervious surface and the significant amount of fill required to the landscape, it is possible that the boundary defining the drainage area of the Little Patuxent River Watershed could be altered. As described in Chapter 3, the TMF site slopes downward toward the Little Patuxent River to the north and east. Current design indicates the need to provide up to 154 feet of fill to raise the site to a level grade. The fill would be supported by perimeter retaining walls. This results in a significant change to the landscape and to the drainage pattern of the adjacent Little Patuxent River and its upstream and downstream tributaries. This facility is located less than one-half mile upstream from the PRR, and with the added impervious surface, fill within the floodplain and wetlands, and loss for forest canopy, it is expected to indirectly affect resources located within PRR. With the changes in topography, extensive BMPs, construction controls, and Environmental Site Design (ESD) measures would be required to protect the surrounding environment and prevent further degradation. Additional impacts to this system and watershed, including floodplain and water quality, are described below in subsequent sections.

Both the BARC Airstrip TMF and MD 198 TMF would also impact the Patuxent River Upper Watershed (Tier II Watershed), with approximately 10 acres (Build Alternatives J and J1), and approximately 29 acres (Build Alternative J1), respectively. It is anticipated that with appropriate minimization and mitigation measures in place, the BARC Airstrip would not result in a permanent loss of this watershed's function and not change its status as a Stronghold Watershed. Similarly, although the MD 198 TMF is anticipated to have direct permanent impacts to the Little Patuxent Watershed functions as noted above, FRA does not anticipate a direct loss of watershed function to the Patuxent River Upper Watershed as a result of this TMF. Build Alternatives J1-01 through J1-06 impact this watershed from the necessary viaduct connections spanning over the BWP and to

the 198 TMF. Minimization and mitigation measures to reduce effects within the watershed are identified in Sections 4.10.5.1 and 4.10.5.2 below.

With approximately 200 acres of permanent impact proposed for any of the TMFs, it is anticipated that both the Anacostia and the Little Patuxent Watersheds will experience a change in watershed function, specifically their ability to filter and store water in the soil, and may risk a change in status of Stronghold Watershed. Hydrology patterns in and surrounding any of the TMF sites will also be altered, which may influence seeps and low-lying areas that may support sensitive species. These effects are discussed in greater detail in Sections 4.11 Wetlands and Waterways and 4.12 Ecological Resources.

Water Quality

All Build Alternatives would introduce new impervious surfaces to the landscape, result in clearing of vegetation, and have the potential for downstream impacts within the watershed, specifically to water quality. Examples of pollutant sources from the SCMAGLEV Project would include the runoff of chemicals and increased stormwater from SCMAGLEV operations at proposed facilities and viaduct, and sediment from soil erosion during construction. Permanent clearing of forest canopy may result in detrimental effects to areas supporting vernal pools and waterways, allowing greater light and heat to directly reach waters. This can cause a direct effect to the instream temperatures, changing both the physical and chemical properties of the waterway.

Indirect effects may result in detriment to species who rely on a shaded environment to thrive. Habitat and species effects are described further in Sections 4.11 Wetlands and Waterways and 4.12 Ecological Resources.

New impervious surface as a result of the Build Alternatives range from approximately 712 acres to 826 acres as identified in Appendix D.7 NETR impact summary tables. FRA included the proposed long-term construction laydown areas in the calculations of new impervious surface because of the duration of work; however, specific needs of the site are not defined at this phase, and it is anticipated that these areas may not be completely converted to impervious surfaces. Land not required for new structures will be returned to natural conditions, with the intent to replace lost resources to the extent possible, pending future use of that land by the property owner.. Soil disturbance and compaction will prevent laydown areas from being fully restored to pre-construction conditions on BARC's long-term research project areas

Below-ground project elements or elements that are proposed in areas of already existing impervious surfaces were not considered within these estimated impacts, because it is the intent that no change in the amount of impervious surface would occur per these conditions post construction. FRA also excluded from this calculation of new impervious surface, areas of proposed permanent stormwater management facilities associated with each Build Alternative, as these elements would not contribute to additional impervious surfaces.

The increased impervious surfaces can generate greater risk of stormwater runoff that can make its way to streams. The runoff can carry pollutants from SCMAGLEV operations and maintenance. Vehicles and wayside equipment, particularly maintenance activities, would use cleaners, lubricants, and other materials. Minor but continuous release of materials via water runoff into the environment over time would create the potential for long-term impacts to water quality. During final design, the Project Sponsor would produce final calculations of new impervious surfaces per location within each county, Baltimore City, and Washington, D.C. to comply with applicable stormwater management and Critical Area laws. Stormwater management ESD practices and BMPs would reduce these potential impacts from runoff, and ensure there is no discharge into adjacent waterways, in accordance with National Pollutant Discharge Elimination System (NPDES) regulations. Refer to Section 4.10.5 for additional information on how stormwater management can minimize and mitigate effects to water quality.

Alignment

For the purpose of this analysis, FRA considered the viaduct to be new impervious surface because it would intercept and concentrate stormwater runoff. As noted above, long-term construction laydown areas are included in the calculations of new impervious surface because of the duration of the work intended at these locations. All Build Alternative alignments include approximately 402 acres of new impervious surface associated with long-term construction laydown areas, which is approximately 50 percent of the total estimated new impervious surface as a result of the SCMAGLEV Project. Build Alternatives J-01 through J-06 alignments would have roughly 50 acres more impervious surface than Build Alternatives J1-01 through J1-06 alignments due to their longer above-ground viaduct.

The Anacostia River and unnamed tributary and the Patapsco River and tributaries are crossed as deep tunnel for any alignment, with nearby SCMAGLEV structures proposed in locations of existing developed impervious environments. FRA does not anticipate a resulting change in the landscape at these locations, and therefore no change is anticipated in water quality. Beaverdam Creek, Beck Branch, the Patuxent River, and smaller unnamed tributaries throughout the SCMAGLEV Affected Environment are crossed as viaduct for any alignment, with potential long-term impacts to these waterways as a result of SCMAGLEV operations, introducing the threat of increased runoff bringing larger quantities of pollutants into the affected water resources. For example, a diesel-powered, rubber tire fleet of maintenance vehicles would be on the alignment nightly for inspections and other activities and may add diesel pollutant load to the nearby waterways. As previously noted, construction of the viaduct would also require the clearing of vegetation over and surrounding these waterways. This vegetation helps regulate temperatures within the waterways and supports healthy aquatic habitats. The effects noted here are anticipated to be of greater significance in areas of existing natural environments, such as within the parklands of Anne Arundel and Prince George's Counties, and on Federal properties such as Fort George G.

Meade, Patuxent Wildlife Refuge (PRR) and Beltsville Agricultural Research Center (BARC).

The effects of the alignments alone may contribute to the overall impairment of nearby waterways as a result of a Build Alternative but are not expected to affect a designated waterway status. Such increases in runoff and/or thermal impacts are not anticipated to be as significant in areas of greater existing urbanization, located mostly within Baltimore County and Baltimore City. In order to minimize the effects of diesel pollutant and other pollutants entering the waterways, the Project Sponsor will evaluate ESD measures to trap runoff from the viaduct and ancillary facilities along the alignment. Refer to Appendix B.1 for the proposed location of stormwater management facilities along the Build Alternative alignments.

Stations

The Mount Vernon Square East, Baltimore-Washington International Thurgood Marshall Airport (BWI Marshall Airport), and Camden Yards Stations would result in very little new impervious surface and no clearing of vegetation due to their proposed locations below ground and in areas of existing impervious surface cover. These station locations would not likely contribute to impairments in the waterways nor affect status. The Cherry Hill Station would have the greatest increase in impervious surface at 74 acres due to its above-ground location. Of the 74 acres of new impervious surface, approximately 30 acres are associated with a long-term construction laydown area, which is currently partially vegetated and adjacent to the Middle Branch of the Patapsco River. This location currently functions as an open space providing a buffer between adjacent commercial/industrial and residential areas and the tidal waters. The Cherry Hill Station is located close to waterways and within the Critical Area and therefore has a greater likelihood of impacting water quality through pollutant runoff. Stormwater and erosion and sediment control BMPs would be developed to minimize and mitigate for the disruption of this area and to prevent sedimentation and potential hazardous substances from leaving the laydown area and into the waterway.

TMF

All TMF sites under study occur in areas with low existing impervious coverage and require the clearing of forest canopy in watersheds associated with notable quality waterways, so each TMF site would have the potential to result in detrimental permanent impacts to water quality. For the purpose of this analysis, the TMF was considered a totally impervious project element. The MD 198 TMF would convert approximately 177 to 198 acres of undeveloped land to new impervious surface in the Little Patuxent Watershed, a Stronghold Watershed. With the changes to the landscape proposed for grading and the removal of vegetation and habitat at the MD 198 TMF, it is anticipated that water quality within the Little Patuxent River and tributaries would be impaired as a result. The SCMAGLEV Project would require strict ESC practices and BMPs, such as silt fence and temporary soil stabilization measures, to reduce the potential for water quality impacts.

The BARC Airstrip and BARC West TMFs would add approximately 188 to 193 acres and 187 to 190 acres, respectively, of new impervious surface and impacts to Beaverdam Creek and tributaries, with BARC Airstrip most notably impacting Beaverdam Creek, headwaters. FRA anticipates that stream relocations and/or creation of large culverts would be required for these streams, including the headwaters. Beaverdam Creek (part of the Anacostia watershed) was the only major waterway identified within the SCMAGLEV Project Affected Environment as having good health indices based on MBSS data. With direct and permanent impacts to its headwaters proposed there is the potential that the health of this waterway would decline, potentially resulting in inclusion on 303(d) listed waters.

FRA anticipates that during final design the TMF locations would have areas within the site where pervious features would be integrated into the design to help mitigate potential runoff. Construction of any of the TMFs would incorporate appropriate stormwater management facilities that would meet water quantity and water quality requirements at the Federal, state, and county level. Redundant practices and/or treatment train configurations⁷ would be considered to further improve water quality. It is anticipated that all stormwater management would be maintained within the existing limits of the indicated TMF LOD. Additionally, with the significant increase in impervious surfaces and direct impact to waterways, it is anticipated that MDE would prioritize these watersheds (Little Patuxent River and Anacostia) for total optimum daily load (TMDL) requirements and potential status changes to waterways. Affects to the waterways are described further in Section 4.11 Wetlands and Waterways and Section 4.12 Ecological Resources. Similar concerns of water quality are a concern for groundwater, and potential impacts to drinking water sources, wells and aquifers.

Groundwater

The SCMAGLEV Project has the potential to impact groundwater through many of the same direct and indirect ways as it would impact surface waters, including but not limited to: the increase of impervious surface and therefore potential decrease in the amount of natural precipitation connecting with the ground surface, the potential for dewatering during construction activities, and a potential for greater stormwater runoff contributing to potential groundwater contamination.

The level of the water table can naturally change over time due to changes in weather cycles and precipitation patterns, streamflow and geologic changes, and even human-induced changes, such as the increase in impervious surfaces on the landscape⁸. The greater the distance between a source of contamination and a groundwater source, the more likely that natural processes reduce impacts of contamination. Processes such as oxidation and adsorption (binding of materials to soil

⁷ Stormwater management treatment trains include a combination of stormwater treatment processes (e.g. swales, filters, ponds and/or basins) to manage all pollutants.

⁸ USGS. <https://www.usgs.gov/media/images/cone-depression-pumping-a-well-can-cause-water-level-lowering>

particles) can reduce the concentration of a contaminant before it reaches groundwater.⁹ This is further described in Section 4.15 Hazardous Materials and Solid Waste. Releases of hazardous materials into the environment noted to affect surface water quality would also have the potential to impact groundwater quality, especially if a water supply well is near a source of contamination. The well would then be at risk, which could result in human health impacts. These factors are all considered when WHPAs are created. Specific areas of contamination are not anticipated, however would need to be further analyzed following more detailed hazardous materials investigations and groundwater studies.

As groundwater is the most significant source of fresh drinking water in Maryland's Coastal Plain, continued ground investigations and agency coordination will be critical to ensuring the SCMAGLEV Project does not adversely affect drinking water quantity and quality. The Project Sponsor will coordinate with the MDE Water Supply Program, part of the Water and Science Administration, appropriate local governments, water suppliers, and other agencies that developed the WHPAs and wells to further assess the potential for impacts and develop appropriate measures to avoid or minimize impacts, as needed. Water level and water quality monitoring will also be necessary to evaluate the health of the aquifers and determine greater detail and potential for impacts to aquifers.

Alignment

Build Alternatives J1-01 through J1-06 alignments have greater lengths of guideway in a deep tunnel, and therefore potentially more susceptible to impacts to groundwater than Build Alternatives J-01 through J-06 alignments. Proposed tunneling would occur in the Patapsco aquifer and the Patuxent aquifer in Anne Arundel County, particularly within or near WHPAs in the aquifers. The depth of the Patuxent aquifer ranges greatly within Maryland, from approximately 125 feet to 525 feet, and the Patapsco aquifer between 250 to 350 feet. The depth of SCMAGLEV tunnel is proposed to reach an optimum depth of approximately 320 feet, therefore it is possible that the aquifers would experience direct impacts such as disruption within the aquifer and therefore changes in recharge and/or groundwater levels, and indirect impacts such as a change in the water supply or increased risk of contamination. A few of these locations include the vicinity of the Washington, D.C. and Prince George's County line; the area just south of the Veterans Parkway FA/EE; and just south of MD 198.

Geotechnical studies completed at later design phase would support design and construction measures proposed to reduce risk of aquifer impacts.

With the tunnel structures potential for localized changes to the water table and water pressures affecting the aquifers, creates the potential for a loss of groundwater recharge to the WHPAs. Build Alternatives J1-01 through J1-06 alignments tunnel

⁹ Environmental Protection Agency. <https://www.epa.gov/sites/production/files/2015-08/documents/mgwc-gwc1.pdf>

sections would cross more WHPAs than Build Alternatives J-01 through J-06 alignments. They would also reach greater depths near a WHPA in the vicinity of MD 198, while Build Alternatives J-01 through J-06 alignments would be elevated in this area.

Also associated with tunnel construction is the potential frac-out risk, which would occur if drilling fluid penetrates fractured bedrock or seeps into the rock and sand that surrounds the bedrock, traveling towards the Earth's surface. This risk will be further analyzed through site-specific investigations and anticipated construction techniques.

Stations

None of the proposed stations are located within a WHPA, however with underground station construction (Mount Vernon Square East, BWI Marshall Airport, and Camden Yards) there may be risk of long-term sources of contamination from operational activities within the stations more closely located to levels of groundwater. The Cherry Hill Station is the least impactful station when considering groundwater due to its proposed construction above ground and its largely already disturbed and developed landscape.

TMF

All TMF sites, although above ground surface structures, would influence groundwater, as groundwater is largely derived from precipitation and all the TMF locations would result in a large increase of impervious surfaces, greater than 160 acres. This reduces the landscape's ability to absorb precipitation directly and support the groundwater supply, potentially affecting water table levels. Additionally, the MD 198 TMF and the BARC West TMF are also located within identified WHPAs, therefore these areas may have a greater effect on groundwater as noted above. Due to the risk of contamination of BARC well water supplies, the identification and location of additional wells in the area surrounding the proposed BARC TMF sites will need to be coordinated with property owners during later design and provide greater detailed information regarding their connection to existing infrastructure and potential impacts that may result from the SCMAGLEV Project. This would occur with further detailed design and selection of a preferred alternative. The significant vegetation clearing for these areas would also remove or alter those natural features such as nontidal wetlands, riparian buffers and floodplain, that capture runoff and increase the potential for contaminants to reach groundwater.

The BARC Airstrip TMF is adjacent to the GGAO, and the impacts that would occur if there is a withdrawal or modification of groundwater may extend onto the GGAO site. As groundwater is withdrawn, pore spaces within the aquifer can no longer support the load and can become crushed, causing subsidence and ground compaction, which has the potential to impact the geodetic stability of the GGAO site.

Floodplains

All proposed Build Alternatives would result in permanent floodplain impact. FRA proposes several permanent project features within the floodplain including viaduct piers, transition portals, TMFs, and various SCMAGLEV system elements. Refer to Appendix D.7 NETR impact summary tables for the quantitative analysis of permanent impacts and temporary construction impacts on 100-year floodplains by alignment, station, and TMF. These floodplain impacts will require permitting through the MDE. Based on proposed permanent SCMAGLEV Project elements and anticipated grading and/or fill that would be required in the floodplain, FRA has also provided a qualitative assessment of direct and indirect effects to the floodplain. Additional studies including a hydraulic and hydrology analysis would be required as part of permitting and final design to estimate the total impacts of the proposed structures on floodplain elevations and functions. If these studies find that flood elevation would change, floodplain storage mitigation would be proposed, if required.

Floodplain impacts within National Park Service (NPS) property will require a Statement of Findings per Directors Order (DO) 77-1 and DO-77-2 as well as wetland and waterway impacts described in Section 4.11 Wetlands and Waterways. Refer to Appendix D.7 NETR for the supplemental quantitative analysis for NPS floodplain impacts from the SCMAGLEV Project.

Alignment

Build Alternatives J-01 through J-06 alignments would incur more permanent floodplain impacts (15 acres) than Build Alternatives J1-01 through J1-06 alignments (9 to 10 acres) because of the longer above ground viaduct crossing more floodplains of surface waters and waterbodies. Specifically, the greatest difference in floodplain impact between alignments, as noted similarly for other water resources, is due to Build Alternatives J alignments impact to the floodplain of the Little Patuxent River with viaduct piers and SCMAGLEV systems. Additionally, the MDNR indicates that the project disturbance within this floodplain may affect rare species, and work should incorporate stringent BMPs for sediment and erosion control in order to reduce the likelihood of adverse impact to these species. Build Alternatives J1 alignments would not impact this floodplain as it is within deep tunnel under this resource.

All alignments cross over the floodplains of Beaverdam Creek and the Patuxent River with viaduct and the Middle Branch of the Patapsco River with construction of a substation. The location of SCMAGLEV facilities above-ground structures within the floodplains such as a tunnel portal at Beaverdam Creek or the noted proposed substation, may increase flooding risk to these structures but it is not expected to put the viaduct piers or viaduct at risk. Additionally, piers located within the floodplain and viaduct spanning over the floodplain are not anticipated to affect the base flood elevations or diminish floodplain functions.

Station

The Mount Vernon Square East and the BWI Marshall Airport Stations would not have any impacts to 100-year floodplains. The Cherry Hill Station would result in approximately 28 acres of permanent impact to the 100-year floodplain mostly due to the long-term construction laydown area located within the floodplain of the Patapsco River associated with this station (Refer to Appendix B.3 Map Sheet 12). This impact is not anticipated to affect the base flood elevations. Because this low-lying area of topography has only portions that consist of pervious open space and a minimal amount of vegetated surface, FRA has considered these existing conditions and located the laydown area largely over portions of existing gravel and pavement and avoided the vegetated northern corner of the site. There is the potential that this long-term construction laydown area could be affected by storm events producing flood hazards, but it is not anticipated that it would affect the function of the floodplain. The Project Sponsor will consider risk management to be prepared for potential flooding to reduce the potential for delayed project timelines, damage to the site and/or construction equipment, and any potential for contamination.

The Camden Yards Station would result in approximately seven acres of permanent floodplain impact however largely in already disturbed or developed area. This station has a greater temporary impact to the floodplain described above. Additional measures to avoid and minimize floodplain impacts are identified in Section 4.10.5 below.

TMF

The MD 198 TMF would have the greatest floodplain impact of the three TMF options, between 31 and 39 acres of permanent disturbance along the Little Patuxent River due to new impervious surface. These impacts are associated with the TMF footprint, viaduct, and the MOW ramp. The TMF overlaps the Little Patuxent River and would require a substantial amount of fill material within the 100-year floodplain. This area is currently subject to routine flooding that impacts vehicular traffic. Impacts to the Little Patuxent River would include a decrease in the flood storage capacity and toxicant filtering functions and increase risks for erosion in this location. Indirect effects of this floodplain impact would include alteration and decrease to the riparian buffer surrounding the Little Patuxent River, potential changes to water temperature and thus water quality due to alterations in shading and filtering capacity and a resulting effect upon aquatic species.

The BARC West TMF would have limited impact to floodplains, between two and three acres, whereas the BARC Airstrip TMF would have a larger impact to the Beaverdam Creek floodplain and its tributaries, between 14 and 16 acres. This acreage of proposed new impervious surface within the floodplain presents similar direct and indirect effects as noted above for the MD 198 to impact the Little Patuxent River. Additional hydraulic studies would need to be conducted to determine if site-specific SCMAGLEV facilities located within the floodplain would result in a change in base floodplain elevation.

Scenic and Wild Rivers

All Build Alternatives would cross in tunnel under the Anacostia River and on viaduct over the Patuxent River, which are designated as state Scenic Rivers.

Alignment

All Build Alternatives propose tunneling under the Anacostia River (approximately 275 linear feet) with no proposed surface impacts within the river or immediately along the shoreline. A proposed FA/EE would be located within approximately 500 feet of the river to the northeast co-located in an existing developed landscape. No instream work would occur; therefore, FRA does not anticipate a change to the physical character or quality of the Anacostia River per any Build Alternative alignment. Use of appropriate ESD and BMPs described below would mitigate potential impacts to water quality.

FRA identified direct, temporary and permanent impacts associated with both alignments for the proposed viaduct crossing over the Patuxent River, with additional discussion provided in Section 4.11 Wetlands and Waterways and Section 4.12 Ecological Resources. FRA considered the following characteristics to evaluate the potential impacts to this scenic river:

- **Viaduct span over the Patuxent River:** Build Alternatives J-01 through J-06 alignments would span the approximately 65-foot-wide river one time at a perpendicular crossing. Build Alternatives J1-01 through J1-06 alignments would cross the Patuxent three times due to the waterway's sinuosity beneath the viaduct, for a total span of approximately 190 linear feet. Piers would be designed to limit impact to waterways.
- **Location of viaduct piers within surrounding natural resources (tributaries, wetlands, floodplain, and forest):** Piers associated with viaduct would potentially impact adjacent natural resources resulting in permanent vegetation impacts. Final design would avoid placement of piers within waterways to the greatest extent possible, which would reduce or eliminate permanent impacts to the river and nearby tributaries; however, adjacent wetlands and floodplains would be permanently impacted by pier placement.
- **Properties crossed:** Build Alternatives J-01 through J-06 alignments would cross NPS and Washington Suburban Sanitary Commission properties north to the PRR. Build Alternatives J1-01 through J1-06 alignments would cross Maryland National Capital Park and Planning Commission's Patuxent River Park north through Anne Arundel County's Maryland City Park, where both parks border NPS property.
- **Viewshed of the Patuxent River:** Both alignments would require clearing of vegetation and construction of viaduct and piers over/adjacent to the river; therefore, the SCMAGLEV Project would permanently alter the current viewshed in the vicinity of the viaduct. Although the viewshed would be altered, it is anticipated that minimization and immediate mitigation measures such as site

plantings would enable this river to maintain its status as a Scenic River. This would require detailed coordination with the agencies to address issues such as aesthetics of the viaduct and piers and type of species planted.

As a result of construction of the viaduct, the indirect effects to the Patuxent River would include changes to species composition and biodiversity from the removal of adjacent forested wetland and riparian habitat, and increased potential for runoff from the overhead viaduct to the waters below affecting water quality. Additional discussion on the effects to wetlands, waters and habitat is located in Section 4.11 Wetlands and Waterways and Section 4.12 Ecological Resources.

Station

No proposed stations would be in or near the Anacostia or Patuxent Rivers; therefore, the proposed stations would not impact the Anacostia or Patuxent Rivers or their designations.

TMF

No proposed TMF sites would be in or near the Anacostia or Patuxent Rivers; proposed stations would not impact the Anacostia or Patuxent Rivers or their designations.

Chesapeake Bay Critical Area

The Critical Area is associated with three major rivers and one water body within the SCMAGLEV Project Affected Environment: the Anacostia River, the Patapsco River, the Middle Branch Patapsco River, and the Baltimore Harbor. Temporary and permanent impacts would occur primarily in the Baltimore City area within Intensely Developed Areas (IDA), ranging from 57 to 124 acres of permanent impact per Build Alternative. Impacts to Resource Conservation Areas (RCA) would be very limited and would include those areas converted to infrastructure and impervious surface that could increase pollutant loads. RCA impacts would range from one to two acres of permanent impact per Build Alternative. No impacts to Limited Development Areas (LDA) would occur. Additional impacts to the Critical Area Buffer would occur in the vicinity of Gwynns Falls and Middle Branch Patapsco River. For the purpose of this analysis, FRA quantified the Buffer impacts based on the required 100-foot limit, without making assumptions on an expanded buffer; however, based on the presence of erodible soils, wetlands, and steep slopes, the SCMAGLEV Project would require the development of a detailed expanded Buffer, subject to review and confirmation by the Critical Area Commission and/or local reviewers. Therefore, the Buffer impact analysis is the minimum acreage of impact associated with the Buffer. **Table 4.10-2** enumerates impacts to the Critical Area, associated land classifications, and impacts specifically within the Buffer of proposed LOD of all SCMAGLEV Project surface features. Permanent impact illustrated in the table is calculated per acreage of any surface feature within the LOD. It does not infer that it is all new impervious surface. Many of these areas already have considerable impervious surface present, as they are situated within developed areas.

Table 4.10-2: Critical Area Impact Summary

Build Alternative	RCA			IDA			Total Critical Area Boundary Impact			Total Critical Area Buffer Impacts*		
	P	T	Total	P	T	Total	P	T	Total	P	T	Total
J-01	2	0	2	124	2	126	126	2	128	9	<1	9
J-02	2	0	2	124	2	126	126	2	128	9	<1	9
J-03	2	0	2	124	2	126	126	2	128	9	<1	9
J-04	1	1	2	57	27	83	57	27	85	3	6	9
J-05	1	1	2	57	27	83	57	27	85	3	6	9
J-06	1	1	2	57	27	83	57	27	85	3	6	9
J1-01	2	0	2	124	2	126	126	2	128	9	<1	9
J1-02	2	0	2	124	2	126	126	2	128	9	<1	9
J1-03	2	0	2	124	2	126	126	2	128	9	<1	9
J1-04	1	1	2	57	27	83	57	27	85	3	6	9
J1-05	1	1	2	57	27	83	57	27	85	3	6	9
J1-06	1	1	2	57	27	83	57	27	85	3	6	9

*Buffer impacts are included within the total boundary impact.

Alignment

Permanent impacts would be similar for all Build Alternatives, including impacts resulting from:

- fresh air emergency egress (FA/EE) within the Anacostia River Critical Area (approximately three acres);
- FA/EE and substation located southeast of the intersection of Interstates 895 and 295 within the Patapsco River Critical Area (approximately 17 acres); and
- long-term construction laydown proposed in the Patapsco River Critical Area (approximately 14 acres).

The two FA/EE facility impacts do not pose a significant change of land use within the Critical Area. These are both situated on already developed industrial properties, of almost entirely paved surface. The long-term construction laydown would provide the greatest change in land use, as this area is currently open space, natural features. A portion of the property is paved; however, no development exists. Temporary impacts associated with cut/cover and construction are also similar for both alignments. Refer to Appendix B.3, Natural Resource Map Atlas Sheets 2, 11, and 12.

Station

Permanent and temporary impacts associated with the construction of both the Cherry Hill Station and the Camden Yards Station would occur primarily in Baltimore City and are associated with the Middle Branch Patapsco River. The Cherry Hill Station impacts

would result in approximately 126 acres of permanent impacts and two acres of temporary impacts, resulting from the station features including the main station, parking garage, long-term construction laydown areas, and the substation. Nearly nine acres of this permanent impact is within the 100-foot Buffer, mostly associated with the long-term construction laydown areas noted above. The Camden Yards Station would result in approximately 57 acres of permanent impacts and 27 acres of temporary impacts to the Critical Area. Most of the permanent impacts are associated with the maintenance of way facility and the temporary impacts are associated with the construction LOD. Of the permanently impacted Critical Area, approximately three acres would be within the Buffer.

TMF

None of the TMF options are proposed within the Critical Area.

4.10.4.3 Short-Term Construction Effects

Watersheds - During construction of any Build Alternative, land would be disturbed, and soil removed. Construction activities would include excavation, filling, cutting, pile driving, and clearing of vegetation. In some instances, construction would involve the demolition of existing buildings. Temporary impacts would occur and would be both direct and indirect. Temporary direct impacts to water resources may include increased runoff, additional pollutant and sediment load to surface waters and groundwater resources, while temporary indirect effects may include disruption to species or habitat as a result of pollutant and sediment loads. The Project Sponsor will return areas with temporary surface disturbances to their original state if feasible, or to natural conditions, through restoration and/or replanting in all possible locations, with the goal of maintaining pervious surface coverage. Selective limb and root pruning would be conducted to reduce damage to plants. With ESD and BMPs in place during construction, and minimization and mitigation measures proposed for all water resources described below, it is not anticipated that overall watershed functions would be lost due to short-term construction operations.

Water Quality – Sediment deposition in adjacent waterways may occur during construction due to grading and forest/vegetation clearing needed for laydown/staging areas and construction equipment. The clearing of vegetation would result in greater potential for runoff, as the vegetative cover would no longer be present to absorb rainfall, the runoff would in turn carry higher sediment and pollutant loads into affected water resources. Sedimentation in waterways could result in cloudy water, which could prevent natural vegetation growth and indirectly affect species in search of food and habitat in the waterways. Temporary stream crossings for construction access are anticipated and would result in temporary disturbance to streambed habitat and hydrology from the use of stream diversions, temporary culverts, and other standard construction and access elements. Refer to Sections 4.11 Wetlands and Waterways and 4.12 Ecological Resources for additional description on temporary waterway and habitat impacts.

Other impacts to water quality may occur due to the introduction of pollutants from the use of chemicals and fuels during construction. FRA has identified the potential frac-out risk associated with tunnel construction, which would occur if drilling fluid penetrates fractured bedrock or seeps into the rock and sand that surrounds the bedrock, traveling towards the Earth's surface. This risk will be further analyzed through site-specific analysis based on more detailed ground investigations and anticipated construction techniques. The Project Sponsor will prepare a Spill Prevention Plan and Contingency Restoration Plan as part of the SCMAGLEV construction, operational and safety measures. These plans will be submitted to the MDE with project permitting materials.

Groundwater –Impacts to groundwater resources could occur during construction from dewatering during excavations for tunnels which could affect groundwater quantity and flows. Due to the regionally high-water table, activities such as tunneling, and underground station construction would take place just above or within the identified aquifers. Dewatering could result in a depression of the cone of groundwater and possibly result in a loss of aquifer recharge capacity to nearby WHPA supply wells and surface water bodies. Nearby supply wells located at similar depths as the construction would be especially vulnerable.

With advancing design details, FRA would identify more precisely if supply wells would be at similar depths as proposed tunnel and underground stations. The Project Sponsor will need to provide effective groundwater control through construction techniques such as either pumping the groundwater out to control flow and pressure or using barriers to keep the groundwater out of tunneling operations. The construction contractor would need to comply with USEPA's dewatering requirements, as well as state requirements for treatment and metering of pumped groundwater. Through approval from the MDE, DOEE, and USEPA, disposal of clean water from the dewatering operations can be directed into a stable channel, such as a storm drain or an existing swale. Sediment laden water would be discharged into sediment bags, portable sediment tanks, or pumped into a sediment trap. Compliance with agency requirements would mitigate impacts. Additionally, the chemicals and fuels used during construction that affect surface water quality may also impact groundwater due to seepage and exposure during construction. The Project Sponsor will develop a Waste Management Plan and/or Spill Prevention Plan that addresses measures to avoid and minimize, and mitigate if necessary, the threat of contamination.

Floodplains - During construction, direct, short-term effects would occur within the 100-year floodplains in those areas of temporary use identified for cut/cover operations, tunnel boring machine locations for tunnel construction, and around large river crossing largely due to vegetation removal and site grading. Additionally, compaction from construction equipment may affect the softer soils located within floodplain and may affect the base floodplain elevation. All areas without an above-ground structure would be returned to original conditions or as close to original conditions as possible. In general, Build Alternatives J-01 through J-06 would also incur more temporary impacts

to floodplains during SCMAGLEV Project construction due to the greater proposed above ground viaduct proposed with these Build Alternatives.

The Camden Yards Station would result in more temporary impacts to the 100-year floodplain due to construction operations at ground level proposed adjacent to the Patapsco River and Inner Harbor area. This location and other low-lying areas of construction within the floodplain presents an additional flooding risk to construction equipment in the case of storm events, greater potential for effects to downstream resources, and potential impacts to the floodplain functions. Construction activities may result in changes in flood control, disruption of habitat, and impacts to water quality.

Scenic and Wild Rivers – Short-term effects to the Anacostia River and the Patuxent River would be the same as those identified in the water resource sections above. BMPs and mitigation measures noted below would offset the impacts and it is not anticipated that short-term construction effects would alter the Scenic and Wild River designation.

Chesapeake Bay Critical Area - Short-term effects within the Critical Area would be the same as those identified in the water resource sections above. Build Alternatives J using the Camden Yards Station result in the greatest temporary impact within the Critical Area and specifically the Buffer. The Project Sponsor will mitigate the impact of short-term construction effects and it is not anticipated that construction activities would be in conflict with regulations.

4.10.5 Potential Minimization and Mitigation Strategies

4.10.5.1 Minimization

Impacts within watersheds would be unavoidable, as construction of Build Alternatives would result in an increase in the amount of impervious surface area, removal of vegetation, and alteration of the surrounding environment. The Project Sponsor will approach design and development of TMFs, stations, and ancillary facilities with the goal of avoiding and minimizing impacts to water resources and will optimize opportunities to incorporate ESD to meet (and exceed where feasible) floodplain, Critical Area, groundwater, and water quality-related requirements. The Build Alternatives would be primarily situated in deep tunnels and stations located underground, minimizing increases in impervious area and removal of vegetation. Above-ground portions of the Build Alternatives would utilize a viaduct, which inherently attempts to avoid and minimize impacts to waterways and floodplains.

In accordance with the NPDES permit program, the Project Sponsor will prepare a Stormwater Pollution Prevention Plan (SWPPP) and identify activities and conditions that could cause water pollution and detail steps taken to prevent the discharge of any unpermitted pollution. The SCMAGLEV Project would also require strict ESC and BMPs, such as silt fence and temporary soil stabilization measures, to reduce the

potential for water quality impacts and ensure that all required ESC practices are put in place to prevent sediment loading.

The Project Sponsor will conduct groundwater modeling during final design and permitting to quantify potential effects. Modeling may demonstrate that nearby supply wells that obtain groundwater from deeper depths than the proposed Build Alternatives, obtain groundwater beneath confining layers, or are not hydraulically connected to the area of impact, have no predicted loss of recharge. The Project Sponsor is proposing the use of a closed-face Tunnel Boring Machine (TBM) capable of maintaining a pressurized face during excavation. The pressurized face would prevent dewatering of the sediments and minimize the loss of potential groundwater recharge to nearby supply wells and surface water features during construction. Use of the USEPA mapping and guidance for delineating and protecting surface and groundwater sources would supplement the next phase of ground investigations and geotechnical surveys. This will provide site specific information regarding drinking water supplies.

The purpose of these measures would be to avoid short-term effects and ensure that no long-term impacts would result. As the SCMAGLEV Project design advances, FRA and the Project Sponsor will further consider several planning measures designed to minimize, restore, and preserve natural and beneficial watershed, groundwater, and floodplain values. This would include, but is not limited to, the following:

- Evaluate additional construction staging/laydown areas to avoid construction staging and any temporary fill within 100-year floodplain.
- Utilize site design practices and ESD measures for construction staging/laydown areas such as minimizing impacts, maintaining vegetated buffers, disconnecting impervious areas, and supplementing vegetated areas with shallow ponding and microscale stormwater facilities. By supplementing vegetated areas with these BMPs, additional vegetation impacts are avoided. Larger BMPs, such as ponds and sand filters, may be considered where ESD measures are not practicable.
- Return disturbed areas to existing natural contours.
- Use minimum grading requirements.
- Reduce compaction of soils.
- Minimize vegetation removal.
- Span floodplains, floodways, wetlands and waterways, where possible, with strategic placement of viaduct piers, thus avoiding direct and permanent impacts. This would also be considered during placement of maintenance roads, where they would be discontinuous and stop prior to impacting waters and start again in upland areas.
- Utilize BMPs for stream work, such as perpendicular crossings of waterways and floodplain and avoiding longitudinal crossings to the extent practicable as these would result in greater fill that could affect conveyance and floodplain levels.

- Where possible, temporary crossings would bridge waters to allow for natural stream channel design and aquatic organism passage.
- Develop erosion and sediment controls and stormwater management to meet the Critical Area 10% Rule regarding phosphorus load requirements, to maintain and improve water quality.
- Avoid placement of any features or disturbance inside the Critical Area Buffer.
- Prepare a Spill Prevention Plan and Contingency Restoration Plan.

The Project Sponsor will also establish an operations plan that would include stipulations for the use, handling, and disposal of hazardous materials, as well as an emergency plan for addressing accidental spills of materials. See Section 4.15 for further discussion.

4.10.5.2 Mitigation

SCMAGLEV Project designs would adhere to the developed ESD and required BMP, erosion and sediment control, and stormwater management practices as noted above, to treat runoff from new impervious surfaces and implement MDNR recommendations to manage stormwater in a way that mimics natural infiltration. BMPs would help to attenuate and infiltrate runoff, filter pollutants, and trap sediments. Such measures would reduce water quality impacts due to additional impervious surfaces in the watersheds.

In addition to these measures, FRA has evaluated the need for mitigation as a result of permanent impacts to water resources and potential indirect effects of these impacts to other resources. Specific mitigation measures associated with surface waters including wetlands is addressed in Section 4.11 Wetlands and Waterways and affects to habitat and species is addressed in Section 4.12 Ecological Resources.

Mitigation would be required for impacts within the Critical Area, specifically for proposed impacts within the Critical Area Buffer. Critical Area rules require that new development and redevelopment include techniques to reduce pollutant loadings associated with stormwater runoff. State and local Critical Area regulations specify that these techniques must be capable of reducing pollutant loads generated from a developed site to a level at least 10 percent below the loads generated at the same site prior to development. This requirement is commonly referred to as the "10% Rule". FRA would work to adjust the design to minimize impacts within the Buffer and RCA areas, and would abide by mitigation requirements including:

- Planting for all permanent vegetation clearing impacts, including a higher ratio of required planting within the Buffer;
- Improvements to water quality and overall watershed health through 10% phosphorus removal requirements;

- Adhering to appropriate MDE Time-of-Year Restrictions¹⁰ for in-stream construction when working in and around waters of the U.S.

Due to the visual setting differences proposed to the Patuxent River, FRA recognizes that avoidance and minimization of the surrounding environment would be required, and FRA would continue through final design to make determinations of bridge pier locations, and the potential to restore resources lost in and around the river following construction. Aesthetic treatments of these areas would also be required and directly coordinated with the MDNR and adjacent property owners including the U.S. Fish and Wildlife Service and the NPS.

Continued coordination with the MDNR and MDE through the Coastal Zone Consistency Determination process and compliance with the CZMP will inform the FRA and Project Sponsor of any proposed actions that may not be consistent with the program and any additional avoidance and/or mitigation measures that may be necessary to bring it into compliance.

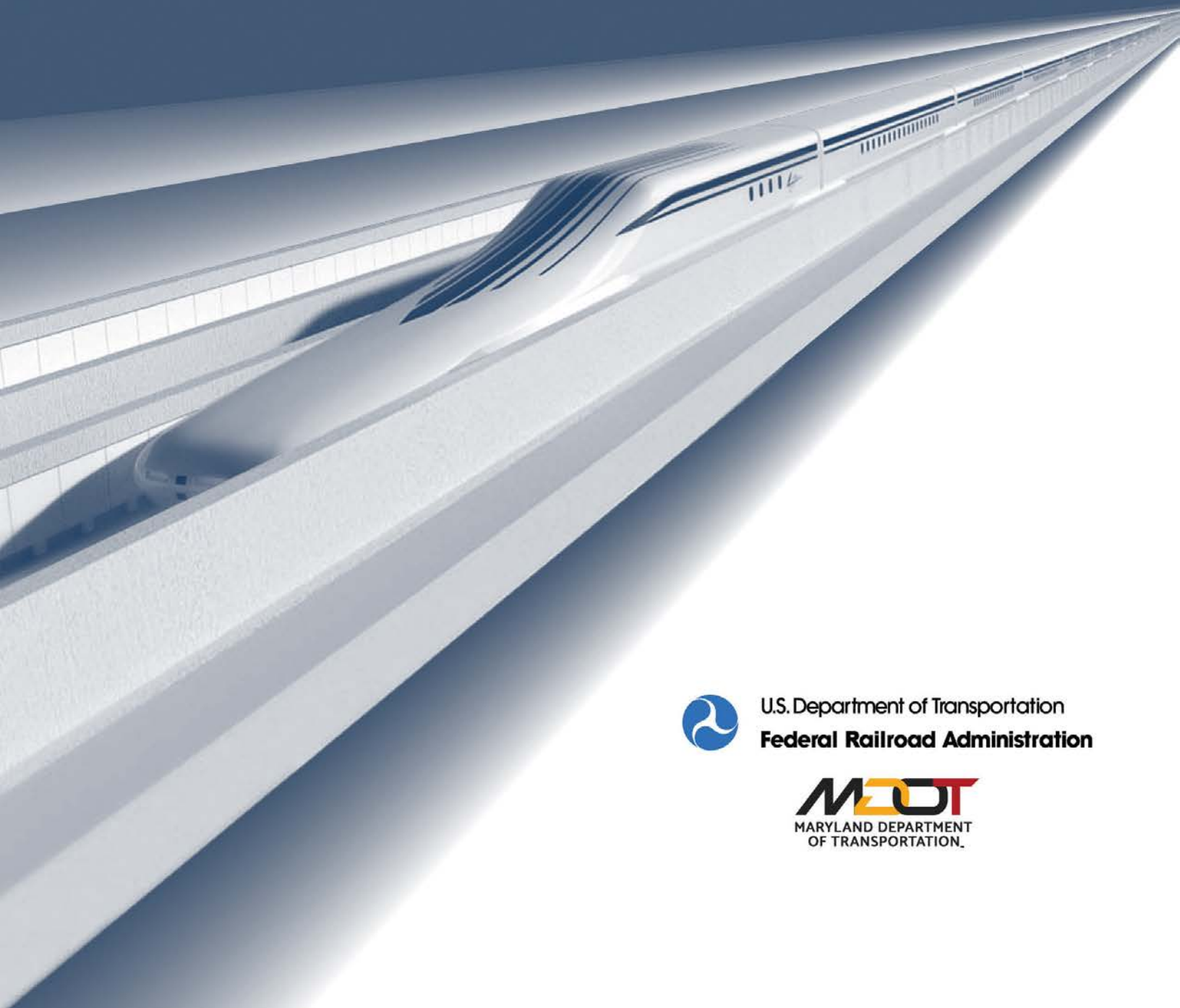
¹⁰Time-of-Year Restrictions are windows during which construction activities cannot occur to minimize impacts to aquatic habitats during construction projects. These windows are set by MDE and based on Use Class (refer to Section 4.11).

Section 4.11

Wetlands and Waterways

BALTIMORE-WASHINGTON SUPERCONDUCTING MAGLEV PROJECT

DRAFT ENVIRONMENTAL IMPACT STATEMENT AND
SECTION 4(f) EVALUATION



U.S. Department of Transportation
Federal Railroad Administration



4.11 Wetlands and Waterways

4.11.1 Introduction

This section evaluates the existing Waters of the U.S. and other jurisdictional¹ systems that could be affected by the Superconducting Magnetic Levitation Project (SCMAGLEV Project). This section also identifies and evaluates impacts on select notable wetlands and Nontidal Wetlands of Special State Concern. Additional details related to these resources can be found in Appendix D.7 Natural Environment Technical Report (NETR).

4.11.2 Regulatory Context and Methodology

4.11.2.1 Regulatory Context

In accordance with the National Environmental Policy Act (NEPA), 42 U.S.C. § 4321 et seq., the Council on Environmental Quality (CEQ) regulations, 40 C.F.R. Parts 1500 - 1508, and the Federal Rail Administration's (FRA) Procedures for Considering Environmental Impacts, 64 Fed. Reg. 28545 (May 26, 1999) FRA assessed impacts to Waters of the U.S. Jurisdictional waters are regulated by the U.S. Army Corps of Engineers (USACE) and the U.S. Environmental Protection Agency (USEPA) under Section 404 of the Clean Water Act (CWA), and the Rivers and Harbors Act. In Maryland and Washington, D.C., the Maryland Department of the Environment (MDE) and the D.C. Department of Energy and Environment (DOEE), respectively, jointly administer this program with the USACE.

MDE also regulates activities within waters of the State, which includes altering tidal or nontidal wetlands, the 25-foot nontidal wetland buffer, and certain designated high-quality wetlands called Nontidal Wetlands of Special State Concern (NTWSSC). A NTWSSC is one with unique ecological value, often those in which rare, threatened or endangered (RTE) species or a unique habitat may be present. MDE regulates activities in these wetlands, including a 100-foot buffer, to protect these wetlands from the impacts of development. Impacts to tidal wetlands require a tidal license issued by the Maryland Board of Public Works (BPW). The DOEE also regulates activities within waters of the District, including wetlands, in accordance with the District's Water Pollution Control Act, D.C. Official Code §§ 8-103.01, et seq.

Additional regulations include, but are not limited to:

- The Navigable Waters Protection Rule: Definition of "Waters of the United States" (85 Fed. Reg. 22250, April 21, 2020) (effective June 22, 2020)
- Code of Maryland Regulations (COMAR) Title 26, Subtitle 23 Nontidal Wetlands, Subtitle 24 Tidal Wetlands, and Subtitle 17 Section 04 Construction on Nontidal Waters and Floodplains;

¹ State-regulated and/or District-regulated waters

- COMAR Title 26, Subtitle 23, Section 6, Wetlands of Special State Concern;
- National Park Service (NPS) Director's Order 77-1 Wetland Protection;
- Executive Order 11990, Protection of Wetlands (42 Fed. Reg. 26961, May 24, 1977);
- U.S. Department of Transportation Order 5660.1A, Preservation of the Nation's Wetlands

4.11.2.2 Methodology

The FRA conducted a qualitative analysis of resources within the SCMAGLEV Project Affected Environment, identifying the presence of wetlands and waterways. FRA defined the geographic limits of the SCMAGLEV Project Affected Environment for wetland and waterways analyses as the proposed SCMAGLEV Project impact area plus an additional 30-foot buffer. The SGMAGLEV Project impact area includes the limits of operational/physical disturbance, as well as the construction related impact area, which includes additional areas of temporary disturbance required for construction activities. These impact areas comprise the overall limit of disturbance (LOD) of the SCMAGLEV Project Build Alternatives. The LOD includes all surface and subsurface elements. As noted, the SCMAGLEV Project Affected Environment for wetland and waterways includes an additional 30-foot buffer around the LOD. This buffer was included so field investigations would capture areas of potentially regulated 25-foot wetland buffers and notable landscape features adjacent to the LOD.

Wetlands and other waters of the U.S. defined in the 33 CFR Part 328 and identified using the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Atlantic and Gulf Coastal Plain Region (Version 2.0)*, and National Park Service (NPS) methodologies and policies have been identified within the SCMAGLEV Project Affected Environment. FRA obtained the location, extent, and defining characteristics of wetlands and waterways from multiple sources, including field-based delineations and observations, available published mapping, and aerial imagery. Between July 2018 and July 2020, FRA conducted field delineations specifically within the areas of proposed surface disturbance of the SCMAGLEV Project Affected Environment, which includes the 30-foot buffer around the LOD. Investigations were conducted for areas where property access was available, which accounted for approximately 70 percent of the total field investigation area. In areas of proposed surface disturbance where property access was not available, as well as for areas of proposed subsurface disturbance, FRA used existing published information from the Maryland Department of Natural Resources (MDNR) wetland mapping, U.S. Fish and Wildlife Services (USFWS) National Wetland Inventory (NWI), MDE stream mapping, and the U.S. Geological Survey (USGS) National Hydrologic Data (NHD) to approximate the boundaries of wetlands and waterways within the SCMAGLEV Project Affected Environment that were not field investigated. The location of wetlands and waterways identified and considered in this analysis are illustrated in Appendix B.3 Natural Resource Map Atlas.

FRA identified both potential direct and indirect effects from the SCMAGLEV Project to resources within the SCMAGLEV Project Affected Environment. FRA conducted a

quantitative analysis for resources proposed within the LOD for areas of surface disturbance only (which includes areas of tunnel portals, cut and cover areas, elevated viaduct, and above ground ancillary facilities, stations, and trainset maintenance facilities [TMF]) and construction-related surface disturbance (e.g. laydown areas, etc.), as coordination with USACE, MDE, and DOEE indicated that resources located under proposed deep tunnel areas would not be considered an impact in the permitting process. Impacts are described as both permanent and temporary. Although systems tunneled under may not be considered an impact requiring mitigation, work proposed “in, on, over, or under” a tidal system will be regulated and subject to Maryland BPW authorization. All tidal systems were evaluated based on the State Tidal Boundaries and corresponding designated use classes.

FRA has applied an exception to the methodology presented above for calculating wetland and waterway impacts to the proposed long-term construction laydown area near MD 200 and I-95. FRA did not conduct field delineations at this site; therefore, published information and recent aerial imagery were reviewed to identify wetlands and waterways. Published data indicated approximately 21 acres of wetlands and 10,500 linear feet of waterways are located at the site; however, aerial imagery indicates that recent clearing and development of the site has occurred that may have impacted the amount and quality of these resources. If the site is used during construction, the Project Sponsor will conduct delineations to confirm the locations of remaining features and ensure that they are avoided. No impacts to waterways are anticipated at this site; therefore, while the site’s wetlands and waterways (as shown in published data) are included in totals presented for the SCMAGLEV Project Affected Environment, the site was excluded from the quantitative impact analyses.

For evaluating the presence of and potential effects to NTWSSC as a result of the SCMAGLEV Project, FRA utilized published mapping from MDNR, which generally includes a larger identified NTWSSC boundary as compared with associated field-delineated wetlands; therefore, FRA is presenting the most conservative evaluation of potential effects to NTWSSC. The FRA used this approach because NTWSSC boundaries must be confirmed by the agencies upon review of field conditions. FRA illustrates both MDNR NTWSSC boundaries and associated field-delineated wetland boundaries in Appendix B.3 Natural Resource Map Atlas.

4.11.3 SCMAGLEV Project Affected Environment

Wetlands and waterways occur throughout the SCMAGLEV Project Affected Environment, with larger and more notable systems occurring on undeveloped lands on the Beltsville Agricultural Research Center (BARC) property, Patuxent Research Refuge (PRR) property, and NPS property adjacent to the Baltimore-Washington Parkway (BWP). Other concentrations of wetlands and waterways are located at National Aeronautics and Space Administration (NASA) Goddard Space Flight Center (GSFC), on City of Greenbelt properties, on Washington Suburban Sanitary Commission (WSSC) property, on Fort George G. Meade property, at county parks and open spaces (Springfield and Maryland City Parks, and Tipton Airport), on National Security

Administration (NSA) property, and on D.C.-owned land on several parcels identified northeast of the BWP/MD 198 interchange and currently leased to the Maryland Department of Juvenile Services. These surface water systems represent individual and interconnected wetland and waterway complexes that ultimately convey hydrologic flow to and through major regional stream systems, including the Anacostia River, Patuxent River, Little Patuxent River, Patapsco River, and Baltimore Harbor.

The following subsections describe wetlands and waterways, including notable systems, that occur in the SCMAGLEV Project Affected Environment. A broader discussion of these resources in the context of watersheds, other water resources, and aquatic habitats is provided in Section 4.10 Water Resources and Section 4.12 Ecological Resources. The location of wetlands and waterways identified are illustrated in Appendix B.3. **Table 4.11-1** provides a summary of existing wetland and waterways within the SCMAGLEV Affected Environment.

Table 4.11-1: Affected Environment Wetlands and Waterways Summary

Build Alternative	Wetlands* (acres)	Wetlands designated as NTWSSC** (acres)	Waterways* (linear feet)
J-01	83	12	37,371
J-02	69	30	41,859
J-03	62	19	40,910
J-04	82	12	38,348
J-05	68	30	42,837
J-06	61	19	41,887
J1-01	89	7	38,363
J1-02	67	23	40,077
J1-03	58	9	39,256
J1-04	89	7	39,341
J1-05	66	23	41,054
J1-06	57	9	40,234

* All Build Alternative alignments include the long-term laydown area near MD 200 and I-95, which accounts for over 21 acres of wetlands and 10,500 linear feet of waterways, as identified through published data. No vegetated tidal wetlands are present within the Affected Environment. Waterways represent all systems, both tidal and nontidal crossed by the SCMAGLEV Project.

**NTWSSC acreages are not in addition to the wetland acreage presented, but are a separate analysis of impacts based on state-published boundaries, not field-delineated boundaries.

FRA initiated coordination with the USACE and MDE in 2018 for the SCMAGLEV Project and this coordination is currently ongoing. On September 6, 2018, representatives from multiple state, Federal and county agencies and departments, the Project Sponsor and design engineers, and MTA, FRA, and NEPA team members

conducted a field review of several of the planned surface disturbance locations for proposed alignment and ancillary features. Meeting minutes from this field walk are included in Appendix D.7 NETR agency correspondence. In July of 2019 a pre-application meeting was held specifically with the MDE and USACE. Major waterways and wetland complexes were visited and reviewed. In November 2020 an additional field walk was held with the USEPA, USACE, MDE, and the U.S. Department of Agriculture/Beltsville Agricultural Research Center (BARC) to review and discuss the proposed TMF locations and facilitate the agency reviews. Pending a formal jurisdictional determination for the SCMAGLEV Project in coordination with the USACE, all aquatic resources delineated in the field and described herein are assumed to be jurisdictional.

4.11.3.1 Wetlands

FRA identified extensive wetlands within the SCMAGLEV Project Affected Environment, ranging from 61 to 89 acres depending upon the Build Alternative, including approximately 21 acres of wetlands (identified via published data) associated specifically with the proposed long-term construction laydown area near MD 200 and I-95. All wetlands identified are nontidal palustrine systems and are classified into four types: PEM – palustrine emergent; PSS – palustrine scrub-shrub; PFO – palustrine forested; and PUB – palustrine unconsolidated bottom (pond-like).² Most wetlands that FRA identified are classified as PFO and are located predominantly on many of the Federal and county lands noted above. Many of these wetland systems are associated with and located within the floodplain of a perennial waterway. FRA identified smaller, more fragmented and sometimes more disturbed wetlands influenced by urbanization closer to Baltimore City, within existing roadway infrastructure and utility easements, and between residential neighborhoods. It is anticipated that the majority of wetlands present would be regulated under both USACE and MDE jurisdiction, however this jurisdictional designation has not been coordinated and defined by the agencies. No vegetated tidal wetlands were identified within the SCMAGLEV Project Affected Environment. Open water tidal systems are present within the Affected Environment, and discussed in the following waterways section.

Of those wetlands noted above, FRA identified wetlands classified as NTWSSCs based on MDNR mapping, located along three major waterways and their tributaries within the SCMAGLEV Project Affected Environment, including Beaverdam Creek, Beck Branch, and the Patuxent River (Appendix B.3 Map Sheets 5 and 6). As shown in **Table 4.11-1**, NTWSSC range from seven acres to as much as 30 acres of the total wetland acreage identified per Build Alternative. In coordination with MDNR, FRA determined that these NTWSSCs provide habitat for RTE odonate (a dragonfly or damselfly), fish, and plant species.

FRA identified several notable wetland systems that should be avoided if possible and may require special protection if they cannot be avoided. FRA identified these systems based on their classification, location within the SCMAGLEV Project Affected

² Cowardin et al. 1979. *Classification of Wetlands and Deepwater Habitats of the United States*. Prepared for the USFWS.

Environment and possible connection to larger natural systems/habitat, presence of a high-quality resource, and/or through agency coordination. FRA identified the following important wetland systems:

- NTWSSC located within riparian buffers of waterways noted above and supporting RTE species.
- Vernal pools, spring-fed wetland complexes, and forest-stream complexes containing RTE plants identified by the USFWS at PRR.
- High-quality wetlands located north of the Patuxent River west of the BWP, requested by the USACE to be avoided.
- A bald cypress swamp located on BARC and NPS property east of the BWP.

4.11.3.2 Waterways

FRA identified tidal and nontidal waterways within the SCMAGLEV Project Affected Environment. Waterway classifications include perennial (groundwater flows year-round), intermittent (groundwater flows at some point during the year), and ephemeral (does not intersect groundwater at any time of the year) systems. With new ruling in 2020 on the definition of Waters of the U.S., ephemeral features that contain water only in direct response to rainfall or snowmelt are no longer considered jurisdictional resources. Therefore, ephemeral waters delineated during field investigations may no longer need representation on SCMAGLEV documentation and mapping, pending confirmation from the USACE.

As previously identified in Section 4.10 Water Resources, waterways are also given designated Use classes by MDE, identifying the state's goals for water quality. FRA identified all nontidal waterways within the SCMAGLEV Project Affected Environment as Use I (water contact recreation and protection of nontidal warmwater aquatic life) or Use I-P (water contact recreation, protection of aquatic life, and public water supply). FRA identified the tidal systems within the SCMAGLEV Project Affected Environment as Use II (water contact recreation and support of estuarine and marine aquatic life).

Greater than 37,000 linear feet of waterway crossings are located within the SCMAGLEV Project Affected Environment, increasing up to approximately 43,000 linear feet depending upon the Build Alternative. All Build Alternatives include the long-term laydown area near MD 200 and I-95, which includes 10,500 linear feet of waterway; however, the presence of these waterways is based on published data and has not been field verified. Several waterways within the SCMAGLEV Project Affected Environment are notable for their position as headwater or first order tributaries, significant riparian habitat supporting potential RTE species, associated with NTWSSC, or designation as a state Scenic River (also detailed in Section 4.10 Water Resources). FRA identified the presence of several important waterways in the SCMAGLEV Project Affected Environment including the following:

- Headwaters of Beaverdam Creek

- Headwaters of Little Patuxent River
- Headwaters for a tributary known to support sensitive species and habitats at the north end of PRR property
- Beck Branch, bounded by NTWSSC
- Beaverdam Creek, bounded by NTWSSC
- Patuxent River, State Scenic and Wild River, bounded by NTWSSC
- Little Patuxent River, upstream of NTWSSC
- Four tidal waterways: Anacostia River (a State Scenic and Wild River); tributary to Anacostia River Middle Branch Patapsco River; and Gwynns Falls

4.11.4 Environmental Consequences

FRA evaluated potential impacts to wetlands and waterways associated with the No Build Alternative and the Build Alternatives. FRA considered direct and indirect, permanent and temporary impacts associated with the Build Alternatives, as well as the short-term construction effects. FRA considers direct impacts that will result from new permanent structures and operations to be permanent impacts. FRA considers direct impacts that will result from areas of anticipated temporary disturbances associated with construction activities to be temporary impacts, with some resulting in short-term effects and others in long-term effects. FRA presents a breakdown of anticipated permanent and temporary impacts for each Build Alternative, including station and trainset maintenance facility (TMF) options, in Appendix D.7 NETR impact summary tables. However, a determination on temporary impacts will have to be finalized through further agency coordination and final design. All impacts present totals rounded to the nearest whole number. All impacts to wetlands and waterways should be considered estimates as they use a combination of published information and field investigations subject to further review and jurisdictional determination by the regulatory agencies.

Coordination with the regulatory agencies for submission of a Joint Federal/State Application for the Alteration of Any Floodplain, Waterway, Tidal or Nontidal Wetland in Maryland (JPA), is currently ongoing and anticipated to coincide with release of this document. The SCMAGLEV Project will trigger an individual permit with the USACE and MDE through the Section 404(b)(1) process and will be thoroughly evaluated to determine compliance with all provisions of those guidelines. Submission of an application for a tidal wetlands license will be required through the BPW, as the agency regulates all tidal systems “in, over, or under” project activities. Tidal system impacts are not anticipated to require tidal mitigation. Coordination with the USACE has also been initiated in accordance with Section 10 of the Rivers and Harbors Act for bridging over or tunneling under navigable waters and Section 408 review under Section 14 of the Rivers and Harbors Act for the proposed tunneling under the Anacostia River Federal Navigation Channel and levee system located in the area of the Bladensburg Waterfront Park. Additionally, the SCMAGLEV Project Sponsor must submit a Statement of Findings per DO 77-1 and DO-77-2 to the NPS for impacts to any wetland and floodplain located on NPS property.

Coordination with the Critical Area Commission would also be required as noted in Section 4.10 Water Resources, to address impacts to wetlands and waterways within the Chesapeake Bay Critical Area (Critical Area) should final review of permit materials indicate wetland impacts in these areas. At this time there are no wetlands identified where proposed surface disturbance will occur within the Critical Area. Additional compensation/ mitigation may be required for impacts to wetlands that fall within this boundary.

4.11.4.1 No Build Alternative

Under the No Build Alternative, the SCMAGLEV Project would not be built and therefore no impacts related to the construction or operation of the SCMAGLEV Project will occur. However, other planned and funded transportation projects will continue to be implemented in the area and could result in effects to wetlands and waterways such as filling wetlands, crossing or culverting waterways, and increasing stormwater runoff to these systems as a result of roadway expansions.

4.11.4.2 Build Alternatives

FRA evaluated the potential for effects to wetlands and waterways located within the SCMAGLEV Project Affected Environment. FRA has considered all areas of surface disturbance to be a direct impact to wetlands and waterways. In coordination with the USACE and MDE, FRA learned that a deep tunnel under wetlands and waterways will not result in impacts that will require permitting through their agencies; therefore, no calculated impacts are attributed in these areas. The following section provides both a qualitative and quantitative analysis of impacts. Impact calculations include wetlands and waterways located within the footprint of the LOD for all proposed surface disturbance. As clarified in the methodology section, quantitative analyses do not include published resources at the proposed long-term construction laydown area near MD 200 and I-95. Wetland and waterway impacts as a result of the SCMAGLEV Project would include the following types of resource disturbance:

- Complete or partial fill of a wetland system and disconnection and/or fill within a waterway as a result of placement of permanent structures such as viaduct piers or other standing structures including maintenance of way (MOW) facilities, fresh air/emergency egress (FA/EE) facilities, TMFs, or stations.
- Conversion of wetland type (e.g. removal of vegetation from a PFO wetland resulting in a PEM wetland due to disturbance during construction and/or the systems location under elevated viaduct).
- Relocation of waterways or creation of culverted systems, while maintaining hydrologic connection.

Impact calculations also include areas that will require temporary cut/cover for tunnel construction. Impacts have not been calculated for wetland boundaries that may either extend beyond the LOD or be directly connected hydrologically if they are beyond the

LOD. FRA recognizes that significant minimization and mitigation efforts would be required to ensure that the impacts identified within the LOD do not also directly or indirectly affect those adjacent systems through potential dewatering from loss of groundwater supply and/or hydrologic connections; alterations in habitat which may introduce invasive species and competition for food and protection; and visual/human intrinsic value that may be placed upon these natural areas. Impacts are presented in **Table 4.11-2** and **Table 4.11-3** below, with additional qualitative analyses and impact summary tables included in Appendix D.7 NETR.

Summary of Build Alternative impacts:

- Build Alternatives J-02, J-03, J-06, and J1-03 would result in the greatest linear feet of waterway impact. Build Alternative J-04 would result in the least waterway impact.
- Four Build Alternatives associated with the MD 198 TMF would result in the greatest acreage of wetland impact, just less than two times the permanent wetland impacts as compared to the other eight Build Alternatives.
- Build Alternatives that include the BARC Airstrip TMF option would result in more than two times the permanent NTWSSC impacts as compared to the other eight Build Alternatives.
- Build Alternatives J1-03 and J1-06 would result in the least permanent wetland impact and among the lowest permanent NTWSSC impacts.

Wetlands

Direct wetland impacts would occur at locations of proposed surface disturbances, where existing wetland vegetation would be removed, soils altered/removed, and/or sources of hydrology disrupted. **Table 4.11-2** provides a summary of direct permanent wetland impacts by wetland classification and for NTWSSC associated with each Build Alternative. Refer to Appendix D.7 NETR for a breakdown of anticipated permanent and temporary wetland impacts for each Build Alternative, including station and TMF options, as well as a breakdown of NTWSSC total impacts.

Table 4.11-2: Permanent Wetland Impact Summary

Build Alternative	Acres of Permanent Impact by Wetland Type*				Total Wetland Impact (acres) Classified as NTWSSC**	Total Wetland Buffer Impact (acres)***
	PUB	PEM	PFO	TOTAL		
J-01	1	7	37	45	6	20
J-02	1	2	22	26	19	37
J-03	1	3	18	22	9	21
J-04	1	7	37	45	6	20
J-05	1	2	22	25	19	37

Build Alternative	Acres of Permanent Impact by Wetland Type*				Total Wetland Impact (acres) Classified as NTWSSC**	Total Wetland Buffer Impact (acres)***
	PUB	PEM	PFO	TOTAL		
J-06	1	3	18	22	9	21
J1-01	<1	8	43	51	4	23
J1-02	<1	3	24	27	14	39
J1-03	<1	3	20	23	5	24
J1-04	0	8	43	51	4	23
J1-05	0	3	24	27	14	39
J1-06	0	3	20	23	5	24

*All Build Alternative impact calculations exclude published wetland data associated with the long-term construction laydown area near MD 200 and I-95 (approximately 21 acres of primarily PUB and PFO wetlands). No vegetated tidal wetlands will be impacted.

** NTWSSC acreage is calculated separately from the total acreage, based on state-published boundaries, not field-delineated boundaries.

***Wetland buffer impacts include the 100-foot buffer required for NTWSSC.

Removal or fill within wetlands would result in an immediate and permanent removal of habitat, potential hydrologic disconnection, and alter the functions and values of the systems. The functions and values that may be altered include:

- A direct removal or change in habitat which may indirectly affect the species relying on the wetland for food, water, protection, and breeding.
- A direct removal or change in hydrologic functions may include a reduction in water storage capacity which may indirectly affect both surface water hydrology downstream and groundwater recharge and supply. This may also affect flooding patterns, and the ability to slow down flow velocities.
- A direct removal or fill within wetlands can directly affect the landscape's capacity to trap and filter sediments and pollutants, which may indirectly affect water quality.

Wetlands that would only experience a temporary conversion of cover type (e.g. PFO wetland converted to PEM or PSS wetland) would not lose total function and value to the environment, but they would be altered. A forested wetland habitat that is cleared for construction may have the ability to regenerate or be restored with plantings, but the length of time it will take to become reforested may result in indirect changes in habitat and species dynamics noted above. This may occur at locations of viaduct, where permanent maintenance access is not required under the viaduct and a natural system is able to be reestablished, or at a location of temporary clearing just for construction activities. FRA has determined that a conversion of wetland type will have both direct and indirect effects. For example, the effects of tree removal from a PFO wetland or its buffer may result in increased ground saturation affecting site hydrology, as well as increased sunlight to the wetland resulting in the potential introduction of invasive vegetation. These direct habitat changes lead to indirect effects to terrestrial and

aquatic species. FRA provides additional detail regarding potential habitat effects in Section 4.12 Ecological Resources.

Permanent structures and construction activities outside of wetlands but within wetland buffers can also indirectly affect wetlands. Wetland buffers are critical to the function of wetland systems. Changes to upstream hydrology from new impervious surface can indirectly affect wetland hydrology for downstream receiving wetlands.

The following subsections describe the wetland impacts of the alignments, stations, and TMFs. Due to the expanse of wetland impacts located on Federal properties, FRA also provided a breakdown of impacts per Federal lands, as well as state, county and local land (Appendix D.7 NETR). Impacts do not represent a comprehensive list of impacts broken down per all properties impacted by the SCMAGLEV Project, but rather the more prominent areas of natural systems traversed.

Alignments

Impacts to wetlands for the alignments would result in similar amount of permanent acreage, with only two acres differentiating the alignments associated with Build Alternatives J-01 through J-06 (11 acres) versus alignments associated with Build Alternatives J1-01 through J1-06 (13 acres). Of the total permanent impacts, FRA estimates that the Build Alternatives J alignments would permanently impact approximately six acres of NTWSSC surrounding Beck Branch, Beaverdam Creek, and Patuxent River. By comparison, the Build Alternatives J1 alignments would permanently impact approximately three to four acres of NTWSSC surrounding Beck Branch and Beaverdam Creek. Therefore, the Build Alternatives J1 alignments would have less permanent impact to NTWSSC.

The total LOD for the viaduct is included in the calculations of permanent wetland impacts to present the most conservative estimation. Through final design and engineering, and continued coordination with the agencies, FRA will account for areas located underneath of the viaduct where wetland functions and values may be retained. In most locations, shading of wetlands underneath of the viaduct is not anticipated to diminish the functions of the wetland or its ability to regenerate. Areas calculated as permanent PEM wetland impacts have the potential to be reduced to temporary impacts. For other wetland types, conversion of vegetation type would be considered a permanent impact. Refer to Appendix D.7 NETR for a comparison of the permanent, as well as temporary, impacts of the alignments.

FRA has considered important wetland systems present in the SCMAGLEV Project Affected Environment within their design and has modified design plans to the extent feasible. For example, impact to the high quality PFO wetland located just north of the Patuxent River west of the BWP was specifically minimized by placement of bridge piers for Build Alternatives J1 alignments, outside of this wetland with elevated viaduct spanning above. The unavoidable portion of this wetland within the LOD would require vegetation removal and temporary disturbance during construction, but with appropriate BMPs and continued ESD techniques it would not lose important wetland functions.

Similarly, FRA has considered the more extensive wetland systems present, largely located around the major waterways and present NTWSSC. In these areas, FRA has proposed extended elevated guideway sections, with longer spans between piers in order to minimize ground disturbance. Refer to the minimization and mitigation section below for additional details.

Stations

FRA found no wetland impacts or NTWSSC impacts associated with the Mount Vernon Square East, BWI Marshall Airport, and Camden Yards Stations. The Cherry Hill Station would impact less than one acre of wetland and would result in no impacts to NTWSSC.

Trainset Maintenance Facilities (TMFs)

The MD 198 TMF would impact the most acres of wetland among the three TMF options, with total permanent impacts of 33 acres with Build Alternatives J-01 through J-06 or 38 acres with Build Alternatives J1-01 through J1-06. The direct and permanent wetland impacts as a result of this TMF would significantly alter habitat, including sensitive species habitat and RTE species, water quality, flood storage, and drainage patterns of the Little Patuxent River Watershed, as previously detailed in Section 4.10 Water Resources.

The BARC Airstrip TMF would result in 13 to 14 acres of permanent wetland impacts, which includes the most permanent NTWSSC impacts (11 to 12 acres). BARC West would result in 10 acres of permanent wetland impact, which includes two to three acres of permanent NTWSSC impacts. While the MD 198 TMF option has by far the greatest wetland impact (33 to 38 acres), it would impact no more than one acre of NTWSSC.

All TMF options would directly and permanently impact wetland systems located within Tier II and Stronghold Watersheds. Fill within these wetlands in order to construct the TMF buildings and tracks would result in a direct loss of these wetlands and would permanently alter the existing natural environment and valuable functions provided by wetlands as noted previously. During final design of the TMF locations, ESD would be utilized to intermix natural systems to the area, for example, stormwater management swales that would provide conveyance of hydrology and attenuation of stormwater runoff, with the goal to restore lost functions for both water quantity and water quality for the surrounding landscape.

Waterways

Direct waterway impacts will occur at locations of proposed surface disturbances, where waterway geomorphology, flow, or water quality will be altered. Greater detail regarding water quality impacts is discussed in Section 4.10 Water Resources.

Table 4.11-3 provides a summary of direct permanent nontidal waterway impacts by waterway classification associated with each Build Alternative. Refer to Appendix D.7 NETR for temporary impacts. With final design, all efforts will be made to span

waterways underneath of viaducts by placing the support piers outside of the waterway banks. For the purpose of this analysis, though, the viaduct was counted as a permanent impact. Although ephemeral waterways are treated separately dependent upon the regulatory authority, FRA has included ephemeral waterways in this analysis. Tidal waterways are not located within areas of proposed SCMAGLEV surface disturbance but are crossed underneath by proposed deep tunnel. **Table 4.11-4** provides a summary of tidal waterways crossed.

Table 4.11-3: Permanent Nontidal Waterway Impact Summary

Build Alternative	Linear Feet of Impact by Waterway Type*			
	Ephemeral	Intermittent	Perennial	TOTAL
J-01	1,224	5,296	3,741	10,261
J-02	1,418	5,649	5,557	12,624
J-03	1,549	5,385	5,962	12,896
J-04	1,224	5,296	3,426	9,946
J-05	1,418	5,649	5,243	12,310
J-06	1,549	5,385	5,647	12,581
J1-01	814	4,526	6,669	12,009
J1-02	893	3,487	7,728	12,108
J1-03	852	3,617	8,189	12,659
J1-04	814	4,526	6,354	11,694
J1-05	893	3,487	7,414	11,794
J1-06	852	3,617	7,875	12,344

* All Build Alternative impact calculations exclude published waterway data associated with the long-term construction laydown area near MD 200 and I-95.

Table 4.11-4: Tidal Waterway Impact Summary

Summary of LOD Crossings Under Tidal Portions of Anacostia River, Unnamed Tributary to the Anacostia River, Gwynns Falls, and Middle Branch Patapsco River						
Build Alternative	Alignment*		Camden Station*		Total*	
	LF	SF	LF	SF	LF	SF
J-01	146	15,251	0	0	146	15,251
J-02	146	15,251	0	0	146	15,251
J-03	146	15,251	0	0	146	15,251
J-04	146	15,251	1,105	50,839	1,251	66,090
J-05	146	15,251	1,105	50,839	1,251	66,090
J-06	146	15,251	1,105	50,839	1,251	66,090
J1-01	142	15,406	0	0	142	15,406

Summary of LOD Crossings Under Tidal Portions of Anacostia River, Unnamed Tributary to the Anacostia River, Gwynns Falls, and Middle Branch Patapsco River						
Build Alternative	Alignment*		Camden Station*		Total*	
	LF	SF	LF	SF	LF	SF
J1-02	142	15,406	0	0	142	15,406
J1-03	142	15,406	0	0	142	15,406
J1-04	142	15,406	1,105	50,839	1,247	66,245
J1-05	142	15,406	1,105	50,839	1,247	66,245
J1-06	142	15,406	1,105	50,839	1,247	66,245

The Patapsco River is crossed by deep tunnel just south of I-895 and east of Route 295. This area is included within the scanned areas of the 1972 State Tidal Waterways and adjacent land therefore considered within the Chesapeake Bay Critical Area; however it is identified as a Use I water and a tidally influenced, riverine, deep water system (R1UBV) by MDE. Because this particular location would require coordination with the regulatory agencies to determine its final jurisdiction, it has not been included within either Table 4.11-3 as a nontidal waterway impacted by surface features, or Table 4.11-4 as a tidal waterway crossed beneath by deep tunnel. Approximately 9,575 square feet of this system falls within the SCMAGLEV Project LOD.

The Build Alternatives would require the relocations, culverting, or fill within waterways at various locations within the SCMAGLEV Affected Environment for ancillary facilities along the alignments, TMF options, and at the Cherry Hill Station. FRA assumes the following as a result of surface disturbance:

- FRA recognizes that waterway channel formations are variable, depending on changes in flow and underlying geology. The addition of SCMAGLEV Project runoff from structures into waterway channels could cause direct impacts to the channel with additional changes in flow, bank or in-channel erosion, sand and gravel bar creation and shifting, and scouring.
- Waterway relocations will be a direct temporary impact with potential for long-term effects noted above. Waterway relocation design would attempt to mimic the appropriate waterway dimensions, materials, and volume capacity. Additional factors such as waterway length, soils, and surrounding land uses could affect the success of a given relocation.
- FRA would consider construction of culverts to maintain hydrologic connections in locations of proposed permanent surface disturbance where fill would be required. This loss of natural substrate for the waterway would affect the temperature and composition of species able to function with these new conditions.

FRA evaluated the effects to waterways not only for the direct impacts that will result from the SCMAGLEV Project, but the indirect effects that other project actions will have

on waterways. Many waterways in the LOD are buffered by forest, which will be removed by the SCMAGLEV Project. As previously described, many of the waterways identified within the SCMAGLEV Project Affected Environment consist of interconnected wetland and waterway complexes that ultimately convey hydrologic flow to and through major regional stream systems. The greatest loss of forested stream buffers are associated with these major waterways, identified in proposed areas of elevated viaduct and surface ancillary features. Acreage of forest impacts is included in the following Section 4.12 Ecological Resources. The loss of forest along waterways will directly affect water temperature regimes and in-stream/floodplain vegetation composition. Although the viaduct would provide or replace shading to portions of stream, the full benefit of forest shading would not be achieved. Additional indirect effects of potential changes to water temperature and vegetation changes would affect aquatic organisms and water quality, wildlife habitat and corridors, flood control and reducing the effects of nutrient runoff into waters. Changes to flooding regimes of waterways could affect the forest buffers and could potentially influence the species present that are adapted to life along waterways.

The following subsections identify and compare the waterway impacts among the alignments, stations, and TMFs (refer to Appendix D.7 NETR impact summary tables for additional breakdown of waterway impacts).

Alignments

The alignments would result in similar amounts of permanent impacts. The alignments associated with Build Alternatives J-01 through J-06 would permanently impact between approximately 7,600 and 7,800 linear feet of waterways. The alignments associated with Build Alternatives J1-01 through J1-06 would permanently impact between approximately 7,000 and 7,400 linear feet of waterways. Likely the most notable difference in impacts results from the Build Alternatives J alignments being elevated over the Little Patuxent River and the Build Alternatives J1 alignments tunneling under. Additionally, only the Build Alternatives J alignments have the potential to impact important headwaters identified by USFWS on PRR.

The additional length of elevated viaduct associated with the alignments of Build Alternatives J-01 through J-06, does not significantly increase proposed waterway impacts compared with the alignments of Build Alternatives J1-01 through J1-06. This is in part due to the sinuosity of the waterways within the SCMAGLEV Affected Environment. For example, several tributaries paralleling the BWP and alignment associated with Build Alternatives J1-01 through J1-06 require multiple crossings of the same waterway, which increases the risk of both direct and indirect waterway impacts. These occurrences would be considered during final planning and design to avoid instream impacts by spanning systems and use of temporary stream crossings to the extent possible during construction. Further design techniques and BMPs to minimize impacts is discussed in later sections.

Two tidal waterways are traversed through deep tunnel by alignments associated with all Build Alternatives, the Anacostia River and an unnamed tributary to the Anacostia.

The top of the SCMAGLEV tunnel would be approximately 75 feet below the surface elevation of the Anacostia River. Although historic records of the Anacostia show it to have been as deep as 40 feet in this area near Bladensburg, it is currently thought to be as shallow as three feet at the Bladensburg Waterfront Park³; therefore, the tunnel would be well below this resource.

As noted previously, coordination would be required with the regulatory agencies to determine the jurisdiction and classification of the Patapsco River at the location it is crossed by any alignment, just south of I-895. The proposed top of tunnel beneath the surface elevation of the Patapsco River would be approximately 78 feet. This is also anticipated to be well below the depth of the Patapsco River, although further ground investigations would need to be conducted to provide official depths of the rivers.

It is not anticipated that these waterways will be impacted by the SCMAGLEV Project tunnel, as they are in deep areas below the surface at these locations. However, tunneling under these systems will require coordination with the USACE and MDE Tidal Wetlands Division and the BPW for the waterway crossings illustrated in **Table 4.11-4** and potentially for the approximate 9,575 square feet of the Patapsco River tunneled under by all Build Alternatives.

Stations

There are no waterway impacts at the Mount Vernon Square East Station or BWI Marshall Airport Stations. Deep tunnel proposed for Build Alternatives J-04 through J-06 and J1-04 through J1-06 associated with the Camden Yards Station (illustrated in **Table 4.11-4**) will cross under the Gwynns Falls at its confluence with the Middle Branch of the Patapsco River and three small “fingers” of the Middle Branch. Depth to the top of tunnel below these tidal systems is approximately 40 to 60 feet below the water surface. The Cherry Hill Station would permanently impact approximately 315 linear feet of nontidal waterways.

Trainset Maintenance Facilities (TMFs)

The MD 198 TMF would permanently impact over 2,300 linear feet of waterways for Build Alternatives J-01 and J-04 and over 4,700 linear feet of waterways for Build Alternatives J1-01 and J1-04. The difference in this approximate doubling of impact would result from the MD 198 connecting tracks from any Build Alternatives J1 alignments through a long portal area just below the surface and at-grade, which would traverse the Little Patuxent River and its tributaries.

The BARC Airstrip TMF and BARC West TMF would similarly result in approximately 4,500 to 5,000 linear feet of permanent impacts to waterways. The BARC Airstrip TMF would impact important headwaters of Beaverdam Creek, and the BARC West TMF would impact Beaverdam Creek and its tributaries. The impacts to these waterways

³ <https://www.anacostiaaws.org/our-watershed/aws-faqs.html>

located largely on BARC and NPS properties have been provided in additional detail in sections 4.10 and 4.12. No tidal waterways would be impacted by any TMF.

4.11.4.3 Short-term Construction Effects

Wetlands

Construction of viaduct and other surface features will require temporary access roads for equipment and materials. Use of these roads could require crossing of wetlands and their buffers and removal of wetland vegetation. These actions would result in temporary direct impacts, dependent upon the needs of the contractor, the type of access road necessary, and the ability for selective removal of vegetation. Impacts could result from matting over wetlands for construction vehicles to traverse the site which has the potential to compact wetland vegetation and soils. However, removal of construction equipment and matting would allow the area to regenerate.

As previously noted, additional temporary impacts (a decrease of proposed permanent impacts) to wetlands could occur in locations where proposed viaduct will span aerially over existing PEM wetland, although FRA has identified this as a very small amount of the overall wetland impacts as a result of the SCMAGLEV Project (note: placement of viaduct piers will be considered a permanent impact). The total estimated PEM wetlands that will be aerially spanned for Build Alternatives J-01 through J-06 is one acre and less than 0.1 acre for Build Alternatives J1-01 through J1-06. Estimated temporary impacts to wetlands are included in Appendix D.7 NETR impact summary tables.

Dewatering may be required during construction of subsurface features, to remove any accumulated water within areas of excavation. As noted in Section 4.10, this action may affect the availability of groundwater, which in turn may effect the groundwaters ability to support sustained hydrology to adjacent wetlands. The Project Sponsor will determine the most appropriate means of dewatering, either excluding the groundwater from reaching the work area or pumping it out. The length of time that dewatering would be required may dictate proposed measures to mitigate for potential impacts.

The improper disposal of excavated material from tunnel construction would also have the potential to affect wetlands if the excavated materials were placed within wetlands or in un-stabilized areas where they could be washed into existing wetlands. FRA expects that compliance with any USACE CWA Section 404 permit and implementation of all BMPs would reduce or avoid this potential.

Waterways

FRA has identified short-term construction impacts that may occur within waterways as a result of the Build Alternatives. Short-term temporary effects would occur as a result of temporary waterway crossings, which could utilize existing fords if possible and small bridges that span a waterway from bank to bank. Larger instream construction activities may require instream diversions, use of cofferdams, pump-arounds, or other BMPs to minimize the effects to the waterway during construction of surface features. In

addition, pumping or washing operations would be necessary for tunnel construction. All these potential short-term construction effects could result in sedimentation or increased turbidity within the waterways. Effects of tunneling could cause the disposal of excavated materials into waterways, as stated previously for wetland effects. Refer to Appendix D.7 NETR impact summary tables for a breakdown of estimated temporary waterway impacts.

4.11.5 Potential Minimization and Mitigation Strategies

The Project Sponsor will avoid and minimize impacts to wetlands and waterways to the maximum extent practicable, not only for short-term construction activities, but also for long-term operational effects on the resources. For impacts that cannot be avoided, the following measures would be considered to minimize and mitigate potential impacts.

4.11.5.1 Minimization

FRA has considered the vast expanse of wetlands and waterways throughout the SCMAGLEV Protect Affected Environment, most notably in areas of proposed surface features located on several Federal and county properties. Alignment shifts were considered as feasible during early design phases and supplemented with design measures such as increased elevated span lengths and pier construction techniques to allow for avoidance of instream piers to large waterways to the extent possible.

Spanning large systems, such as the Patuxent River, may not be feasible, specifically for the alignments associated with Build Alternatives J1-01 through J1-06, due to the bend in the river. An alternative option would be to use a “straddle bent,” which is often used when crossing a skewed surface feature or constraint. This allows for an extension of the superstructure without extending the impact of the pier to the surface below. The Project Sponsor will consider additional minimization, and mitigation measures as it advances its engineering design.

In addition to the high-level design minimization measures noted above, the Project Sponsor has minimized and avoided impacts at the following noted sensitive areas:

- Wetland, stream, and riparian buffers located immediately north of Veterans Highway. The design is avoiding all direct impacts to these systems by shifting the proposed FA/EE north and proposing access to the area from Riverdale Road instead of Veterans Highway.
- High-quality wetlands located within Maryland City Park north of the Patuxent River, west of the BWP. The design is avoiding direct placement of piers within this system.
- High-quality wetlands that support rare species located in the Harman’s area of Baltimore County. The design is avoiding above ground impacts by shifting the proposed FA/EE farther north in the commercial/developed area.

- Floodplain and wetlands located along the northern boundary of the Patapsco River, south of I-895. The design is avoiding above ground impacts by shifting the proposed FA/EE farther east in the commercial/developed area.

The Project Sponsor will continue to identify design opportunities to avoid and minimize impacts to wetlands and waterways, with removing viaduct pier locations from these resources as a priority strategy. This may include spanning as many resources as feasible. Impacts to wetlands and waterways for any Build Alternative would likely occur along the Patuxent River and Beaverdam Creek and their associated tributaries, wetlands (including NTWSSC), forests, and floodplains. Because resources along these waterways would be impacted, the Project Sponsor will implement BMPs during construction, in addition to complying with MDE, USACE, and NPS regulations. The Project Sponsor will also develop and implement restoration efforts in these areas in coordination with the USFWS.

The Project Sponsor will avoid and minimize short-term construction effects mainly using site BMPs required through existing agency coordination and future permitting process with the state and Federal agencies including the USACE, MDE, NPS, USFWS, and MDNR, as well as in accordance with county/local authorities. These BMPs can include:

- Same-day stabilization measures as feasible for any earth disturbing activities.
- Use of appropriate erosion and sediment control BMPs.
- Compliance with MDNR Time-of-Year restrictions for all work that occurs within waterways. All waterways within the proposed Build Alternatives area of surface disturbance are classified as Use I or Use I-P waters, which MDNR suggested should avoid work within the channel between February 15 and June 15, inclusive, during any year.
- Use of temporary bridge crossings over smaller waterways. Where practicable, bridge crossings will be installed perpendicular to the waterway. If a bridge cannot be installed without impact to the waterway, a diversion will be set up and the site dewatered.
- Proposed low-water fords for crossing small streams will be limited to areas where the streambed has a firm bottom and/or stable material, and where fish passage is less of a concern. These measures will require coordination with the MDE to maintain in accordance with their “no work in the wet” policy for all stream activities which includes mechanized equipment crossing of streams.
- If instream work cannot be avoided the use of cofferdams will be evaluated. This is a system in which a watertight enclosure can be pumped dry to allow construction work to happen below the waterline, while the remainder of the waterway can flow freely to allow fish passage.
- Placement of ground protection matting over wetland and wetland buffers.

- Vegetation clearing required for construction activities will attempt to fell trees away from streams or wetlands to prevent organic debris from entering the wetland or waterway, as well as avoid rutting and soil disturbance.

If the long-term construction laydown area near MD 200 and I-95 is used during construction, the Project Sponsor will refine site development design after conducting wetland and waterway delineations. With consideration of ESD and planning to strategically locate entrances, storage, and other site uses, and with implementation of onsite BMPs, the Project Sponsor will avoid all permanent impacts to these resources.

4.11.5.2 Mitigation

All Build Alternatives would result in wetland and waterway impacts and would require a permit under Section 404 of the CWA. Mitigation for wetland loss may include a combination of onsite and offsite wetland mitigation. As per NPS regulations, any impacts to wetlands on NPS property will also require a Statement of Findings. The NPS will be consulted on proposed methods of mitigation on NPS lands.

Additional field surveys and agency coordination is required within areas of NTWSSC to receive final concurrence on delineation of boundaries. This final determination will support final design efforts to avoid and minimize impacts to these systems. For impacts to NTWSSC, additional protections, such as 100-foot buffers would be required. NTWSSC also receive higher mitigation ratios than other nontidal wetlands.

At PRR, the Project Sponsor will coordinate with USFWS to finalize delineations of vernal pools and other sensitive wetlands to establish, as feasible, protective buffer zones for resources within and adjacent to the LOD.

The Project Sponsor is currently pursuing possible mitigation strategies to satisfy anticipated compensatory mitigation that will be required for impacts to wetland and waterways. The USACE has a hierarchical preference for wetland mitigations: purchase of wetland credits from an approved mitigation bank; in-kind mitigation (i.e. restored PFO for impacted PFO); and out-of-kind mitigation. Mitigation is always preferred within the same watershed as the impact occurs, if possible. Coordination with the USACE and MDE is ongoing, and additional detail on mitigation proposed is anticipated prior to completion of a Final Environmental Impact Statement. Additional mitigation strategies that would be considered during final design and construction planning may include:

- Onsite re-establishment of wetland habitat, where feasible
- Onsite re-establishment of forested wetland habitat, where feasible, including planting of trees of appropriate mature height under the guideway to provide contiguous canopy while maintaining the 13-foot clearance beneath the structure
- Offsite wetland mitigation, whether through banking or permittee-created wetlands within the watersheds
- Onsite and offsite restoration of degraded stream reaches associated with the major river systems

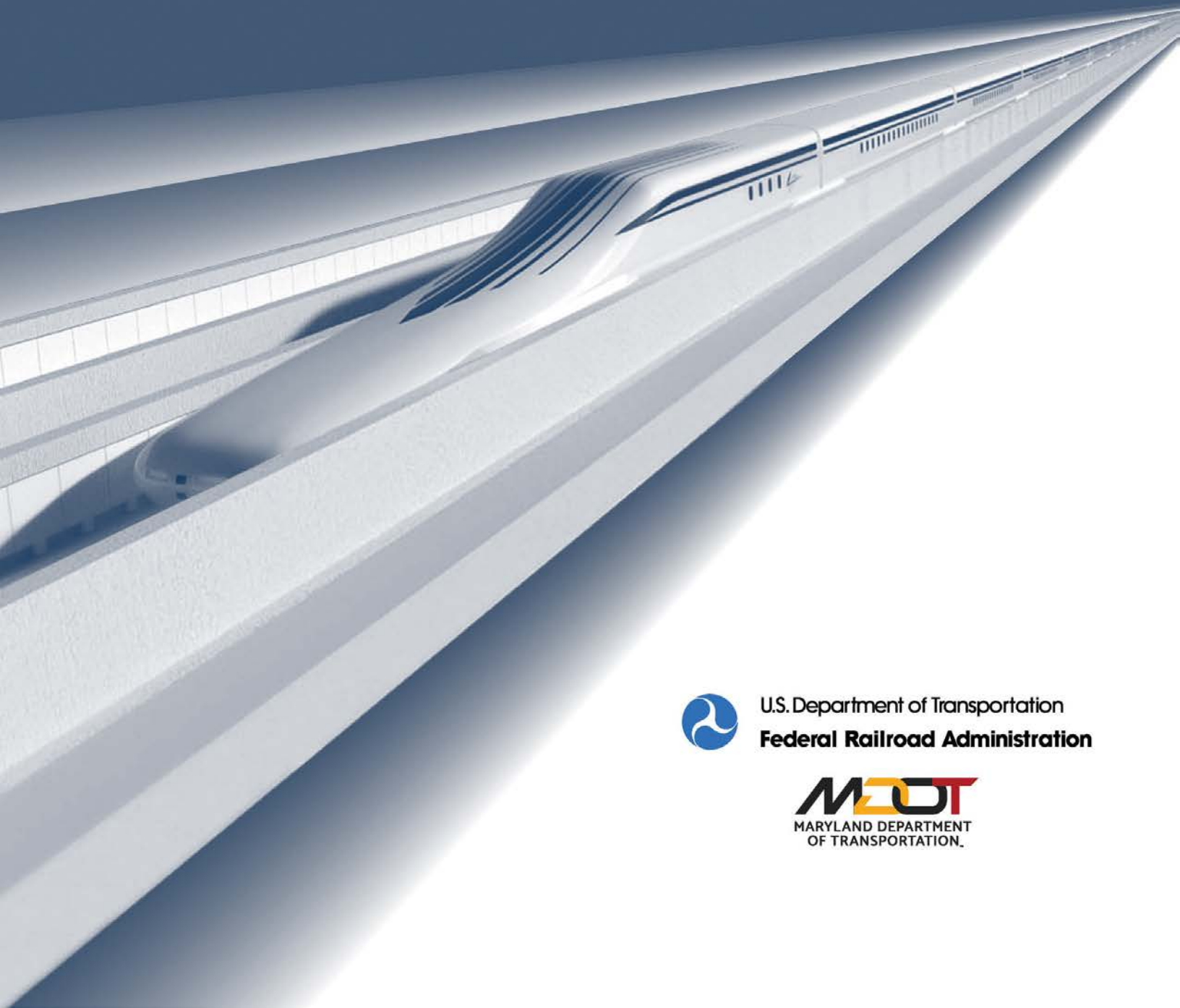
- Coordination with MDE and USFWS to determine compensatory mitigation value and restoration opportunities for unavoidable impacts to NTWSSC and other high-value wetlands and waterways at PRR
- Coordination with MDNR and county and local municipalities to identify wetland and waterway restoration priorities
- Purchasing of intact wetland complexes for placement in perpetual easement
- Invasive species management of onsite and adjacent habitats
- Funding ecological research and restoration at PRR and BARC
- Dam removal per USACE Regulatory Guidance Letter (September 25, 2018)

Additional information on these strategies can be found in Appendix D.7 NETR.

Section 4.12

Ecological Resources

BALTIMORE-WASHINGTON SUPERCONDUCTING MAGLEV PROJECT DRAFT ENVIRONMENTAL IMPACT STATEMENT AND SECTION 4(f) EVALUATION



U.S. Department of Transportation
Federal Railroad Administration



4.12 Ecological Resources

4.12.1 Introduction

This section describes the regulatory context and methodology the Federal Railroad Administration (FRA) used to evaluate the Superconducting Magnetic Levitation Project (SCMAGLEV Project) effects to ecological resources and minimization and mitigation measures that would reduce impacts to these resources. This study of ecological resources includes an analysis of the relationships between living things and their environment. The Natural Environmental Technical Report (NETR) with supplemental detail is provided in Appendix D.7. FRA has included the following dominant resources in this analysis:

- **Forest** – As defined by the Maryland Department of Natural Resources (MDNR), a forest is “a biological community dominated by trees and other woody plants covering a land area of 10,000 square feet or greater.”¹
- **Forest Interior Dwelling Species (FIDS) Habitat** – Habitat supporting bird species that depend upon large, contiguous forested habitat to successfully breed and produce sustainable populations.
- **Terrestrial and Aquatic Wildlife** – Species living on land and species living in waters.
- **Rare, Threatened, or Endangered (RTE) Species** – Species that may be the rarest or the most in need of conservation (at the Federal and/or state level), which are provided a designated status under the Endangered Species Act (ESA) of 1973 and/or granted additional protections by the government. Critical habitats for RTE species are also protected.
- **Sensitive Species Project Review Areas (SSPRA)** – State-wide database developed and maintained by the MDNR Wildlife and Heritage Service (WHS) to aggregate and portray state and locally significant habitat areas, often including habitat for RTE species.

4.12.2 Regulatory Context and Methodology

4.12.2.1 Regulatory Context

In accordance with the National Environmental Policy Act (NEPA), 42 U.S.C. § 4321 et seq., the Council on Environmental Quality (CEQ) regulations, 40 C.F.R. Parts 1500 - 1508, and FRAs Procedures for Considering Environmental Impacts, 64 Fed. Reg. 28545 (May 26, 1999), FRA assessed both construction period (short-term impacts) and long-term impacts of the Build Alternatives on wildlife and vegetation in the SCMAGLEV Project Affected Environment. FRA’s analysis of ecological resources considered

¹ Maryland Department of Natural Resources (MDNR). 1997. *State Forest Conservation Technical Manual*, Maryland Department of Natural Resources, Third Edition, 1997.

comments received by state and Federal agencies, specifically the United States Fish and Wildlife Service (USFWS) and MDNR through coordination meetings, and considers the various applicable laws and regulations governing ecological resources, including but not limited to:

- ESA 16 U.S.C. § 1531 et seq
- Maryland Forest Conservation Act regulations and Nongame and Endangered Species Conservation Act of 1975, COMAR 08.03.08
- Fish and Wildlife Coordination Act, 16 U.S.C. § 661-667e; Bald and Golden Eagle Protection Act, 16 U.S.C. § 668-668c; and Migratory Bird Treaty Act, 16 U.S.C. § 703-712. May require approval of the Migratory Bird Conservation Commission.
- Magnuson-Stevens Fishery Conservation and Management Act, 16 U.S.C. § 1801 et seq
- Executive Orders 13112 (Feb. 3, 1999), and 13751 (Dec. 5, 2016)

Additional discussion regarding ESA Section 7 consultation with USFWS is provided in Section 4.12.5.

4.12.2.2 Methodology

FRA analyzed ecological resources within the SCMAGLEV Project Affected Environment to evaluate the presence of vegetated communities and specifically the condition of forests (including FIDS habitat), terrestrial and aquatic wildlife and habitat, and RTE species and habitat. FRA defined the SCMAGLEV Project Affected Environment for ecological resources as the limits of operational/physical disturbance impact area, as well as the construction related impact area, which includes additional areas of temporary disturbance required for construction activities. These impact areas comprise the overall limit of disturbance (LOD) of the SCMAGLEV Project Build Alternatives which includes all surface and subsurface elements, and FRA included an additional 30-foot buffer around the LOD to be consistent with the area evaluated for specific wetland and water resources and capturing the adjacent habitat that may be affected by the SCMAGLEV Project. FRA qualitatively evaluated permanent and temporary impacts as well as direct and indirect effects to these resources, with additional quantitative analysis conducted for forest, FIDS habitat, and SSPRA impacts. To conduct this evaluation, FRA sought information via the following resources:

- Federal and state statutes; local and regional agency policies and ordinances; published Geographic Information Systems (GIS) databases; and aerial imagery.
- Results of FRA field visits conducted between 2018 and 2020 to characterize habitat types within the SCMAGLEV Project Affected Environment. FRA identified upland field/meadow, scrub-shrub, and forested habitats, in addition to wetlands and waterways, all of which support common terrestrial and aquatic wildlife.

- Federal and state resource agency correspondence and meetings, which yielded agency input regarding species and habitats monitored for conservation located within or adjacent to the SCMAGLEV Project Affected Environment (see Appendix D.7 NETR Agency Correspondence).
- Available regional transportation project published NEPA documents.

The USACE's Public Interest Review considers fish and wildlife values to aid their evaluation of projects that have submitted a permit application. FRA has considered these values and provided an evaluation of impacts in Section 4.12.4 Environmental Consequences.

In accordance with Section 7 of the ESA, FRA queried the USFWS Information for Planning and Consultation (IPaC) online system to identify federally listed RTE species and their habitats within the SCMAGLEV Project Affected Environment. FRA contacted MDNR WHS to identify any known occurrences of state listed RTE species and their associated habitats within the SCMAGLEV Project Affected Environment. FRA reviewed MDNR GIS data for SSPRA locations and accessed Maryland Biological Stream Survey (MBSS) data to assess aquatic habitat for waterways within and adjacent to the SCMAGLEV Project Affected Environment. Although wetlands and waterways habitat are discussed in this section, impacts to these resources were specifically addressed in Section 4.11 Wetlands and Waterways. Similarly, because the variability of water quality is highly correlated with the quality of and impacts to vegetated habitats, this section is also supported by Section 4.10 Water Resources.

4.12.3 SCMAGLEV Project Affected Environment

Ecological resources within the SCMAGLEV Project Affected Environment include terrestrial and aquatic habitats associated with forests (including FIDS habitat), fields/meadows, scrub-shrub areas, aquatic environments, and SSPRAs (including RTE species habitat). **Table 4.12-1** provides a summary of habitat types and their quantified presence within each SCMAGLEV Project Build Alternatives Affected Environment.

FRA identified forest as the dominant ecological resource in the portions of the SCMAGLEV Project Affected Environment in Prince George's County and Anne Arundel County, including deciduous and coniferous vegetative communities, with several areas of FIDS habitat (described in more detail below). FRA identified forest fragments or hedge rows as more common on the fringes of densely developed areas, often surrounding existing transportation systems and commercial/industrial businesses. Forested fragments and hedge rows include wooded areas, but do not meet the MDNR size and composition criteria of a forest.

Forested habitats, including forest fragments, and FIDS habitat are somewhat more prevalent in the SCMAGLEV Project Affected Environment of Build Alternatives associated with alignments J (at 581 to 663 acres for forests, and 490 to 573 acres for FIDS habitat) than in those associated with alignment J1 (at 519 to 618 acres for forests, and 397 to 475 acres for FIDS habitat).

Table 4.12-1: Presence of Habitat Types within the SCMAGLEV Project Affected Environment

Build Alternative	Forest (acres)	FIDS (acres)	Shrub-Scrub (acres)	Field (acres)	Aquatic (linear feet)*	SSPRA (acres)**
J-01	627	530	100	493	37,371	295
J-02	602	490	108	602	41,859	381
J-03	663	573	100	502	40,910	430
J-04	606	529	88	487	38,348	306
J-05	581	490	96	595	42,837	392
J-06	642	573	88	496	41,887	441
J1-01	618	461	29	486	38,363	291
J1-02	540	397	34	595	40,077	356
J1-03	596	475	26	494	39,256	392
J1-04	597	461	17	480	39,341	302
J1-05	519	397	22	589	41,054	367
J1-06	575	475	14	487	40,234	403

* Aquatic habitat is presented above as a function of linear feet of waterways, as presented in Section 4.11 Wetlands and Waterways.

** SSPRAs are not a specific habitat type, but instead can include any of the above listed habitat types. They are included in the table to indicate their presence in the SCMAGLEV Project Affected Environment.

Areas of roadway right-of-way (ROW) and utility crossings largely consist of meadow and scrub-shrub vegetation, which include low lying woody and herbaceous vegetation, no greater than 20 feet in height. Other areas of meadow habitat include fallow and maintained agricultural and recreational fields. On average, the SCMAGLEV Project Affected Environment for Build Alternatives associated with alignment J include 75 percent more scrub-shrub habitat than those associated with alignment J1. Acreage of field/meadow habitat across Build Alternatives is similar for those associated with alignments J and J1.

Aquatic habitats occur within the waterways (and adjacent wetland and floodplain systems) as identified in Section 4.11 Wetlands and Waterways. Depending on the Build Alternatives, linear feet of aquatic habitat ranges from approximately 37,00 to 42,000, with slightly more habitat areas occurring within Build Alternatives associated with the BARC West and BARC Airstrip TMF options.

The SCMAGLEV Project Affected Environment consists of areas of urbanized land with habitat fragments and roadside edges of larger forest systems. Noxious weeds and invasive species typically occur in, and often dominate, these disturbed habitat areas; however, interior areas of large, unfragmented forests and vegetated corridors typically exhibit little to no invasive species presence or dominance. FRA did not catalog noxious and invasive species within the project LOD. However, FRA does address the threat of

contaminating functioning native plant-based habitats through project-related disturbance and fragmentation in Section 4.12.4.

4.12.3.1 Forests and Forest Interior Dwelling Species Habitat

Forests and forest fragments are common throughout the SCMAGLEV Project Affected Environment and provide nesting, foraging, and refuge for wildlife including birds, fish, mammals, insects, reptiles, and amphibians. Forested riparian corridors provide wildlife passages and are the optimal vegetative cover for meeting water quality goals (see Section 4.12.3.2 for more information on wildlife habitat and Section 4.10 Water Resources for more information on water quality). MDNR identifies mesic mixed hardwood and Coastal Plain oak-pine forests as the primary forested wildlife habitats within the SCMAGLEV Project Affected Environment.² In addition to functioning as habitat, forests help to enhance water quality and air quality and promote human health and recreation. According to the USFWS, important communities of chestnut oak (*Quercus montana*) and other mature native tree species of substantial size (greater than 24 inches diameter at breast-height) have been identified on Patuxent Research Refuge (PRR) lands.

Depending on the Build Alternatives, the SCMAGLEV Project Affected Environment includes 31 to 39 existing forest conservation areas (one in Prince George's County and 38 in Anne Arundel County), which provide compliance with the Maryland Forest Conservation Act (FCA). These areas are preserved and/or reforested areas under long-term protective easements for compensation for forest impacts. Forest conservation easements are maintained at the state and county levels. Additionally, there is a Maryland Environmental Trust Easement that occurs at the eastern end of the MD 198 trainset maintenance facility (TMF). This easement is associated with high quality forested habitat identified for conservation. With continued design and refinement of alternatives the Project Sponsor will complete a Forest Stand Delineation (FSD) and survey for specimen trees, which are defined as trees having a diameter measured at 4.5 feet above the ground of 30 inches or more, or trees having 75 percent or more of the diameter of the current state champion tree. During field investigations between 2018 and 2020, FRA observed specimen trees within the SCMAGLEV Project Affected Environment, commonly consisting of tulip poplar (*Liriodendron tulipifera*), northern red oak (*Quercus rubra*), and white oak (*Quercus alba*). Required compliance with the FCA is discussed in greater detail in Section 4.12.5.

FIDS depend upon large, contiguous forest to successfully breed and produce sustainable populations. FIDS include migratory songbirds, warblers, the barred owl, and various hawks and woodpeckers. According to a Critical Area Commission for the

² MDNR. 2015. *Maryland State Wildlife Action Plan*. Annapolis, Maryland. Available at: https://dnr.maryland.gov/wildlife/Pages/plants_wildlife/SWAP_Submission.aspx

Chesapeake and Atlantic Coastal Bays guidance document³, FIDS habitat includes a forest tract that meets either of the following conditions:

- Greater than 50 acres in size and containing at least 10 acres of forest interior habitat (forest greater than 300 feet from the nearest forest edge); or
- Riparian forests that are, on average, at least 300 feet in total width and greater than 50 acres in total forest area. The stream within the riparian forest must be perennial.

Historically, there has been an overall decline of bird species populations dependent on FIDS habitat and acreage of this habitat type in the Mid-Atlantic Region. FRA identified areas of forest and FIDS habitat most notably adjacent to the Baltimore-Washington Parkway (BWP) within the National Park Service (NPS) property, Beltsville Agricultural Research Center (BARC), PRR, Fort George G. Meade, City of Greenbelt properties, and north of MD 198 on and in the vicinity of the MD 198 TMF site. Other notable areas of forest and FIDS habitat are located along Veterans Parkway (MD 410), at National Aeronautics and Space Administration (NASA) property at Goddard Space Flight Center (GSFC) and at NASA land leased from BARC, at county parks and open spaces (Springfield and Maryland City Parks, and Tipton Airport), at Patuxent River Park, and within Washington Suburban Sanitary Commission (WSSC) property. FRA used the MDNR FIDS GIS database to map areas of FIDS.⁴ FIDS identified in PRR include, but are not limited to, warblers and thrushes such as the Kentucky warbler (*Geothlypis formosa*), Nashville warbler (*Leiothlypis ruficapilla*), Swainson's thrush (*Catharus ustulatus*), wood thrush (*Hylocichla mustelina*), and northern parula (*Setophaga americana*). In a letter dated August 5, 2020, USFWS indicated the presence of other "sensitive terrestrial and aquatic communities associated with forest such as vernal pools, sphagnum bogs, and heath communities."

4.12.3.2 Terrestrial and Aquatic Wildlife

The SCMAGLEV Project Affected Environment contains multiple habitat types ranging from small, vegetated fragments with marginal resource value to large habitat corridors with exceptional resource value that support common and rare wildlife. Migrating and resident birds, including FIDS and raptors, are dependent on small and large areas of vegetation for foraging and nesting. A diversity of terrestrial and aquatic fauna is reliant on vegetated riparian habitats for uninterrupted access to resources within waterways and adjacent wetlands and uplands. During field investigations, FRA identified upland field/meadow, scrub-shrub, and forested habitats, in addition to wetlands and waterways, all of which support common terrestrial and aquatic wildlife. The MDNR Environmental Review Unit (ERU) identified the following aquatic resources and habitat

³ Critical Area Commission (CAC) for the Chesapeake and Atlantic Coastal Bays. 2000. *A Guide to the Conservation of Forest Interior Dwelling Birds in the Chesapeake Bay Critical Area*. Available at: http://dnr2.maryland.gov/education/Documents/tweetyjune_2000.pdf

⁴ MDNR. 2013. Maryland Living Resources - Forest Interior Dwelling Species. Feature Service Link: https://geodata.md.gov/imap/rest/services/Biota/MD_LivingResources/FeatureServer/10

within the SCMAGLEV Project Affected Environment: anadromous fish habitat from tidal waters into major stream systems; black bass and largemouth bass fisheries in the tidal areas; American eel habitat; and stocked trout management areas. According to MBSS data, most rivers and streams intersecting the SCMAGLEV Project are characterized as supporting fish and benthic macroinvertebrate communities with high pollutant/impact tolerance. Other streams were noted to support several sensitive fish and benthic species or have suboptimal instream habitat and poor amounts of stable substrate for benthic species colonization. A study completed at PRR in 2009 also indicated relatively poor biological health of streams based on benthic macroinvertebrate populations; however, the study did show good habitat scores with most of the land cover identified as pervious and forested. This study concluded that the biological communities in these streams may still be recovering from past impacts on the property prior to PRR ownership⁵ as this correlation is not necessarily what is expected.

MDNR WHS identified two large Nontidal Wetlands of Special State Concern (NTWSSC) and great blue heron (GBH) colonies near the Little Patuxent River, Patuxent River, and Beaverdam Creek crossings. An additional GBH colony occurs within the SCMAGLEV Project Affected Environment in the vicinity of the MD 198 TMF. The NTWSSCs support common and RTE species. Smaller wetlands present within the SCMAGLEV Project Affected Environment include vernal pools critical for amphibian breeding and nesting, and emergent, forested, and marsh wetlands that support a wide variety of aquatic and terrestrial wildlife. As discussed in Section 4.10 Water Resources, MDNR identified the Little Patuxent as a Stronghold Watershed, a designation for “watersheds around the State that are the most important for the protection of Maryland’s aquatic biodiversity. These locations are the places where rare, threatened, or endangered species of fish, amphibians, reptiles or mussels have the highest numbers.”⁶

The USFWS IPaC report states that there are migratory birds of conservation concern protected under the Migratory Bird Treaty Act within the SCMAGLEV Project Affected Environment but did not identify critical habitats or fish hatcheries. Potential impacts to PRR, which encompasses a diversity of habitats, would necessitate coordination with PRR, a designated National Wildlife Refuge as discussed in Section 4.7 Recreational Facilities and Parklands and Appendix F Section 4(f). At PRR, USFWS manages vegetation beneath the Baltimore Gas and Electric (BGE) right-of-way (ROW) to promote and maintain scrub-shrub habitat, which functions as necessary habitat for shrub-nesting bird species. USFWS has noted that, in addition to FIDS species, PRR forests support active communities of bats, and has also identified that management of PRR habitats for pollinator species is a high priority for the Refuge. See Appendix D.7 NETR Agency Coordination for PRR species and habitats of concern.

⁵ Anne Arundel County Department of Public Works Bureau of Engineering Watershed, Ecosystem, and Restoration Services. 2009. *Assessment of the biological health of streams on the Patuxent Research Refuge within Anne Arundel County, Maryland*.

⁶ <https://dnr.maryland.gov/streams/Pages/streamhealth/Maryland-Stronghold-Watersheds.aspx>

Information obtained from the Maryland Bird Conservation Partnership online mapping program indicates two assigned bald eagle nest locations less than one mile of the SCMAGLEV Project Affected Environment. Bald eagles do not rely on large tracts of forest as FIDS do, instead they can often be found along a forest edge, usually near a water source such as a lake, marsh, or coastline. Although bald eagles are no longer considered an RTE species, Maryland continues to survey existing nesting sites and promote sound design practices to limit the effects of development to habitat and to limit disturbance during nesting season.

4.12.3.3 Rare, Threatened, and Endangered (RTE) Species

Several habitats that support RTE species exist in the SCMAGLEV Project Affected Environment, most notably in larger natural forested tracts in Anne Arundel and Prince George's Counties as described previously. Through the IPaC report and coordination with USFWS and MDNR WHS, FRA has identified the following Federal and state listed species and habitats:

- Northern long-eared bat (*Myotis septentrionalis*): This Federally listed threatened species is identified through the IPaC report and requires live and standing dead hardwood trees for summer roosting habitat.
- Swamp pink (*Helonias bullata*): This Federally and state listed plant species is identified through the IPaC report and specifically identified by MDNR WHS as occurring in the Harmans area in Anne Arundel County. According to MDNR WHS (October 22, 2020 letter), this species typically occurs in "perennially saturated nontidal wetland habitat, including forested wet depressions, spring seeps, bogs, wet meadows and margins of small streams, but has very specific hydrological requirements."
- American peregrine falcon (*Falco peregrinus anatum*): This state-listed species is identified by the MDNR WHS as In Need of Conservation and occurring at a nest site in downtown Baltimore.
- Little Patuxent River and Vicinity:

Dorsey Run forms the headwaters of the Little Patuxent River and supports two state-listed Threatened fish species, glassy darter (*Etheostoma vitreum*) and American brook lamprey (*Lethenteron appendix*), both "found in the sandy, gravelly river bottom and spawn in the riffles" (MDNR WHS October 22, 2020 letter).

The segment of the Little Patuxent River within and downstream of the SCMAGLEV Project Affected Environment also supports the glassy darter and American brook lamprey, as well as white catfish (*Ameiurus catus*), which is identified by DNR WHS as possibly rare, and fifteen RTE dragonfly species.

- Patuxent River and Vicinity:

Upstream and downstream of the SCMAGLEV Project Affected Environment, the Patuxent also supports American brook lamprey and is designated as a

Stronghold watershed due to presence and abundance of glassy darter populations.

An extensive NTWSSC at PRR along the Patuxent River provides habitat for state-listed species: ten odonate (dragonfly and damselfly) species, two RTE fish species, and one RTE plant species.

A globally rare natural community (coastal plain oak floodplain forest) occurs within the SCMAGLEV Project Affected Environment west of the BWP, north of the Patuxent River.

- Beaverdam Creek and Vicinity:

In the area of the BARC West TMF, MDNR has identified two RTE plant species, white fringed orchid (*Platanthera blephariglottis* var. *blephariglottis*) and northern pitcher-plant (*Sarracenia purpurea*), both associated with high quality wetlands. This area also supports the American brook lamprey and three RTE odonate species.

A highly globally rare/imperiled woodland community (pine barrens pine-oak woodland) occurs east and west of the BWP. The Beaverdam Creek NTWSSC extends east and west of the BWP along Beaverdam Creek and Beck Branch. Within and adjacent to the SCMAGLEV Project Affected Environment, this NTWSSC provides habitat for three RTE odonate species, one RTE fish species, white fringed orchid, a globally critically imperiled natural community (coastal plain-piedmont acidic seepage swamp), and a globally imperiled natural community (coastal plain-piedmont acidic seepage fen).

The area of the BARC Airstrip TMF also falls within the drainage area of another NTWSSC near Telegraph Road, which supports three RTE odonate species.

Additional RTE species observations on BARC property within one mile of the SCMAGLEV Project Affected Environment include a state-listed endangered odonate species and nine other RTE plant species.

In addition to the RTE species identified by USFWS and MDNR above, PRR staff notified FRA of the presence of vernal pools, spring-fed wetland complexes, and forest stream complexes containing RTE and other at-risk plant and animal species. Yellow lance (*Elliptio lanceolate*), a Federally endangered mussel species, has been found in surveys of the Patuxent River on the PRR property. Spotted turtle (*Clemmys guttata*), which is a petitioned species for listing, and eastern box turtle (*Terrapene carolina carolina*), a designated species of greatest conservation need, have also been known to use the habitats within PRR. Refer to RTE and coordination letters with detailed information in Appendix D.7 NETR Agency Correspondence.

In addition to those species identified above, BARC staff notified FRA of the presence of unique forest communities supporting pitch pine (*Pinus rigida*) and dwarf chinquapin oak (*Quercus prinoides*).

Based on published information from previous regional transportation projects, the following RTE plant species have been documented in the area associated with the long-term construction laydown area near MD 200 and I-95: state-endangered low rough aster (*Eurybia radula*) and state-threatened long-stalk greenbrier (*Smilax pseudochina*). Due to the presence of these species, a protective easement is in place. With receipt of additional MDNR coordination, these species and protections can be confirmed.

RTE species are typically associated with high quality, contiguous habitats and are sensitive to habitat disturbance and fragmentation. Therefore, potential RTE species habitat, beyond those areas identified above, may occur within the SCMAGLEV Project Affected Environment in large undeveloped areas and corridors, as illustrated in Appendix B.3 Natural Resources Mapping Atlas, including aquatic and upland forested areas near Fort Lincoln Park; along the Anacostia River and its adjacent floodplain parks (including Bladensburg South Park), along Veterans Highway near Martins Wood Park, south of the southern tunnel portals, between BARC and PRR, on Fort George G. Meade military base, along Stony Run and tributaries south of Baltimore-Washington International Thurgood Marshall Airport (BWI Marshall Airport), and along the Patapsco River and its adjacent floodplain parks. As Build Alternatives are refined, the Project Sponsor will coordinate with MDNR and USFWS to identify areas for more detailed surveys for RTE and sensitive species and habitats.

Sensitive Species Project Review Area

SSPRAs are state and locally significant habitat areas including RTE species and their habitats, Natural Heritage areas, colonial water bird sites, NTWSSCs, habitat protection areas, areas subject to Critical Area review, and geographic areas of concern. Species and resources are categorized into one of four SSPRA Groups depending on their level of regulation and protection. Groups 1 and 2 contain species that are officially regulated, with federally listed threatened or endangered species classified as Group 1, and state-listed species and their habitats classified as Group 2. Group 3 includes species or resources of concern to MDNR that lack a Federal- or state-regulated status. Group 4 includes areas with bald eagle nests and suitable surrounding habitat. Because SSPRA are designated by the MDNR, none are identified in Washington, D.C.

FRA identified the following SSPRAs within the SCMAGLEV Project Affected Environment, as illustrated on mapping in Appendix B.3:

- Baltimore City: A Group 2 SSPRA, likely associated with the peregrine falcon nest site, is located in the area proposed as the Camden Yards Station.
- Anne Arundel County: A Group 1 SSPRA is near the SCMAGLEV Project's intersection with Ridge Road (MD 713) which is likely associated with the swamp pink site. A Group 2 SSPRA is near the SCMAGLEV Project's intersection with the Little Patuxent River north of MD 198 (TMF site) and its intersection with PRR property just south of MD 198, likely associated with the NTWSSC downstream of the SCMAGLEV Project. This Group 2 SSPRA also intersects the headwaters

and wetlands on the Fort George G. Meade property. A small Group 3 SSPRA is also located at the eastern end of the MD 198 TMF along the Little Patuxent River.

- Anne Arundel and Prince George's County boundary: A large Group 2 SSPRA is partially within PRR, likely associated with the NTWSSC along the Patuxent River.
- Prince George's County: A large Group 2 SSPRA encompasses much of the BARC property, north of Powder Mill Road to south of Beaver Dam Road, including a portion of Springfield Park, likely associated with the NTWSSC along Beaverdam Creek. Another larger Group 2 SSPRA intersects the long-term construction laydown area near MD 200 and I-95, likely associated with state-listed plant species identified during previous regional transportation project coordination.

4.12.4 Environmental Consequences

FRA evaluated the potential impacts to ecological resources as a result of the Build Alternatives. FRA concluded that impacts would occur in areas with surface disturbance to forests and other habitat components. The greatest potential direct impacts would occur in areas where permanent structures would replace habitat, in areas of vegetation removal or alteration of habitat (e.g., shading of normally open areas or forest fragmentation), and destruction of individual plants or animal habitats during construction. These impacts can be permanent, such as fill in wetlands, or temporary, such as alterations of habitat during construction that can be re-established when construction ends.

Indirect impacts include degradation of water quality or hydrologic changes on aquatic organisms. Indirect impacts also include effects of habitat disturbance, such as vegetation clearing and noise, on habitats and species beyond those immediately within and adjacent to the SCMAGLEV Project LOD. FRA considered some of these effects to be temporary and identified appropriate measures the Project Sponsor will apply to mitigate indirect impacts.

FRA examined operational impacts that would result from ongoing, routine, and occasional activities associated with the SCMAGLEV Project and related services, as well as short-term impacts during SCMAGLEV Project construction. FRA's analysis focused on the following potential impacts:

- Changes in migration patterns and accessibility of habitat to fish, wildlife, or sensitive species.
- Current conditions of natural habitats and their proximity to the SCMAGLEV Project and how that could change important habitat characteristics (for example, water and air quality, noise and vibration, and water resources).

- The type and amount of habitat and potential impacts by direct removal, filling, hydrological interruption, or other means.
- Sensitivity of ecological conditions that may rely on soil type, quality, or characteristics specific to the area.

4.12.4.1 No Build Alternative

Under the No Build Alternative, the SCMAGLEV Project would not be built and no impacts related to the construction or operation of the SCMAGLEV would occur. However, other planned and funded transportation projects would continue to be implemented in the area and could result in effects to ecological resources including disturbance to forest, FIDS habitat, RTE species, and habitat for other flora and fauna.

4.12.4.2 Build Alternatives

The Build Alternatives would result in direct and indirect impacts to ecological resources. The subsections below describe potential SCMAGLEV Project impacts to forests and FIDS habitat, terrestrial and aquatic wildlife, and RTE species.

Summary of Build Alternative Impacts

- Build Alternatives J-01 through J-06 would result in forest, FIDS, and other sensitive species habitat impacts at PRR, a National Wildlife Refuge. Build Alternatives J1-01 through J1-06 would not result in impacts to PRR.
- Build Alternatives J1-01 through J1-06 would result in an estimated 40 acres of forest habitat impacts on City of Greenbelt property and an estimated 5 to 16 acres of forest impacts on MNCPPC park property, depending on the Build Alternatives. Build Alternatives J-01 through J-06 would not result in impacts to these properties.
- The three TMF options would result in substantial impacts to forest, FIDS habitat, and SSPRAs. The BARC Airstrip TMF option would be the least impactful, with just under 100 acres of forest impact and approximately 93 acres of FIDS habitat. The other TMF options (BARC West and MD 198) would each impact over approximately 150 acres of forest and FIDS habitat. For SSPRAs, the MD 198 TMF would result in the fewest impacts at 59 acres, and BARC West would result in the greatest impacts at 157 acres.
- All Build Alternatives would impact forest, FIDS habitat, and SSPRAs along NPS property, but those associated with the Build Alternatives J1 would incur greater impacts (46 to 47 acres) to SSPRAs than those associated with the Build Alternatives J (31 to 35 acres).

Forest and Forest Interior Dwelling Species

Clearing of forest and mature trees, even if replanted, would result in long-term impacts to adjacent and surrounding forest resources. Re-establishment of contiguous forest requires decades of woody and herbaceous plant growth and species succession, which can be undermined by competition from invasive vines and trees adapted to such

disturbances. Adjacent forested areas not cleared as part of the SCMAGLEV Project may convert to fragmented forest unsuitable for FIDS. Edge forest habitat, while supportive of common avian and other wildlife species, allows for the introduction of invasive birds and plants that reduce the viability of FIDS habitat.

With the removal of forest and FIDS habitat, noise associated with the operation of trains and ancillary facilities may also negatively affect FIDS species, which are adapted to interior forests buffered from the sounds of transportation and other human activities. Increased anthropogenic noise has the potential to disrupt typical species behavior, such as vocal communication and foraging, and result in reduced species abundance and fitness.⁷ Potential noise mitigation measures are discussed in Section 4.17 Noise and Vibration. Similar impacts may result from increased light pollution, which refers to the introduction of artificial light into these newly denuded forests. These species effects are discussed below.

An indirect impact of forest and FIDS habitat loss is the potential for change in species composition and a decrease in biodiversity, with a less complex vegetative structure. This change may result from increased light and wind or a decrease in humidity. There is then the potential for a ripple effect to other species in the area, both flora and fauna. These changes can make the ecosystem more vulnerable to invasive species and introduce more competing or predatory edge species. According to the CAC guidance, FIDS can help control insect numbers, insects that can prove harmful to human health, such as those which may carry disease. Refer to Appendix D.7 NETR impact summary tables for a numerical breakdown of the impacts to forest and FIDS proposed per each Build Alternative with the individual alignment, station and TMF options and the following subsections describe these impacts.

The quantitative analysis of forest and FIDS provides acreage within the LOD of surface features only, which includes elevated viaduct and piers, transition portals and areas of cut and cover, maintenance-of-way (MOW) and fresh air/emergency egress (FA/EE) facilities, miscellaneous systems features, and TMFs. FRA recognizes however that FIDS may be impacted beyond these limits in many areas beyond the LOD, as much as 300 feet, as noted previously is the favorable forest conditions for FIDS. Refer to Appendix D.7 NETR for more detailed qualitative and site-specific description of potential FIDS impacts.

FRA will consider Site Design Guidelines published by the CAC for protection, minimization, and mitigation for the loss of FIDS habitat. It is anticipated that there would be an adverse effect on forest and FIDS as a result of the SCMAGLEV Project, however minimization and mitigation measures are viable as described further in Section 4.12.5.

⁷ A synthesis of two decades of research documenting the effects of noise on wildlife. Available at <https://doi.org/10.1111/brv.12207>. Accessed 9/4/20.

Alignments

Forest clearing, grading, and land development associated with the alignments would directly remove forest and FIDS habitat. Build Alternatives J alignments would have approximately 30 percent more impacts to forests and approximately 50 percent more impacts to FIDS habitat than Build Alternatives J1 alignments. See Appendix D.7 NETR impact summary tables for additional calculations on public property (primarily Federal and local properties), which generally encompass the largest areas of contiguous forest. Distinguishing factors for impacts to forest and FIDS include the following:

- The greater forest and FIDS impact with the Build Alternatives J alignments is largely due to the amount of contiguous forest impacts proposed on PRR (only impacted by the Build Alternatives J alignments) and Fort George G. Meade / NSA properties (larger impacts from Build Alternatives J alignments). Forest impacts on Fort George G. Meade property would diminish and fragment the forested buffer and wildlife corridor that separates the military base from the BWP.
- Although Build Alternatives J1-01 through J1-06 have less overall forest and FIDS habitat impacts, only the Build Alternatives J1 alignments would result in forest clearing on City of Greenbelt property (approximately 40 acres) and at Maryland City and Patuxent River Parks in Anne Arundel County and Prince George's County, respectively.
- Local property/park impacts with the Build Alternatives J1 alignments are smaller in size and existing acreage than the larger Federal properties and would experience a greater percent loss of forest per property, and remove existing forest buffers between more residential land uses and the existing transportation corridor along BWP.
- Approximately 12.5 acres of forest would be removed from Maryland City Park for the MOW associated with J1-01 through J1-04. The same acreage of forest impact is proposed to NPS property for the MOW for J-01 through J-04.
- Although all Build Alternatives result in considerable impacts to contiguous forests on NPS and BARC properties, the alignments in these locations are closely associated with the existing forest edges along the BWP. FRA's intent with alignment selection along the existing transportation corridor was that it would decrease the acreage of forest impact required and attempt to avoid greater fragmentation.
- All Build Alternatives would result in impacts to forest conservation easements.
 - Those associated with Build Alternatives J1 alignments would result in greater acreage of impacts (approximately nine to 13 acres, versus approximately three to six acres from those associated with J alignments), specifically due to impacts from the portal, stormwater management facility, construction

laydown, and other SCMAGLEV Project elements proposed in Maryland City Park in Anne Arundel County.

- Despite the greater acreage of impacts, Build Alternatives J alignments would result in impacts to nine to 10 forest conservation easement parcels versus seven to 10 parcels for Build Alternatives J1 alignments.

Stations

The four stations associated with the Build Alternatives would not impact FIDS habitat, as the stations are in primarily unforested or already forest fragmented areas. However, between the Baltimore-area station options, the Cherry Hill Station would impact approximately 24 acres of forest and forest fragments, which is three times the impact associated with the Camden Yards Station. No forest impacts are associated with the Mount Vernon Square East or BWI Marshall Airport stations, and none of the four stations would impact forest conservation easements.

TMFs

All three TMF options would require extensive clearing of over 90 acres of forest and FIDS habitat. A comparison of the impacts includes the following:

- MD 198 and BARC West TMFs each have about 60 percent more forest impacts than the BARC Airstrip TMF.
- MD 198 and BARC West TMF are roughly comparable in their proposed FIDS habitat impacts of between 150 to 180 acres, respectively. The BARC Airstrip TMF results in fewer impacts to FIDS habitat (92 to 93 acres).
- The MD 198 TMF would result in approximately 20 acres of permanent impact to a Maryland Environmental Trust Easement.
- The MD 198 TMF would result in impacts to three to four forest conservation easements.

Both direct and indirect effects of deforestation as a result of any TMF have been discussed previously in Sections 4.10 Water Resources and 4.11 Wetlands and Waterways as well as detailed within this section below. In summary, these effects include, but are not limited to, forest fragmentation, changes in biodiversity, invasive species introduction, weather effects such as sunlight and wind, precipitation and stormwater, alteration in water chemistry and quality, and human effects from noise and artificial light.

Terrestrial and Aquatic Wildlife

The Build Alternatives would directly impact terrestrial and aquatic resources, including a diverse array of habitats for terrestrial and aquatic wildlife, primarily through the removal of habitat for the proposed above-ground structures. Removal of vegetation would temporarily (if restored post-construction) or permanently (if not) remove specific

forest, scrub-shrub, wetland and/or meadow habitats critical for the nesting, foraging, and refuge of migratory birds, raptors, reptiles, amphibians, bats, pollinator species, mammals, and other faunal species. Permanent fragmentation of habitat resulting from clearing and construction may undermine the viability of some wildlife populations and allow for the establishment and/or dominance of invasive species in areas currently valued for their native species communities. Indirect effects of the SCMAGLEV Project include potential changes in water quality, which could adversely affect state-monitored fisheries and further degrade benthic habitat in the major streams and tributaries within and downstream of the SCMAGLEV Project Affected Environment. Short-term and long-term displacement of plant and animal species would result in further loss of species diversity, which can disrupt food webs and create the potential for undesirable species introduced to the environment.

Fencing would be installed along discrete segments of the proposed ROW, including at tunnel transition portals, open cut sections, restricted areas associated with stations and facilities, other sensitive aboveground locations, and as needed for safety. Fencing proposed in low-development areas could impact wildlife habitat access and movement.

The effects of increased noise may affect not only FIDS that require a greater depth of forested habitat described previously, but other terrestrial and aquatic species. Some species are affected by increased noise in how they search for food, avoid predators, or seek a mate for reproduction. Species may have to adjust their vocal behaviors to adapt to the increased human sounds in their surroundings, which has the potential to affect their populations. Additional details regarding potential noise and/or vibration effects are included in Appendix D.7 NETR. Additionally, the effects of light pollution may affect species in areas where forest clearing has occurred and there has been an introduction to artificial lights. Humans and wildlife perceive light differently. Artificial light may also disrupt critical behaviors and cause physiological changes in wildlife.⁸ These effects can be difficult to measure and regulate, however there are studies that can provide guidelines to support design measures to reduce light pollution.

The following subsections describe terrestrial and aquatic wildlife impacts of the alignments, stations, and TMF, which generally align with the impact discussions associated with forest impacts, RTE impacts, and wetland and water resources impacts presented in Section 4.10 Water Resources and Section 4.11 Wetlands and Waterways.

Alignments

Build Alternatives J alignments would result in greater overall habitat impacts than those associated with the Build Alternative J1 alignments, primarily because it has a longer above-ground viaduct and includes direct impacts to PRR, in addition to BARC, NPS, and Fort George G. Meade/NSA properties, all large areas of existing natural

⁸ Australian Government Department of the Environment and Energy Department of Biodiversity, Conservation and Attractions. National Light Pollution Guidelines for Wildlife. January 2020 Version 1.0.

communities. The direct loss of habitat causes a direct loss of species who may rely on that habitat. Additional impacts of the proposed alignments include the following:

- Permanent clearing of forest canopy along the Build Alternatives J alignments at PRR may result in detrimental effects in areas supporting vernal pools, where USFWS staff and wetland delineation field assessments identified the presence of such habitat. This may affect the breeding success of local amphibian populations, particularly for species only adapted to a shaded environment.
- Build Alternatives J alignments would impact non-forested areas of PRR, particularly the BGE ROW that is managed for shrub-dependent bird species and pollinators.
- An assigned bald eagle nest is located approximately 2,000 feet from a proposed FA/EE associated with all Build Alternatives located immediately north of the Patapsco River and south of I-895. The alignment is located underground at this location. Existing noise levels near I-895 is 72 to 75 decibels (dBA). Future operational noise as evaluated and presented in greater detail in Section 4.17 Noise and Vibration, is estimated to be approximately 66 dBA, with temporary construction noises for the FA/EE reaching approximately 70 to 74 dBA. Therefore, the FA/EE is not anticipated to impact this resource, as the proposed structure would be located in an existing area of industrial and commercial development. The National Bald Eagle Management Guidelines advise against blasting within 0.5 miles of bald eagle nests during the breeding season. If blasting would be required for any construction, which would be assessed during future ground/geotechnical investigations, these impacts would be re-evaluated.
- Build Alternatives J alignments would directly impact the NTWSSC located on PRR, southeast of the viaduct crossing of the Patuxent River, with potential impacts to a GBH colony site.
- All Build Alternative alignments would directly impact the NTWSSC located on BARC property, associated with Beaverdam Creek. With the placement of piers potentially within these sensitive habitats and clearing of vegetation (including forests, as discussed above) for construction needs and potential continuing maintenance needs along the alignment, a direct impact would result to NTWSSC sensitive species.
- Water-related impacts associated with Build Alternatives J alignments crossing the Little Patuxent River upstream of the Patuxent River NTWSSC could result in indirect adverse effects to sensitive species and habitats.
- Impacts to waterways from the Build Alternative alignments may include shading of wetlands and streams by overpassing structures, increased sunlight from riparian vegetation removal, and potential waterway relocations necessary at various locations, such as for the Build Alternatives J alignments portal area at

Fort George G. Meade. These impacts may induce changes to water quality and hydrology due to grading, which could impact aquatic organisms and plant communities dependent on pre-construction hydrologic conditions.

Stations

The Mount Vernon Square East and BWI Marshall Airport Stations would have no impacts on terrestrial and aquatic wildlife, as these stations are in areas of urbanized land uses and impervious surfaces, not located near terrestrial and aquatic wildlife habitats.

Impacts to habitats associated with the Cherry Hill Station and Camden Yards Station would likely include shading of wetlands and streams by overpassing structures, increased sunlight from riparian vegetation removal, potential waterway relocations, and loss of remnant forest and hedgerow habitats. Features associated with both Baltimore area stations occur adjacent to the Gwynns Falls and Patapsco River (Middle Branch) and may result in impacts to remnant vegetative and aquatic habitats associated with these waterbodies.

TMFs

All three TMFs would impact diverse terrestrial and aquatic habitats primarily through clearing, grading, and creation of impervious surface. Each TMF proposes at least 90 acres of forest habitat removal and at least 20 acres of wetland impacts, including impacts to NTWSSC and other sensitive species habitats. Forest and water-related impacts associated with and surrounding tributaries at each TMF site could result in indirect adverse effects to sensitive species and habitats, with the same adverse impacts noted previously. Although the BARC Airstrip may result in 50 to 60 percent fewer acres of forest and FIDS habitat removal, this TMF option would result in the largest impact to the Beaverdam Creek NTWSSC, including disruption to the system's forested headwaters with new developed impervious surface.

Rare, Threatened, and Endangered Species

While efforts would be made to avoid and minimize impacts to RTE species and their habitats, each Build Alternative removes, fragments, disturbs, and/or otherwise affects sensitive wildlife habitats, specifically:

- Northern long-eared bat: Depending on the proximity of SCMAGLEV Project forest removal activities, locations of summer roosting areas may be directly or indirectly affected through immediate loss of forest or the presence of adjacent temporary construction disruption or new structures.
- Swamp pink: The Project Sponsor will avoid impacts to the swamp pink population and associated wetland hydrology near the Harmans area.
- Peregrine falcon: Project activity in downtown Baltimore is not expected to exceed typical noise or disturbance conditions associated with the nesting area.

- At PRR, BARC, and within NTWSSCs supporting RTE plant, odonate (dragonfly), and fish species, SCMAGLEV Project disturbance may result in direct impacts to rare natural communities and species populations that rely on forested uplands and wetlands, vernal pools, or riparian areas during any part of their life cycles, specifically:

RTE fish, odonate, and mussel species associated with Dorsey Run, Little Patuxent River, Patuxent River, Beaverdam Creek, and/or associated tributaries are particularly sensitive to sedimentation and siltation, disturbance to sand/gravel stream bed conditions, changes in hydrology, water quality degradation, increased stream temperatures, and loss of riparian vegetation. SCMAGLEV Project disturbance, including forest clearing, runoff from permanent structures, and stream crossings would result in direct and indirect impacts to RTE fish populations.

RTE odonate species associated with these waterways are “considered highly sensitive to changes in hydrology and water quality, especially during their aquatic larval stages,” according to MDNR WHS (October 22, 2020 letter). Important habitat elements include streambed habitat and riffles, small headwaters for life cycle migratory patterns, and perching areas along the shoreline.

- RTE plant species and globally rare natural communities associated with wetland hydrology, most notably along the Patuxent floodplain and throughout the BARC property, are particularly vulnerable to direct impacts from SCMAGLEV Project elements that will result in direct removal of vegetation, filling surface water areas, altering above and below ground hydrology, or contributing runoff to these areas. RTE plant species and globally rare natural communities associated with upland areas would also experience direct impacts resulting from vegetation removal and potentially from changes in grade.

Refer to agency correspondence in Appendix D.7 NETR for a list of all species that may be impacted by the project, as identified by the resource agencies. The SSPRAs that intersect the surface components of the Build Alternatives are closely associated with sensitive species and habitats described above (FIDS, NTWSSCs, RTE species, fisheries). Temporary and permanent impacts to SSPRAs are presented in Appendix D.7 NETR impact summary tables. RTE species are of particular concern as their declining populations or limited habitat may already be threatened. Therefore, the SCMAGLEV Project requires continued coordination with MDNR, National Marine Fisheries Service (NMFS), and USFWS, including ESA Section 7 consultation, to refine impacts, construction and design best management practices (BMPs), and mitigation plans, as discussed in Section 4.12.5. FRA anticipates that specific species surveys would be required throughout the SCMAGLEV Project LOD and/or specifically on identified properties within the LOD.

Alignments

Surface disturbances associated with the viaduct crossings of the Little Patuxent River, the Patuxent River (at the NTWSSC), and Beaverdam Creek (at the NTWSSC) have the potential to adversely impact RTE species of odonates, fish, and an aquatic plant.

- The MDNR WHS identified 14 species and potentially two GBH colonies that may be impacted due to Build Alternatives J alignments crossing the Little Patuxent River. This would potentially be avoided by Build Alternatives J1 alignments that tunnels under the river, avoiding surface disturbance.
- All Build Alternatives include a proposed access road across Dorsey Run in the vicinity of Fort Meade, which would require vegetation removal and may result in impacts to water quality and habitat.
- Additional species of concern identified by USFWS may also incur detrimental impacts from Build Alternatives J alignments, largely through PRR property.
- The MDNR WHS identified 13 noted species that the existing NTWSSC associated with the Patuxent River may support as well as a GBH site. All Build Alternatives have the potential to impact these species. The MDNR WHS states that Build Alternatives J alignments would directly impact part of a population of state-listed rare dragonfly species. Refer to Appendix D.7 NETR Agency Correspondence for additional details.
- Build Alternatives J1 alignments would directly impact the globally rare coastal plain oak floodplain forest natural community, located north of the Patuxent River.
- Impacts to the two RTE species identified at the long-term construction laydown area near MD 200 and I-95 may result from construction activities.

Stations

MDNR WHS does not anticipate adverse impacts to the peregrine falcon nest site in Baltimore City from construction or operational activity associated with the SCMAGLEV Project, including the Camden Yards Station. RTE species and SSPRAs are not present at any other station.

TMFs

The MD 198 TMF would convert a large area of vegetated habitats, wetlands, and waterways within the SSPRA and upstream of the Little Patuxent NTWSSC into permanent surface features, resulting in the risk for habitat removal and localized species eradication. Direct impacts to the Little Patuxent River may threaten populations of RTE fish and odonate species. MDNR indicates the location of a GBH colony overlapping with the LOD of this TMF.

Likewise, construction of both BARC TMFs would have similar effects on the Beaverdam Creek NTWSSC, globally rare natural communities, unique forest

communities supporting pitch pine and dwarf chinquapin oak, and associated RTE species and GBH colonies. The BARC Airstrip TMF could result in greater threat to species as it impacts the headwaters to this waterway and its associated wetland and riparian habitat buffers. Fill within or adjacent to the North Branch of Beaverdam Creek associated with the BARC West TMF could result in degradation of aquatic and riparian habitat sufficient to disrupt the local occurrence of American brook lamprey. Construction of either TMF on BARC property would result in grade changes, which would alter surface hydrology associated with sensitive species and habitats within and adjacent to the SCMAGLEV Project LOD. Groundwater and surface water changes, sedimentation, and nutrient runoff resulting from project elements may degrade suitable habitat for populations of White Fringed Orchid and acidic seepage fen and swamp communities, which are highly sensitive to these types of disturbances.

4.12.4.3 Short-term Construction Effects

The Build Alternatives have the potential for short-term impacts to ecological resources during construction, including degradation of FIDS habitat. Construction activities for viaduct piers, tunnels, and other structural components of the project would require temporary access, laydown/staging areas, and launching of tunnel boring machines and construction equipment. This results in additional habitat clearing and human activity, including the introduction of additional noise in sensitive habitats.

Temporary stream crossings for construction access would have short-term impacts to aquatic wildlife, including some species of fish, odonates and mussels. Temporary disturbance to streambed habitat and hydrology may result from the use of stream diversions, temporary culverts, and other standard construction and access elements. The Project Sponsor would adhere to in-stream and near-stream BMPs and time of year restrictions for in-stream work.

Construction of the MD 198 TMF, BARC TMFs, and Build Alternatives J over the Patuxent River would potentially impact GBH colony sites. GBH colonies are sensitive to human activity, especially during the breeding season, and may disband if disturbed by nearby development.

4.12.5 Potential Minimization and Mitigation Strategies

4.12.5.1 Minimization

FRA has determined that the SCMAGLEV Project would impact ecological resources, including forest and FIDS; terrestrial and aquatic species and their habitats; and RTE species and habitats. The following section provides measures that the Project Sponsor has taken and will take to minimize impacts.

Following DEIS publication and selection of a Preferred Alternative, FRA will continue targeted coordination with USFWS, NPS, BARC, MDNR, NMFS, and other stakeholders in identifying future studies and coordinating impact avoidance, minimization, and

mitigation efforts. FRA will continue ESA Section 7 consultation with USFWS and will also coordinate with the Migratory Bird Permit Office regarding the potential for bald eagle nesting sites and the need for an eagle conservation plan prior to the FEIS. To reduce the likelihood of an eagle take, additional consideration for implementation of carrion removal protocol will be addressed, as train strikes are a known source of mortality for bald eagles. Eagles tend to be struck when attempting to feed on remains of carrion.

FIDS habitat, other terrestrial and aquatic habitats, and RTE species and habitats (including SSPRAs) generally occur within the same largely forested areas within the SCMAGLEV Project LOD. Therefore, impacts to one of these sensitive resources is typically associated with impacts to one or more of the other resources, often also overlapping with NTWSSC. As a result, the Project Sponsor will have the opportunity to minimize impacts to multiple sensitive habitats when forest, FIDS or other sensitive habitat is avoided. Likewise, the Project Sponsor may have a compounded mitigation requirement in areas supporting multiple sensitive habitats.

An Invasive Species Control and Management Plan will be required for construction and operational activities on PRR property and anticipated within NPS, BARC, and other Federal lands. Similarly, the Critical Area Commission Site Design Guidelines will be considered, and invasive plant treatments considered for all project activities located within the Chesapeake Bay Critical Area.

To minimize bisecting large areas of intact sensitive habitats, Build Alternatives J-01 through J-06 and J1-01 through J1-06 were located as close to existing transportation corridors as possible. In addition, large portions of the SCMAGLEV Project have been designed as guideway tunnels, with 75 to 83 percent of the Build Alternatives located in tunnel. As a result, habitats and sensitive species associated with the Anacostia River and Patapsco River crossings have been avoided. Additionally, based on agency input, the Project Sponsor revised the location of an ancillary facility to avoid impacts to the federally threatened swamp pink and extensive wetlands in the Harmans area of Anne Arundel County, as detailed in Section 4.11 Wetlands and Waterways.

Although the SCMAGLEV Project would span across or tunnel beneath major waterways and their tributaries to avoid impacts to aquatic and riparian habitats, temporary construction-related instream activities may be necessary, as outlined in Section 4.11 Wetlands and Waterways. Build Alternatives largely avoid fisheries resources and migration paths associated with major stream systems and/or high-quality Tier II Waters (Anacostia, Patuxent, and Patapsco Rivers, Beaverdam Creek, Baltimore Harbor and tributaries) by tunneling below or spanning over the systems. FRA has considered Environmental Site Design (ESD) in planning and placement of piers to avoid and minimize impacts to wetlands and waterways to the extent possible. Because of the sensitive nature of these systems and their ecological surroundings, further ESD and additional BMPs to avoid greater impacts would be included during final design.

Short-term effects have less opportunity for indirect impacts compared to long-term effects because the Project Sponsor will employ specific construction related BMPs, per regulatory requirements and coordination with regulatory agencies, including:

- Complying with time-of-year restrictions associated with streams, and for nesting and breeding habitats associated with sensitive species, including FIDS and GBH colonies.
- MDNR recommended a February 15 through June 15 time of year restriction for the protection of anadromous fish and yellow perch spawning activities. Minimizing impacts to active GBH colonies would require implementing a one-quarter-mile buffer around each colony and avoiding disturbance activities during the breeding season (February 15 through July 31, during any year). During final design, the Project Sponsor will conduct further coordination with MDNR to refine restrictions on allowable activities within this buffer.
- USFWS recommended time of year restrictions for breeding migratory birds (April through August) and breeding wintering birds (November through February) for forest clearing activities.
- Continued observation of bald eagle nesting sites and compliance with National Bald Eagle Management Guidelines, including buffer recommendations, as appropriate to any findings.
- Developing construction sequencing to minimize effects to the same location continuously.

Incorporating detailed erosion and sediment control (ESC) BMPs, including performing frequent inspection of BMPs to ensure their optimal performance and revegetating temporarily disturbed areas as soon as possible. Because many of the sensitive species and habitats identified by USFWS and MDNR are associated with wetland and waterway habitats, MDNR has requested strict adherence to all appropriate BMPs for sediment and erosion control during any ground disturbance or instream work, to minimize siltation that could adversely affect RTE aquatic species located upstream and downstream of the SCMAGLEV Project.

The Project Sponsor will also incorporate detailed stormwater BMPs into the final design and throughout all phases of construction to further minimize impacts to forests, habitats, and sensitive species. The location of permanent stormwater management features associated with the alignments are proposed within or adjacent to areas already proposed for surface disturbance. The Project Sponsor will approach design and development of TMFs, stations, and ancillary facilities with the goal of avoiding and minimizing impacts to forests, habitats, and sensitive species and will optimize opportunities to incorporate beneficial ESD to meet (and exceed where feasible) water quality-related requirements. The Project Sponsor will implement supplemental protection measures based on MDNR recommendations to prevent changes to wetland and stream hydrology and water quality and implementing environmentally sensitive

design to manage stormwater in a way that mimics natural infiltration (see Section 4.10 Water Resources for more discussion on stormwater).

Construction staging areas and access roads would coincide with existing infrastructure, where feasible, to minimize impacts to natural areas and therefore potential habitat. An existing gravel access road in the PRR/BGE ROW could be used during construction of the SCMAGLEV Project to minimize impacts, if agreeable by BGE. The Project Sponsor will also coordinate with the USFWS to identify and implement a designated route in existing access roads and maintenance locations of PRR, and with other landowners on properties with existing ecological resources to avoid impacts to habitats to the greatest extent practicable.

FRA will implement, as feasible, specific efforts to reduce FIDS habitat impact. Although no FIDS habitat impacts would occur within the Critical Area, FRA's impact minimization will consider the CAC Site Design Guidelines, which include but are not limited to:

- Limiting forest clearing to the minimum footprint of disturbance necessary;
- Maintaining forest canopy closure over access roads;
- Avoiding forest clearing during FIDS breeding seasons;
- Reestablishing forest cover using native tree and shrub species; and,
- Targeting forest reestablishment along riparian corridors, in gaps of existing forest, and abutting existing FIDS habitat.

Build Alternatives J-01 through J-06 would require more ecological coordination and surveys due to impacts at PRR. The Project Sponsor will coordinate with USFWS to conduct required surveys during the appropriate time of year to determine species presence/absence. USFWS has requested the following efforts to aid in identifying feasible avoidance, minimization, and mitigation measures for resources within and adjacent to the Project LOD:

- acoustic surveys and mist-netting for northern long-eared bat;
- surveys in the Patuxent River for yellow lance;
- large-diameter tree surveys; and
- delineation of vernal pools and wetlands that may support RTE species.

USFWS also requested further assessment of the risk of collisions with birds, forest bats, and migrating pollinators, and opportunities to preserve forest edges and other vegetative buffer zones. Additionally, in coordination with USFWS, FRA may be required to locate sensitive species, such as spotted or box turtles, and consider relocation of individuals prior to construction, with the understanding that species relocation poses disease transmission risks. The NPS has indicated that bat surveys should be more comprehensive, to include all declining bat species such as tricolored, Indiana, big brown, and little brown. NPS has also indicated that seeps and springs

should be added to the list of surveys to aid in identifying feasible avoidance, minimization and mitigation measures. These habitats support a variety of species, including potential RTE species.

To eliminate or greatly reduce the impacts to birds due to direct strikes with moving rail cars, FRA examined mitigation techniques such as a form of shroud or hood over the guideway to prevent birds from accessing the vicinity of the moving train. Similarly, techniques such as bat gates can be considered at tunnel openings to prevent bats from entering.

Upon identification of a preferred alternative, the Project Sponsor will consider further details regarding fence design and siting in coordination with resource agencies and landowners to address concerns over wildlife passage and habitat fragmentation.

4.12.5.1 Mitigation

Impacts to forest resources would require compliance with the Maryland FCA. As previously noted, the Project Sponsor will conduct a full FSD and specimen tree survey to identify forest stand impacts, specimen trees, priority retention areas, and reforestation requirements. The Project Sponsor will prepare a Forest Conservation Plan (FCP) to identify areas of forest retention, reforestation, afforestation, and long-term protective measures, such as easements. The Project Sponsor will mitigate for forest loss with onsite and offsite forest mitigation, with emphasis on expanding FIDS habitat in the region. Mitigation of impacts to forests would also include additional requirements associated with impacting existing forest conservation easements and tree conservation plans, if such areas cannot be avoided. Impacts to state and county-level forest conservation easements would require additional mitigation and coordination with MDNR and county agencies. These often require a greater mitigation ratio be applied to those areas. The Project Sponsor will also coordinate with MDNR and the Maryland Environmental Trust regarding impacts to forest conservation easements. Additionally, property owners may require additional or separate mitigation for vegetation removal. The United States Secret Service would require a minimum 1:1 replacement for lost forest habitat with similar habitat.

The Project Sponsor will continue to coordinate with agencies and consider the following additional mitigation strategies during final design and construction planning, which both overlap and supplement strategies presented in Sections 4.10 Water Resources and 4.11 Wetlands and Waterways:

- Onsite re-establishment of forest habitat, where feasible, including planting of trees of appropriate mature height under the guideway to provide contiguous canopy while maintaining the 13-foot clearance beneath the structure
- Offsite plantings to expand and restore forests, FIDS, and riparian habitats within the watersheds
- Onsite and offsite wetland mitigation, whether through banking or permittee-created wetlands within the watersheds

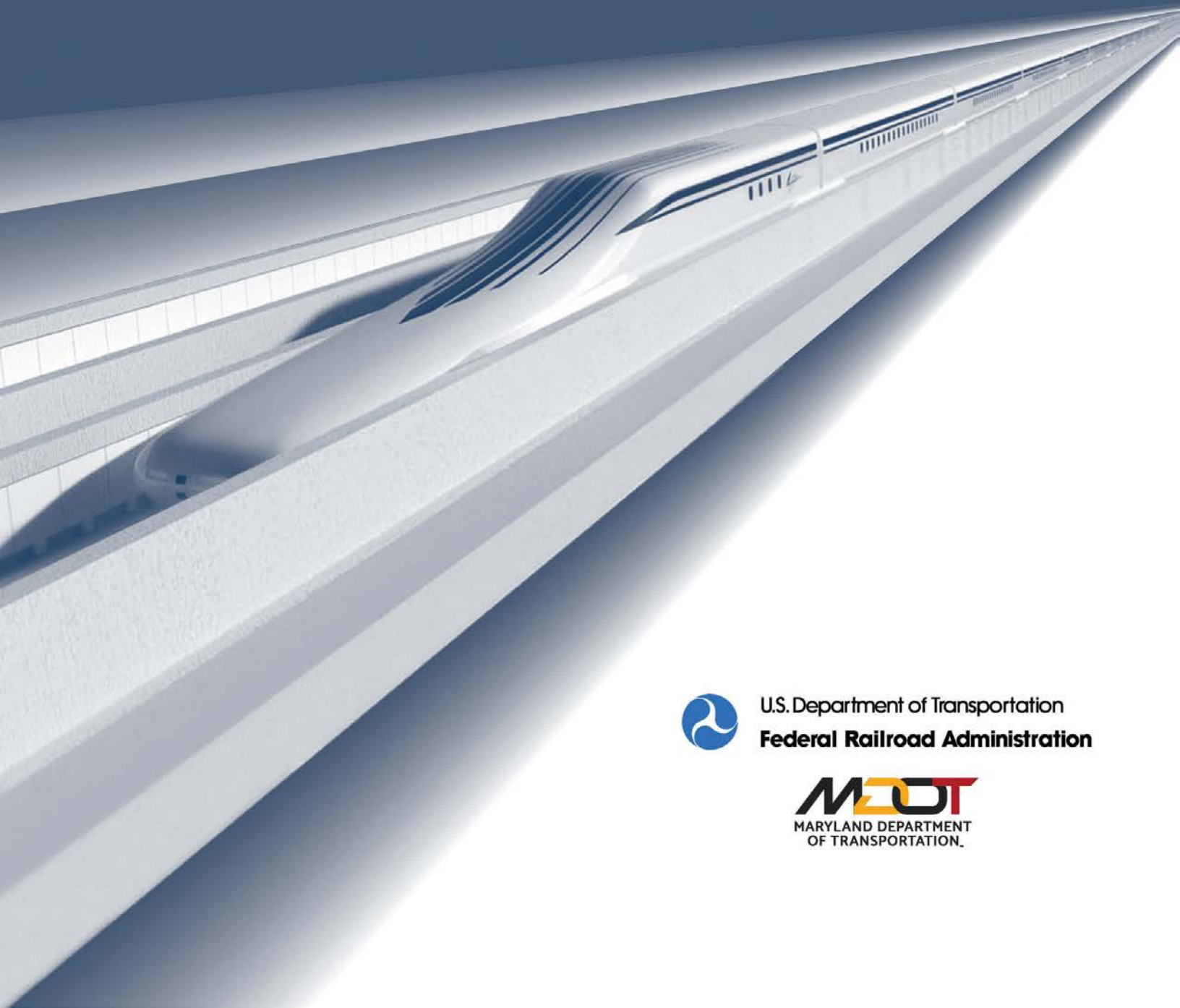
- Tidal marsh restoration within or near the Baltimore Harbor, Patapsco River, and/or Anacostia River
- Onsite and offsite restoration of degraded stream reaches associated with the major river systems
- Coordination with USFWS to determine compensatory mitigation value and restoration opportunities for unavoidable impacts to large-diameter trees and areas of FIDS habitat encroachment at PRR. This analysis would consider ecological functions lost such as nesting habitat, carbon sequestration, oxygen production, seed production (forest regeneration or wildlife food resource), stormwater retention, and groundwater recharge. The loss of these functions may be determined to have a dollar value applied and compared for example to the new artificially created municipal systems that may be required.
- Coordination with MDNR and county and local municipalities to identify ecological restoration priorities and consider funding agency and nonprofit community greening, water quality, and/or environmental education projects and programs
- Purchasing of intact forest and/or wetland complexes for placement in perpetual easement
- Invasive species management of onsite and adjacent habitats
- Funding ecological research and restoration at PRR and BARC

Section 4.13

Topography and Geology

BALTIMORE-WASHINGTON SUPERCONDUCTING MAGLEV PROJECT

DRAFT ENVIRONMENTAL IMPACT STATEMENT AND
SECTION 4(f) EVALUATION



U.S. Department of Transportation
Federal Railroad Administration



4.13 Topography and Geology

4.13.1 Introduction

Topography relates to the shape and features of the earth; and a geologic resource can be described as a naturally occurring feature that has formed during evolution of the earth. Geologic resources, including fossilized flora and fauna (i.e., paleontological resources), fossil fuels, mineral resources, and rock formations, may provide value to the human and/or physical environment. Geologic hazards, such as earthquakes, sinkholes, and landslides, can be described as a naturally occurring feature that may result in a threat to the human or physical environment. This section evaluates how the Superconducting Magnetic Levitation Project (SCMAGLEV Project) would interact with and potentially impact regional topography, geologic resources and hazards, as well as the SCMAGLEV Project's location in relation to setting and features such as existing mines. Additional information about the geology of the area can be found in the Natural Environment Technical Report (Appendix D.10).

4.13.2 Regulatory Context and Methodology

4.13.2.1 Regulatory Context

In accordance with the National Environmental Policy Act (NEPA), 42 U.S.C. § 4321 et seq., the Council on Environmental Quality (CEQ) regulations, 40 C.F.R. Parts 1500 - 1508, and the Federal Rail Administration's (FRA) Procedures for Considering Environmental Impacts, 64 Fed. Reg. 28545 (May 26, 1999), FRA assessed the existing geologic conditions along the Build Alternatives to determine whether the SCMAGLEV Project would impact geologic resources. In addition, the following regulatory requirements are relevant should certain geologic resources or hazards be identified during final design and construction:

- 16 U.S. Code (U.S.C.) § 470aaa (Paleontological Resources Preservation Act)
- 29 U.S.C. § 651 et seq. (Occupational Safety and Health Act)
- 42 U.S.C. § 300f et seq. (Safe Drinking Water Act of 1974)
- Maryland Surface Mining Control and Reclamation Act (SMCRA)
- Code of Maryland Regulations: COMAR 26.20.30: Postmining Land Use

4.13.2.2 Methodology

FRA performed a qualitative analysis based on readily and publicly available desktop information such as published and online reports and maps from the U.S. Geological Survey (USGS), Maryland Geological Survey (MGS), Maryland Department of the Environment (MDE), and site-specific studies. These sources provide information concerning the topographic and geologic setting and geologic formations. FRA reviewed existing data to document the presence or absence of geologic resources and hazards

within and surrounding the SCMAGLEV Project Affected Environment. FRA defined the geographic limits of the SCMAGLEV Project Affected Environment for geology as the proposed impact area, which includes the limits of operational/physical disturbance proposed as well as the construction-related impact area, which includes additional areas of temporary disturbance required for construction activities. These areas have been identified as an overall limit of disturbance (LOD) of the SCMAGLEV Project Build Alternatives. FRA identified relationships between project components and geologic resources/hazards at locations within the SCMAGLEV Project Affected Environment for proposed subsurface work such as tunnels, underground stations, and construction borings. As relevant, analyses extended beyond the SCMAGLEV Project LOD to describe the overall topographic setting as well as capture resources such as mines that could be close to the Build Alternatives. FRA considered mines within 300 feet of the LOD in this analysis. The following geologic resources and hazards were analyzed:

Geologic Resources

- **Mines** – mineral resources that can be extracted from the earth
- **Paleontological Resources** – physical evidence (e.g., fossils) of preexisting organisms
- **Unique Geological Features** – any unique or rare physical feature of the earth's surface, or of the rocks exposed at the surface, that is formed by a geologic process

Geologic Hazards

- **Seismic Hazards/Faulting (Seismicity)** – the frequency and severity of earthquakes. Seismic hazards are typically associated with a geologic fault or fracture and areas requiring tunnels or bridges may be especially susceptible to potential damage.
- **Naturally Occurring Asbestos** – United States Environmental Protection Agency (USEPA) regulated asbestiform minerals, as a natural component of soil or rock. Excavating in areas with naturally occurring asbestos typically requires engineering controls, site monitoring, and regulatory interaction and reporting.
- **Radon Gas** – a common radioactive gas that results from the natural breakdown of uranium in soil, rock, and water. USEPA recommends reducing concentrations of radon gas that may accumulate in the air in poorly ventilated enclosed spaces.
- **Landslide Prone Soils** – the susceptibility for rock or landslides (debris, mudflows, rock fall). Construction and tunneling in areas that contain landslide prone soils require engineering/design considerations to minimize hazards to workers during construction and the future utilization of the corridor.
- **Acid Producing Soils** – soils with low pH. These soils may contain enough acidity to degrade concrete and steel structures, requiring additional consideration during design.

- **Karst Topography** - dissolution of a soluble layer or layers of bedrock. These areas are susceptible to sinkholes, groundwater contamination, and erosion.

4.13.3 SCMAGLEV Project Affected Environment

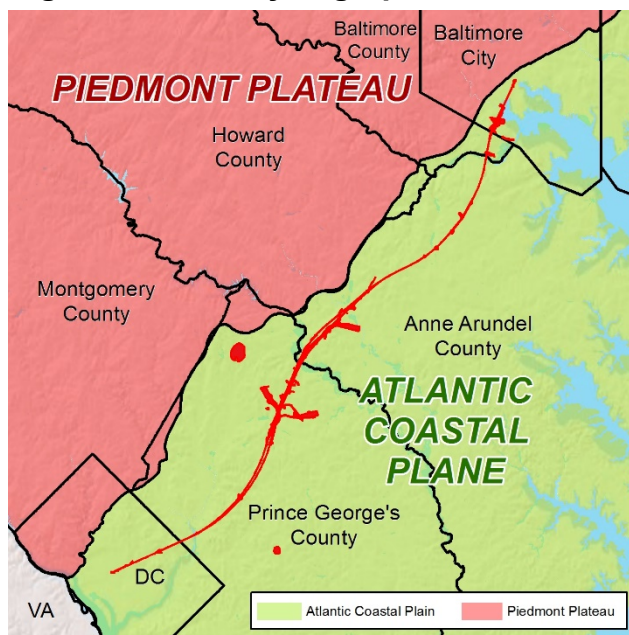
Topography surrounding the SCMAGLEV Project ranges from approximately 5 feet above sea level to over 200 feet above sea level, spanning a broadly undulating landscape with relative topographic highs within Anne Arundel and Prince George's Counties, and relative lows near Washington, D.C. and Baltimore City. The SCMAGLEV Project falls entirely within the Atlantic Coastal Plain physiographic province, located just south and east of the Fall Zone separating it from the Piedmont Plateau Physiographic Province as seen in **Figure 4.13-1**. A physiographic province is a geographic area in which the geology (including lithology¹ and structure) and climate history have resulted in landforms that are distinctly different from adjacent areas. The Atlantic Coastal Plain represents the easternmost contact with crystalline bedrock to the shorelines of major estuaries or the Atlantic Ocean.

Sediments across the province include gravel, sand, silt, and clay of both terrigenous and marine origin. The geologic hazards and resources known to occur within the SCMAGLEV Project Affected Environment are summarized below.

Seismicity - The SCMAGLEV Project is in an area of the U.S. with a low probability of seismic activity. The USGS identifies the eastern U.S. as a "Stable Continental Region" because of its location in the center of a tectonic plate. According to the MGS, strong earthquakes are unusual in Maryland, although the state occasionally experiences perceptible earthquakes. In 2011, a 5.8 magnitude quake occurred 35 miles north of Richmond, Virginia, and registered as a 2.2 magnitude quake in Anne Arundel County. In 2010, a 3.6 magnitude quake occurred in nearby Montgomery County, Maryland. The latest quake occurred in Maryland on November 11, 2017, classified as a 1.5 magnitude.

Naturally Occurring Asbestos - Given the composition of bedrock throughout the region, there is the potential for the SCMAGLEV Project to encounter naturally occurring asbestos within the bedrock. The USGS Mineral Resources Data System (MRDS) lists multiple occurrences of naturally occurring asbestos to the northwest of Washington, D.C., one occurrence in Baltimore City, and multiple occurrences to the northwest of

Figure 4.13-1: Physiographic Provinces



¹ Lithology – the study of the general physical characteristics of rocks.

Baltimore. Although these known occurrences do not fall within the SCMAGLEV Project Affected Environment, they indicate the potential for naturally occurring asbestos within the regional bedrock formations that do extend into the SCMAGLEV Project Affected Environment beneath the unconsolidated surficial strata. The presence of asbestos-containing rock will be further determined during the next phase of geotechnical investigations.

Radon Gas - Radon gas is a colorless, odorless, radioactive gas. It forms naturally from the decay of radioactive elements, such as uranium, which are found in different amounts in soil and rock throughout the world. Radon gas in soil and rock can move into the air and into underground water and surface water. Generally, the USEPA recommends mitigating structures where radon gas concentrations exceed 4 picocuries per liter (pCi/L).² According to the Maryland Department of Health, the SCMAGLEV Project Affected Environment includes only one ZIP Code designation where radon gas concentrations exceed 4 pCi/L³, and this part of the alignment is on elevated track. In Washington, D.C., no radon gas tests near the alignment exceeded 3.1 pCi/L.⁴

Landslide Prone Soils - Regional topography, precipitation, and past events are taken into account when developing a landslide susceptibility percentage for a region. According to information obtained from the USGS, FRA has identified much of the SCMAGLEV Project within a "High Landslide Incidence Area," which means that over 15 percent of the area is prone to land sliding. Within the SCMAGLEV Project Affected Environment, the clay layers of the Arundel Formation (from deposits of the Potomac Group), as previously described in Section 4.10.3.3, act as the confining unit between aquifers, and are known to cause stability issues and create a landslide risk.⁵ Reports of rockslides in the coastal plain are rare. Given the flat topography and deep sandy soils generally found in this physiographic region, rockslides are not considered an exceptional risk.

Acid Producing Soils - Atlantic Coastal Plain sediments have the potential to contain acid producing sediments considered a geologic hazard. Such sediments are known to exist in Virginia and New Jersey in the Atlantic Coastal Plain region and are likely to occur in Atlantic Coastal Plain sediments of Maryland, and potentially the SCMAGLEV Project Affected Environment. FRA did not identify published Maryland- and Washington, D.C.- specific information available for review. The presence of iron ore mines in the vicinity of the SCMAGLEV Project however, as discussed below, indicates the likely presence of acid producing soils.⁶

² Environmental Protection Agency. Accessed July 2020. <https://www.epa.gov/radon/what-epas-action-level-radon-and-what-does-it-mean#:~:text=EPA%20recommends%20homes%20be%20fixed,L%20and%204%20pCi%2FL>.

³ Maryland Department of Health. *Maryland: 2005-2016 Average Radon Measurements by ZIP Code*. Accessed July 2020. <https://maps.health.maryland.gov/phpa/eh/radon/>

⁴ District Department of the Environment. *District of Columbia Radon Map 2010-2012*. Accessed July 2020. <https://doee.dc.gov/node/22322>

⁵ Pomeroy, J.S. (1988). Map showing landslide susceptibility in Maryland. United States Geological Survey. Retrieved from <https://pubs.er.usgs.gov/publication/mf2048>

⁶ Acidic Soil, Metal in Soils and Acid Rock Drainage. Virginia Division of Geology and Mineral Resources. Accessed January 2019. Retrieved from <https://www.dmme.virginia.gov/DGMR/acidicsoils.shtml>

Karst Topography - According to the MGS, karst areas do not occur in the unconsolidated sediments of the Atlantic Coastal Plain; therefore, FRA has not further evaluated this geologic resource.

Mines - Nine mining locations, identified as “past producers” are present within 300 feet of the SCMAGLEV Project LOD⁷. The locations listed are locations where sand, gravel, and iron ore have historically been mined, including six iron ore and three sand/gravel mines. One mine located near the tunnel laydown area for the Camden Station also mined heavy metals. These mines are currently inactive, and the potential for modern mining of resources in these areas is limited due to land development and economic feasibility. Because details such as the extent and type of backfill at the former open quarries and the extent of mine reclamation activities is not available, additional coordination with state sources is necessary. Although sand and gravel mines in this area are typically mined from the surface, the type of iron ore mine can vary depending on the type of iron being mined. The acquisition and reclamation of abandoned mines may require coordination under the Maryland SMCRA.

Paleontological Resources - Mesozoic Era rock found within northern Prince George's and Anne Arundel Counties is called the Potomac Group which consists of three subgroups: the Patuxent Formation, the oldest and westernmost subgroup that abuts the Fall Zone; the Arundel Formation; and the Patapsco Formation, the youngest deposits of the Group. The Potomac Group is believed to be up to 1,000 feet thick within and surrounding the SCMAGLEV Project Affected Environment. During the late 19th century, dinosaur teeth and bones were found in sedimentary iron mines that intersected the Potomac Group rock layer⁸. In 2012, exceptionally preserved fossilized reptile and mammal tracks from the Cretaceous Patuxent Formation were discovered at NASA's Goddard Space Flight Center (GSFC) about one-half mile from the proposed SCMAGLEV project. The finding contains the largest number of dinosaur-era mammal tracks on a single slab and the largest sized mammal track known from the age of dinosaurs. The finding is considered one of the most important dinosaur-era mammal track fossils ever discovered.⁹ The Patuxent formation is found along the entire LOD and may be present as surface rock outcroppings or overlain by the Arundel Formation.¹⁰ Given the SCMAGLEV Project's location within the Potomac Group sediments, there is the possibility for prehistoric animal and plant fossils to be present in the subsurface, specifically within the Patuxent Formation and Arundel Clay, however fossils are expected to be especially scarce in Washington, D.C. and parts of Prince George's County, where the Arundel Clay is thinner and discontinuous.

⁷ Mineral Resource Data System by common geographic areas. United States Geological Survey. Mineral Resource Data System. KML files. Washington, D.C. and Maryland. Retrieved from <https://mrdata.usgs.gov/mrds/geo-inventory.php>

⁸ Kranz, Peter M., 1989, Dinosaurs in Maryland: Maryland Geological Survey, Educational Series No. 6, 34 p.

⁹ Stanford, R., Lockley, M.G., Tucker, C. et al. A diverse mammal-dominated, footprint assemblage from wetland deposits in the Lower Cretaceous of Maryland. *Sci Rep* 8, 741 (2018). <https://doi.org/10.1038/s41598-017-18619-w>

¹⁰ Stanford, R., Lockley, M.G., Tucker, C. et al. A Diverse Mammal-Dominated, Footprint Assemblage from Wetland Deposits in the Lower Cretaceous of Maryland. *Sci Rep* 8, 741 (2018)

Unique Geological Features - Exposed bedrock in the Atlantic Coastal Plain is rare. MGS does not identify any geologic features of particular interest near the proposed alignment. The geologic features near the proposed alignment are similar to those found along the fall zone along the eastern coast of North America. Perhaps the most notable geologic features are the fossil containing beds discussed above.

4.13.4 Environmental Consequences

Geologic hazards exist throughout the SCMAGLEV Project Affected Environment and affect the types and placement of infrastructure where such hazards exist. FRA identified areas where the Build Alternatives intersect known geologic resources or hazards. Given the proximity of the Build Alternatives, they generally have the same potential to encounter geologic features and hazards. FRA determined that the greatest impacts would occur in areas where the SCMAGLEV Project proposes tunnel or subsurface features.

4.13.4.1 No Build Alternative

Under the No Build Alternative, the SCMAGLEV Project would not be built and therefore no impacts to site topography and geology related to the construction or operation of a SCMAGLEV system would occur. However, other planned and funded transportation projects would continue to be implemented in the area in and surrounding the LOD and could result in alterations to geologic conditions.

4.13.4.2 Build Alternatives

Construction of the Build Alternatives J1-01 through J1-06 would require more subsurface activity than construction of Build Alternatives J-01 through J-06; therefore, Build Alternatives J1 may inherently result in greater potential to encounter geologic hazards.

Permanent topographical changes would occur from grading or filling landscape to accommodate appropriate structure stability requirements for surface features (i.e., viaduct piers, stations, TMF) and are similar for Build Alternatives J and J1. The landscape would continue to undulate above or below the viaduct as it exists now. Some modifications may be required in areas of access needed for maintenance to the viaduct but would remain largely unchanged. Groundwater pumping could result in topographic subsidence and ground compaction which has the potential to affect sensitive instrumentation at GSFC. The Project Sponsor will continue to coordinate with NASA to determine the potential risk of topographic subsidence. Other long-term changes are consistent with many transportation projects and would not be considered an adverse effect, nor induce indirect effects.

Although the SCMAGLEV Project is located in an area considered low potential for seismic hazards, there have been earthquakes in Maryland as identified Section 4.13.3. Continuing ground investigations and geotechnical studies for the SCMAGLEV Project will be analyzed and the Project Sponsor will consider seismic risk, safety factors, and potential mitigation measures should an event occur that affects the structures and/or

surrounding infrastructure and population. At this time the need for blasting is not identified. Future studies will also consider the possibility for construction of the tunnels to result in any micro-seismic activity and the Project Sponsor will evaluate the need for and specific type of micro-seismic monitoring.

Alignment

Both Build Alternative alignments have similar potential to encounter naturally occurring asbestos, radon gas, landslide prone soils, acid producing soils, mines and fossils during construction of subsurface features. All open trench type soil excavations and a majority of the tunneling activity would be conducted within the Patapsco Formation. Given that Potomac Group sediments of this Formation lie close to the surface and are believed to run as deep as 1,000 feet beneath the surface, there is potential for an adverse impact to the fossil record.

Geologic hazards of greatest concern during operation and potential to incur long-term and indirect impacts include landslide prone soils and acid producing soils. These are considered of greater risk due to their widespread occurrence either documented within the SCMAGLEV Project Affected Environment (landslide) or in areas near the SCMAGLEV Project Affected Environment (acid producing soil). The risk of landslides after completion of construction could present a concern, as areas of tunneling and excavation would be particularly vulnerable to these occurrences. This would be consistent for impact with any alignment. Future geotechnical investigations would determine whether accounting for rockslides in the project design is recommended.

Similarly, risks from acid producing soil hazards are also present and certain unconsolidated soils and sediments in the Atlantic Coastal Plain could contain minerals that produce enough acidity to degrade concrete and steel structures to the point of failure.¹¹

Potential indirect effects would also include potential worker health concerns associated with airborne asbestiform particles, should naturally occurring asbestos be encountered, as well as radioactive particles from radon gas. These are discussed further in Section 4.21 Public Health and Safety. Surface water run-off containing acidic discharges from soils could also degrade the environment, as previously noted in Section 4.10 Water Resources, which has the potential to indirectly affect water quality and aquatic species.

Stations

All stations have the potential to encounter naturally occurring asbestos, landslide prone soils, and acid producing soils. The Baltimore-Washington International Thurgood Marshall Airport Station (BWI Marshall Airport Station) (associated with all Build Alternatives) and Camden Yards Station (Build Alternatives J-04 through J-06 and J1-04 through J1-06) have a greater potential to encounter fossil deposits as they are in

¹¹ Federal Railroad Administration. December 2016. *A Rail Investment Plan for the Northeast Corridor. Tier 1 Final Environmental Impact Statement*. Section 7.7 Geologic Resources.

the Patapsco Formation. The Cherry Hill and Camden Yards Stations are within 300 feet of a recorded mine, therefore affecting all Build Alternatives.

TMF

The BARC Airstrip, BARC West, and MD 198 TMFs have the potential to encounter landslide prone soils and acid producing soils. There is a mine within 300 feet of the MD 198 TMF, associated with Build Alternatives J-01, J-04, J1-01 and J1-04. All the TMFs are located in the Patapsco Formation, which is known to contain fossil deposits. Construction of the BARC TMFs and the viaduct in this area could have the potential to impact paleontological and archeological resources, such as the recent finds of dinosaur-era footprint fossil records.

4.13.4.3 Short-term Construction Effects

Geologic conditions and hazards have the greatest potential to be impacted during short-term construction activities of subsurface features. Where construction will intersect bedrock, most notably in Washington, D.C. and Baltimore City, (Mount Vernon Square East Station and Camden Yards Station, respectively) naturally occurring asbestos would be of concern.

Future geotechnical investigations completed for the preferred alternative and determinations of final construction methods necessary based on subsurface materials will provide a better assessment of potential disruption to BWI Marshall Airport and its daily operations, as well as Tipton Airport operations.

Natural factors considered to most directly contribute to landslide potential are precipitation, slope, and the nature of the geologic unit (or lithology). During construction activities and the exposure of soils, creation of exposed slopes, and removal of vegetation that help to stabilize these features, areas are more susceptible to landslide.

Subsurface excavation and construction also have the potential for permanent impacts to paleontological resources to be caught in the transport and movement of earth and soil during construction activities, that is not always captured by the contractor or inspector on site and thus going unnoticed. Measures to avoid such impacts are discussed below. During subsequent phases of SCMAGLEV Project development, subsurface geotechnical testing and documentation would be undertaken to confirm locations of geologic hazards and recommend structural materials that will mitigate for such hazards during construction.

4.13.5 Potential Minimization and Mitigation Strategies

4.13.5.1 Minimization

The Project Sponsor will minimize construction impacts to geologic resources using specifically identified Best Management Practices (BMPs) and construction techniques within SCMAGLEV erosion and sediment design plans and geotechnical investigations.

Such measures utilized to minimize risk of landslides, exposure to naturally occurring asbestos and acid producing soils includes, but is not limited to the following:

- Use of a “one-pass tunnel lining system” and a “pressurized closed-face tunnel boring machine (TBM),” further described in Section 4.11 Wetlands and Waterways, to reduce the amount of subsurface soils and groundwater dewatering required by tunneling activities and to minimize the amount of geologic material disturbed.
- In areas of excavation of ground surface not utilizing TBM techniques, BMPs include the use of sheeting and shoring methods in order to minimize the amount of subsurface soils disturbed and removed during excavation.
- Other possible measures include soldier pile and lagging, tangent piles, and secant pile walls as potential excavation support systems to be used during excavation.
- Additional details regarding piers/pilings as well as cofferdams that may be used surrounding in-stream piers can be found in Section 4.11 Waters of the U.S. including Wetlands.

The Project Sponsor will minimize exposure to geologic hazards during construction by adhering to appropriate building codes, Occupational Safety and Health Administration (OSHA) regulations, and engineering controls. In construction areas where potential naturally occurring asbestos is encountered in bedrock, implementation of proper protection and engineering controls to protect and educate workers on handling and monitoring would be necessary and would be described in a Health and Safety Plan prepared for the SCMAGLEV Project during the design-build phase. The use of a TBM, a water-tight segmental lining, and constant ventilation helps ensure that there is no accumulation of radon during construction and during the post-construction lifespan of the structures. Radon gas will be monitored in tunnels during construction and, if necessary, additional ventilation or personal protective equipment will be used to minimize health risk. Additional evaluation of radon content of sediments and groundwater will also be conducted at later design phase. Tests will also include the presence of other gases such as methane and hydrogen sulfide.

The Project Sponsor will monitor for paleontological resources in excavated soil and TBM spoils. These may be more likely found in areas around Camden Yards and BWI Marshall Airport Stations. Methods to minimize impacts to these geologic resources include, but are not limited to:

- Identification of those locations of the selected Build Alternatives where subsurface activities will disturb previously undisturbed strata in rock units considered to have a higher paleontological sensitivity.
- Conduct ground penetrating radar surveys of areas proposed for surface disturbance to determine the presence of large, potentially fossil-rich rocks.

- Retaining a certified paleontologist to supervise monitoring of construction excavations.
- Conducting visual surveys of ground disturbance areas before construction.
- Training provided to personnel running ground disturbing equipment.
- If paleontological materials are found during construction qualified paleontological resource staff would be contacted, and construction would be suspended, as appropriate.

4.13.5.2 Mitigation

The Project Sponsor will further evaluate subsurface structures and construction methods in order to mitigate potential effects and will design soil staging and removal practices to mitigate potential acidic surface water runoff. Recognition and appropriate soil amendments for burial, removal, or disposal of acid producing soils would mitigate the amount of potential acidic material produced.¹²

The Project Sponsor will identify and document former mine locations within the LOD on final site plans. For cases in which the guideway tunnel would pass below a former mine without intersecting it, reclamation documentation may not be necessary.

The Project Sponsor will consider seismic risk and adopt appropriate criteria in design of SCMAGLEV elements during later design and continued study.

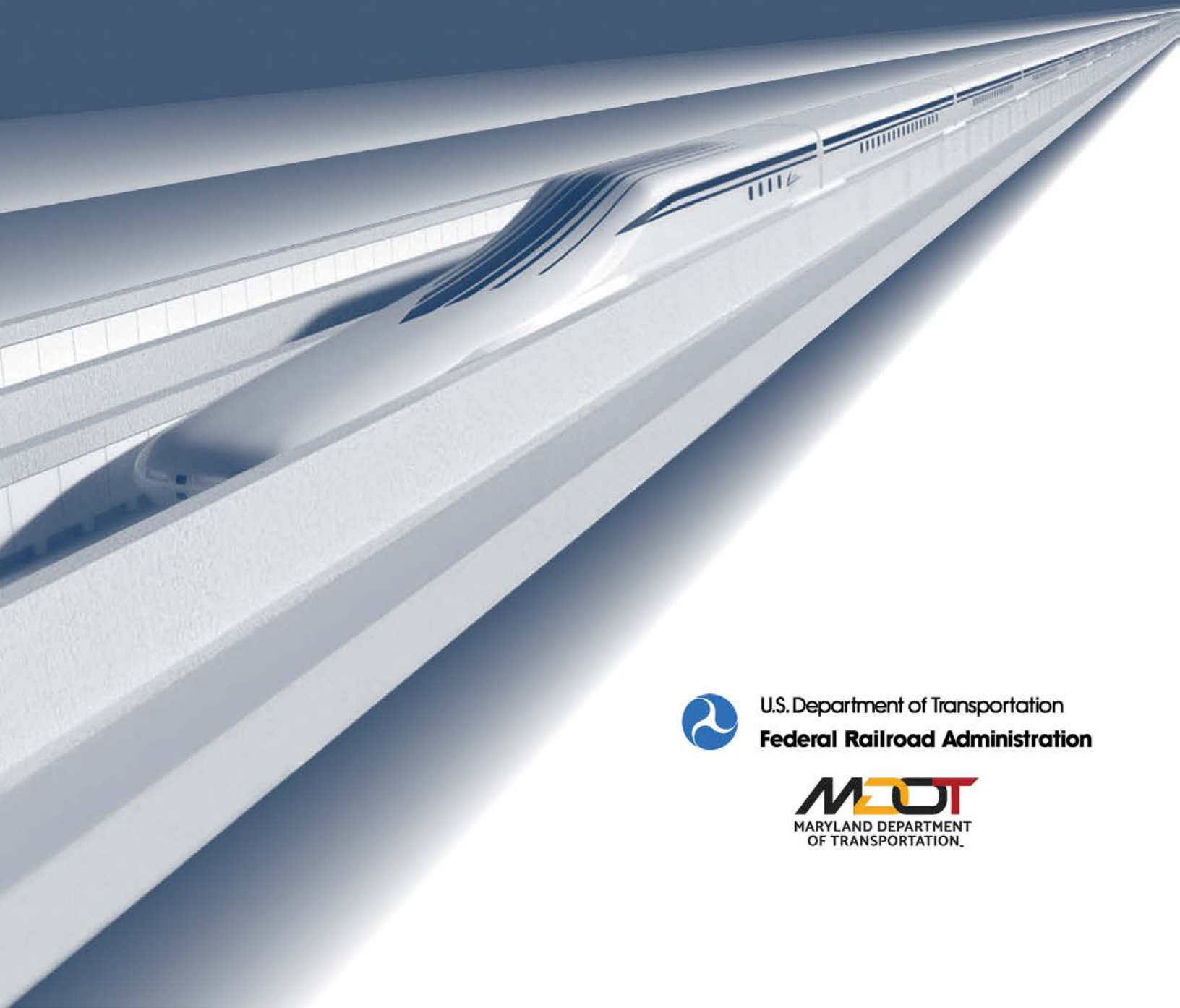
¹² New Jersey Department of Agriculture-State Soil Conservation Committee. May 2012. *The Standards for Soil Erosion and Sediment Control in New Jersey*.

Section 4.14

Soils and Farmlands

BALTIMORE-WASHINGTON SUPERCONDUCTING MAGLEV PROJECT

DRAFT ENVIRONMENTAL IMPACT STATEMENT AND
SECTION 4(f) EVALUATION



U.S. Department of Transportation
Federal Railroad Administration



4.14 Soils and Farmlands

4.14.1 Introduction

This section identifies soil types, potential soil hazards, and areas designated prime and unique or soils of statewide and local importance (farmland) that could either influence project design or be affected by the Superconducting Magnetic Levitation Project (SCMAGLEV Project). Additional details related to these resources can be found in Appendix D.7 Natural Environment Technical Report (NETR).

4.14.2 Regulatory Context and Methodology

4.14.2.1 Regulatory Context

In accordance with the National Environmental Policy Act (NEPA), 42 U.S.C. § 4321 et seq., the Council on Environmental Quality (CEQ) regulations, 40 C.F.R. Parts 1500 -1508, and the Federal Rail Administration's (FRA) Procedures for Considering Environmental Impacts, 64 Fed. Reg. 28545 (May 26, 1999) FRA assessed impacts to soils and farmland. In addition, the Farmland Protection Policy Act (FPPA) of 1981 (7 U.S.C. § 4201 et seq.) was created "to minimize the extent to which Federal programs contribute to the unnecessary and irreversible conversion of farmland to non-agricultural uses" and is regulated by the Natural Resources Conservation Service (NRCS). All lands identified with soils that are prime, unique, or of statewide or local importance are subject to FPPA. For the purposes of this analysis, farmland includes soils designated as prime farmland (prime soil characteristics), unique farmland (high value specialty crops), and farmland of statewide or local importance. Although soils are not a regulated resource, as detailed in Section 4.10, Water Resources, Section 402 of the Clean Water Act (CWA) requires that an Erosion and Sediment Control (ESC) Plan, and/or Stormwater Pollution Prevention Plan (SWPPP), be prepared and approved, considering the potential loss of soils from the project site during construction activities and addressing the risk to pollution of waterways.

4.14.2.2 Methodology

FRA conducted an analysis of resources based on readily and publicly available desktop information such as published/online reports and maps from the NRCS, the U.S. Geological Survey (USGS), and the U.S. Census Bureau (USCB). These agencies provide information concerning soil types, characteristics and limitations, topography, and land use, including information on "urbanized area" that is generally excluded under the FPPA. FRA considered the geographic limit of the SCMAGLEV Project Affected Environment on a regional landscape level to complete a qualitative assessment of potential impacts that may result from the Build Alternatives and the implications or limitations that may be encountered as a result of the SCMAGLEV Project. FRA overlaid the proposed limit of disturbance (LOD) of the Build Alternatives for both permanent surface and subsurface elements as well as anticipated construction

laydown areas onto the existing soils and farmland mapping and identified areas of direct and indirect conversion of farmland soils. Through coordination with the NRCS, it was determined that the SCMAGLEV Project would result in a direct conversion from all activities within the LOD, whether temporary or permanent, and that an indirect conversion would occur outside of the LOD where access to land would be permanently restricted by SCMAGLEV Project features or other natural/physical features that prevent access. Parameters used in the quantitative analysis for direct and indirect conversion of farmland is included in Appendix D.7 NETR.

FRA reviewed existing data to document the presence or absence of soil hazards that may be encountered by the SCMAGLEV Project. Potential soil hazards evaluated include:

- **Linear Extensibility (Shrink-Swell Potential)** – the relative change in volume to be expected with changes in moisture content. The NRCS describes this potential for change as “low,” “moderate,” “high,” or “very high.”
- **Erosion Hazard** – based on soil erodibility (K factor), slope, and content of rock fragments. The hazard rating is described as “slight,” “moderate,” “severe,” or “very severe.”
- **Risk of Corrosion** – indication of where soil-induced electrochemical or chemical action may weaken concrete or uncoated steel. The risk of corrosion is expressed as “low,” “moderate,” or “high.”

Land protected under the FPPA does not have to currently be in use (e.g., irrigated) for agriculture. As such, FRA considered mapped prime farmland and any area mapped as having prime farmland soils the same. Generally, land that is already in, or committed to, urban development or water storage is not considered protected under the FPPA. Using the published and available data, FRA prepared Parts I, II, III and VI of the NRCS-CPA-106 (*Farmland Conversion Impact Rating for Corridor Type Projects*) form, and the local NRCS field office completed Parts IV and V. The forms aid in identifying the relative value of farmland and rank it across a series of criteria that account for the site in a larger context such as whether there is farming support services or urban areas in the greater landscape. The ranked relative value of the farmland is added to the sitewide context and the overall value of the farmland is assigned a score by the NRCS on a scale of 0 to 260. For farmland that scores below 160, no additional action is required under the FPPA. If the farmland scores 160 or above, Federal agencies will give increasingly higher levels of consideration for protection. Forms prepared in coordination with the NRCS are also included in Appendix D.7 NETR.

4.14.3 SCMAGLEV Project Affected Environment

4.14.3.1 Soils

Silt loam to sandy loam soils occur throughout the SCMAGLEV Project Affected Environment. Silt loams usually occur in lowland areas and sandy loams occur in

uplands. Hydric soils and occasional swamp areas occur within most of the lowland soils. In the Washington, D.C. and Baltimore, MD areas, soils are greatly disturbed and mostly categorized as urban land by the NRCS.

In evaluating soil hazards, FRA did not identify any soils with a shrink-swell potential described as “high” or “very high.”¹ FRA identified seven soil map units described as “severe” (none as “very severe”) for potential erodibility. FRA identified several soil map units described as “high” risk of corrosion throughout the length of the SCMAGLEV Project LOD, with almost every soil type having this risk present. Soil map units and detailed soil series descriptions are depicted in Appendix D.7 NETR.

4.14.3.2 Farmlands

Soils with farmland classifications for prime farmland soils and farmland of statewide importance, located outside of urbanized areas, are illustrated on natural resource mapping and listed in Appendix D.7 NETR. Most NRCS-mapped soil locations are ultimately excluded from consideration as farmland under FPPA, as much of the SCMAGLEV Project LOD occupy areas identified as “UA” on USCB mapping, denoting an urban area.²

Prime farmland or farmland of statewide importance occurs in the SCMAGLEV Project Affected Environment in Prince George’s and Anne Arundel Counties. These mapped soils are predominantly located between Beaverdam Creek and the Little Patuxent River, including land within and surrounding the Patuxent Research Refuge (PRR) and the Beltsville Agricultural Research Center (BARC). Located in Prince George’s County, BARC is owned and administered by the U.S. Department of Agriculture (USDA), Agricultural Research Service (ARS) and includes approximately 6,500 acres for agricultural research, approximately 3,037 of which are considered prime farmland soils. See Appendix B.3 Natural Resource Map Atlas for figures depicting the location of BARC and of farmland soils. The research experiments and studies conducted on the property are critical to the mission of USDA. The property supports a variety of agricultural research including approaches to remote sensing; sustainable agriculture; plant, animal, and insect research; and genetics and genomics studies.

4.14.4 Environmental Consequences

4.14.4.1 No Build Alternative

Under the No Build Alternative, the SCMAGLEV Project will not be built and therefore no impacts related to the construction or operation of a SCMAGLEV system will occur. However, other planned and funded transportation projects will continue to be

¹ Natural Resources Conservation Service, 2019. Web Soil Survey. United States Department of Agriculture. Available online at <https://websoilsurvey.nrcs.usda.gov/>. Accessed January 8, 2019.

² United States Census Bureau, 2017. Cartographic Boundary Shapefiles – Urban Areas, 2017 Urban Areas Boundary File. Available online at https://www.census.gov/geo/maps-data/data/cbf/cbf_ua.html. Accessed July 14, 2020.

implemented in the Project Study Area and could result in alterations to soil conditions and existing farmland.

4.14.4.2 Build Alternatives

Based on a qualitative assessment of soil impacts and a quantitative assessment of farmlands, impacts to soils are similar for each Build Alternative, as there are similar soil types throughout the SCMAGLEV Project Affected Environment. However, impacts do vary by alternatives due to the comparative length of viaduct and tunnel for the alignments, and for the different station and TMF locations. FRA does not expect that the SCMAGLEV Project would result in changes to, or increased risk to public safety or the built environment from soil resources or hazards. **Table 4.14-1** shows temporary and permanent impacts to farmland soil for each Build Alternative. Appendix D.7 NETR provides more detailed information on impacts for each Build Alternative.

Table 4.14-1: Summary of Total Farmland Soil Impact

Alternative	Acres of Permanent Impact by Federal and State Recognition		
	Farmland of Statewide Importance	Prime Farmland	Total
J-01	50	160	210
J-02	44	114	158
J-03	59	167	226
J-04	50	160	210
J-05	44	114	158
J-06	59	167	226
J1-01	63	128	191
J1-02	51	79	130
J1-03	67	133	199
J1-04	63	128	191
J1-05	51	79	130
J1-06	67	133	199

Note: Numbers have been rounded to the nearest whole number.

A direct impact to soils would occur if the SCMAGLEV Project directly alters soil stability during construction, which could result in both long-and-short-term impacts, depending on the type of construction and stabilization procedures such as filling, grading, earthmoving, and/or permanent inundation that would result in the physical or chemical change of soils and/or preclude agricultural use. The conversion of farmland to a non-agricultural use, such as transportation,³ directly impacts farmlands. An indirect impact would occur if the SCMAGLEV Project induces other changes that could affect soils,

³ Impacts are considered with respect to mapped prime farmland, which do not have to currently be in use for agriculture (irrigated or otherwise).

such as creating a long-term potential for ongoing soil erosion or creating/ increasing the potential for future development that could impact soil stability or impact drainage.

FRA has prepared the NRCS-CPA-106 worksheet (*Farmland Conversion Impact Rating for Corridor Type Projects*), obtained NRCS input on Land Evaluation Information, and applied the corridor assessment criteria outlined in 7 CFR 658.5(c) for each of the proposed Build Alternatives. None of the Build Alternatives impact rating scores exceeds 160 points; therefore, no additional action is required under the FPPA. Table 4.14-2 shows the total impact rating score of each of the Build Alternatives. The score is presented by County for consistency with how NRCS tracks farmland impacts.

Table 4.14-2: Summary of Farmland Conversion Impact Rating Scores

Build Alternative	Anne Arundel County Rating Score	Prince George's County Rating Score
J-01	111	94
J-02	108	112
J-03	108	105
J-04	111	94
J-05	108	112
J-06	108	105
J1-01	113	114
J1-02	109	108
J1-03	105	103
J1-04	113	114
J1-05	109	108
J1-06	105	103

Alignments

FRA identified the following soil hazards along the both the Build Alternatives J and J1 alignments:

- Shrink-swell potential of soils is minimal, as existing soils are rated as “low” to “moderate” throughout the length of the alignments
- Severe erosion hazard potential in soils is located predominantly within Washington, DC, Prince George’s County, and Baltimore City
- Risk of corrosion to concrete and steel occurs throughout both alignments

Both alignments result in impacts to farmland from the conversion of prime farmland soils or soils of statewide importance to transportation use. Alignments associated with Build Alternatives J have greater impacts to farmland soils (approximately 81 to 83 acres) compared to alignments associated with Build Alternatives J1 (approximately 50 to 57 acres).

Of these totals, alignment associated with Build Alternatives J impacts about two and a half acres of farmland soils within the BARC property and alignment associated with Build Alternatives J1 impact between approximately 11 and 13 acres. The use of tunnel for a large portion of the SCMAGLEV Project would minimize direct impacts to surface soils and would not preclude continuing or new agricultural use in those areas. The use of viaduct may however result in indirect effects to existing farmland soils, by fragmenting, or cutting off adjacent farmland uses.

Stations

The same soil conditions and risks described above exist in station areas. The potential for “severe” erosion hazards exists at the Cherry Hill Station, including the proposed parking garage at that station. No prime farmland soils or farmland soils of statewide importance would be impacted by any of the proposed stations.

Trainset Maintenance Facilities (TMFs)

The same soil conditions and risks described above exist at TMF locations with the potential for “severe” erosion hazards for soils at all three TMF options. Prime farmland soil exists at all three TMF locations. The BARC Airstrip TMF would impact the least amount of prime farmland soil (approximately 73-75 acres), BARC West TMF the most (approximately 142-147 acres), and MD 198 TMF impacts approximately 129-140 acres. Due to the significance of prime farmland soils located on BARC property, FRA considered an additional breakdown of BARC impacts from the TMFs.

The BARC Airstrip TMF would directly convert approximately two percent of the BARC lands overall classified prime farmland soils, with 58 to 60 acres for TMF associated with Build Alternatives J1 and J respectively, identified on BARC. The BARC West TMF would directly convert approximately four percent of BARC’s overall prime farmland soils, with 115 acres identified on BARC. The MD 198 TMF would directly convert less than 0.2 percent of BARC’s overall prime farmland soils, due to necessary supporting viaduct ramps connecting the alignment to the TMF, equating to approximately six acres on BARC due to necessary supporting viaduct ramps associated with Build Alternatives J1 only.

4.14.4.3 Short-term Construction Effects

During construction, land would be disturbed, and soil removed. Construction activities would include cut/cover, excavation, filling, cutting, pile driving, vegetation clearing, and the development of temporary impervious surfaces and physical elements. Short-term construction activities, including vegetation clearing, would also impact soils and farmland. However, these areas have the potential to be re-vegetated and restore the soil’s ability to absorb and retain water, stabilize the soil, and retain potential environmental benefits to adjacent farmland.

Construction of the Build Alternatives would result in the disposal of excavated soils. Soils removed will require testing prior to disposal. During construction, contractors would follow United States Environmental Protection Agency (USEPA) guidelines to

remove, test, and dispose of soils, including those that may be suspected of contamination. Testing ensures that spoils can be safely placed into the environment at approved locations. Section 4.1 and Section 4.15 Hazardous Materials and Solid Waste discuss soil contamination and disposal in more detail.

4.14.5 Potential Minimization and Mitigation Strategies

4.14.5.1 Minimization

The Project Sponsor will prepare and implement an SCMAGLEV Project-specific ESC Plan and ensure that appropriate best management practices (BMP) are in place during construction. An ESC Plan will be prepared during final design in accordance with the guidelines provided by Maryland Department of the Environment (MDE) and the DC Department of Energy and the Environment (DOEE). Successful implementation of appropriate BMPs would ensure that the SCMAGLEV Project complies with state and Federal requirements, and that the resulting short-term and long-term soil impacts are maintained at acceptable levels. These measures could include the following:

- Install and monitor erosion-prevention measures, such as silt fences and water breaks, sedimentation basins, filter fences, sediment berms, interceptor ditches, straw bales, rip-rap, swales, and/or other sediment control structures; and re-spreading stockpiled topsoil.
- Seed and revegetate areas temporarily cleared of vegetation, and use native seed mixes and plants, whenever possible.
- Retain vegetation to the extent reasonably feasible.
- Install and maintain soil-stabilizing vegetation, mulch, or man-made materials to provide soil stabilization on disturbed areas.
- Minimize soil compaction by restricting vehicle travel, avoiding working on wet soils, and restoring soil conditions when necessary.

Indirect conversions of farmland to be minimized in areas of proposed fencing under the elevated viaduct with the use of gates, to allow farming equipment to access land that has been split by the alignment or other proposed SCMAGLEV systems. With more detailed design, the Project Sponsor will continue coordination with the USDA and other landowners where farmland may be impacted to enable use of these lands if desired, while maintaining safety and security to the SCMAGLEV systems and users of the property.

Mitigation

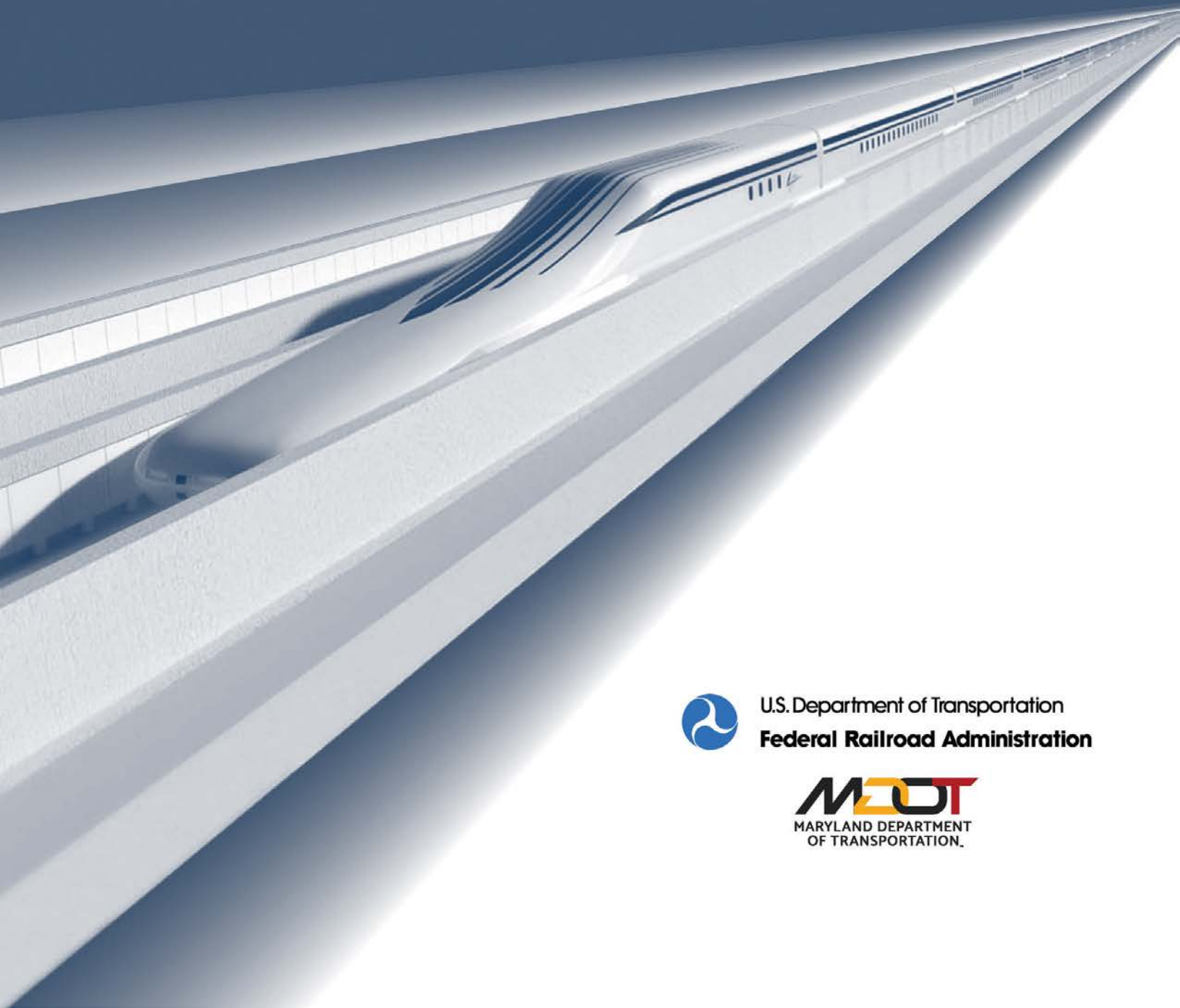
Once a preferred Build Alternative is selected, the appropriate NRCS-CPA-106 worksheet would be finalized and submitted to the local NRCS field office. Because none of the Build Alternatives exceeds 160 points on the conversion impact rating, mitigation for prime farmland soils is not anticipated.

Section 4.15

Hazardous Materials Sites and Solid Waste

BALTIMORE-WASHINGTON SUPERCONDUCTING MAGLEV PROJECT

DRAFT ENVIRONMENTAL IMPACT STATEMENT AND
SECTION 4(f) EVALUATION



U.S. Department of Transportation
Federal Railroad Administration



4.15 Hazardous Material Sites and Solid Waste

4.15.1 Introduction

This section identifies existing hazardous material sites that may be encountered during construction, and solid waste that would be generated during construction and operation of the Superconducting Magnetic Levitation Project (SCMAGLEV Project). An existing hazardous material site is land that has hazardous substances present in the site soil or groundwater. Hazardous substances include those substances defined as hazardous by the United States Environmental Protection Agency (USEPA). A solid waste is any garbage or refuse, sludge from a wastewater treatment plant, water supply treatment plant, or air pollution control facility and other discarded material, resulting from industrial, commercial, mining, and agricultural operations, and from community activities.”¹

4.15.2 Regulatory Context and Methodology

4.15.2.1 Regulatory Context

In accordance with the National Environmental Policy Act (NEPA), 42 U.S.C. § 4321 et seq., the Council on Environmental Quality (CEQ) regulations, 40 C.F.R. Parts 1500 - 1508, and the Federal Rail Administration’s (FRA) Procedures for Considering Environmental Impacts, 64 Fed. Reg. 28545 (May 26, 1999), the Federal Railroad Administration (FRA) assessed the transportation or use of any hazardous materials which may be involved in the Build Alternatives, and the level of protection afforded residents of the SCMAGLEV Project Affected Environment from construction period and long-term operations associated with the Build Alternatives. In addition, Federal and state laws guide the scope of FRA’s hazardous materials analysis, including:

Federal

- 29 United States Code (U.S.C.) § 651 (Occupational Safety and Health Act [OSHA])
- 15 U.S.C. §2601-2629. (Toxic Substances Control Act [TSCA])
- 40 U.S.C. § 11001-11050 (Emergency Planning and Community Right-to-Know Act [EPCRA])
- 42 U.S.C. § 6901 et seq. (Resource Conservation and Recovery Act [RCRA])
- 42 U.S.C. § 9601 et seq. (Comprehensive Environmental Response, Compensation, and Liability Act [CERCLA])

¹ Criteria for the Definition of Solid Waste and Solid and Hazardous Waste Exclusions
USEPA. <https://www.epa.gov/hw/criteria-definition-solid-waste-and-solid-and-hazardous-waste-exclusions#solidwaste>

Maryland

- Code of Maryland Regulations (COMAR) 26.10 (Oil Pollution and Tank Management)
- COMAR 26.13 13 (Disposal of Hazardous Substances) - Chapter 01 (Hazardous Waste Management System: General); Chapter 02 (Identification and Listing of Hazardous Waste); and Chapter 03 (Standards Applicable to Generators of Hazardous Waste)
- COMAR 26.04.06.01 to 26.04.10.10 Solid Waste Management

District of Columbia

- Title 8, Environmental and Animal Control Protection
- Title 21, Water and Sanitation; Chapter 7, Solid Waste Control

4.15.2.2 Methodology

Hazardous Materials Sites

To evaluate the potential to encounter existing hazardous materials during construction, FRA utilized Environmental Data Resources, LLC (EDR) to conduct a regulatory database search of Federal, state, and local records for known underground storage tank (UST) facilities; landfills; hazardous waste generator facilities; hazardous waste treatment, storage, and treatment/storage/disposal (TSD) facilities; and other potentially contaminated sites. Consistent with EDR's default search distance, the search was conducted within an approximate one-mile search radius from a centerline estimated between the Build Alternatives.

FRA then defined the SCMAGLEV Project Affected Environment for hazardous materials to consist of the limits of disturbance (LOD) for each Build Alternative, including all surface and subsurface elements, plus an additional 0.25-mile buffer extending outward from the LOD. FRA utilized the search results found within these limits to evaluate the potential impacts the SCMAGLEV Project may have on the identified sites and the human health and environmental impacts associated with the identified sites. The Affected Environment considered for this analysis includes that identified in Section 4.22 Safety and Security, for vulnerable locations or vulnerable population centers within a 500-foot radius of the LOD. This considers sites that, if affected, could amplify safety or security concerns to confirm and supplement data included in the EDR report, FRA completed a "windshield" survey to obtain additional information regarding visual evidence and confirmation of EDR data. The survey consisted of observing sites from inside vehicles utilizing roadways and other public areas. The purpose of the "windshield" survey was to identify possible evidence of existing use or storage of toxic or hazardous materials, landfills or other disposal units, visible soil contamination, aboveground storage tanks, drums or barrels of hazardous materials, or monitoring wells. Because the observations were made from outside property boundaries or adjacent observation points, the information obtained in the survey is limited and is not meant to be all inclusive.

FRA used the EDR report to identify sites within the SCMAGLEV Project Affected Environment that are of potential concern; considered the proximity of each site to the SCMAGLEV Project LOD; and used additional information obtained from the “windshield” survey and web research to assign a Risk Ranking to each site (see Step 3 in the Methodology described in Appendix D.8). The “Risk” refers to the potential for the site to pose threats to human health and the environment. The assignment of a Risk Ranking is a three-step process:

1. Assign a Listing Score based on the regulatory databases of concern associated with each site. Using the definition of each database and best professional judgement, FRA estimated the relative risk posed by sites in each database to assign a Listing Score using numerical indicators 2 through 5. Thus, the Listing Score reflects the relative risks of the listing(s) associated with a site, without regard to location or site conditions.
2. Identify Adjustment Factors that account for the distance from each site to the LOD, the relative direction of groundwater flow at the site, and readily available information from other sources (e.g., documented completion of environmental remediation).
3. Apply the Adjustment Factors, where applicable, to the Listing Score to assign a Risk Ranking for each site that ranges from High (5) to Insignificant (1).

Appendix D.8 provides a detailed description of this process, including a full list of the regulatory databases and their associated listing score, and the Adjustment Factor definitions used to develop the Risk Rankings.

Hazardous Materials, Hazardous Waste, and Other Solid Waste

FRA defined the SCMAGLEV Project Affected Environment for an analysis of hazardous materials, hazardous waste, and other solid waste as the LOD for each Build Alternative, including both surface and subsurface elements. FRA reviewed available plans for construction and operations to identify what types and quantities of hazardous materials will be used and stored as part of the SCMAGLEV Project construction (e.g., diesel fuel/gasoline, emergency generator emissions, solvents, adhesives) and operations (e.g., cleaning supplies, fuel). FRA also reviewed the types of hazardous waste and other solid waste that may be generated by the SCMAGLEV Project, both in the short-term during construction and the long-term during planned operations. In the absence of further detailed SCMAGLEV Project specific information, FRA has identified the types of materials and wastes expected. FRA qualitatively considered potential effects from the Build Alternatives on water resources, hazardous materials, and solid waste. Impacts to these resources may also result in potential public health, safety and risks to the environment. Based on the analysis presented for each resource, FRA identified impacts to the resources noted above that could pose a direct risk to public health, employee safety and the environment. Specific avoidance and minimization

measures to reduce or eliminate potential impacts to these resources have been summarized in Section 4.21 Public Health and Safety.

4.15.3 SCMAGLEV Project Affected Environment

4.15.3.1 Hazardous Materials Sites

FRA identified and ranked more than 1,000 sites within the SCMAGLEV Project Affected Environment with the potential for hazardous materials site concerns. Most sites identified within the SCMAGLEV Project Affected Environment are designated a Risk Ranking of 1 or 2, meaning relatively low risk. FRA focused on sites with Risk Rankings of 3 or higher because they have the greatest potential for the SCMAGLEV Project to encounter contaminated soil, groundwater, or other hazardous materials during construction. In such cases, environmental remediation may be required to remove the hazardous materials or design measures needed to protect human health. The Risk Rankings for all sites are identified in Appendix D.8.

Only three sites had the highest Listing Score of 5 (High Risk), as National Priority List (NPL) sites: Fort George G. Meade, the Beltsville Agricultural Research Center (BARC), and the Patuxent Research Refuge (PRR). FRA developed a Risk Ranking for these sites based on the information summarized below.

- **Fort George G. Meade:** Each Build Alternative would be located on and near the western border of Fort George G. Meade military base. The base was placed on the NPL on July 28, 1998, based on known contamination at four locations. These four locations are well outside the SCMAGLEV Project Affected Environment. However, in addition to the four known contaminated locations, the base contains multiple other locations of potential soil and groundwater contamination, two of which FRA identified within the SCMAGLEV Project Affected Environment. FRA reviewed documents that describe the nature of contamination at these two locations and the status of cleanup efforts. Both of these two additional sites were formally designated as requiring No Further Action by the United States Environmental Protection Agency (USEPA). Based on this information, FRA used the three-step process (described in Appendix D.8) to assign these two locations a Risk Ranking of 1 (Insignificant) for all Build Alternatives.
- **BARC:** The U.S. Department of Agriculture (USDA) is conducting CERCLA activities at BARC, which was placed on the NPL in 1994, and has been addressing soil and groundwater contamination throughout the BARC campus since that time. Many of the contaminated locations have already been cleaned up or are involved in investigations aimed at completing cleanups. Based on available information of these contaminated locations, all a part of their Remedial Action Program, FRA has assigned a Risk Ranking of less than 3 to all sites identified on BARC property, except one: BARC 32 – polychlorinated biphenyls (PCB) Storage Area.

At BARC 32, data from monitoring wells indicate that chlorinated solvents (perchloroethylene [PCE] and trichloroethylene [TCE]) are present in the groundwater at a depth of approximately 30 feet and have migrated southeast from the site toward the Baltimore-Washington Parkway (BWP). The known limits of the BARC 32 groundwater plume extend within the LOD for eight of the 12 Build Alternatives. Based on this information, FRA assigned the BARC 32 site a Risk Ranking of 4 for Build Alternatives J1-01 through J1-06, as well as Build Alternatives J-03, -04, -05, and -06. The remaining Build Alternatives have a Risk Ranking of 3 for this site.

Coordination with USDA on the status of remedial investigations and remedial actions at BARC sites would be necessary to better understand the risks posed and liabilities that may be incurred by the SCMAGLEV Project. In particular, the consequences of siting facilities over the groundwater plume from BARC 32.

- **Patuxent Research Refuge (PRR):** The North Tract of PRR was originally part of Fort George G. Meade and used as a military training ground. It was transferred from Fort George G. Meade to the PRR as part of Defense Base Closure and Realignment. FRA identified one site of potential concern on PRR property, the Medical Waste Site (MWS - OU16) within the SCMAGLEV Project Affected Environment. The MWS was investigated in the late 1990s, and the conclusion was made by USEPA that No Further Action was necessary. The resulting MWS Risk Ranking was 1 (Insignificant) for all Build Alternatives.

The North Tract of the PRR has been designated as a High Explosive Impact (HEI) Area, with the potential for buried unexploded ordnance (UXO). The North Tract abuts the east side of the BWP and appears to extend beneath the LOD for surface elements associated with Build Alternatives J-01 through J-06. FRA has assigned the HEI area of the PRR a Risk Ranking of 4 for these Build Alternatives. Build Alternatives J1-01 through J1-06 are not located on the PRR, and no impact is expected. Further coordination and survey of the UXO area would be required within this area prior to final design and implementation and plans for avoiding UXO within the areas of disturbance.

Most of the sites (32) identified within the SCMAGLEV Project Affected Environment and designated with a Risk Ranking of 3 or 4 are associated with leaking underground storage tanks (LUSTs) or other petroleum releases to the environment. These LUST sites are generally located within the densely developed areas of Baltimore City and Washington, D.C.

Appendix D.8 provides detailed information for all sites regarding location, database listings, and association with Build Alternatives.

4.15.3.2 Hazardous Materials, Hazardous Waste, and Other Solid Waste

The SCMAGLEV Project will involve the use of hazardous materials for construction and operation and will result in the generation of hazardous waste and other solid waste. This will require management of construction and operating activities to protect human health and the environment.

Construction

Within the SCMAGLEV Project Affected Environment, solid wastes generated during construction and demolition (i.e., C&D waste) is likely to include materials and products incorporated into the built environment, including earth, pavement, and organic plant materials. Types of solid wastes associated with land clearing operations are earthen material such as clays, sands, gravels, silts, and topsoil; tree stumps, brush, and limbs; logs; vegetation; and rock. Types of C&D wastes associated with the razing of buildings, roads, bridges, and other structures includes structural steel, concrete, bricks (excluding refractory type), lumber, plaster and plasterboard, insulation material, cement, shingles and roofing material, floor and wall tile, asphalt, pipes and wires, and other items physically attached to the structure.

Some C&D waste materials and products encountered or generated during construction present a known risk to human health and the environment. These include hazardous wastes (listed, characteristic and universal types identified by the USEPA); asbestos-containing materials (friable); asbestos-containing materials (non-friable); lead-containing materials (including lead-based paint); products containing polychlorinated biphenyls (PCBs); solvents, chemicals, paints, petroleum-derived products; diesel/gasoline; fluorescent and compact fluorescent lamps; electronics; and medical waste. The SCMAGLEV Project does have the potential to encounter naturally occurring asbestos during tunneling operations through bedrock, as described in Section 4.13 Geology.

Spoils from tunneling and cut/fill from construction would be generated during construction activities. The soils anticipated to be produced by the SCMAGLEV Project would be disposed of pursuant to a coordinated plan developed during final design. FRA recognizes that further geotechnical and soil studies may determine that much of the spoil derived through construction has the potential to be useful as daily cover for local landfills (e.g. Millersville Landfill, Baltimore City Dump, Prince George's County Waste Management) and/or fill for local or future projects (e.g. Sparrow's Point redevelopment, Baltimore-Washington International Thurgood Marshall Airport [BWI Marshall Airport]). Spoils that are not transported to landfills for daily cover use or put to some other productive use would be designated as a solid waste. The Project Sponsor will provide additional detail regarding estimated volumes and final transportation routes of spoil during continuing design. FRA identifies potential preliminary routes in Section 4.1

Operations

The operation and maintenance of the SCMAGLEV Project would require the handling, transporting, generating, storing, and disposing of hazardous and solid waste. Hazardous materials including lubricants, hydraulic fluids and cleaning products would be used during the routine maintenance of rail vehicles and stations. Wastes that would require disposal include used oil, used cleaning products, solvents, and paint. Most of these hazardous materials and wastes are used or generated at the transfer stations and maintenance facilities during maintenance, repair, washing and fueling activities. Based on the type of waste, the waste would be transferred to a landfill if considered

clean and acceptable to the landfill owner; a RCRA Part B permitted incinerator if classification of products indicates it necessary for incineration; or a recycling facility and would be disposed of in accordance with Federal, state and local requirements. Solid waste is also generated from passenger and employee usage including maintenance, administrative, security, and food service, and is primarily composed of municipal solid waste consisting of everyday items and food waste.

More complete information on hazardous and solid waste is expected to be developed as the design advances and geotechnical and environmental subsurface site investigations are conducted. This information would be used to prepare a Construction Contingency Plan and Hazardous Materials and Solid Waste Management Plan.

4.15.4 Environmental Consequences

This section describes the environmental consequences of encountering hazardous materials sites, and the potential consequences of using hazardous substances and generating solid waste during construction and operation of the Build Alternatives.

4.15.4.1 No Build Alternative

Under the No Build Alternative, the SCMAGLEV Project would not be built and therefore no impacts related to the construction or operation of a SCMAGLEV system would occur. However, remediation of contaminated sites due to construction of the SCMAGLEV Project would also not occur.

4.15.4.2 Build Alternatives

The quantity and nature of the use and storage of hazardous materials and generation of solid waste during SCMAGLEV Project construction would be greater in areas that require a higher degree of earth-moving, such as tunnel excavation sites, portals, and underground station construction sites.

Hazardous Materials Sites

Build Alternatives J1-01 through J1-06 include a longer tunnel portion than Build Alternatives J-01 through J-06. However, excavations conducted for Build Alternatives J-01 through J-06 may have a slightly greater impact than Build Alternatives J1 due to the higher number of medium-high risk sites identified along the Build Alternatives. Sites identified within the SCMAGLEV Project Affected Environment with a Risk Ranking of 3 or 4 represent the greatest potential for hazardous materials to be present in the soil and groundwater at the listed sites. These sites therefore pose a greater potential risk to human health and the environment. **Table 4.15-1** provides the total of sites ranked 3 or 4 for each of the Build Alternatives.

Table 4.15-1: Medium High and Medium Risk Hazardous Materials Sites

Build Alternative	Risk Rankings		Total Sites
	3	4	
J-01	40	11	51
J-02	47	13	60
J-03	40	11	51
J-04	31	12	43
J-05	38	14	52
J-06	31	12	43
J1-01	36	6	42
J1-02	37	6	43
J1-03	36	6	42
J1-04	27	7	34
J1-05	28	7	35
J1-06	27	7	34

Build Alternatives J-01, J-02, J-03, and J-05 have the highest number of sites ranked with a medium risk (3) to medium high risk (4), ranging from 51 to 60. The other Build Alternatives have a lower number of sites ranked 3 or 4, ranging from 34 to 43.

Alignment

Approximately nine more sites are associated with Build Alternatives J alignments (42) than associated with Build Alternatives J1 alignments (32), suggesting that the Build Alternatives J1-01 through J1-06 alignments would potentially encounter fewer hazardous material site concerns.

The BARC 32 groundwater contamination plume, with a Risk Ranking of 4, is associated with Build Alternatives J1-01 through J1-06 alignments, but it is also associated with two of the six Build Alternatives J alignments. Build Alternatives J-01, J-02, J-04 and J-05 would not be at risk by the identified plume, as these do not encroach the west side of the BWP where the plume is located. The proposed SCMAGLEV Project elements that do exist over the plume are the support structures for the viaduct and proposed overhead power line relocations. Efforts to minimize disturbance to this area such as spacing between power lines, containment of soils/spoil, and construction BMPs would be evaluated and incorporated into site design and mitigation measures. During final design and selection of a preferred alternative, this area and other potential contaminated soil and groundwater locations would be investigated further to determine the presence of volatile organic compounds (VOC)s and similar contaminants which may have the potential risk for vapor intrusion. This may occur if the VOC vapors migrate into buildings or enclosed spaces. FRA does not

consider this of concern at this specific location, as the plume is not located in an area where any SCMAGLEV systems buildings would be constructed. Continued monitoring of this location would be required to determine if it has or is migrating.

The PRR HEI Area, also with Risk Ranking of 4, is associated with the Build Alternatives J-01 through J-06.

Stations

The Cherry Hill Station is associated with nine sites, the Camden Yards Station and Mount Vernon Station are only associated with one site each, and the BWI Station did not have any listings. The nine listings for the Cherry Hill location, in Baltimore, include a variety of commercial and industrial properties. Based on these numbers, the Cherry Hill Station is likely to require more remediation and mitigation than the two other stations.

Trainset Maintenance Facilities (TMFs)

The BARC Airstrip option is the only TMF option that resulted in any listings with a Risk Ranking of 3 or 4. The seven sites identified for this option include a variety of commercial and industrial sites.

Hazardous Materials, Hazardous Waste and Other Solid Waste

The solid wastes generated during construction are generally expected to be similar for all Build Alternatives, except for solid wastes that are a result of C&D waste at sites with existing buildings or contaminated soil or groundwater. FRA anticipates there to be a difference in the volume of tunneling spoils between the Build Alternatives, but the solid waste implications between Build Alternatives would be insignificant. Given the depth and nature of the soils, which are anticipated to be clean and undisturbed, FRA anticipates that the material can potentially be useful as daily cover for local landfills. Spoils used for cover would not be classified as solid waste. Solid wastes generated during operations are expected to be the same between all Build Alternatives.

Soil suspected of contamination, and wastes that are generated, would be tested and disposed of in accordance with applicable Federal, State, and local laws and regulations. Prior to construction the Project Sponsor will prepare a Construction Management Plan which includes a Waste Management Plan (WMP) to address sampling analysis, characterization, handling, storing, transporting and disposing of hazardous waste and construction and demolition waste generated during construction and operation activities. The Waste Management Plan would specify that where practicable, uncontaminated construction and demolition waste would be diverted from landfills by reuse or recycling. The structures to be demolished as part of the SCMAGLEV Project would be inspected for the presence of asbestos-containing materials, PCBs or lead-based paint, and other hazardous building materials. This coordination would take place during preliminary engineering.

4.15.4.3 Short-term Construction Effects

SCMAGLEV Project construction would require the use and storage of certain hazardous materials and subsequent generation and accumulation of hazardous wastes and/or solid waste that have the potential to create an environmental impact. Potential short-term construction effects may include:

- Dewatering and excavation activities may further cause migration of contaminants through the soil and groundwater.
- Accidental spills or releases of hazardous substances used to run construction equipment.

FRA anticipates that excavation and special disposal of contaminated soils and groundwater may be required at some sites during construction. Demolition of buildings and roadways with potential asbestos-containing materials, PCBs and lead-containing materials may require abatement or special handling and disposal requirements. The WMP would additionally specify designated hazardous materials and waste storage areas for items needed both during construction and operations such as fuel storage tanks and emergency generators.

4.15.5 Potential Minimization and Mitigation Strategies

Hazardous materials information for the sites identified above was limited to data from the EDR reports, windshield surveys, and web research. Although detailed information was available for sites on Federal properties listed in the EDR report (Fort Meade, PRR, and BARC), most of the site information used in this analysis relied on EDR data and did not include more in-depth review of available file material. The EDR reports do not describe site conditions, only the regulatory status. Moving forward, the following actions are recommended to provide detailed information about sites that may be encountered and affect the design of the SCMAGLEV Project.

- Conduct environmental site assessments for all properties along the selected Build Alternative, including final construction laydown areas located both north and south of the Build Alternatives (refer to Appendix B Mapping Atlas), to identify sites for further evaluation. Assessments will include review of data in the USEPA Enforcement and Compliance History Online (ECHO) which provides details on site compliance history.
- Review of USEPA online EJSCREEN database, which provides relevant hazardous waste and demographic data sets that may relate to considerations of human health.
- For sites with higher risks and potential for significant impacts to design and construction, contact site owners and arrange for site investigations.
- Consult with regulatory agencies for sites where regulatory status is not certain, or where detailed information is needed.

- Site specific research and comparison of 2020 BWI Marshall Airport Environmental Assessment Finding of No Significant Impact/Record of Decision, to SCMAGLEV Project EDR results.

Identification and review of the higher risk hazardous material sites is the first step toward minimizing the impacts posed by hazardous materials sites within the SCMAGLEV Project Affected Environment. In order to minimize risk, additional knowledge of sites may be necessary. Such assessments could include:

- Further collaboration with Federal, state, and local agencies to obtain more detailed information regarding potential hazardous materials sites.
- Additional/supplemental detailed site reconnaissance; a review of additional regulatory records and existing technical reports; interviews with persons knowledgeable about the properties; or site investigation through sampling of soil and groundwater.
- Evaluation of completed soil and groundwater sampling and monitoring to determine the potential for contaminant migration due to construction and project operations and identify measures that could avoid or minimize such migration.

The Project Sponsor will need to conduct further coordination and survey of the identified UXO area within PRR property prior to final design and implementation. The survey would include a scan or probe of the area of concern to assess if there is any unexploded material embedded in the ground, ensuring any planned construction works can be carried out as scheduled with the minimum amount of risk to those involved. A UXO clearance could then be established and associated with any proposed earth disturbance.

With a better understanding of the potential hazards, consideration of remediation activities can be evaluated, such as removal of contamination, in situ treatment, or soil capping. Alternatively, Activity Use Limitations (AULs) could be used to prevent land use that prevent exposures from the substances of concern, based on risk assessments. In some cases, the development of design features that provide protection against the effects of the contamination, rather than conducting remediation, may be used to minimize impacts. This can include standard best management practices (BMPs) identified in previous Sections 4.10 Water Resources and 4.11 Wetlands and Waterways, such as silt fencing, sediment traps, and dewatering operations. If VOCs and other chemicals that may migrate into vapor are identified within the soils and/or groundwater, mitigation may be required to minimize and prevent the risk for vapor intrusion. In areas where the SCMAGLEV Project may impact existing restoration/clean-up sites, where No Further Action was identified, additional clean-up may be required. This therefore may result in the No Further Action status removed.

FRA anticipates that some excavation and special disposal of contaminated soils and groundwater may be required during construction. Requirements for management of such soils and groundwater would be established through sampling from borings and temporary wells installed in areas of concern. The sampling results would be used to

determine the levels of hazardous substances and classify the materials for appropriate disposal. The results may also require the design of barriers to prevent contaminated groundwater inflows or harmful vapors into structures.

This information, including a site-specific sampling and analysis approach will be included in a WMP prepared by the Project Sponsor. The Project Sponsor will document the methodology, procedures, equipment, and analytical requirements for sampling performed and characterize areas exceeding regulatory thresholds in a Sampling and Analysis Plan as part of the WMP. Pollutants may include petroleum or hazardous substances listed in the current Maryland Department of the Environment Soil and Groundwater Cleanup Standards document or the current USEPA Regional Screening Levels (RSLs) table. Soils or fill material that are subject to Federal and state hazardous waste regulations (40 Code of Federal Regulations [CFR] Part 260 and the Code of Maryland Regulations [COMAR] 26.13) are any soils contaminated by a listed hazardous waste, or that display a characteristic of a hazardous waste.

FRA will require establishment of procedures for the proper storage and maintenance of equipment and hazardous materials. This will include but not be limited to the mitigation measures listed below.

- Ensure that all SCMAGLEV Project personnel receive the appropriate type and level of hazardous materials training and RCRA training.
- Conduct frequent and routine documented inspections of the construction site for violations, to verify consistent implementation of general construction permit conditions and BMPs.
- Designate special storage areas for hazardous materials and hazardous waste, containment berms, and coverage from rain.
- Avoid disturbing contaminated locations, if possible.
- Conduct frequent and routine spill drills.
- Ensure adequate supply of spill kits.

The Project Sponsor will develop a Construction Management Plan, which includes the WMP, that describes how to avoid and/or mitigate existing contamination and handle discovery of unknown contamination. This plan will outline procedures for initial contaminant screening, soil and groundwater sampling, laboratory testing, soil stockpiling, and removal, transport, and disposal of contaminated materials at licensed facilities, according to the nature and concentration of the contamination. Specific disposal methods and facilities will be identified as more detailed site data are available.

The plan would also establish roles, responsibilities and procedures for workers to follow in areas with known or suspected soil or groundwater contamination. For sites that require demolition and removal, the plan will address issues such as lead, asbestos, PCBs, and other materials that would require disposal in a TSCA landfill. The plan will specify how to appropriately contain, remove, and dispose of the asbestos and

lead-containing material at licensed disposal facilities. The Project Sponsor will consider the addition of site-specific plans for high-risk sites.

For SCMAGLEV Project operations, the Project Sponsor will develop a Hazardous Materials and Solid Waste Management Plan as a tool for compliance that will address the following:

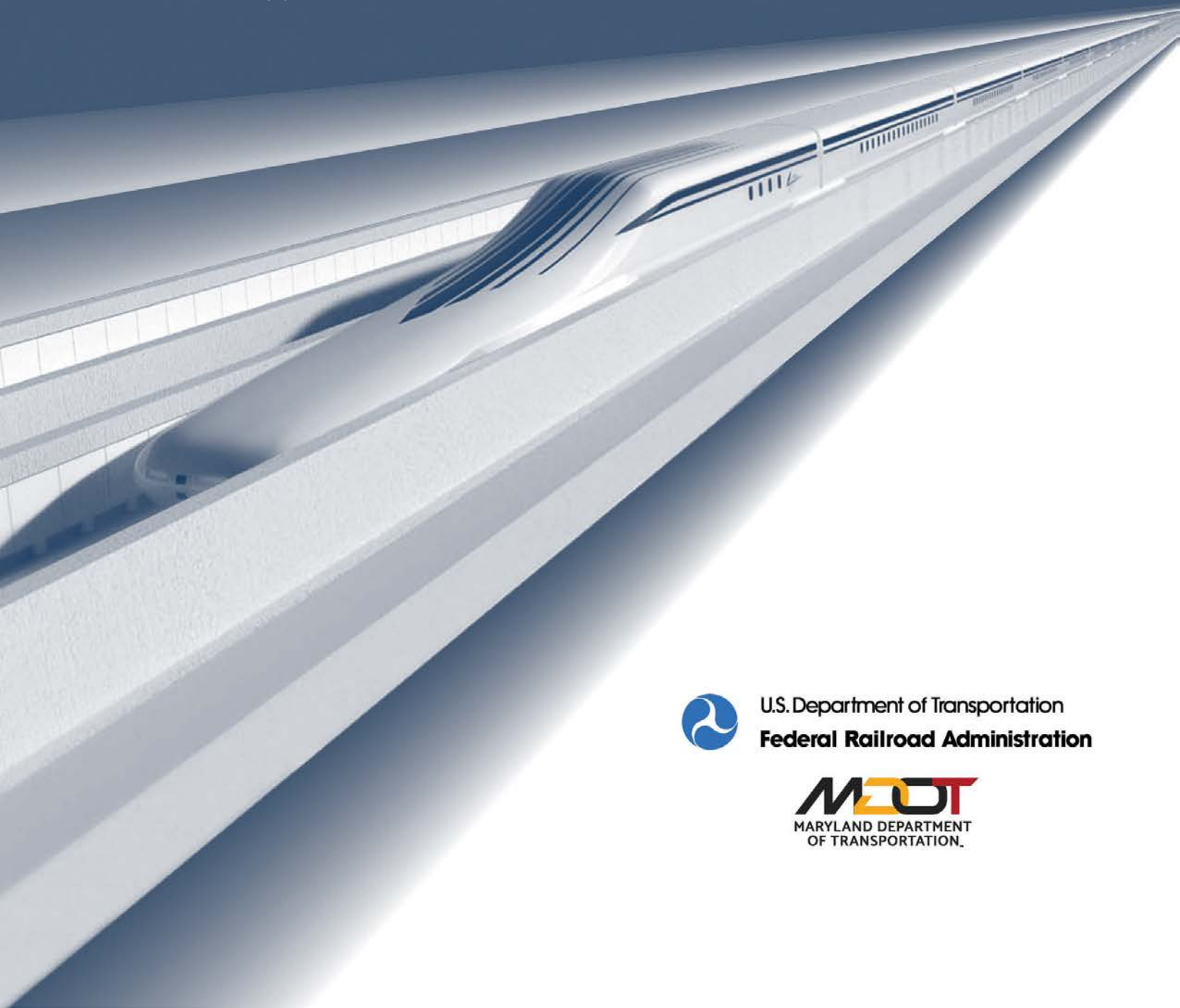
- Waste characterization (e.g. hazardous) and accumulation (inspections, secondary containment, liners and covers, waste compatibility, selecting the proper container, security, communication, equipment, etc.)
- Green Procurement/Waste Minimization
- HAZMAT safety requirements
- Spill Prevention Control and Countermeasure (SPCC) plan or Spill Prevention Plan (SPP) for fuels and oils to address tank design (leak detection, overfill protection, double-walled, etc.); drum storage area design/containment system; tank and container inspections; spill prevention techniques; spill response; and spill training and reporting
- Stormwater Pollution Prevention Plan (SWPPP) requiring that all persons are trained on the plan and know how to implement all the required BMP (Refer to Section 4.10 Water Resources for further stormwater management requirements)

Section 4.16

Air Quality

BALTIMORE-WASHINGTON SUPERCONDUCTING MAGLEV PROJECT

DRAFT ENVIRONMENTAL IMPACT STATEMENT AND
SECTION 4(f) EVALUATION



U.S. Department of Transportation
Federal Railroad Administration



4.16 Air Quality

4.16.1 Introduction

This section describes the existing air quality conditions and the potential for the Superconducting Magnetic Levitation Project (SCMAGLEV Project) to impact existing air quality and discusses General Conformity under the Clean Air Act (CAA) (42 USC § 7401 *et seq.*). The Federal Railroad Administration (FRA) also evaluates greenhouse gas (GHG) emissions and potential climate change impacts.

4.16.2 Regulatory Context and Methodology

4.16.2.1 Regulatory Context

In accordance with the National Environmental Policy Act (NEPA), 42 U.S.C. § 4321 *et seq.*, the Council on Environmental Quality (CEQ) regulations, 40 C.F.R. Parts 1500 - 1508, and the Federal Rail Administration's (FRA) Procedures for Considering Environmental Impacts, 64 Fed. Reg. 28545 (May 26, 1999), FRA assessed the consistency of the alternatives with Federal and state plans for the attainment and maintenance of air quality standards.

National Ambient Air Quality Standards (NAAQS)

Humans affect ambient air quality through the emission of air pollutants, including emissions by mobile and stationary sources. The concentration levels of specific pollutants in ambient air may affect health and welfare of the general public. In order to protect the public from the adverse effects associated with pollutants in the ambient air, as required under the CAA, the United States Environmental Protection Agency (USEPA) has established the NAAQS for six contaminants, referred to as criteria pollutants (40 C.F.R. Part 50). The criteria pollutants are: carbon monoxide (CO), nitrogen dioxide (NO₂), ozone (O₃), particulate matter with diameters up to 10 µm (PM₁₀), particulate matter with diameters up to 2.5 µm (PM_{2.5}), lead (Pb), and sulfur dioxide (SO₂).

Attainment of the NAAQS

For each criteria pollutant, USEPA classifies geographic areas based on the concentration of the criteria pollutant in the ambient air. Areas are classified as:

- **Attainment** – Areas where no exceedance of NAAQS for a specific criteria pollutant occurred.
- **Nonattainment** – Areas where exceedance of NAAQS for a specific criteria pollutant occurred. The nonattainment designations for certain pollutants include degrees of classifications. For example, for ozone (O₃), the classification could be extreme, severe, serious, moderate, or marginal nonattainment, which indicates the severity of the air quality problem.

- **Maintenance Area** – Areas that had previously been designated as a nonattainment area but are now consistently meeting the NAAQS. These areas generally have a maintenance plan to ensure compliance with NAAQS.

If an area is designated as nonattainment for a criteria pollutant, the appropriate state government must develop and implement control plans to reduce the emission level of that pollutant. This is referred to as a State Implementation Plan (SIP). For a maintenance area, state governments must develop maintenance plans to ensure and demonstrate compliance with NAAQS for 20 years.

The Maryland Department of Environment (MDE) and Metropolitan Washington Air Quality Committee (MWAQC) are responsible for developing a SIP for Maryland (including Baltimore City) and Washington, D.C. metropolitan nonattainment areas, respectively.

In addition to the criteria pollutants, the CAA also lists 187 air toxins, known as hazardous air pollutants (HAPs). Toxic air pollutants include several substances that are known or suspected to cause cancer or other health effects in humans when they are exposed to certain levels. The CAA authorizes the USEPA to characterize and control emissions of these pollutants. However, unlike the criteria pollutants, the majority of air toxins do not have ambient air quality standards. Of the 187 HAPs, 93 have been identified as mobile source air toxics (MSAT) and nine MSAT are priority MSAT.¹ FRA identified these priority MSATs and associated health effects in Appendix D.9.

Greenhouse Gases (GHG)

GHG emissions are emissions that trap heat in the atmosphere. CEQ published *Draft National Environmental Policy Act Guidance on Consideration of Greenhouse Gas Emissions* (84 FR 30097, June 26, 2019). The dominant GHG emissions emitted by manmade sources is CO₂, mostly from fossil fuel combustion and is the pollutant most relevant to the SCMAGLEV Project. Therefore, FRA only considered CO₂ emissions in the DEIS. FRA estimated the GHG emissions within the mesoscale subarea along the corridor quantitatively to compare the SCMAGLEV Project Alternatives and has qualitatively addressed potential effects to climate change.

Clean Air Act Conformity

The CAA requires Federal agencies to ensure that their actions on a project-level conform to the SIP in nonattainment areas for purposes of reducing the severity and number of violations of the NAAQS. FRA actions are subject to the Federal General Conformity (GCR) rule. Transportation conformity applies to Federal highway and transit projects, while general conformity applies to all other Federal actions. However, certain

¹ EPA priority MSATs are those with significant contributions from mobile sources that are among the national and regional-scale cancer risk drivers or contributors and non-cancer hazard contributors from the [2011 National Air Toxics Assessment \(NATA\)](#).

transportation projects can involve Federal actions that necessitate the evaluation of both transportation conformity and general conformity requirements.

FRA assessed the levels of criteria pollutants within SCMAGLEV Project Affected Environment at the local level at hot spots within the areas immediately surrounding the new stations and/or maintenance facilities for which the detailed roadway traffic forecasts were developed, described in Section 4.2 Transportation. Additionally, FRA assessed the levels at a mesoscale level emissions burden within the most affected subarea extending quarter miles on both sides of the corridor that was established for detailed roadway traffic forecasts.

Within the mesoscale subarea along the corridor, as the operation of SCMAGLEV trains will not generate any emissions associated with burning fossil fuels, the criteria pollutants related to the SCMAGLEV Project are on-road vehicle- and/or construction equipment-related CO, PM₁₀ and PM_{2.5}, and O₃ precursors [nitrogen oxides (NO_x) and volatile organic compounds (VOCs)]. In addition to these pollutants, FRA also considered SO₂ because the SCMAGLEV Project would be constructed and operated within areas of Baltimore and Anne Arundel Counties, both of which are in nonattainment for SO₂ NAAQS. Lead emissions from gasoline-fueled vehicles have been virtually eliminated through the use of unleaded gasoline and are not of concern for this analysis. Details regarding the criteria pollutants and NAAQS are provided in Appendix D.9.

4.16.2.2 Methodology

For the counties within the study area, FRA identified the attainment status for criteria pollutants. FRA evaluated potential air quality impacts at the local level (i.e., localized impacts at congested intersections around each new station), mesoscale (i.e., changes in traffic patterns within the corridor subarea) and, construction period emissions impacts.

In addition, FRA evaluated the potential impacts to determine for project-level CAA general conformity for applicable nonattainment areas, based on the applicable SIP. In the analysis, FRA demonstrated compliance with CAA general conformity requirements, using the methodologies and procedures established by Federal Highway Administration (FHWA) for assessing potential mobile source impacts from changes in traffic patterns for a transportation project.

The SCMAGLEV Project will use grid power to operate trains, stations and other facilities and is not expected to require new power generating facilities. FRA did not quantify the powerplant emissions required for train operations and facilities, as emissions from powerplants will be regulated through the applicable CAA permits and SIP.

Localized Impact Analyses

The SCMAGLEV train will not emit criteria pollutants during operation, as the system runs entirely on electricity. Therefore, the localized impact analysis focuses on the

potential for negative impacts as a result of the change in roadway traffic patterns around the three new stations by following available USEPA and FHWA guidelines established for addressing roadway traffic related air quality impacts described below.

FRA's analysis predicted concentrations of localized criteria pollutants and compared those concentrations to the NAAQS using the FHWA hot spot analysis guidance. FRA assessed whether localized emissions from the SCMAGLEV project would result in an exceedance of the NAAQS.

To calculate localized emissions, FRA computed vehicular exhaust emission factors for future 2027 build year and 2045 design year using the USEPA mobile source emissions factor model, Motor Vehicle Emission Simulator (MOVES) (Version 2014b – MOVES2014b), incorporating basic input parameters provided by the Metropolitan Planning Organizations (MPOs), Metropolitan Washington Council of Governments (MWCOCG) and Baltimore Metropolitan Council (BMC), for their respective controlled regions. FRA predicted the optimum concentrations resulting from vehicle emissions at the selected worst-case intersections around each new station using USEPA's CAL3QHC dispersion model to evaluate potential localized mobile source impacts because of change in traffic patterns as a result of the SCMAGLEV Project.

For localized impacts of CO and PM, FRA used the traffic study analyses, which analyzed 65 intersections, considering the sensitive land uses immediately adjacent to the roadways. FRA identified and selected three worst-case intersections, as depicted in Appendix D.9, for hot-spot concentration modeling analyses for CO considering traffic inputs within a 1000-foot radius surrounding each worst-case intersection. Consistent with USEPA hot spot analysis guidance² for PM, FRA also evaluated forecasted traffic conditions around the proposed stations to assess potential air quality concerns. Any Build Alternative deemed to have a potential air quality concern would require hot spot concentration modeling analysis for PM_{2.5} and PM₁₀. Since the diesel vehicle component within the affected roadway network along the corridor and the three new station areas will essentially remain the same under the Build Alternatives as compared to the No Build Alternative, PM concentration modeling is not warranted per USEPA guidelines.

To address potential traffic impacts within a local roadway network from a project, FHWA defines three analysis categories for MSATs, depending on specific project circumstances (i.e., no analysis, qualitative, or quantitative).³ For localized MSAT impacts, the SCMAGLEV Project does not have higher potential MSAT effects because the Annual Average Daily Traffic (AADT) at each affected roadway around the corridor and stations will be less than 140,000. Therefore, a quantitative MSAT analysis is not required, and a qualitative discussion is sufficient.

² USEPA Transportation Conformity Guidance for Quantitative Hot-spot Analysis in PM_{2.5} and PM₁₀ Nonattainment and Maintenance Areas. November 2015. www.epa.gov/state-and-local-transportation/project-level-conformity-and-hot-spot-analyses#pmguidance

³ Updated Interim Guidance on Mobile Source Air Toxic Analysis in NEPA Documents. October 18, 2016. http://www.fhwa.dot.gov/environment/air_quality/air_toxics/policy_and_guidance/msat

Mesoscale Impact Analyses

As compared to a localized microscale impact analysis at specific congested traffic or site location, the purpose of conducting a mesoscale emission analysis is to provide a comparison of pollutant emission levels within the affected roadway network immediately adjacent to the corridor (i.e., roadways within a quarter mile buffer along the corridor alignment and around new stations) for each Build Alternative and the No Build Alternative. This analysis provides the criteria pollutant emission burden on a mesoscale or corridor level. The defined mesoscale boundary is illustrated in Appendix D.9. Since GHG emissions affect climate change on a global scale, FRA evaluated GHG emissions on a mesoscale level for the purpose of this analysis.

FRA utilized the MOVES2014b model to estimate emission factor for criteria pollutants and GHGs at the mesoscale level based on MPOs-provided county-specific parameters for their respective regions for applicable road types and speed bins. The average daily vehicle miles travelled (VMT) predicted within the affected roadway network along the corridor using MWCOG- and BMC-developed regional transportation models were multiplied by MOVES2014b-predicted emission factors to predict daily emission levels for each applicable Build Alternative and the No Build Alternative. Since the subarea (mesoscale) traffic network along the corridor will remain essentially unchanged for the majority of the Build Alternatives, FRA evaluated two scenarios based on the new station selection in the Baltimore area, which includes either the Cherry Hill or Camden Yards Station scenario. FRA conducted mesoscale emissions analysis for the two station scenarios, respectively.

Construction Period Impact

In contrast to operational activities, construction activities are relatively short-term conditions with the potential to produce temporary air quality effects. However, the impacts of construction vehicle and equipment emissions from large-scale construction activities occurring over many years (typically over five years) at a specific local site could cause adverse air quality effects and may need to be quantitatively addressed.

Based on the Project Sponsor's construction schedule, described in the Construction Planning Memorandum (BWRR, May 14, 2020), no site-specific construction element or section will last more than five years with the exceptions of overall construction schedule for stations and trainset maintenance facilities (TMF) lasting six years. However, according to the Construction Planning Memorandum (BWRR, May 14, 2020), given the number of stations to be constructed, at a specific station, the construction will not last more than five years. For each TMF option, the entire facility will have a standardized size of 170 acres involving many phases and moving elements anticipated to occur over the entire TMF facility area. Construction activities will likely not last more than five years with measurable continuing negative impacts to a specific neighborhood around the TMF site. The negative impacts would be limited and of short duration. Therefore, since construction activities at these sites are considered temporary, FRA did not conduct a quantitative hot spot analysis.

General Conformity Rule (GCR) Analysis

FRA conducted an applicability analysis to determine whether the SCMAGLEV Project would require a conformity determination under the General Conformity Rule (GCR). FRA estimated annual emission for direct and indirect nonattainment or maintenance criteria pollutants emissions, as applicable, from construction and operational activities associated with SCMAGLEV Project on a corridor mesoscale level. FRA-estimated emissions were then compared to the applicable *de minimis* threshold.

FRA estimated construction manpower and equipment including truck activities for each construction element such as viaduct, above ground activities associated with tunnel construction, shaft, portal, substation, station, TMF, MOW, etc. using RSMeans data. FRA performed MOVES14b modeling to predict construction nonroad equipment and on-road truck and commuter vehicle emissions factors and multiplied them with manpower and equipment activity data to determine total emissions from each project construction component such as viaduct, TMF, station, etc. Based on the construction schedule for each construction component, FRA evenly distributed total emissions for each component over the corresponding duration for that component and then determined the overall annual emissions for the project by combining overlapping emissions from each component on an annual basis over the entire construction duration. For the tunnel boring, it is anticipated that standby generators will be installed and operated under power outage conditions. However, the actual emissions from these generators cannot be reasonably estimated and therefore they are not considered in the analysis.

After completion of the SCMAGLEV Project construction, potential long-term emissions from affected power plants providing grid power to various project facilities and trains could have potential negative regional air quality impacts.

Based on the power energy consumption levels estimated for the SCMAGLEV Project and the available existing capacity within the grid power pool in the region, the existing power facilities from Potomac Electric Power Company (PEPCO) and Baltimore Gas and Electric (BGE) to be used for providing grid power have the capacities under their current air permit conditions with permitted air emissions already accounted for in the SIP emissions budget.

For indirect operational emissions from on-road mobile source operations, FRA included the estimated corridor mesoscale emissions in the GCR analysis. Therefore, FRA performed GCR analysis for applicable nonattainment or maintenance pollutants by estimating annual emissions from mobile source operations on a mesoscale along the corridor and vehicle and equipment operations during the construction period. FRA compared these estimated annual emissions with the applicable *de minimis* threshold.

4.16.3 SCMAGLEV Project Affected Environment

FRA identified the existing, localized air quality conditions surrounding three identified intersections that were determined in the traffic studies to be affected by the SCMAGLEV Project. FRA also identified the existing air quality conditions at the mesoscale level along the corridor, including the subarea roadway networks

surrounding new stations under Cherry Hill and/or Camden Yards options and within a quarter mile buffer along the entire corridor. These conditions are reflected through the current status of NAAQS attainment and the recent ambient air monitoring data collected and published by Washington, D.C. Department of Energy and Environment (DOEE) and MDE.

The current air quality designations for the cities and counties and Washington, D.C. through which the SCMAGLEV Project is located, are summarized in **Table 4.16-1**.

Table 4.16-1: Nonattainment and Maintenance Status

County/City	Nonattainment		Maintenance	
	O ₃	SO ₂	PM _{2.5} ¹	CO
Washington, D.C.	X (Marginal)	n/a	X	X
Prince George's	X (Marginal)	n/a	X	X
Montgomery	X (Marginal)	n/a	X	X
Anne Arundel	X (Marginal)	X	X	n/a
Baltimore	X (Marginal)	X	X	n/a
Baltimore City	X (Marginal)	n/a	X	X

Note: An X designates this location as nonattainment or maintenance for the identified pollutants. All areas are in attainment for all other criteria pollutants.

¹ Related to the revoked 1997 standard with a maintenance plan still in place.

Source: <https://www.epa.gov/green-book>

The most recent measured ambient air concentrations within metropolitan areas in Baltimore and in Washington, D.C., illustrated in Appendix D.9, present a picture of the recent actual ambient air quality conditions within SCMAGLEV Project Affected Environment in addition to the attainment designation status summarized in **Table 4.16.1**. These measurements are mostly consistent with the above attainment designations.

4.16.4 Environmental Consequences

FRA evaluated potential air quality impacts within the SCMAGLEV Project Affected Environment under the SCMAGLEV Project through localized CO concentration modeling at the worst-case congested intersections and PM and MSATs qualitative assessment, corridor mesoscale emissions quantification for Cherry Hill and Camden Yards Station options for all concerned criteria pollutants and GHG, and GCR applicability analysis based on estimated construction and operation annual emissions for applicable pollutants.

4.16.4.1 No Build Alternative

Under the No Build Alternative, the SCMAGLEV Project will not be built and, therefore, no impacts related to the construction or operation of a SCMAGLEV system will occur. However, other planned and funded transportation projects will be implemented in the area and could result in impacts to air quality. Although the overall traffic increase is shown in the mesoscale subarea network primarily as a result of economic and population growth in the region under the No Build Alternative as compared to the baseline existing condition, continuing emission control programs, such as improving engine combustion efficiency, inspection, and maintenance programs, implemented on both Federal and state levels typically offset or reduce the overall vehicular pollutant emissions from traffic increase in general.

FRA estimated the criteria pollutant and GHG emissions within the mesoscale network for purposes of providing a comparison with the Build Alternatives discussed below.

4.16.4.2 Build Alternatives

Localized (Microscale) Impact

FRA conducted a screening analysis at a total of 65 intersections for which 2027 (i.e., estimated time of completion year) and 2045 (i.e., design year reflecting traffic growth over future years) traffic level-of-service (LOS) and volume forecasts were estimated for the roadway network surrounding each of the three stations (Refer to Section 4.2). FRA ranked the worst-case intersections showing a LOS of level D or worse (Refer to Section 4.2.8.4). Based on the approach volumes at each ranked intersection, FRA considered the intersection(s) with the highest levels and land use sensitivity, such as the presence of sidewalks, vacant land, etc., around each ranked congested intersection and then selected one overall worst-case primary signalized intersection within each of the three station areas, in Washington, D.C. and Baltimore. These selected worst-case intersections are summarized in **Table 4.16-2**; each was further analyzed for CO microscale (localized) concentration modeling. Intersections are also illustrated on SCMAGLEV Project mapping in Appendix D.9.

According to the traffic forecasts, traffic patterns on a local level around stations and maintenance facilities would not be meaningfully different among Build Alternatives. The predicted highest CO concentrations are well below the NAAQS for CO as illustrated in **Table 4.16-2**. As the studies were conducted at the worst-case intersections identified, FRA anticipates that CO concentration levels at other intersections in the vicinity of the SCMAGLEV Project will be lower than or will remain the same as these modeled intersections and will also be well below the NAAQS for CO. Consequently, FRA concluded that potential air quality impacts on a local level will not be considered negative under each Build Alternative.

Table 4.16-2: Worst-Case CO Intersections and Predicted CO Concentrations

Intersection	CO Concentration (ppm)			
	2027		2045	
	1-hour	8-hour	1-hour	8-hour
New York Ave. NW @ 7 th St. NW/ Massachusetts Ave. NW @ 7 th St. NW Combined	4.6	3.4	3.0	2.2
Howard Street @ Conway Street	4.5	3.3	3.8	2.8
Annapolis Road @ Patapsco	4.6	3.3	3.8	2.8
NAAQS	35	9	35	9

Source: AECOM July 2020

The Build Alternatives would not increase diesel vehicle traffic on roadways with 140,000 or greater AADT within the SCMAGLEV Project Affected Environment, therefore potential localized impacts from PM_{2.5} and MSAT would likely not be significant. Additional information is presented in Appendix D.9.

Corridor Mesoscale Impact

FRA predicted project-level mesoscale emissions for criteria pollutants and GHG emissions in terms of CO₂ for both No Build and Build Alternatives under Cherry Hill and Camden Yards Station options and provided a comparison of mesoscale pollutant emission levels within the affected roadway network within the boundary defined for traffic impact analysis as depicted in Appendix D.9.

FRA utilized the MOVES2014b model with input parameters established by BMC and MWCOG that are applicable for their respective regional air conformity demonstration. These parameters were used to estimate emission factors for both criteria pollutants and GHG in terms of CO₂. The average daily VMT within this mesoscale roadway network along the corridor between Washington, D.C. and Baltimore were multiplied by MOVES2014b-predicted emission factors to predict daily mesoscale emission levels, thus providing a comparison of mesoscale pollutant emission levels to the No Build Alternative for both 2027 and 2045.

When compared to the No Build, the Build Alternatives would result in a slight emission increase summarized in **Tables 4.16-3 and 4.16-4** for each criteria pollutant within the mesoscale network, primarily as a result of new trips around the new stations within the roadway network immediately adjacent to the corridor. Both estimated daily emissions in tons per day (tpd) and annual emissions in tons per year (tpy) are shown in **Tables 4.16-3 and 4.16-4** for Build Alternatives under Cherry Hill and Camden Yards Station options, respectively.

Table 4.16-3: Cherry Hill Station Alternatives Mesoscale No-Build to Build Net Change in Daily and Annual Emissions

Pollutant	2027 Net Difference (tpd)	2027 Net Difference (tpy)	2027 Percent Change	2045 Net Difference (tpd)	2027 Net Difference (tpy)	2045 Percent Change
VOC	0.0049	1.79	0.66%	0.0087	3.18	1.69%
NO _x	0.0509	18.58	0.76%	0.0802	29.27	1.52%
CO	0.1808	65.99	0.82%	0.2697	98.44	1.50%
PM _{2.5}	0.0018	0.66	0.89%	0.0025	0.91	1.77%
PM ₁₀	0.0074	2.70	1.02%	0.0131	4.78	1.86%
SO ₂	0.0002	0.07	0.90%	0.0003	0.11	1.59%
CO ₂	59.4853	21,712.13	0.89%	103.1077	37,643.31	1.55%

Source: AECOM July 2020

Table 4.16-4: Camden Yards Station Alternatives Mesoscale No-Build to Build Net Change in Daily and Annual Emissions

Pollutant	2027 Net Difference (tpd)	2027 Net Difference (tpy)	2027 Percent Change	2045 Net Difference (tpd)	2045 Net Difference (tpy)	2045 Percent Change
VOC	0.0015	0.55	0.20%	0.0033	1.20	0.64%
NO _x	0.0258	9.42	0.38%	0.0326	11.90	0.62%
CO	0.0982	35.84	0.44%	0.1069	39.02	0.59%
PM _{2.5}	0.0009	0.33	0.46%	0.0010	0.37	0.68%
PM ₁₀	0.0039	1.42	0.53%	0.0050	1.83	0.71%
SO ₂	0.0001	0.04	0.52%	0.0001	0.04	0.64%
CO ₂	34.3013	12,519.97	0.51%	41.5163	15,153.45	0.62%

Source: AECOM July 2020

The predicted increases in mesoscale corridor emissions are primarily attributed to the increases in new trips or VMT around new stations particularly within the Baltimore area, according to the traffic forecasts, presented in Appendix D.9. Increases in emissions will occur within the same traffic impact analysis area that includes roadways within approximately quarter mile buffer areas along the corridor and does not reflect the change in emissions over all affected roadways in the region.

Based on the regional VMT forecasts provided in Ridership Data Request (BWRR, May 6, 2020), the SCMAGLEV Project will likely reduce overall regional VMT in a range of nine to 12 percent during 2027 and 2045 under Cherry Hill and Camden Yards Station

options. Therefore, the SCMAGLEV Project will likely result in an overall reduction in regional mobile source emissions, as a result of significant overall reduction of vehicle miles travelled over the entire regional affected environment while the corridor wide emissions within the selected mesoscale network will slightly increase around station areas. The mesoscale subarea emissions increase particularly around new stations would be expected to result in a benefit of reducing overall regional emissions substantially as more commuters shift from personal vehicle within the region to SCMAGLEV.

The potential effects of GHG emissions are by nature global and cumulative impacts, as individual sources of GHG emissions are not large enough to have appreciable effects on climate change. The reduction of overall regional VMT from the SCMAGLEV Project, as compared to the No Build Alternative, will likely result in GHG emission reductions on a regional scale.

The SCMAGLEV system will operate entirely on electricity, with the exception of certain maintenance vehicles. As a result, the SCMAGLEV train will not increase greenhouse gas emissions. However, as described in Section 4.19 Energy, the SCMAGLEV system will result in an increase in power consumption in the region. Therefore, an increase in greenhouse gas emissions from powerplants would likely occur.

General Conformity Rule Applicability

For those nonattainment or maintenance pollutants as listed in **Table 4.16-1**, only NO_x, VOC and SO₂ are the pollutants considered as part of this general conformity applicability analysis. For maintenance pollutant CO, the 20-year maintenance periods ended on December 15, 2015 (Baltimore) and March 16, 2016 (Washington, D.C.). Since the SCMAGLEV Project would be implemented after the end of the maintenance period for CO, a conformity determination for CO is not required. For PM_{2.5}, EPA revoked the 1997 PM_{2.5} NAAQS and the area is in attainment for the 2006 PM_{2.5} NAAQS, therefore the GCR is not applicable for PM_{2.5} emissions.

For NO_x, VOC, and SO₂, FRA predicted mesoscale nonattainment pollutant operational emissions for 2027 and 2045 as summarized in **Table 4.16-5** for both Cherry Hill and Camron Yard Station Alternatives. The predicted annual operational emissions are below the applicable *de minimis* levels for each criteria pollutant.

Table 4.16-5: Mesoscale Operational Emissions (tons per Year)

Pollutant	2027 Cherry Hill Alternatives	2027 Camden Yards Alternatives	2045 Cherry Hill Alternatives	2045 Camden Yards Alternatives	GCR <i>de minimis</i> Threshold	Exceed <i>de minimis</i> Threshold?
VOC	1.79	0.55	3.18	1.20	50	No
NO _x	18.58	9.42	29.27	11.90	100	No
SO ₂	0.07	0.04	0.11	0.04	100	No

Source: AECOM July 2020

Short-term Construction Effects

Emissions from on-site construction equipment and on-road construction-related vehicles have the potential to affect localized air quality that is typically assessed through a hot spot analysis. The proposed construction activities are not anticipated to occur at an individual local site over five years and, therefore, potential air quality impacts from construction activities are considered temporary and a quantitative air quality hot spot analysis is not warranted.

FRA predicted construction period nonattainment pollutant emissions associated with each project component and then evenly distributed them over the respective construction schedule on an annual basis. The breakdown of predicted tons per year for each applicable pollutant under the worst case condition amongst all 12 Build Alternatives are summarized in **Table 4.16-6** and further illustrated in detail in Appendix D.9 for each construction element and each Build Alternative defined based on different project element combinations as described in Chapter 3 Alternatives Considered. Since the build year is 2027, FRA further combined construction and operational emissions starting from 2027 and beyond as shown in **Table 4.16-7**. The predicted worst-case annual construction emissions are below the applicable *de minimis* levels for each respective pollutant during each construction year.

**Table 4.16-6: Worst-case Construction Emissions for All Build Alternatives
(tons per Year)**

Year	VOC	NO _x	SO ₂
2022	2.2	18.9	0.05
2023	4.9	42.6	0.11
2024	4.8	41.0	0.10
2025	4.8	41.0	0.10
2026	2.6	22.5	0.01
2027	0.7	6.6	0.01
2028	0.6	5.6	0.01
GCR <i>de minimis</i> Threshold	50	100	100
Exceed <i>de minimis</i> Threshold	No	No	No

Source: AECOM July 2020

Table 4.16-7: Worst-case Combined Construction and Operational Emissions for All Build Alternatives (tons per Year)

Year	VOC	NO _x	SO ₂
2022	2.2	18.9	0.05
2023	4.9	42.6	0.11
2024	4.8	41.0	0.10
2025	4.8	41.0	0.10
2026	2.6	22.5	0.01
2027	2.5	25.2	0.08
2028	2.4	24.2	0.08
2045	3.2	29.3	0.1
GCR <i>de minimis</i> Threshold	50	100	100
Exceed <i>de minimis</i> Threshold	No	No	No

Source: AECOM July 2020

Since the Project would not result in operational or construction emissions that exceed the *de minimis* thresholds, a formal conformity determination is not required. Significant air quality impacts will not likely result from the implementation of each Build Alternative during construction period as well as the period when construction and operation activities would overlap.

4.16.5 Potential Mitigation Strategies

To mitigate the temporary air quality impacts during the construction period, to the extent practicable, the Project Sponsor would implement various control measures to avoid and/or minimize impacts associated emissions including the following:

- Dust Control - a dust control plan including a watering program would be required as part of contract specifications. The plan would include measures such as:
 - All trucks hauling loose material would be equipped with tight-fitting tailgates and their loads securely covered prior to leaving the construction site.
 - Water sprays would be used for all demolition, excavation, and transfer of soils to ensure that materials would be dampened as necessary to avoid the suspension of dust into the air.
- Idling Restriction - all stationary vehicles on roadways adjacent to the construction site would be prohibited from idling with the exception of vehicles that are using their engines to operate a loading, unloading, or processing device (e.g., concrete-mixing trucks) or otherwise required for the proper operation of the engine.

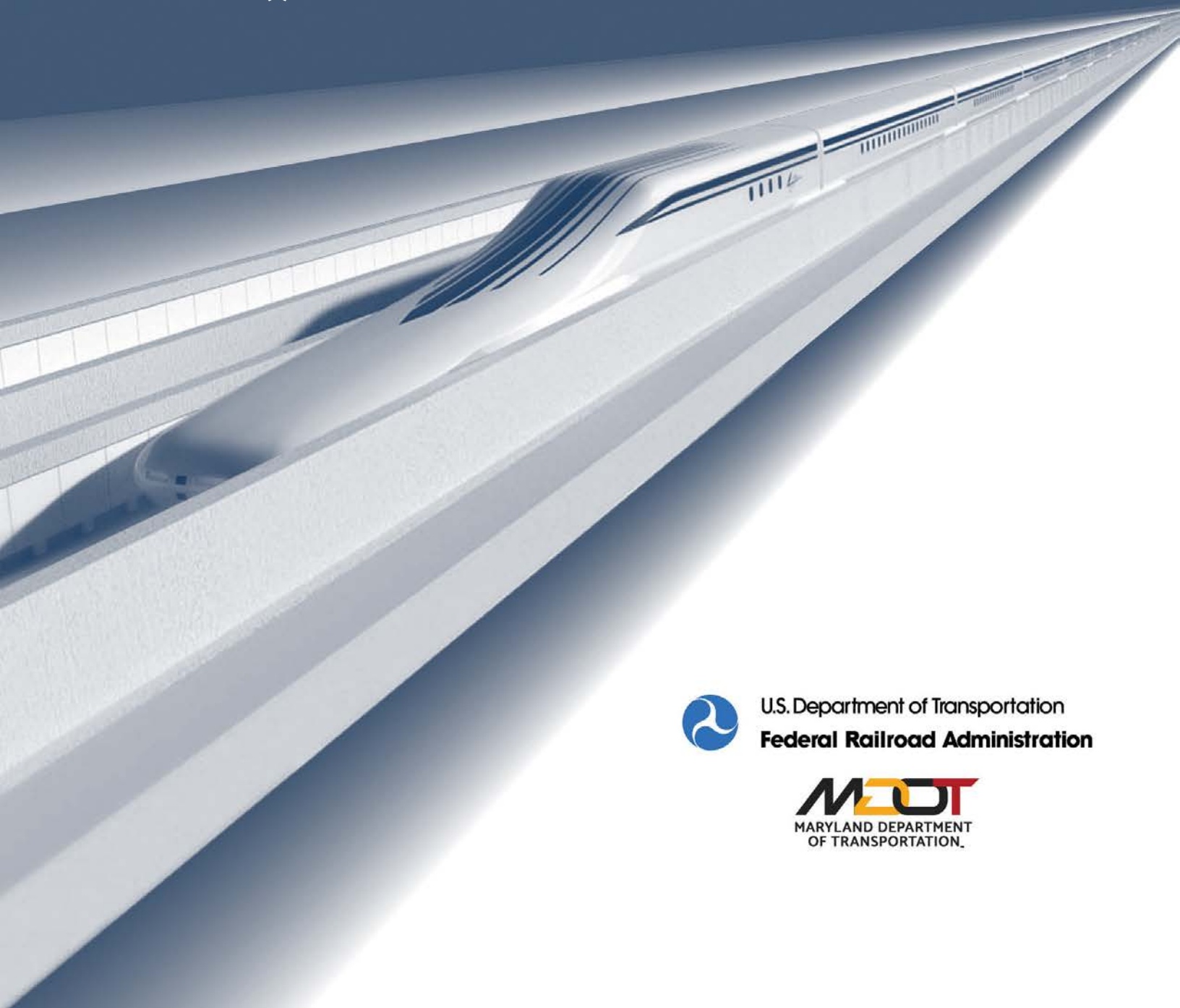
- Clean Fuel – ultra low sulfur diesel fuel would be used for diesel engines.
- Best Available Tailpipe (BAT) Reduction Technologies - nonroad diesel engines and controlled truck fleets (i.e., truck fleets under long-term contract with the project) including but not limited to concrete mixing and pumping trucks would utilize the BAT for further reducing particulate emissions. Diesel particulate filters (DPFs) have been identified as being the tailpipe technology currently proven to have the highest reduction capability and could be installed by the original equipment manufacturer or retrofitted.

Section 4.17

Noise and Vibration

BALTIMORE-WASHINGTON SUPERCONDUCTING MAGLEV PROJECT

DRAFT ENVIRONMENTAL IMPACT STATEMENT AND
SECTION 4(f) EVALUATION



U.S. Department of Transportation
Federal Railroad Administration



4.17 Noise and Vibration

4.17.1 Introduction

This section evaluates potential noise and vibration impacts from construction and operation of the Superconducting Magnetic Levitation (SCMAGLEV) Project. The Federal Railroad Administration (FRA) conducted a comprehensive noise and vibration study to assess the potential for impact from various sources of the SCMAGLEV Project. The assessment included a 24-hour noise monitoring program to establish baseline conditions, a modeling analysis to predict future levels from long-term operations of the system, a modeling analysis to predict noise levels from temporary construction activities and a mitigation assessment to evaluate various control measures. See Appendix D.10 for additional details on noise and vibration.

4.17.2 Regulatory Context and Methodology

4.17.2.1 Regulatory Context

In accordance with the National Environmental Policy Act (NEPA) [42 U.S.C. § 4321 et seq.], the Council on Environmental Quality (CEQ) regulations [40 C.F.R. Parts 1500 - 1508], and the FRA's Procedures for Considering Environmental Impacts [64 Fed. Reg. 28545, May 26, 1999], FRA assessed noise and vibration impacts from the SCMAGLEV Project with respect to applicable Federal, State, and local noise standards, including 49 CFR part 210 (FRA noise regulations) and 40 CFR part 201 (United States Environmental Protection Agency [USEPA] noise regulations).

Operational Criteria

Specifically, FRA evaluated train operations using FRA's *High-Speed Ground Transportation Noise and Vibration Impact Assessment*¹ guidelines while stations and ancillary facilities were evaluated using the Federal Transit Administration's (FTA) *Transit Noise and Vibration Impact Assessment*² guidelines. The FRA guidelines include methodologies and evaluation criteria for assessing potential impacts from very high-speed trains only. The FTA guidelines include methodologies for all other transit-related activities such as stationary sources and ancillary facilities. However, both guidelines share the same evaluation criteria and impact assessment methodologies.

As shown in **Table 4.17-1**, FRA assessed impacts based on land use categories and sensitivity to noise and vibration from transit sources. FRA used the average hourly equivalent noise level or Leq(h) to assess impacts at institutional land-uses such as laboratories and schools (Land Use Category 1 and 3). Similarly, FRA used the average day-night noise level (Ldn) to characterize noise at residences (Land Use Category 2).

¹ Federal Railroad Administration, "High-Speed Ground Transportation Noise and Vibration Impact Assessment," Office of Railroad Policy and Development, DOT/FRA/ORD-12/15, Final Report, September 2012, Washington, D.C.

² Federal Transit Administration, "Transit Noise and Vibration Impact Assessment," May 2006, Washington, D.C.

The Ldn noise metric includes a 10-decibel “penalty” for all nighttime events that occur from 10 pm and 7 am to account for increased annoyance during those times.

Table 4.17-1: Corridor wide Impact Counts for Noise and Vibration

Land-Use Category	Noise Metric (dBA)	Description of Land-Use Category
1	Outdoor Leq(h)*	Tracts of land where quiet is an essential element in their intended purpose. This category includes lands set aside for serenity and quiet, and such land uses as outdoor amphitheaters and concert pavilions, and national historic landmarks with significant outdoor use. Also included are recording studios and concert halls.
2	Outdoor Ldn	Residences and buildings where people normally sleep. This category includes homes, hospitals, and hotels where a nighttime sensitivity to noise is assumed to be of utmost importance.
3	Outdoor Leq(h)*	Institutional land uses with primarily daytime and evening use. This category includes schools, libraries, theaters, and churches, where it is important to avoid interference with such activities as speech, meditation, and concentration on reading material. This category includes places for meditation or study associated with cemeteries, monuments, and museums. Certain historical sites, parks, campgrounds, and recreational facilities are also included.

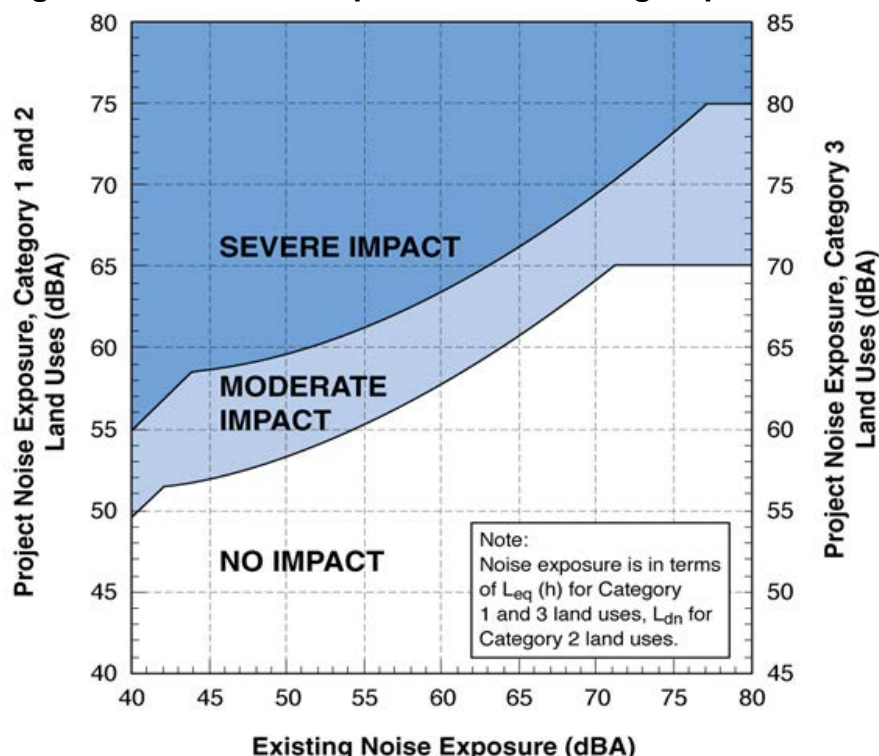
Source: FRA guidelines.

The noise criteria delineate two categories of impact: ‘moderate’ and ‘severe’. The ‘moderate’ impact threshold defines areas where the change in noise is noticeable but may not cause a strong, adverse community reaction. The ‘severe’ impact threshold defines the noise limits above which new noise would highly annoy a significant percentage of the population. The noise criteria are shown graphically in **Figure 4.17-1**.

As shown in **Table 4.17-2**, FRA defines vibration criteria in terms of human annoyance for the same land use categories as for noise. The vibration threshold of human perceptibility is approximately 65 VdB. To reflect FRA’s experience with community response to vibration, the most stringent criteria attributed to ‘frequent’ events was used to assess impacts. The ‘frequent’ event threshold reflects more than 70 events or train passbys per day. Along tunnel sections with no airborne noise, ground-borne noise may cause a rumble indoors due to the propagation of vibration through building structures. Along viaduct sections, ground-borne noise is less perceptible compared to airborne noise, so it is less of a concern.

Specific land-uses more sensitive than those represented by the FTA Category 1 criteria will be addressed during the FEIS pending close coordination with the affected property owners (e.g., United States Department of Agriculture [USDA], National Aeronautics and Space Administration [NASA], General Services Administration [GSA], Surface Transportation Board [STB], and Federal Aviation Administration [FAA]).

Figure 4.17-1: Noise Impact Criteria for High-Speed Rail Project



Source: FRA guidelines.

Table 4.17-2: FRA Ground-borne Vibration and Noise Criteria

Land Use Category	Vibration Criteria 'frequent' ¹	Noise Criteria 'frequent' ¹
Category 1: Buildings where Vibration would interfere with interior operations.	65 VdB ²	N/A ³
Category 2: Residences and buildings where people normally sleep.	72 VdB	35 dBA
Category 3: Institutional land uses with primarily daytime use.	75 VdB	40 dBA

1. Frequent Events are defined as more than 70 vibration events of the same kind per day.

2. This criterion limit levels are acceptable for most moderately sensitive equipment, such as optical microscopes. Vibration-sensitive manufacturing or research will require detailed evaluation to define the acceptable vibration levels. Ensuring lower vibration levels in a building often requires special design of the HVAC systems and stiffened floors.

3. Vibration-sensitive equipment is not sensitive to ground-borne noise.

Source: FRA guidelines.

Construction Criteria

FRA evaluated noise and vibration impacts due to temporary construction activities using the FRA guidelines. The FRA guidelines include methodologies and evaluation criteria for assessing potential impacts from various construction equipment. As shown in **Table 4.17-3**, the FRA used the one-hour average noise level or $L_{eq}(h)$ to assess preliminary impacts at residences, commercial and industrial uses. This general noise

assessment uses the FRA noise criteria when detailed construction activities are unknown.

Table 4.17-3: General Assessment Construction Noise Criteria

Land Use	1-Hour Leq (dBA)	
	Day	Night
Residential	90	80
Commercial	100	100
Industrial	100	100

Source: FRA guidelines.

Similarly, FRA used the peak particle velocity vibration level (PPV) in inches per second (or in/sec) to assess the potential for damage at residences and other sensitive receptors using the criteria shown in **Table 4.17-4**. Unlike the VdB vibration level, the PPV vibration level represents the maximum peak level and is, therefore, typically used to assess stresses on buildings. FRA also used the vibration criteria shown in **Table 4.17-2** to assess the potential for annoyance or interference with vibration-sensitive activities because PPV is not a good indicator of human response.

Table 4.17-4: Construction Vibration Damage Criteria

Building Category	PPV in/sec	Approximate Lv ¹
I. Reinforced-concrete, steel or timber (no plaster)	0.5	102
II. Engineered concrete and masonry (no plaster)	0.3	98
III. Non-engineered timber and masonry buildings	0.2	94
IV. Buildings extremely susceptible to vibration damage	0.12	90

Note 1: RMS velocity in decibels, VdB re 1 micro-in/sec

Source: FRA guidelines.

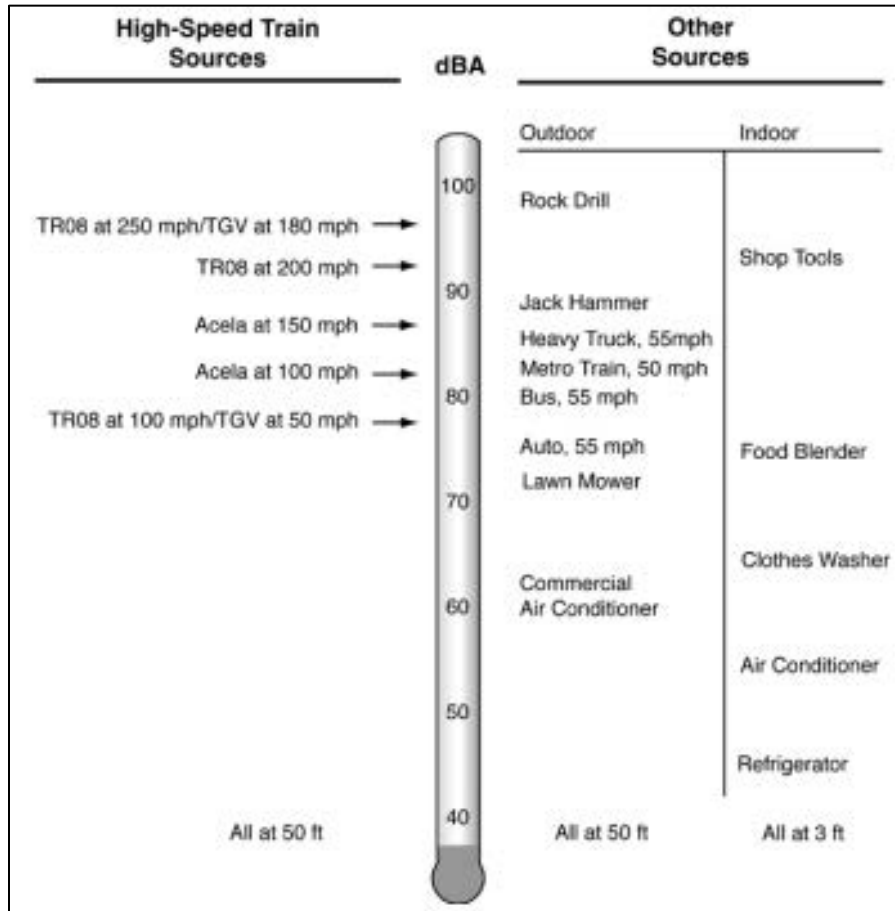
4.17.2.2 Methodology

Noise and Vibration Fundamentals

Noise is defined as unwanted or excessive sound, and can interfere with sleep, work, relaxation, and/or recreation. The adverse effects of noise depend on the duration, loudness, frequency, time of day, and personal preferences. To establish a noise measurement that reflects the likelihood of community annoyance, the A-weighted decibel measurement accounts for those frequencies most audible to the human ear. The A-weighted sound level (dBA) is the descriptor of noise levels most often used for community noise assessment. It is important to note that the dBA scale is logarithmic, meaning that each increase of 10 dBA describes a doubling of perceived loudness. For example, we perceive the background noise in an office at 50 dBA as twice as loud as in a library at 40 dBA. For most people, a 3-dBA change is barely perceptible, while a

5 dBA a change in noise level would be readily noticeable. FRA evaluated all noise levels in this analysis using the 24-hour day-night noise level (or Ldn) for residential receptors and the average peak hourly noise level (or Leq) for institutional and other non-residential receptors. **Figure 4.17-2** shows typical noise levels.

Figure 4.17-2: Typical A-Weighted Maximum Sound Levels



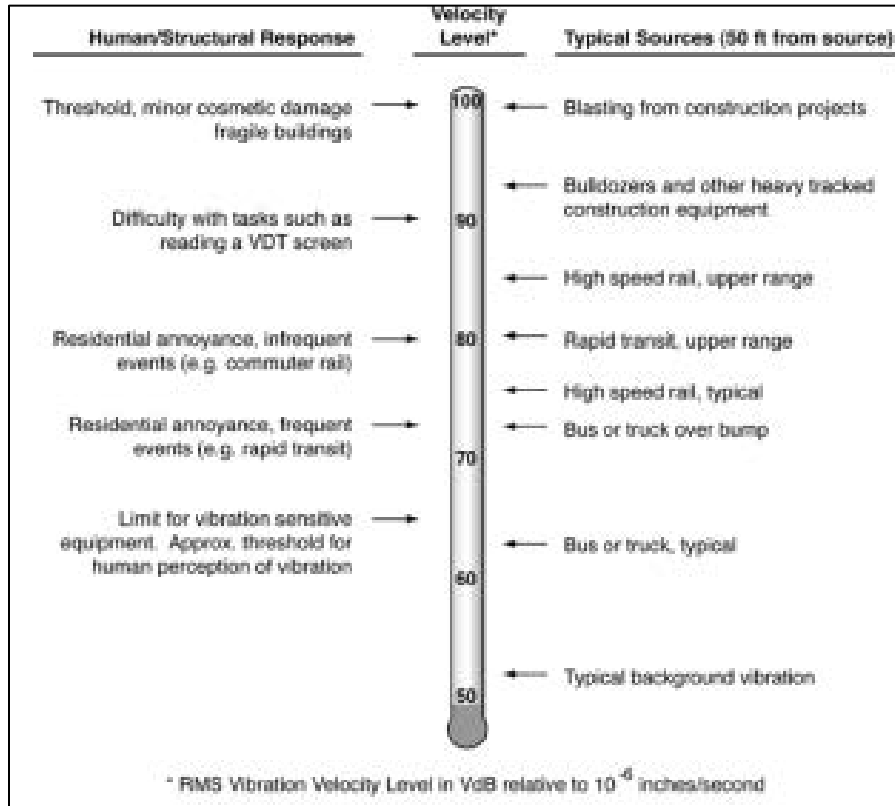
Source: FRA guidelines.

Ground-borne vibration typically travels along the ground and through building structures. Depending on the geological properties of the surrounding terrain and the type of building structure, vibration propagation can be more or less efficient. Buildings with a solid foundation set in bedrock are “coupled” more efficiently to the surrounding ground and experience relatively higher vibration levels than buildings in sandier soil. Heavier buildings (such as masonry structures) are less susceptible to vibration than wood-frame buildings because they absorb more vibrational energy.

The vibration velocity level is used to assess vibration impacts from all transportation and construction projects. More specifically, the human response to vibration used to assess nuisance impacts is the root mean square amplitude, expressed in inches per second (in/sec) or vibration velocity levels in decibels (VdB). The peak particle velocity level (or PPV) is used to assess potential damage during construction and indicates the

stresses experienced by buildings rather than human annoyance. Vibration that radiates inside a building when a train passes can cause a low-frequency sound or rumble. This interior rumble is referred to as ground-borne noise and utilizes the same measurement as airborne noise (dBA). **Figure 4.17-3.** Shows typical vibration levels.

Figure 4.17-3: Typical Levels of Ground-borne Vibration



Source: FRA guidelines.

Noise and Vibration Sources Evaluated

FRA evaluated project noise and vibration impacts using the FRA guidelines for the following sources:

- high-speed train operations; and,
- construction activities.

Similarly, FRA evaluated all other project impacts using the FTA guidelines for the following sources:

- passenger stations
- fresh air and emergency egress facilities (FA/EE);
- trainset maintenance facilities (TMF);
- maintenance of way facilities (MOW); and,

- electrical substations.

As shown in **Table 4.17-5**, FRA conducted a detailed noise and vibration assessment of future operations for each of the 12 Build Alternatives, which include various combinations of passenger stations and ancillary facilities. All the Build Alternatives include Mount Vernon and BWI Marshall Airport Station. In addition to the two optional stations and three optional TMF sites, there are 12 different substation locations.

Table 4.17-5: Build Alternatives and Project Source Evaluation Matrix

Build Alternative	Station	TMF & MOW	Substation
J-01	Cherry Hill	MD 198	SS01
J-02	Cherry Hill	BARC Airstrip	SS02
J-03	Cherry Hill	BARC West	SS03
J-04	Camden Yards	MD 198	SS04
J-05	Camden Yards	BARC Airstrip	SS05
J-06	Camden Yards	BARC West	SS06
J1-01	Cherry Hill	MD 198	SS07
J1-02	Cherry Hill	BARC Airstrip	SS08
J1-03	Cherry Hill	BARC West	SS09
J1-04	Camden Yards	MD 198	SS10
J1-05	Camden Yards	BARC Airstrip	SS11
J1-06	Camden Yards	BARC West	SS12

Source: AECOM.

Methodology Summary

FRA utilized the FRA screening distance of 800' to select all eligible first- and second-row receptors closest to the project alignment. First-row receptors include those residences immediately adjacent to the alignment while second-row receptors include those residences behind and shielded by the first row. Following FRA's guidance, the analysis does not tabulate receptors beyond the first two rows. The intent was not to document project impacts at all receptors within the study area but identify locations with predicted impact. FRA selected almost 4,000 sites closest to the project Build Alternatives to evaluate noise and vibration impacts during operations and construction. One set of receptors was used for all Build Alternatives, due to the similar nature of the alignments.

FRA determined operational train impacts using headway times, train speed profiles, track and ground elevation profiles. Train speeds ranged from 0 mph at stations to 311

miles per hour along the guideway. Track elevations ranged from over 308' below grade near Mount Vernon Station to 142' above grade near the MD 198 TMF. Train consists include 16 cars for all operations during the operating period between 5 am and 11 pm. Unlike standard trains, which include propulsion and guideway/structural noise effects, high-speed SCMAGLEV trains also present significant aerodynamic noise from the train nose cone and the turbulence or disturbance around the train body (or turbulent boundary layer).

Since little information is available for the ancillary facilities (such as the activities proposed there), traditional activity levels were used as a surrogate. For example, the trainset maintenance facilities are expected to have most of their activities indoors including all maintenance, repair and inspection. Therefore, the FTA's railcar washing station was used to represent noise impacts from the TMF sites. Similarly, the FTA's rail yard was used to represent noise impacts from the MOW facilities. Any impacts related to the passenger stations or ancillary facilities predicted as part of this project are preliminary only and final design would address details on these activities.

In accordance with the guidelines, FRA evaluated project noise impacts using cumulative noise metrics (such as day-night noise level for residences). These statistical metrics capture the total noise exposure at residences along the corridor over a 24-hour period. These total noise levels are compared with the project impacts criteria to determine the likelihood of impact. The project impact criteria are based on the baseline noise measurements, which vary along the project corridor.

Vibration impacts were compared against the 'frequent' criteria using levels for single events. Ground-borne noise levels were determined from the vibration levels using a 'typical ground' attenuation factor.

Since the SCMAGLEV train operations would occur along a dedicated guideway, there are no grade crossings and no need for train horns unlike typical surface rail systems.

FRA determined vibration levels from train operations using the FRA 'maglev' general assessment curves. FRA utilized standard ground-attenuation effects with no adjustments for building foundations. Adjustments for individual building foundation effects will be applied during final design where impacts are predicted.

FRA also evaluated temporary construction impacts using the two loudest pieces of equipment as part of the FRA's general assessment guidelines for each of the following scenarios:

- Tunnel boring;
- Viaduct construction;
- Station excavation/construction;
- EE/FA excavation/construction;
- Trainset maintenance facility;

- Maintenance of way facility;
- Staging and laydown areas (at tunnel portals).

For this preliminary construction assessment, all the selected equipment is assumed to operate continuously over a one-hour period. As a conservative assumption, FRA did not apply ground attenuation effects.

Refer to Section 4.12 Ecological Resources for more information on impacts to wildlife.

4.17.3 SCMAGLEV Project Affected Environment

The SCMAGLEV Project Affected Environment contains a wide variety of land use types, ranging from wide open rural areas to open rural areas to dense urban communities. As such, the existing noise conditions within the SCMAGLEV Project Study Area also ranges from quiet conditions along forested/agricultural open spaces (Beltsville Agricultural Research Center (BARC) and Patuxent Research Refuge (PRR)) to louder conditions in the downtown areas (Washington, D.C. and Baltimore City, MD). Local noise conditions reflect the major land use types that they are in and their proximity to existing transportation corridors.

FRA conducted a noise-monitoring program at 20 representative locations within the project study area. As shown in **Table 4.17-6**, 24-hour continuous noise measurements were conducted at each of the selected monitoring locations between October 2018 and March 2019. The noise measurements document existing noise sources along the SCMAGLEV Project and establish the project impact criteria for similar nearby receptors. Overall, the measured noise levels provide an overview of current conditions in communities along the project alignment. As shown in **Table 4.17-6**, measured day-night noise levels range from 55 dBA in Laurel, MD to 75 dBA in Linthicum Heights, MD.

Table 4.17-6: Baseline Noise Monitoring Results

Receptor		Land-use	Noise Level (dBA)	
ID	Description	Category	Ldn	Leq(h)
N01	Anacostia River Trail	3	74	74
N02	M-NCPPC wooded property on Kenilworth Ave	3	65	63
N03	Norman A. Berg National Plant Materials Center	3	58	56
N04	MDOT property, Elmshorn Wy	2	63	61
N05	MDOT property, MD 195 Ramp	2	71	68
N06	Muirkirk Park (M-NCPPC)	2	64	60
N07	MDOT property, I-295 NB Ramp	2	67	63
N08	Maryland City Park	3	64	61
N09	Brock Bridge Elementary School	3	55	53
N10	8400 River Rd	3	62	60

Receptor		Land-use	Noise Level (dBA)	
ID	Description	Category	Ldn	Leq(h)
N11	NSA National Cryptologic Museum	3	66	62
N12	MDOT property, Telegraph Rd	2	74	73
N13	Lindale Middle School, Flighttime Dr	3	60	60
N14	MDOT property, I-895 SB	2	75	72
N15	Southwest Area Park	3	66	64
N16	Unger's Field	2	62	56
N17	Cherry Hill Park	2	67	66
N18	Middle Branch Trail	3	68	63
N19	Waterview Ave	2	68	65
N20	Woodland Job Corps Center	3	58	57

Source: AECOM

In lieu of existing vibration measurements, FRA estimates the existing background vibration to range from 50 VdB or lower in rural areas to 65 VdB near roadways. The background vibration velocity level of 50 VdB in residential areas or rural areas is well below the threshold of perception for humans of around 65 VdB. Within buildings, operation of mechanical equipment, movement of people, or slamming of doors causes most perceptible indoor vibration. Typical outdoor sources of perceptible vibration are construction equipment, steel-wheeled trains and traffic on rough roads.

4.17.4 Environmental Consequences

4.17.4.1 No Build Alternative

Noise

Future noise levels for the No Build Alternative would be similar to existing conditions. Noise from a mix of transportation sources including the NEC and other passenger and freight rail traffic lines, aircraft overflights and motor vehicle traffic along regional and local roadways affects communities along the SCMAGLEV Project. Additionally, other commercial and industrial activities associated with urban and suburban communities also contribute to the ambient noise levels. Implementation of other planned and funded transportation projects could also affect the ambient noise. However, unless the planned projects are in the immediate vicinity, existing noise is unlikely to change. As a result, the No Build Alternative would not contribute to new noise impacts.

Vibration

FRA expects the vibration levels under the No Build Alternative to be similar to those currently experienced under existing conditions. Traffic, including heavy trucks and buses, rarely create perceptible vibration unless vehicles are operating very close to buildings or there are irregularities in the road, such as potholes or expansion joints. Similarly, the dominant source of vibration at receptors adjacent to existing rail corridors

is existing rail service. FRA does not expect this to change significantly from the existing conditions. As a result, the No Build Alternative would not contribute to new vibration impacts.

4.17.4.2 Build Alternatives

Principal Conclusions and Impacts

FRA conducted a detailed noise and vibration assessment of future operations for each of the 12 proposed Build Alternatives. As shown in **Table 4.17-7**, FRA predicted noise impacts at residences and institutional receptors along the proposed Build Alternatives. Along tunnel sections, FRA did not predict any airborne or community noise impacts since all train operations would be underground. Therefore, all predicted operational train noise impacts occur along the viaduct sections of the alignment due to the exposure of the train passbys along the elevated guideway. High train speeds generate operational impacts due to aerodynamic noise effects created by the air turbulence of a rapid train passby. Additionally, FRA also predicted noise impacts at residences adjacent to the proposed ancillary facilities, which include trainset maintenance facilities, fan plants, maintenance of way facilities and substations. FRA did not predict any noise impacts due to startle effects at tunnel portals since the portal design includes noise mitigation hoods to eliminate these effects. Overall, the FRA predicted fairly consistent corridor-wide noise impacts between the various Build Alternatives with only minor differences due to length of the viaduct section, the path of the guideway and the selection of the various ancillary facilities. The following subsections provide further details on the predicted noise impacts.

Similarly, FRA also predicted vibration impacts at residences and one institutional receptor (the National Cryptologic Museum adjacent to the National Security Agency in Fort Meade, MD). **Table 4.17-7** summarizes vibration impacts. Unlike noise, FRA predicted vibration impacts from train operations along both tunnel and viaduct sections of the guideway. FRA did not predict any vibration impacts from the ancillary facilities (including the trainset maintenance facilities) due to the low activity levels there.

Table 4.17-7: Corridor wide Impact Counts for Noise and Vibration¹

Build Alternative	Noise					Vibration ⁴	
	Category 2 ²	Category 3 ²	'moderate' Totals ³	'severe' Totals	Total	Vibration	GB- Noise
J-01	187 / 377	17 / 14	205	392	597	359	485
J-02	186 / 378	17 / 14	204	393	597	359	485
J-03	190 / 377	17 / 14	208	392	600	359	485
J-04	162 / 373	16 / 14	179	388	567	359	485
J-05	161 / 374	16 / 14	178	389	567	359	485
J-06	165 / 373	16 / 14	182	388	570	359	485

Build Alternative	Noise					Vibration ⁴	
	Category 2 ²	Category 3 ²	'moderate' Totals ³	'severe' Totals	Total	Vibration	GB- Noise
J1-01	195 / 96	7 / 9	203	105	308	340	564
J1-02	194 / 97	7 / 9	202	106	308	340	564
J1-03	198 / 96	7 / 9	206	105	311	340	564
J1-04	170 / 92	6 / 9	177	101	278	340	564
J1-05	169 / 93	6 / 9	176	102	278	340	564
J1-06	173 / 92	6 / 9	180	101	281	340	564

Note 1: Impact counts were tabulated for high-sensitivity receptors (FRA Category 1 land-uses), residential receptors (FRA Category 2 land-uses) and institutional receptors (FRA Category 3 land-uses).

Note 2: Category 2 and 3 results include both 'moderate' / 'severe' noise impacts.

Note 3: FRA also predicted one 'moderate' noise impact and one 'severe' noise impact at Category 1 land uses (Goddard GGAO and NSA Headquarters, respectively) for all Build Alternatives J-01 to J-06. FRA also predicted one 'moderate' noise impact at the NSA Headquarters for Build Alternatives J1-01 to J1-06.

Note 4: FRA predicted one vibration impact at the National Cryptology Museum (Category 3) in Fort Meade for all Build Alternatives.

Source: AECOM December 2020

FRA also predicted ground-borne noise impacts along tunnels sections only. Ground-borne noise or the rumbling sound from vibrating building surfaces is an indoor effect that is much lower than airborne noise. It is more noticeable along tunnel sections where there is no airborne noise than along the viaduct sections where airborne noise is more prevalent. Overall, the FRA predicted similar vibration impacts between the various Build Alternatives with only minor differences due to the path of the guideway.

Viaduct / Tunnel Noise Effects

The primary noise source for the SCMAGLEV system at the maximum train speeds is the air turbulence effects (or turbulent boundary layer) caused by the air wash over the body of the train. At these maximum train speeds, the aerodynamic noise effects along the viaduct are orders of magnitude higher than the noise from the train propulsion system or the structural guideway (i.e., viaduct). This is due in part to the shielding effects of the proposed viaduct structure, which includes 7' side walls or parapets. The elevated parapets shield the propulsion and nose cone noise but not the structural noise or the turbulent boundary layer, which is 10' above the track. Due to the effects of the aerodynamic noise effects, FRA predicted no noise impacts at speeds below 150 mph.

For example, along the viaduct sections of the guideway utilizing proposed maximum train speeds, FRA predicted airborne noise impacts up to 2,100' from the guideway. This impact distance is due to a combination of the aerodynamic effects of high-speed train operations, the elevated guideway and the low background noise level.³ To highlight the difference in noise impacts between viaduct and tunnel sections, **Figure 4.17-4** shows a comparison between Build Alternative J-01 and J1-01 in

³ The FRA impact criteria are based on a sliding scale whereby low background noise level result in more stringent thresholds.

Maryland City near a tunnel portal. One set of receptors was used for all Build Alternatives, due to the similar nature of the alignments. FRA predicted 'severe' noise impacts at residences in Maryland City from the viaduct under Build Alternative J-01 but no impacts from the tunnel under Build Alternative J1-01. The severity of impact changes between each of the Build Alternatives depending on proximity to the guideway. At the Brock Bridge Elementary School, for example, the predicted level increases from 'moderate' noise impact under Build Alternative J-01 to 'severe' noise impact under Build Alternative J1-01 because it would be closer.

A unique phenomenon occurs at the tunnel portals when the high-speed trains exit the tunnel onto the viaduct. The rapid release of air pressure is associated with a sudden onset of sound that can cause residents startle or surprise especially when they are not expecting it. Current project designs include flared tunnel openings and noise mitigation hoods to minimize these effects. Therefore, these noise effects are minimized compared to the aerodynamic noise effects of the train passby. For Build Alternatives with the J alignment, the tunnel portal would be located near residential communities (initiative housing) on Fort Meade. Project noise would range from 83 dBA (50 feet from tunnel portals) to 77 dBA (200 feet from tunnel portals) at the maximum train speed of 311 mph.

As shown in **Table 4.17-7**, noise impacts were categorized into 'moderate' and 'severe' impact levels. Although both impact categories require mitigation consideration, it is the 'severe' category that has the greatest adverse impact in the community and would warrant incorporation of mitigation. The number of 'severe' noise impacts predicted for each Build Alternative generally follows the viaduct section due to the preponderance of the aerodynamic noise effects. In other words, the longer the viaduct section is for each Build Alternative, the higher the number of predicted 'severe' noise impacts.

For example, FRA predicted 597 noise impacts for Build Alternative J-01 but only 567 noise impacts for Build Alternative J-04. This reduction of 5 percent is due primarily to the 8 percent reduction in the viaduct's length between these Build Alternatives. Similarly, FRA predicted 308 noise impacts for Build Alternative J1-01 or 48 percent less than Build Alternative J-01. This reduction is due primarily to the 40 percent reduction in the viaduct's length between these Build Alternatives. This trend applies to the other Build Alternatives as well.

Ground-borne Vibration and Ground-borne Noise Effects

Most ground-borne vibration impacts are along tunnels sections of the alignment; with minor exceptions where receptors are within 150' of the viaduct. Overall, FRA predicted vibration impacts up to 225' from the guideway. Similarly, FRA predicted ground-borne noise impacts up to 250' from the guideway. Additionally, all ground-borne vibration and noise impacts occur at maximum train speeds of 311 mph. No predicted impacts occur at speeds below 311 mph. Due to the unique nature of the SCMAGLEV technology, slow-moving trains utilize auxiliary wheels while entering stations and within the trainset maintenance facility. As a result, all vibration impacts are due to train operations along the guideway with no impacts due to ancillary facilities.

As shown in **Table 4.17-7**, FRA predicted 359 vibration impacts for Build Alternatives J-01 to J-06 but only 340 impacts for Build Alternatives J1-01 to J1-06. This reduction of 5 percent does not match the 15 percent increase in tunnel sections between these alternatives. However, as shown in **Figure 4.17-5**, FRA predicted lower vibration due to deeper tunneling under Build Alternatives J1-01 to J1-06 (particularly in New Carrollton south of the Capital Beltway) compared to Build Alternatives J-01 to J-06. As a reminder, one set of receptors was used for all Build Alternatives, due to the similar nature of the alignments

Similarly, FRA predicted 485 ground-borne noise impacts along tunnel sections for Build Alternatives J-01 to J-06 and 564 impacts for Build Alternatives J1-01 to J1-06. This increase of 16 percent reflects a 15 percent increase in tunnel sections and a 17 percent increase in the number of residences within 250' of Build Alternatives J1-01 to J1-06. **Figure 4.17-6** shows this change graphically.

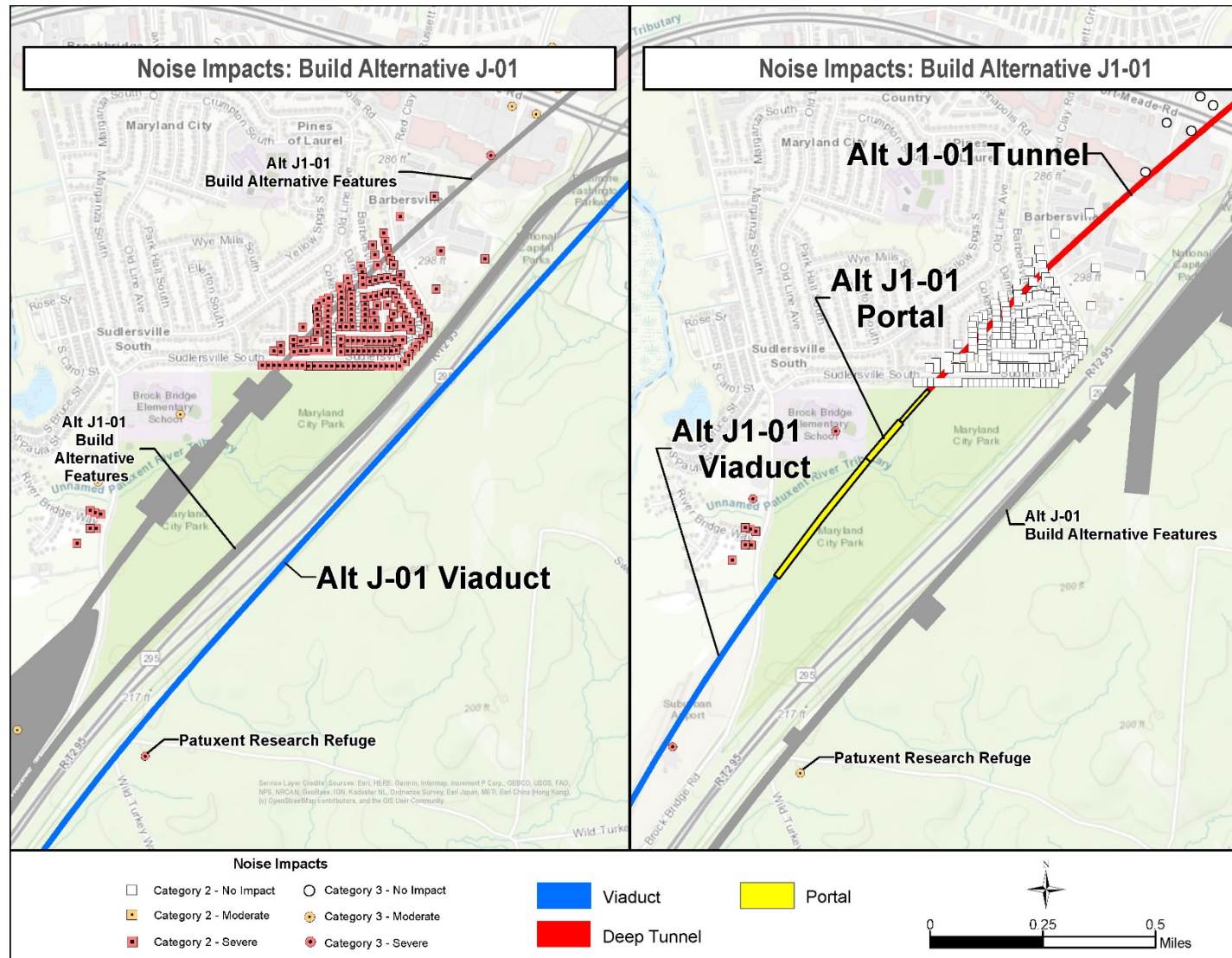
4.17.5 Short-term Construction Effects

4.17.5.1 Noise

Due to the size of the project and the facilities proposed for construction, temporary noise impacts are expected. To maintain the balance between constructing such a large project and quality of life for nearby communities, contractors utilize construction techniques and incorporate control measures to eliminate or minimize noise impacts. Project federal, State and local guidelines determine the appropriate control measures. The following is a preliminary estimation of the types of noise effects expected during the construction phase of the project.

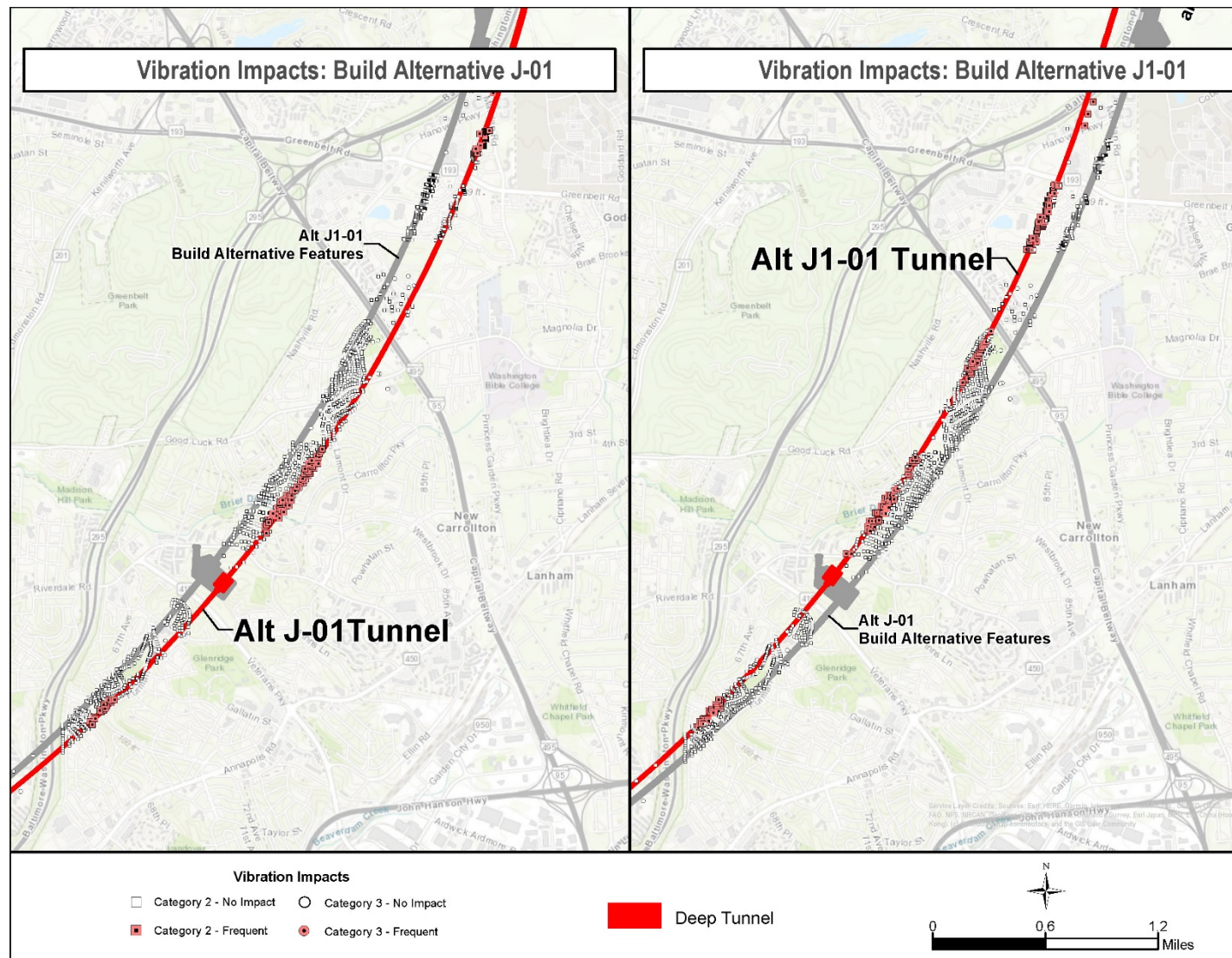
FRA predicts that maximum one-hour construction noise levels would range from below the ambient background (less than 45 dBA) to 85 dBA for FA/EE facilities to 91 dBA for the staging/laydown area at tunnel portals to 94 dBA for the viaduct construction to 96 dBA for the station excavation activities. Since construction could occur day or night depending on the activity and urgency to complete, FRA predicts that several of these levels would exceed the daytime limit of 90 dBA and the nighttime limit of 80 dBA. Construction noise levels vary by activity type and location for each of the Build Alternatives. For example, for Build Alternatives J-01, J-02, J-03, J1-01, J1-02, and J1-03, FRA predicted four daytime noise impacts and 21 nighttime noise impacts. For Build Alternatives J-04, J-05, J-06, J1-04, J1-05, and J1-06, FRA predicted four daytime noise impacts and 20 nighttime noise impacts.

Figure 4.17-4: Viaduct vs. Tunnel Noise Impacts



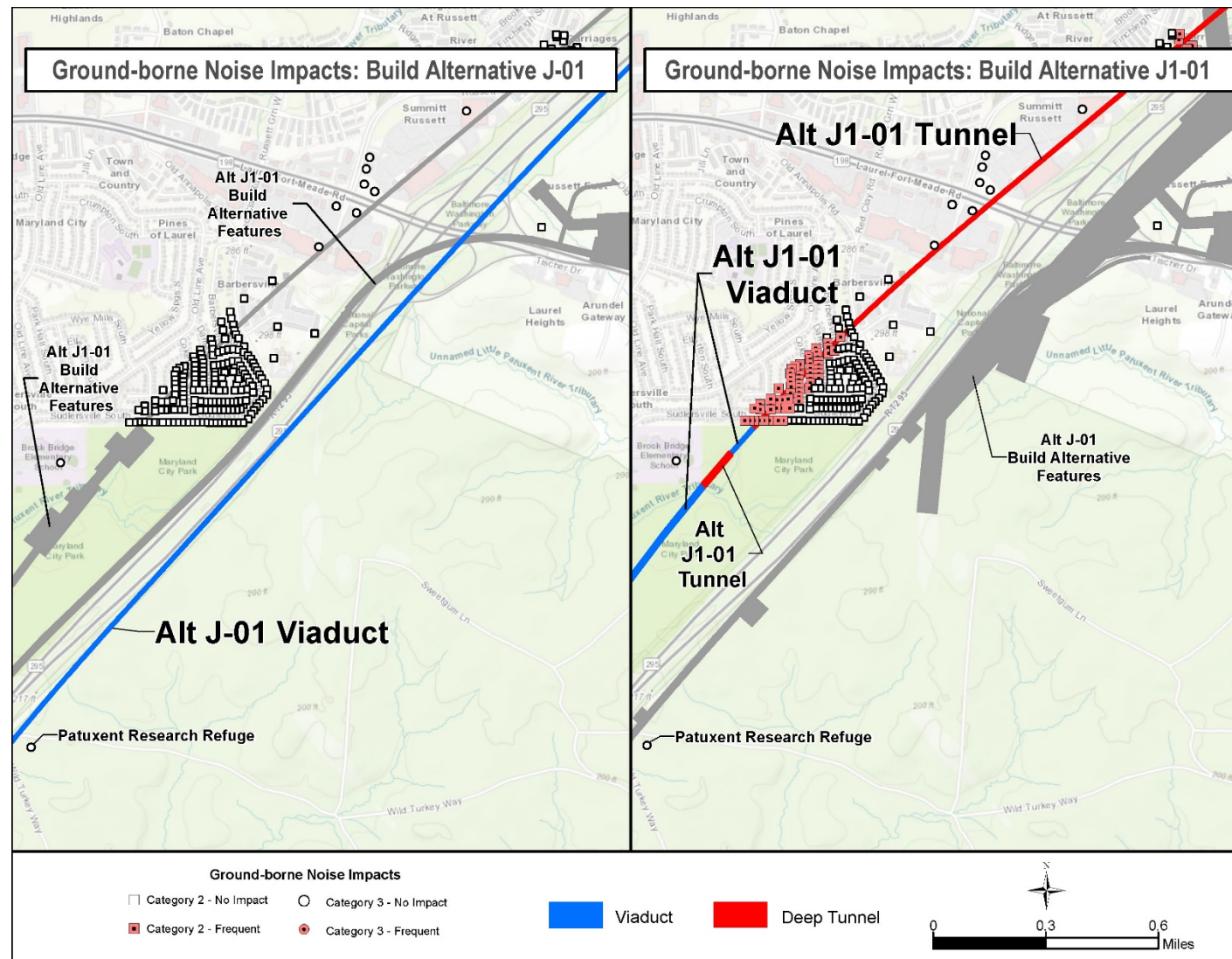
Note: Area shown is in Maryland City, MD.

Figure 4.17-5: Comparison of Vibration Impacts



Source: AECOM.

Figure 4.17-6: Comparison of Ground-borne Noise Impacts



Source: AECOM.

In summary, there are no predicted noise impacts from the tunnel boring machine as all activities would be underground. However, the removal of spoils from the TBM launch areas (which typically occur continuously 24/7 during this phase) could cause impacts at residences in the Maryland City and Fort Meade communities. Localized noise impacts are also expected from station and FA/EE excavation as these will require deep boring, pile driving and possibly blasting.

4.17.5.2 Vibration

FRA predicted maximum construction vibration levels that range from 0.012 in/sec PPV for FA/EE facilities excavation up to 0.121 in/sec for viaduct construction. Based on this preliminary assessment of potential vibration damage, FRA predicted no exceedances of FRA Category I damage threshold (0.5 in/sec for typical timber structures) or the Category II damage threshold (0.5 in/sec for masonry buildings) for any of the Build Alternatives.

Similar to the noise, there are no predicted vibration impacts from the tunnel boring machine along the proposed alignment due to the deep depth of the tunnels. However, the removal of spoils from the TBM launch areas (which typically occur continuously 24/7 during this phase) could cause impacts at residences in the Maryland City and Fort Meade communities. Localized vibration impacts are also expected from station and FA/EE excavation as these will require deep boring, pile driving and possibly blasting.

4.17.6 Potential Mitigation Strategies

Noise and vibration impacts from both temporary construction activities and long-term operations exceed FRA criteria at several receptors in the SCMAGLEV Project Study Area. As a result, FRA has identified several noise and vibration control measures that could reduce potential impacts.

4.17.6.1 Long-term Operations

Mitigation strategies include the application of design features to minimize or eliminate potential noise and vibration impacts at residential communities within the SCMAGLEV Project Affected Environment. Features such as taller parapet walls could minimize noise impacts along viaduct sections but would not eliminate them. Similarly, concrete-lined tunnels and concrete viaducts would reduce vibration transmission but not eliminate them. Additional mitigation measures would be required to reduce noise and vibration impacts. The following proposed noise and vibration-reducing design features would minimize and potentially eliminate all noise and vibration impacts.

- Track design features
 - Sound attenuation hood or shroud to eliminate noise impacts predicted along elevated or at-grade sections of track by extending the hoods near portals to cover longer sections of track along residential communities. (See Appendix G.2 for design details).

- Similar to underground tunnel sections, noise hoods or shrouds would enclose the noise from SCMAGLEV operations, thereby eliminating any escaping noise to the nearby communities.
- Tunnel portal design features
 - Aerodynamic design of the nose of the SCMAGLEV trainset to minimize portal startle effects.
 - Eliminating all gaps between railcars.
 - Flared tunnel portals similar to trumpets.
 - Elongated portals.
 - Perforated portal hoods to reduce aerodynamic effects there.
 - Constructing air shafts along the tunnel to relieve the micro-pressure waves.
 - Adopting larger tunnel cross-sections.
 - Installing specially designed noise mitigation hoods.
 - Creating elevated “tunnels” with enclosed track to eliminate portals all together.
- Augmented Parapet Walls (Refer to Appendix G.2 for design details)
 - Increasing the parapet height from seven to over 15 feet would eliminate ‘severe’ impacts predicted at residences along the SCMAGLEV Project.
- Sound Attenuation Walls
 - Noise barriers (like those constructed by the Maryland Department of Transportation State Highway Administration (MDOT SHA)) are an effective method to eliminate or reduce noise impacts along residential communities with large clusters of homes.
 - Ground-level noise barriers at the property lines are most effective when there are no openings or gaps that allow sound to pass through.
 - The Final Design phase of the SCMAGLEV Project would determine proper sizing and location.
- Vibration control measures for the SCMAGLEV Project would require further research and investigation to find a suitable solution. Based on the limited information available on the use of maglev or SCMAGLEV train service around the world, experience with source-specific vibration control measures is very limited. Applying first-order principles and experience gained from using successful control measures for other concrete-constructed systems has resulted

in successful mitigation of vibration impacts. Typical vibration mitigation would include resilient control such as:

- Resilient track beds and resiliently supported viaducts would de-couple the track structure from the surrounding support system and thereby 'break' the vibration path between the track and the nearby vibration-sensitive receptors. These resilient materials and devices (typically used for buildings in earthquake zones) are those that can recoil or "spring-back" into shape after being compressed. These can come in many forms, including support pads, springs or other resilient material suitable for the structures proposed on this SCMAGLEV Project.
- Similar to floating slabs for conventional track systems, a resiliently supported track bed that accommodates the SCMAGLEV electrical and magnetic propulsion and guidance systems would reduce the impact energy caused by the high-speed SCMAGLEV train passing by.
- At FA/EE Facilities, silencers and acoustical louvers are standard control measures typically used to eliminate noise impacts related to tunnel ventilation fans. Attenuator design would reduce low-frequency fan noise traveling along ventilation ducts. Attenuators include perforated metals with sound absorbing materials inside. FA/EE silencers are used in either supply or exhaust capacities.
- Acoustical louvers, which are architectural elements that allow air intake and exhaust flows to buildings, are also used to provide supplemental noise reduction. They include perforated metal panels with sound absorbing materials inside the louver panels. Final Design phase of the SCMAGLEV Project would determine proper sizing and location.
- Due to the sheer size and location of substations, investigation and design of equipment enclosures and acoustical louvers would eliminate noise impacts by isolating the noise inside the building or enclosure. Final Design phase of the SCMAGLEV Project would determine proper sizing of louvers and enclosure wall heights.
- At TMF and MOW facilities, equipment enclosures, perimeter noise barriers and relocating loud maintenance activities indoors are all typical measures used to eliminate noise impacts related to guideway maintenance facilities. Final Design of the SCMAGLEV Project would determine proper sizing and design of enclosure wall heights.

4.17.6.2 Short-term Construction

Unlike long-term operations, temporary construction mitigation would minimize nuisance, disruptions and potential damage during peak activity periods. For example, to minimize potential noise and vibration impacts at residences near staging, laydown and tunnel boring machine (TBM) launch sites, close coordination is required between

the selected contractor and the affected properties. The Project Sponsor would require its contractors to implement appropriate noise and vibration control measures that would minimize impacts and extended disruption of normal activities.

In addition, the following may be implemented:

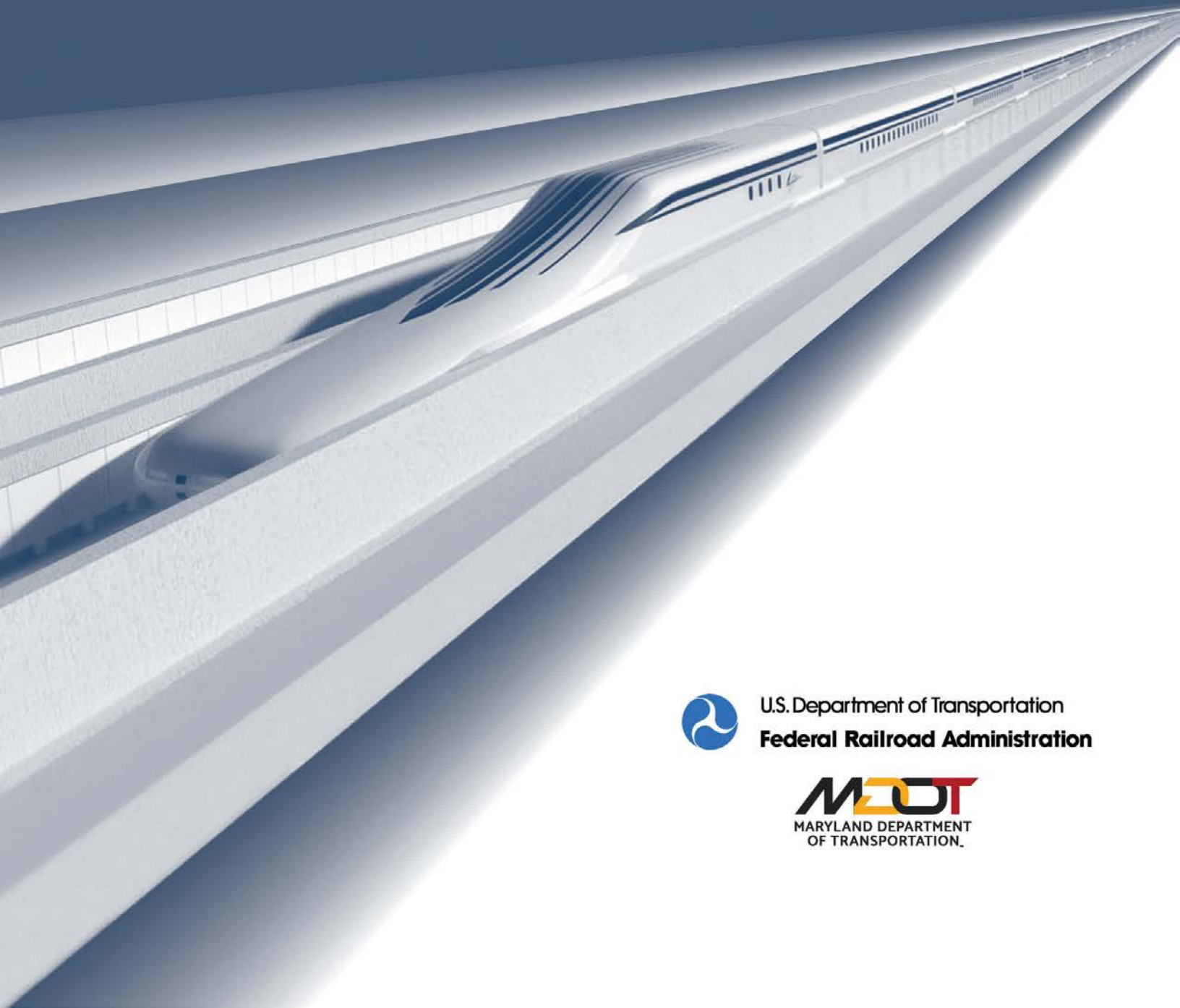
- At staging and laydown sites such as the TBM launch sites, consider installing acoustical curtains or other temporary noise shields to perimeter fencing to act as a temporary noise barrier.
- Strategic placement of containers or other barriers along the perimeter of staging areas would shield nearby residences from construction activities within the laydown area.
- Substituting impulsive equipment such as pile drivers and hoe rams with augers and vibratory pile drivers whenever possible.
- For continuous stationary equipment such as cranes, generators or pumps, enclose or shroud this equipment with temporary or semi-permanent barriers or acoustical enclosures.
- Acoustical curtains or other limp mass barriers hung so as to shield nearby noise-sensitive receivers from the loudest equipment or activities.
- In general, utilize equipment enclosures or shrouds for all exposed stationary equipment while other solutions (such as portable acoustical curtains hung from cranes) may be more practical for mobile sources.
- All equipment should include properly tuned exhaust mufflers or attenuators that comply with the local and municipal noise ordinances.
- Vibration impacts minimized by substituting impact devices with less vibratory equipment such as augers versus pile drivers.
- Additionally, utilize regional roadways rather than local streets for excavation of spoils and new deliveries to further minimize the construction impacts (i.e., noise, vibration, air quality, visual, traffic, etc.) on the nearby community.

Section 4.18

Electromagnetic Fields and Interference

BALTIMORE-WASHINGTON SUPERCONDUCTING MAGLEV PROJECT

DRAFT ENVIRONMENTAL IMPACT STATEMENT AND
SECTION 4(f) EVALUATION



U.S. Department of Transportation
Federal Railroad Administration



4.18 Electromagnetic Fields and Electromagnetic Interference (EMF/EMI)

4.18.1 Introduction

This section considers electromagnetic fields (EMFs) produced by the Superconducting Magnetic Levitation Project (SCMAGLEV Project) and identifies potentially sensitive receptors, those facilities with sensitive electronic equipment, that could be susceptible to electromagnetic interference (EMI). This section also considers other potential issues related to increased electric and magnetic fields associated with the operation of the SCMAGLEV system to include stray currents, broadband emissions, precipitation static, co-located devices, elevated EMFs, and magnetic malfunction.

4.18.2 Regulatory Context and Methodology

4.18.2.1 Regulatory Context

In accordance with the National Environmental Policy Act (NEPA), 42 U.S.C. § 4321 et seq., the Council on Environmental Quality (CEQ) regulations, 40 C.F.R. Parts 1500 - 1508, and the Federal Rail Administration's (FRA) Procedures for Considering Environmental Impacts, 64 Fed. Reg. 28545 (May 26, 1999), FRA assessed impacts from EMF/EMI. In addition, FRA also considered specific standards and regulations relating to EMF/EMI listed below.

The Federal Communications Commission (FCC) and the Occupational Safety and Health Administration (OSHA) have developed standards for EMF exposure for workers while at their workplace. OSHA has prescribed safety standards for occupational exposure to non-ionizing electromagnetic radiation in 29 C.F.R. § 1910.97. However, neither the Federal government nor the State of Maryland has established standards for EMF exposure for residences. Under 47 C.F.R. Part 15, the FCC provides rules and regulations for licensed and unlicensed radio frequency transmissions.¹ Most telecommunications devices sold in the U.S., whether they radiate intentionally or unintentionally, must comply with Part 15. However, Part 15 does not govern any device used exclusively in a vehicle, including on High Speed Rail (HSR) trains. The International Commission on Non-Ionizing Radiation Protection (ICNIRP) and the World Health Organization (WHO) provide guidelines and technical specification on railways.² There will be a magnetic field generated by the SCMAGLEV Project. Shielding and other mitigation will be designed to fully comply with the ICNIRP and WHO guidelines and technical specifications.³

¹ See 47 C.F.R. § 15.103(a).

² ICNIRP - Guidelines for limiting exposure to time-varying electric, magnetic, and electromagnetic fields (up to 300 GHz). Health Physics, 1998, 74(4):494-522 and Guidelines for limiting exposure to time-varying electric and magnetic fields (1 Hz to 100 kHz). Health 932 Physics, 2010, 99(6):818-36.

³ <https://scmaglev.jr-central-global.com/faq/>

4.18.2.2 Methodology

All sources of electricity produce both electric and magnetic fields. Electric fields result from the strength of the electric charge and magnetic fields are produced from the motion of the charge. Together, the combination of electric and magnetic fields is referred to as “electromagnetic fields.” EMFs are invisible, non-ionizing, low-frequency radiation. EMFs are commonly produced by both natural (for example thunderstorms) and man-made sources. EMI is a disturbance emitted by an external source, such as the SCMAGLEV Project technology, that may affect a sensitive electrical circuit in relatively close proximity via induction, coupling or conduction. The disturbance may diminish the quality of the circuit and/or lead to equipment malfunction.

FRA focused on identifying potentially sensitive receptors to EMF/EMI. FRA considered the No Build Alternative as a comparison to the Build Alternatives. FRA defined the SCMAGLEV Project Affected Environment for the EMF/EMI as 500 feet from the Limits of Disturbance (LOD) of the Build Alternatives, unless potential sensitive receptors (e.g. medical or institutional facilities) outside of this area expressed concerns based on sensitive electromagnetic equipment. Appendix D.11 has more information about the EMF regulatory guidelines.

EMF/EMI levels substantially decrease with increased distance from the source. Beyond the 500-foot distance, the EMF/EMI levels would be below existing ambient levels. Segments of the Build Alternatives would be located on an elevated aboveground structure (viaduct); however, the majority of the alignment would be located underground in deep tunnel. Tunnel segments are less likely to result in impacts from EMF/EMI, as EMFs dissipate quickly with distance. However, viaducts may pose a concern for multi-story buildings using sensitive electromagnetic equipment that are in close proximity to the guideway. FRA also considered the EMF/EMI impacts from passenger stations, train maintenance facilities, and ancillary facilities in proximity to potential receptors. FRA reviewed maps, surveys, and photographs to identify potentially sensitive receptors that could be susceptible to EMF/EMI produced by the Build Alternatives. FRA defined sensitive receptors to include Federal installations, universities/schools, medical institutions, high-tech businesses, airports and local governmental facilities (i.e., police and fire) that may use equipment that could be affected by new nearby sources of EMF/EMI. FRA identified an EMF/EMI concern calculating the distance of the receptor from the source and type of Build Alternative (viaduct or tunnel).

FRA did not conduct EMF/EMI calculations or simulations of the SCMAGLEV system as part of the DEIS. The Project Sponsor will coordinate with self-identified receptors to conduct appropriate analysis at site specific locations, as necessary. Additional coordination will be required with potentially impacted resources to identify impacts and develop appropriate mitigation strategies through the FEIS and final design process.

4.18.3 SCMAGLEV Project Affected Environment

FRA reviewed the SCMAGLEV Project Affected Environment for EMF/EMI sensitive receptors based on the Build Alternative relative proximity to the potential sensitive

receptor. **Table 4.18-1** summarizes the analysis of potential sensitive receptors near each Build Alternative and whether each sensitive receptor may present a concern for EMI.

4.18.4 Environmental Consequences

4.18.4.1 No Build Alternative

Under the No Build Alternative, the SCMAGLEV Project will not be built and therefore no impacts related to the construction or operation of a SCMAGLEV system will occur. However, other planned and funded transportation projects will continue to be implemented in the area and could result in EMF/EMI effects for the sensitive receptors identified in **Table 4.18-1**.

4.18.4.2 Build Alternatives

Unlike high voltage transmission lines, EMF/EMI exposure from the SCMAGLEV system would not be constant. EMF/EMI exposure would only occur as the train passes by the source, because exposure depends on the distance of the receptor from the source.

During operation, the Build Alternatives would generate EMF/EMI between 1 and 10 hertz (Hz) caused by the propulsion magnets, 60 Hz and harmonics for power, and radio frequencies for HSR signaling and communication equipment. Based on information reported by Central Japan Rail Central (JRC), EMF exposure levels within and outside the existing L0 Maglev trainsets⁴ are below ICNIRP guidelines; the potential for EMF/EMI exposure is expected to be similar for the SCMAGLEV system. The SCMAGLEV system, including rolling stock as well as boarding bridges (passenger platforms for embarking/disembarking the train) have magnetic shields to limit magnetic exposure⁵. Passengers on the train, passengers waiting at the platform, or people beyond the external security fencing of the right-of-way (ROW), such as passers-by, would not be exposed to EMF levels above the ICNIRP guidelines. Examples of the magnetic shields are shown in **Figure 4.18-1**. Additionally, all equipment would comply with FCC requirements and would not adversely interfere with other electric or electronic equipment, such as radio or televisions. However, the generation of EMF/EMI from the SCMAGLEV system can result in induced currents in nearby metal structures. These currents can lead to shock hazards to humans and animals if the metal is ungrounded and touched. As planning for the Project progresses, more detailed analysis for potential shock hazards and associated risks may be considered.

⁴ The L0 series is a Japanese Maglev train developed by the Central Japan Railway Company. <https://www.maglev.net/worlds-fastest-train-l0-series>

⁵ Central Japan Railway Company, <https://scmaglev.jp-central-global.com/about/magnetic/>

Table 4.18-1: Identified EMF/EMI Sensitive Receptors

Name	Address	City/State Zip Code	Type	Distance from LOD (ft.)	Notes	EMI Concern?
Maryland Aviation Administration (BWI Marshall Airport)	7050 Friendship Rd	Baltimore, MD 21240	Airport	0	Tunnel. Surface features for human entry/exit to airport concourses	Self-identified possible: Airport equipment
Medmark Treatment Centers Cherry Hill	1801 Cherry Hill Rd	Baltimore, MD 21230	Health Center	0	Tunnel	No
Concentra Urgent Care - Baltimore Downtown	100 S Charles St Suite 150	Baltimore, MD 21201	Health Center	0	Tunnel	No
Linthicum Elementary School	101 School Ln	Linthicum Heights, MD 21090	School	380	Tunnel	No
Company 32 - Linthicum Volunteer Fire Company	South Camp Meade Road	Linthicum Heights, MD 21090	Fire Station	100	Tunnel	No
Baltimore Highlands Elementary School	4200 Annapolis Rd	Halethorpe, MD 21227	School	240	Tunnel	No
Beltsville Agricultural Research Center (BARC) Properties	Between NASA Goddard Space Flight Center and Patuxent Research Refuge	Beltsville, MD 20705	Government	0	Tunnel and a transition portal to viaduct and 2 possible sites for a TMF (BARC West and BARC Airstrip)	Self-identified possible: sensitive instruments and research animals
Patuxent Wildlife Refuge	10901 Scarlet Tanager Loop	Laurel, MD 20708	Government	0	Viaduct and SCMaglev Systems	No
Lamont Elementary School	7101 Good Luck Rd	New Carrollton, MD 20784	School	0	Tunnel	No
Rogers Heights Elementary School	4301 58th Ave #1900	Bladensburg, MD 20710	School	0	Tunnel	No

Name	Address	City/State Zip Code	Type	Distance from LOD (ft.)	Notes	EMI Concern?
Port Towns Elementary School	4351 58th Ave	Bladensburg, MD 20710	School	10	Tunnel	No
Bladensburg High School	4200 57th Ave	Bladensburg, MD 20710	School	50	Tunnel	No
Bladensburg Community Center	4500 57th Ave	Bladensburg, MD 20710	Recreation Center	460	Tunnel	No
Elizabeth Seton High School	5715 Emerson St	Bladensburg, MD 20710	School	0	Tunnel	No
Fort George G. Meade	4409 Llewellyn Ave	Fort Meade, MD 20755	Government	0	Tunnel and transition portal to open cut and MD 198 TMF	Self-identified possible: military equipment
NSA	9800 Savage Rd	Fort Meade, MD 20755	Government	0	Tunnel and transition portal to open cut MD 198 TMF	Self-identified possible: intelligence equipment
Tipton Airport	7515 General Aviation Dr. #1	Fort Meade, MD 20755	Airport	800	MD 198 TMF	No
NASA Goddard Space Flight Center (GSFC) and the Goddard Geophysical and Astronomical Observatory (GGAO)	8800 Greenbelt Rd	Greenbelt, MD 20771	Government	0	Tunnel and transition portal to open cut and viaduct; BARC Airstrip TMF site is adjacent to the GGAO	Self-identified possible: experiments, scientific equipment, and satellite reference equipment
Montpelier Elementary School	9200 Muirkirk Rd	Laurel, MD 20708	School	320	Viaduct	No
Monarch Global Academy	430 Brock Bridge Rd	Laurel, MD 20724	School	470	Viaduct	No

Affected Environment, Environmental
Consequences and Mitigation



Name	Address	City/State Zip Code	Type	Distance from LOD (ft.)	Notes	EMI Concern?
Beacon Heights Elementary School	6929 Furman Pkwy	Riverdale, MD 20737	School	90	Tunnel	No
Eleanor Roosevelt High School	7601 Hanover Pkwy	Greenbelt, MD 20770	School	280	Viaduct	No
USS Rowley Training Center	Powder Mill Rd	Laurel, MD 20708	Government	0	Viaduct or Tunnel	Self-identified possible: intelligence equipment
Salvation Army Harbor Light Center	2100 New York Ave NE	Washington, D.C. 20002	Hospital	200	Tunnel and Fresh Air/Emergency Egress	No
Mundo Verde Bilingual Public Charter School	30 P St NW	Washington, D.C. 20001	School	490	Tunnel	No
Metropolitan Police Department - Internal Affairs Division	64 New York Avenue Northeast	Washington, D.C. 20002	Police Station	300	Tunnel	No
The Children's Guild DC Public Charter School	2146 24th PI NE	Washington, D.C. 20018	School	170	Tunnel and Fresh Air/Emergency Egress	No
Holy Redeemer School	206 New York Ave NW	Washington, D.C. 20001	School	160	Tunnel and Cut/Cover plus surface	No
Walker-Jones Education Campus	1125 New Jersey Ave NW	Washington, D.C. 20001	School	400	Tunnel and Cut/Cover plus surface	No
Dunbar High School	101 N Street NW	Washington, D.C. 20001	School	390	Tunnel	No

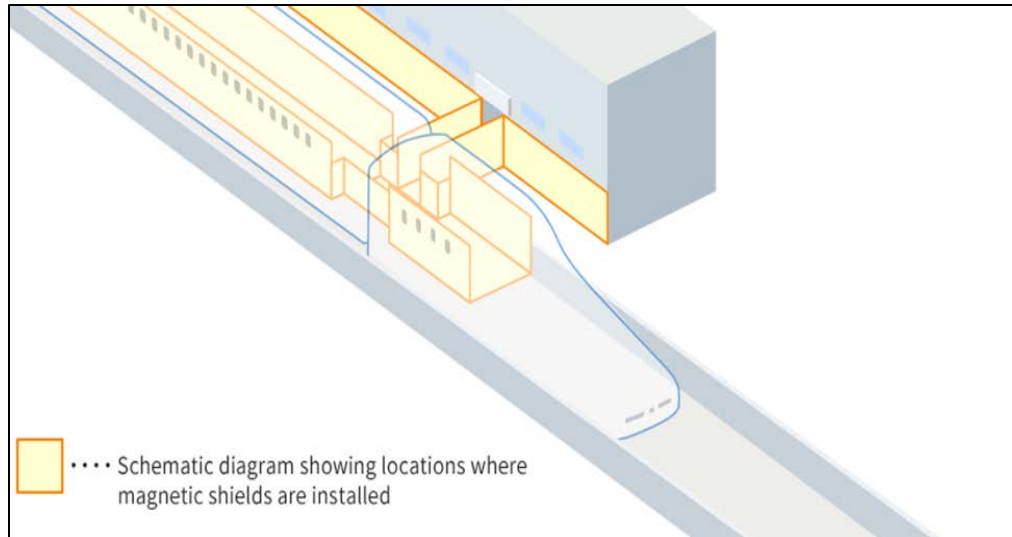
Source: SCMAGLEV Project Team Members 2020

Table 4.18-2: Identified EMF/EMI Sensitive Receptors near TMF's

Name	Address	City/State Zip Code	Type	Distance from Alignment (ft.)	Notes	EMI Concern?
Woodland Job Corps	3300 Fort Meade Road	Laurel MD 20724	School	0	MD 198 TMF	No
Thomas J.S. Waxters Children's Center	375 Red Clay Rd	Laurel, MD 20724	Correctional Facility	300	MD 198 TMF	No
Fort George G. Meade	4409 Llewellyn Ave	Fort Meade, MD 20755	Government	0	MD 198 TMF	Self-identified possible: military equipment
NSA	9800 Savage Rd	Fort Meade, MD 20755	Government	0	MD 198 TMF	Self-identified possible:
BARC Properties	Between NASA GSFC and Patuxent Research Refuge	Beltsville, MD 20705	Government	0	BARC Airstrip TMF BARC West TMF	Self-identified possible: sensitive instruments and research animals
USS Rowley Training Center	Powder Mill Rd	Laurel, MD 20708	Government	0	BARC Airstrip	Self-identified possible: intelligence equipment
NASA GGAO	8800 Greenbelt Rd	Greenbelt, MD 20771	Government	0	BARC Airstrip	Self-identified possible: experiments, scientific equipment, and satellite reference equipment
Patuxent Wildlife Refuge	10901 Scarlet Tanager Loop	Laurel, MD 20708	Government	0	BARC Airstrip 198 TMF	No

Source: SCMAGLEV Project Team Members 2020

Figure 4.18-1: Schematic of Magnetic Shields



Source: Central Japan Railway, <https://scmaglev.jp-central-global.com/about/magnetic/>

FRA did not identify any sensitive receptors within the SCMAGLEV Project Affected Environment that may be impacted from EMF/EMI. However, representatives from, Maryland Department of Transportation Maryland Aviation Administration (MDOT MAA), Baltimore-Washington International Thurgood Marshall Airport (BWI Marshall Airport), Federal Aviation Administration (FAA), National Security Agency (NSA), Fort George G. Meade, National Aeronautics and Space Administration (NASA), and the United States Secret Service (USSS) Rowley Training Center raised concerns regarding sensitive equipment on their properties that could be affected. When the SCMAGLEV system is in operation, the Build Alternatives J-01 through J-06 will be in closer proximity to some of these self-identified government properties and facilities. Additionally, Build Alternatives J-02, J-05, J1-02, and J1-05 have the potential to affect the NASA GSFC and GGAO due to proximity of the BARC Airstrip TMF. The agencies identified above have not disclosed if EMF/EMI levels within ICNIRP guidelines and compliant with FCC requirements will impact their facilities. Depending on the type and location of equipment housed within these resources, the facilities may be impacted by operation the SCMAGLEV system. Additional coordination will be required with these agencies to identify impacts and develop appropriate mitigation strategies.

Potential Issues Related to Increased Electric and Magnetic Fields

The SCMAGLEV Project has the potential to increase electric and magnetic fields as part of operations. Potential issues may exist from increased electric and magnetic fields associated with the operation of the SCMAGLEV system, including stray currents, broadband emissions, precipitation static, co-located devices, elevated EMFs, and magnetic malfunction. Each of these issues is discussed below. **Table 4.18-3** summarizes these potential issues and approaches to minimize related effects.

Table 4.18-3: Potential Issues Related to Increased Electric and Magnetic Fields

Potential Issue	Concern	Effect	Mitigation Strategies
Stray Currents	Induced by passing trains Generated by leakage from within the electrical system	Shock hazards to living beings Corrosion to metal structures ⁶ Arcing (causing broadband emissions to affect nearby receivers) Grounding issues for some sensitive receptors	Select substation locations to minimize interference Provide a continuous grounding system (electrical continuity) Verify return currents are given a low impedance return path Electrical segregation Isolation of structural elements Drainage bonds A routine testing and inspection program
Broadband Emissions	Broadband electrical noise from the switching power supplies	Raise the noise floor of nearby EMF receivers Limits range of electrical equipment, such as cell phones Nuisance issues from increased noise on two-way radios Interference with electric devices currently under development, such as self-driving automobiles	SCMAGLEV equipment uses radiation shielding cooled with liquid nitrogen, which lowers EMF/EMI levels to below the ICNIRP.
Precipitation Static (p-static) ⁷	SCMAGLEV trains moving at speeds sufficient to generate p-static	Interference with internal communications equipment, such as handheld radios used by onboard crew, radio communication between the train and the control center	Equip SCMAGLEV train with a static dissipater and an electrical grounding system
Co-located Devices	Passengers operating multiple types and/or pieces of electronic equipment simultaneously (i.e., wireless, blue tooth, cell phones)	Results in combined emissions that may exceed the specifications and cause interference issues	All equipment used on the SCMAGLEV system will comply with FCC regulations to minimize interference

⁶ Morrow, C. "Design of Reinforced Concrete Civil Structures to Mitigate Against Stray Current Corrosion with a Rail Corridor." 8th Australian Small Bridges Conference, November 28, 2017.

⁷ Precipitation static (p-static) is generally experienced on airplanes and is caused by the exterior of the aircraft experiencing triboelectric charging due to friction, which is caused by the impact of snow, rain, or dust particles on the front surface of the craft. (Thornell, J., "Precipitation-Static (P-Static) Overview of Composite Aircraft," SAE Technical Paper 2001-01-2933, 2001, <https://doi.org/10.4271/2001-01-2933>.)

Potential Issue	Concern	Effect	Mitigation Strategies
Elevated EMFs	Powerful magnets used by the SCMAGLEV system can emit strong electric and magnetic fields	Interference/disruption with other electric and electronic devices near the magnet.	Provide shielding equipment to minimize the EMI below ICNIRP recommended levels for public exposure. Design boarding bridge and seal arrangement to minimize aerodynamic pressure and magnetic field exposure to passengers/crew
Magnetic Malfunction	System malfunction	If the magnet malfunctions, then the magnet ceases to operate, in which case, no EMI would be present Magnets cannot emit more EMI than they already do while operating	Address general, emergency procedures as part of the system technical familiarization process

4.18.4.3 Short-term Construction Effects

Construction of the Build Alternatives would result in periodic increases in EMF/EMI during the use of electric and electronic construction equipment, such as two-way communication radios and power equipment. This standard equipment is regulated by the FCC and associated EMFs would be within the FCC regulatory limits. Typical construction equipment would not interfere with the operation of other nearby electric and electronic equipment; therefore, the impacts from construction activities of the Build Alternatives would be minimal. As part of the construction phase, equipment used on the SCMAGLEV system would be tested, and coordinated with adjacent Federal landowners. Short-term construction effects would be the same as those described for the Build Alternatives in Section 4.18.4.2.

4.18.4.4 Potential Mitigation Strategies

The SCMAGLEV Project design features, such as high-performance magnetic shields on the trainsets, will be implemented to avoid and minimize impacts to the human and physical environment. Based on information reported by JRC, EMF exposure levels within and outside the existing L0 Maglev trainsets⁸ are below ICNIRP guidelines; the potential for EMF exposure is expected to be similar for the SCMAGLEV system. As part of the general operation and maintenance of the SCMAGLEV system, the Project Sponsor would routinely inspect and replace as necessary the external fencing and any other grounded metallic objects within the system. This will avoid or minimize any corrosion.

⁸ The L0 series is a Japanese Maglev train developed by the Central Japan Railway Company.
<https://www.maglev.net/worlds-fastest-train-l0-series>

Design will include mitigation measures, such as proper grounding of nearby metal structures, to minimize shock hazards.

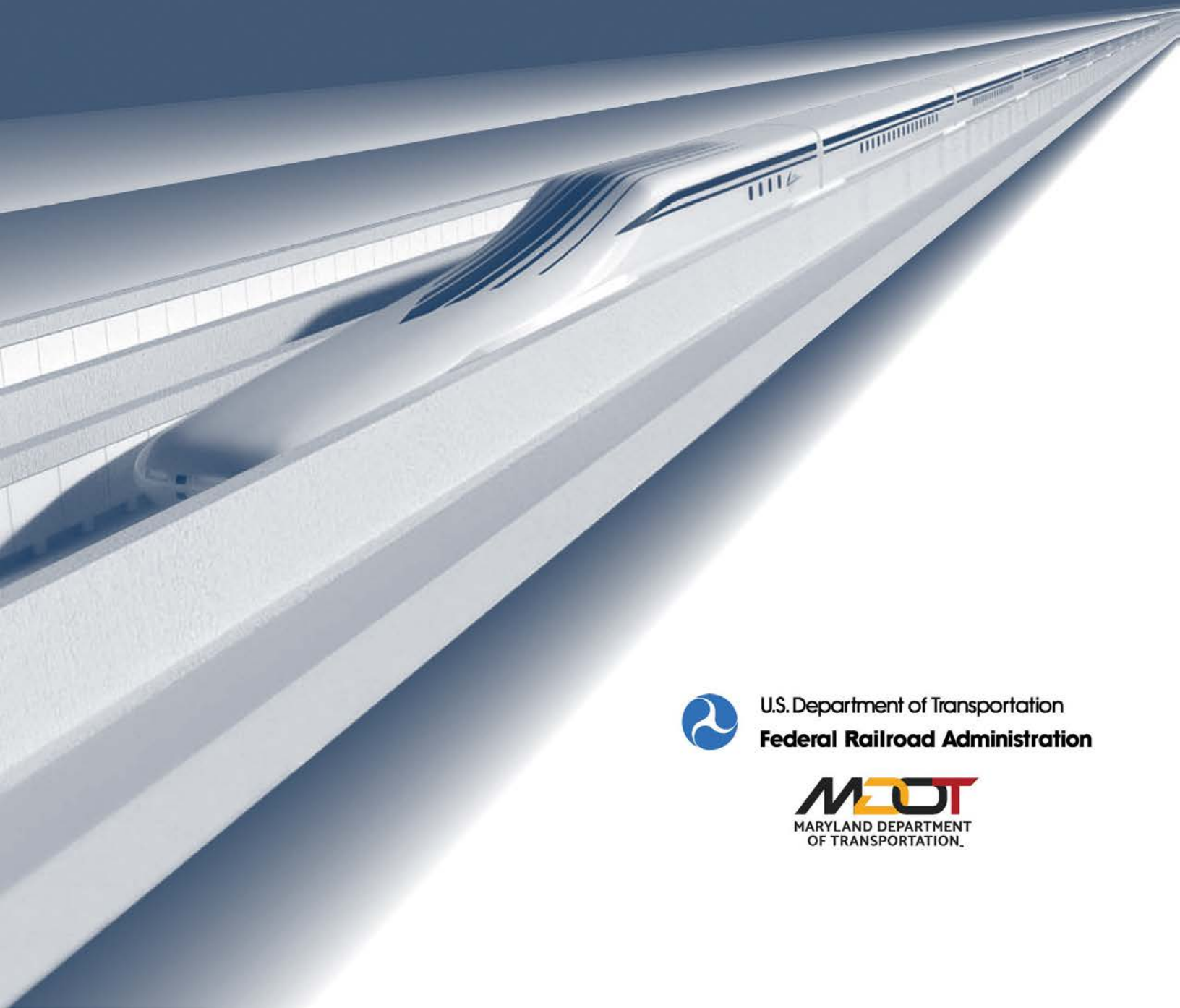
All construction equipment will meet standard operating conditions. Some equipment may result in periodic increases in EMF/EMI while being used; however, it is not expected that adverse impacts would occur to sensitive receptors during construction activities.

Section 4.19

Energy

BALTIMORE-WASHINGTON SUPERCONDUCTING MAGLEV PROJECT

DRAFT ENVIRONMENTAL IMPACT STATEMENT AND
SECTION 4(f) EVALUATION



U.S. Department of Transportation
Federal Railroad Administration



4.19 Energy

This section provides an assessment of the anticipated net changes in energy consumption between the No Build and Build Alternatives. It considers the direct energy consumption of the Superconducting Magnetic Levitation Project (SCMAGLEV) system and ancillary facilities, indirect energy impacts from construction, as well as projected changes in other transportation modes such as passenger vehicles, rail, and buses. This analysis also provides an overview of expected impacts of the SCMAGLEV system to the reliability of the regional power grid, and a discussion of potential strategies to mitigate any adverse impacts.

4.19.1 Regulatory Context and Methodology

4.19.1.1 Regulatory Context

In accordance with the National Environmental Policy Act (NEPA), 42 U.S.C. § 4321 et seq., the Council on Environmental Quality (CEQ) regulations, 40 C.F.R. Parts 1500 - 1508, and the Federal Railroad Administration's (FRA) Procedures for Considering Environmental Impacts, 64 Fed. Reg. 28545 (May 26, 1999), FRA assessed any irreversible or irretrievable commitments of energy resources likely to be involved in each alternative and any potential energy conservation.

4.19.1.2 Methodology

The SCMAGLEV system may impact the availability and reliability of existing energy supply chains and infrastructure in the Superconducting Magnetic Levitation Project (SCMAGLEV Project) Affected Environment described in Section 4.19.2. Given the lack of more localized data, FRA reasonably assessed the impacts of SCMAGLEV Project to energy consumption at the state level for this evaluation.

FRA compared the No Build Alternative against two scenarios of Build Alternatives. The No Build Alternative accounts for projected 2045 growth of existing transportation options. These options include auto and/or bus transportation via I-95, US 1, US 29, and MD 295/BWP, and by the passenger rail services Maryland Area Regional Commuter (MARC) and Amtrak. Changes in air travel were included in the ridership projections, but only in terms of changes in auto trips to and from Baltimore-Washington International Thurgood Marshall Airport (BWI Marshall Airport). Given this data gap, FRA did not analyze the energy impacts of changes to air traffic. The No Build Alternative includes transportation improvements adopted in the Regional Constrained Long-Range Plan for the Baltimore and Washington, D.C. areas and selected planned major rail improvements identified in the NEC FUTURE Record of Decision (ROD).¹ FRA used estimates of Passenger-Miles Traveled (PMT) provided by the Project Sponsor to calculate the combined projected energy use of auto, bus, and rail in 2045

¹ https://www.fra.dot.gov/necfuture/tier1_eis/rod/

under the No Build Alternative.² These estimates are based on modeling of ridership which is valid within the Washington, D.C.-Baltimore corridor.

The variance between the various Build Alternatives in direct energy consumption of the SCMAGLEV system and ancillary facilities is minimal given that the different alternatives have similar track lengths, track gradients, and number of stations served by SCMAGLEV. However, the ridership data provided by the Project Sponsor indicates that there are differences in passenger diversion from other travel modes depending on the location of the SCMAGLEV terminal station in Baltimore. As such FRA groups the Build Alternatives into the following two scenarios for the energy analysis: 1) Build Alternatives with a terminal station in Cherry Hill, and 2) Build Alternatives a terminal station in Camden Yards. FRA's estimate of energy consumption accounts for growth in existing transportation modes, changes in ridership of auto, bus, and rail transportation modes caused by the availability of SCMAGLEV Project as a transportation option, and the future demands of the SCMAGLEV system. FRA estimates the energy consumption of this system in terms of the following direct and indirect use categories:

- Direct energy consumption by SCMAGLEV trains and ancillary facilities (i.e., fresh air and emergency egress (FA/EE) facilities, stations, maintenance of way (MOW), and trainset maintenance facility (TMF) facilities).
- Indirect energy expenditure associated with the construction of physical infrastructure.

The SCMAGLEV Project will also use natural gas to heat offices and work areas. At present the available information is insufficient to estimate total natural gas consumption for these facilities. However, FRA estimates that total energy consumption attributable to natural gas for heating will be small relative to SCMAGLEV Project's other operational energy needs.

FRA measures energy in terms of million British thermal units (MMBtu) and megawatt-hours (MWh). **Table 4.19-1** describes the units of measurement used to document energy consumption and demand. Passenger-miles were converted to energy consumption using estimates from the Energy Information Administration (EIA) on 2045 passenger mode energy intensities. Energy intensity is the energy required to move one passenger one mile. For auto, bus, and passenger rail, these values are 2,000, 1,100, and 1,250 British thermal units (Btus) per passenger-mile, respectively.³

² BWRR provided estimates of auto travel in vehicle-miles traveled. To convert to passenger-miles traveled a conversion factor of 1.5 passengers per trip was applied, calculated based on the average party size provided by the Project Sponsor in a ridership forecast.

³ Energy intensity value for passenger rail is assumed to be applicable both to commuter rail and intercity passenger rail.

Auto travel is considerably more energy intensive per person, given that light-duty vehicles carry on average fewer passengers than bus or rail.

Table 4.19-1: Units of Measurement

Unit	Description
Energy Consumption	
MMBtu	One million British thermal units. A Btu is defined as the amount of heat required to raise the temperature of one pound of water by one-degree Fahrenheit. 1 MMBtu = 1 million Btu.
MWh	A megawatt-hour is equivalent to 1,000,000 watts for one hour. 1 MWh = 1 million Wh.
MMBtu/year; MWh/year	MMBtu and MWh are shown as MMBtu/year and MWh/year to represent energy consumption on an annual basis.
Energy Demand (also referred to as power)	
MW	Megawatt (MW) measures the rate of energy transfer.
Transportation Metrics	
PMT	Passenger-miles traveled (PMT) represents the movement of one passenger for one mile. This metric is used to estimate the energy expenditure of different transportation modes.
VMT	Vehicle-miles traveled (VMT) represents the total number of miles traveled by vehicles. In this analysis, VMT refers to light-duty vehicles.
Energy Intensity	
Btu/PMT	Conversion factor unit for mode energy intensity to convert PMT to transportation energy consumption.

4.19.2 SCMAGLEV Project Affected Environment

As of 2018, Washington, D.C. and Maryland rank below the national average in energy consumption per capita. However, in terms of the percentage of total energy consumption which is *transportation-related*, Washington, D.C. is well below the national average of 28 percent at 12 percent. For Maryland, this figure is slightly above the national average at 32 percent. **Table 4.19-2** provides an overview of the energy profile for both geographies and a comparison to the national average.

Table 4.19-2: State Energy Overview and Consumption by Sector

Geography	Total Consumption (trillion Btu/year)	Energy Consumption Per Capita (MMBtu/year/person)	Percent of Energy Consumption by Sector			
			Transportation	Industrial	Commercial	Residential
Washington, D.C.	175	241	12	3	61	24
Maryland	1,361	218	32	8	30	30
National Average	1,983	347	28	32	18	21

Source: Energy Information Agency (EIA), Energy Consumption Estimates by End-Use Sector, Ranked by State, 2018

According to the Bureau of Transportation Statistics the U.S. transportation sector consumed 26,600 trillion Btus in 2018. Light duty vehicles⁴ accounted for 61 percent of this consumption; more than all other transportation modes combined, as shown in **Table 4.19-3**.

Table 4.19-3: U.S. Energy Consumption by Transportation Mode

Mode	Consumption (trillion Btu)	% of Total
Air	1,872	7
Light Duty Vehicles	16,097	61
Medium/Heavy Trucks	5,801	22
Bus	312	1
Rail (Freight)	507	2
Rail (Passenger) ^a	11	0
Watercraft	970	4
Pipeline	890	3

Source: Bureau of Transportation Statistics, Table 4-6: Energy Consumption by Mode of Transportation, 2018

^a Passenger rail represents Amtrak operations only.

In Washington, D.C. and Maryland, the transportation sector accounts for 78 percent and 85 percent of total petroleum consumption, respectively.⁵ Gasoline and diesel consumption emit more pounds of CO₂ per Btu of energy produced when compared with the other energy source except for coal.⁶ See **Table 4.19.4**.

⁴ Light Duty Vehicles include cars, sport utility vehicles, and small trucks.

⁵ https://www.eia.gov/state/seds/data.php?incfile=/state/seds/sep_fuel/html/fuel_use_pa.html&sid=US&sid=DC (last visited on **July 2, 2020**)

⁶ <https://www.eia.gov/tools/faqs/faq.php?id=73&t=11> (last visited on **July 2, 2020**)

Table 4.19-4: Energy Consumption by Source

Geography	Percent of Annual Consumption (%)					
	Coal	Natural Gas	Petroleum ^a	Nuclear	Renewables ^b	Interstate Flows ^c
Washington, D.C.	0	19	11	0	2	69
Maryland	9	23	33	12	7	17

Source: Energy Information Agency, Maryland and Washington, D.C. Energy Consumption Estimates, 2018

^a Petroleum combines the EIA categories of motor gasoline, distillate fuel oil, jet fuel, Hydrocarbon Gas Liquids (HGL), residual fuel, and other petroleum.

^b Renewables combines EIA categories of hydroelectric power, biomass, and other renewables.

^c Interstate flows refer to energy generated outside of the state and delivered via interstate transmission lines.

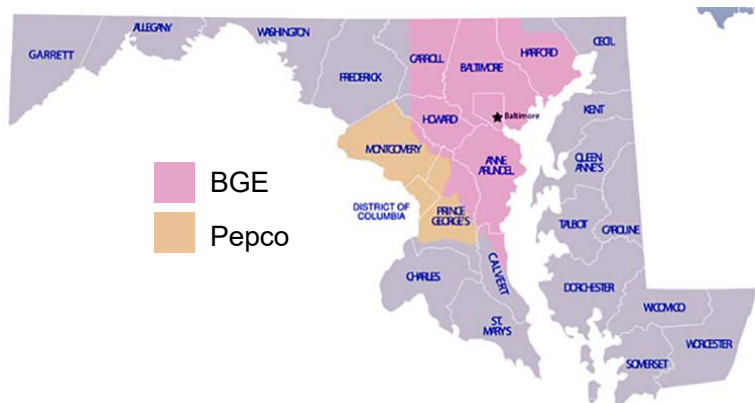
The proposed SCMAGLEV system and its ancillary facilities would draw power from two electric utilities: Potomac Electric Power Company (PEPCO) and Baltimore Gas and Electric Company (BGE). PEPCO and BGE provide electric energy transmission and distribution services for all areas included in the SCMAGLEV Project Affected Environment, as shown in **Figure 4.19-1**. PEPCO has over 883,000 customers in Washington, D.C. and surrounding Maryland counties. BGE serves more than 1.25 million customers across its 2,300 square mile service area, which encompasses Baltimore and most of the Baltimore-Washington Parkway (BWP) corridor.

Both PEPCO and BGE belong to the Pennsylvania-New Jersey-Maryland Power Pool (PJM) which is a regional transmission organization responsible for coordinating the delivery of electricity in the Mid-Atlantic region. Interstate energy flows, which provide 69 percent of the total energy consumed in Washington, D.C. as shown in **Table 4.19-4**, are managed by PJM. PJM is one of the largest power pools in the U.S. with over 65 million customers in 13 states and Washington, D.C. and a generating capacity of over 197,485 megawatts.⁷

The SCMAGLEV Project would also utilize natural gas to heat offices, ventilation buildings, maintenance facilities, and passenger stations. BGE and Washington Gas would provide natural gas service to SCMAGLEV Project. The small volume of natural gas needed for heating ancillary spaces should be easily serviceable by the local utilities with no adverse impact to existing customers.

⁷ <https://learn.pjm.com/-/media/about-pjm/newsroom/fact-sheets/pjm-statistics.ashx>

Figure 4.19-1: BGE and PEPCO Service Areas in the Baltimore-Washington Corridor⁸



Source: <https://oasisenergy.com/maryland/>

4.19.3 Environmental Consequences

The following sections compare the energy consumption of auto, bus, rail, and SCMAGLEV transportation modes in 2045 in the No Build Alternative and for Build Alternatives.⁹

4.19.3.1 No Build Alternative

Under the No Build Alternative, auto travel between Baltimore and Washington, D.C. would account for 96.5 percent of total transportation energy consumption at almost 7.6 trillion Btus annually. The energy consumption of bus travel is projected to account for a negligible percentage (0.3 percent) of energy consumption, with rail making up the remaining 3.1 percent. (See **Table 4.19-5**)

⁸ <https://oasisenergy.com/maryland/>

⁹ For this chapter FRA considers two groups of Build Alternatives: those with a terminal station in Cherry Hill, and those with a terminal station in Camden Yards. Energy consumption varies between these two groups because of differences in ridership projections depending on the location of the Baltimore terminal.

Table 4.19-5: 2045 Projected Transportation Energy Consumption for No Build Alternative

Transportation Mode	2045 Projected Transportation Consumption			
	Passenger-Miles Traveled (in 000s)	Mode Energy Intensity in Btu per PMT	Energy Use (MMBtu)	Percent of Total
Auto Travel	3,775,499	2,000	7,550,998	96.5
Bus Travel	24,638	1,100	27,102	0.3
Rail Travel ^a	195,220	1,250	244,025	3.1
Total			7,822,125	100

Source: BWRR 2020

^a Passenger rail only, does not include freight rail.

4.19.3.2 Build Alternatives

Total energy consumption of the SCMAGLEV system requires an estimated 4.0 trillion Btus per year for its operations (including trains, stations, ancillary facilities, TMF and MOW facilities). This is a preliminary estimate that will be refined as planning for the project progresses. The preliminary estimate is based on public information about the Chuo Shinkansen and other high-speed maglev technologies, as well as input from the Project Sponsor. To contextualize this estimated energy consumption, FRA compared the SCMAGLEV energy consumption against comparable trains. Energy intensity for maglev trains can be evaluated in two ways: (1) In energy per passenger-mile (Btu/seat-mile), or (2) in energy per usable area per distance (Btu/m²-mile). Energy per passenger-mile is the standard for benchmarking transportation energy efficiency and measures the amount of energy necessary to move one passenger a distance of one mile. In the case of maglev trains, usable area is also helpful as it omits variables related to ridership and allows for a more direct comparison of the efficiency of the train system design. Usable area is a measure of the space within the train which can be used to accommodate cargo or passengers.¹⁰

Both metrics are provided in **Figures 4.19-2** and **4.19-3** along with figures for maglev and traditional trains of comparable speed and size in Japan (Chuo Shinkansen), Germany (ICE3 and Transrapid), and France (TGV Duplex).

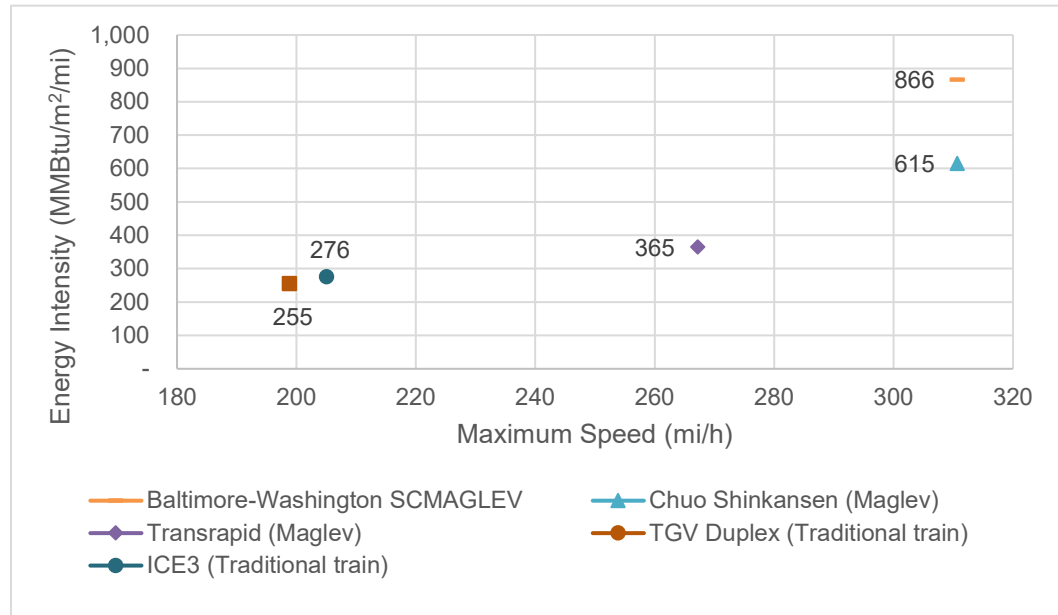
The SCMAGLEV Project's projected energy intensity is the highest of all trains for which data is available. FRA estimates that the energy intensity of the SCMAGLEV system is 866 Btu/m²-mile – 41 percent larger than Chuo Shinkansen which has an efficiency of 615 Btu/m²-mile. In terms of per seat energy intensity, SCMAGLEV Project is 53 percent larger than Chuo Shinkansen at 831 Btu/seat-mile. The relative inefficiency of

¹⁰ This calculation is per the methodology of Fritz et al. 2018, available at https://www.researchgate.net/publication/328733747_Energy_Consumption_of_Track-Based_High-Speed_Transportation_Systems_Maglev_Technologies_in_Comparison_with_Steel-Wheel-Rail. The usable area is equivalent to the train length times the train width, multiplied by a factor of 0.75 to account for space that is exclusively dedicated to mechanical areas and cannot be used to carry people or cargo.

SCMAGLEV Project is likely due to the short distances between the three planned stations which will require frequent periods of acceleration¹¹.

Figure 4.19-3 is provided in units of energy per seat rather than energy per passenger to match the data available for comparable trains. Taken in terms of energy per passenger transported per mile, this figure increases to 1,672 Btu/passenger-mile for Build Alternatives with a terminal station in Cherry Hill and 1,506 Btu/passenger-mile for Build Alternatives with a terminal station in Camden Yards. SCMAGLEV's energy consumption more efficient than personal vehicles, which the EIA estimates at 2,000 Btu/passenger-mile but less efficient than passenger rail or bus at 1,250 and 1,100 Btu/passenger-mile, respectively.

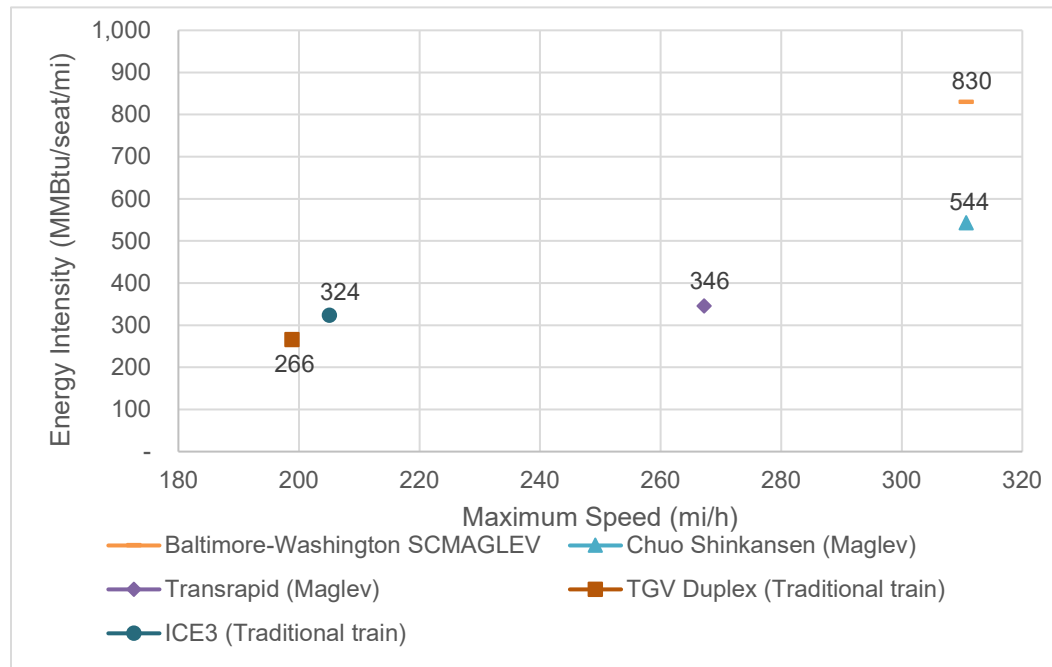
Figure 4.19-2: Benchmarking Projected SCMAGLEV Energy Intensity to Comparable Trains on a Usable Area Basis



Source: FRA calculation based on data and methodology of Fritz et al. 2018

¹¹ Trains are most energy efficient when cruising at top speed. Acceleration is the most energy intense part of maglev train operation. Therefore, a track design which requires frequent stops followed by periods of acceleration decreases the train's energy efficiency.

Figure 4.19-3: Benchmarking Projected SCMAGLEV Energy Intensity to Comparable Trains on a Seat Basis



Source: FRA calculation based on data and methodology of Fritz et al. 2018

Auto travel between Baltimore and Washington, D.C. will continue to increase by 2045, though the SCMAGLEV Project would offset 393 million auto passenger-miles for Build Alternatives with a terminal station in Cherry Hill and 437 million auto passenger-miles for Build Alternatives with a terminal station in Camden Yards. In 2045, auto travel will account for 60 percent of total transportation energy consumption for both groups of Build Alternatives, compared to 97 percent in the No Build Alternative. The SCMAGLEV Project would be the next greatest energy consumer at nearly 4.0 trillion Btus annually and 38-39 percent of total energy consumption. Energy consumption of bus and rail travel are 0.1 percent and 1 percent, respectively, for both groups of Build Alternatives. **Table 4.19-6** provides a summary of the annual energy consumption per mode for both groups of Build Alternatives.

Table 4.19-6: 2045 Projected Transportation Energy Consumption for Build Alternatives

Build Alternative	Transportation Mode	2045 Projected Transportation Consumption			
		Passenger-Miles Traveled (in 000s) ^a	Mode Energy Intensity in Btu per Passenger-Mile Traveled	Energy Consumption (MMBtu)	Percent of Total
Terminal station in Cherry Hill	Auto Travel	3,382,350	2,000	6,764,700	62
	Bus Travel	11,185	1,100	12,304	>0
	Rail Travel	92,883	1,250	116,104	1.0
	SCMAGLEV	2,517,185 ^b	1,671 ^c	4,000,000	37
	Total			10,893,108	100
Terminal station in Camden Yards	Auto Travel	3,338,993	2,000	6,677,866	62
	Bus Travel	10,657	1,100	11,723	>0
	Rail Travel	85,880	1,250	107,350	1
	SCMAGLEV	2,793,521 ^b	1,506 ^c	4,000,000	37
	Total			10,796,939	100

Source: FRA calculation except where otherwise cited

^a Passenger-miles traveled are shown in thousands and are valid for the Baltimore-Washington corridor.

^b SCMAGLEV PMT calculated using estimates of maximum number of passengers estimated for 2045.

^c Energy intensity of SCMAGLEV is taken as average value of Cherry Hill and Camden Yards alternatives on a Btu/passenger-mile basis.

In terms of energy intensity per PMT, SCMAGLEV compares favorably with auto travel but unfavorably with existing bus and rail transportation modes for both terminal station alternatives. At 1,506 Btu per PMT for the Camden Yards scenario, SCMAGLEV is nearly 25 percent more efficient than auto travel, but 37 and 20 percent less efficient than existing bus and passenger rail, respectively.

Table 4.19-7 presents a comparison of energy consumption per mode for the No Build and two groups of Build Alternatives. For Build Alternatives with a terminal station in Cherry Hill, there is an expected net increase in energy consumption of 3.0 trillion Btus. This represents a 39 percent increase from the No Build Alternative despite offsetting 929 million Btus from auto, bus, and passenger rail travel modes. Build Alternatives with a terminal station in Camden Yards are nearly equivalent with a net increase in energy consumption of 2.9 billion Btus, representing a 38 percent increase in total transportation energy consumption.

Table 4.19-7: 2045 Comparison of Changes in Energy Use

Transportation Mode	No Build Energy Consumption (MMBtu)	Energy Consumption of Build Alternatives with Terminal Station in Cherry Hill	Net Consumption of Build Alternatives with Terminal Station in Cherry Hill (MMBtu)	Energy Consumption of Build Alternatives with Terminal Station in Camden Yards (MMBtu)	Net Consumption of Build Alternatives with Terminal Station in Camden Yards (MMBtu)
Auto Travel	7,550,998	6,764,700	-786,298	6,677,866	-873,132
Bus Travel	27,102	12,304	-14,798	11,723	-15,379
Rail Travel	244,025	116,104	-127,921	107,350	-136,675
SCMAGLEV Travel	0	4,000,000	4,000,000	4,000,000	4,000,000
Total			3,070,983	Total	2,974,814

Source: FRA calculation except where otherwise cited

As indicated in **Table 4.19-7**, the SCMAGLEV system and ancillary facilities will increase net transportation energy consumption by approximately 3.0 trillion Btus. For context, this would be enough energy to power around 88,900 average homes for one year.¹² The anticipated decrease in energy expenditure from the diversion of auto, bus, and rail traffic to the SCMAGLEV Project is not expected to offset the increase in energy consumption from the SCMAGLEV system.

PJM had a total generation capacity of 197,485 MW as of 2020. In comparison, the optimum power requirement for a single SCMAGLEV train during acceleration is 35 MW – equivalent to 0.02 percent of PJM’s total generation capacity. In the Southern Mid-Atlantic region specifically, which encompasses the Washington-Baltimore corridor, PJM projects peak annual demand to be 12,537 MW.¹³ An SCMAGLEV train operating during this period of peak demand would add an additional 0.2 percent to peak demand. FRA does not consider this additional demand to be problematic for grid reliability given that PJM maintains a “reserve margin” of extra generation capacity which can be turned on in periods of extremely high demand. From 2020 through 2024, PJM projects a reserve margin of 31-36 percent of expected summer peak demand.¹⁴ Beyond 2024, PJM has planning processes to regularly update their reserve margin in accordance with the Reliability Assurance Agreement, which defines PJM’s obligations in maintaining grid reliability.¹⁵ Even with the estimated 208 SCMAGLEV trips per day, FRA estimates that PJM’s existing generation resources will be sufficient to meet SCMAGLEV’s energy demands.

¹² <https://www.eia.gov/tools/faqs/faq.php?id=97&t=3>

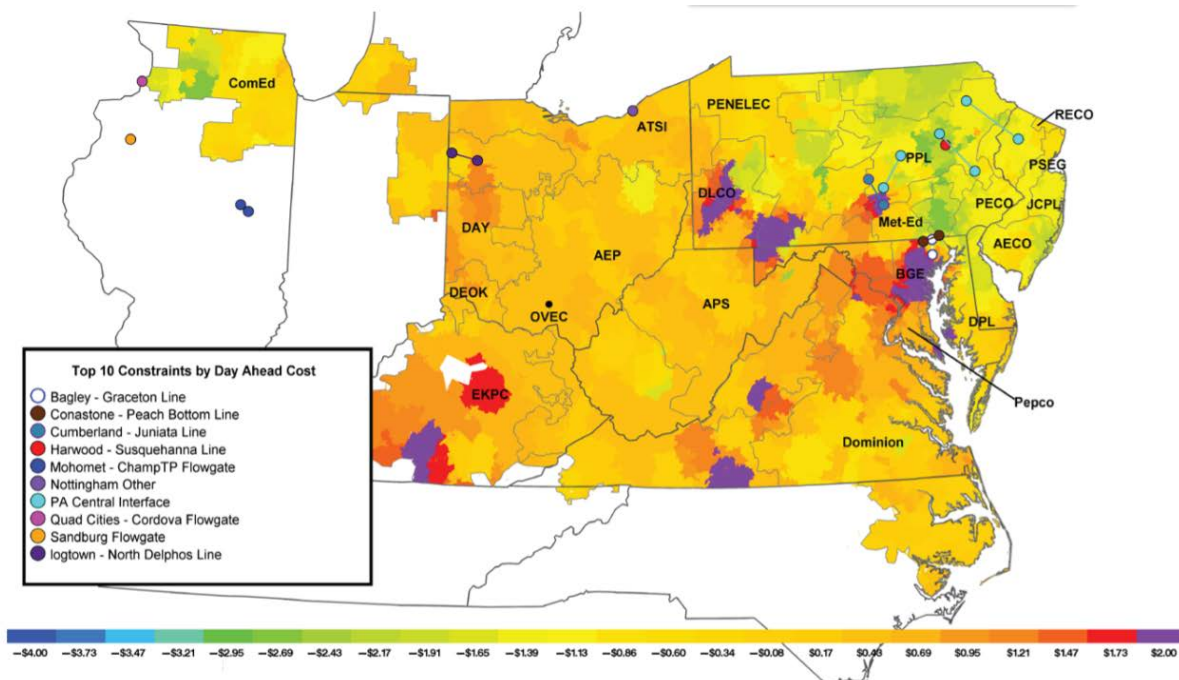
¹³ <https://www.pjm.com/-/media/library/reports-notices/load-forecast/2020-load-report.ashx?la=en>

¹⁴ <https://www.pjm.com/-/media/planning/res-adeq/20200219-forecasted-reserve-margin-graph.ashx?la=en>

¹⁵ <https://www.pjm.com/library/governing-documents.aspx>

A more critical constraint is the capacity of the current transmission infrastructure to handle the power demands of the SCMAGLEV system. Transmission congestion occurs when the capacity of the physical infrastructure (such as transmission lines and transformers) is insufficient to transport power from generators to customers and is of particular concern during periods of high demand. Congestion in urban centers is common and is usually managed effectively through dynamic pricing schemes and long-term planning processes. However, more severe congestion can lead to high electricity prices and, in the worst case, outages. The Washington, D.C.-Baltimore corridor, which lies within BGE's service area, is among the most congested in PJM. This is visible in **Figure 4.19-4**, which shows the average day-ahead congestion costs in millions of dollars in PJM for the first three months of 2020.

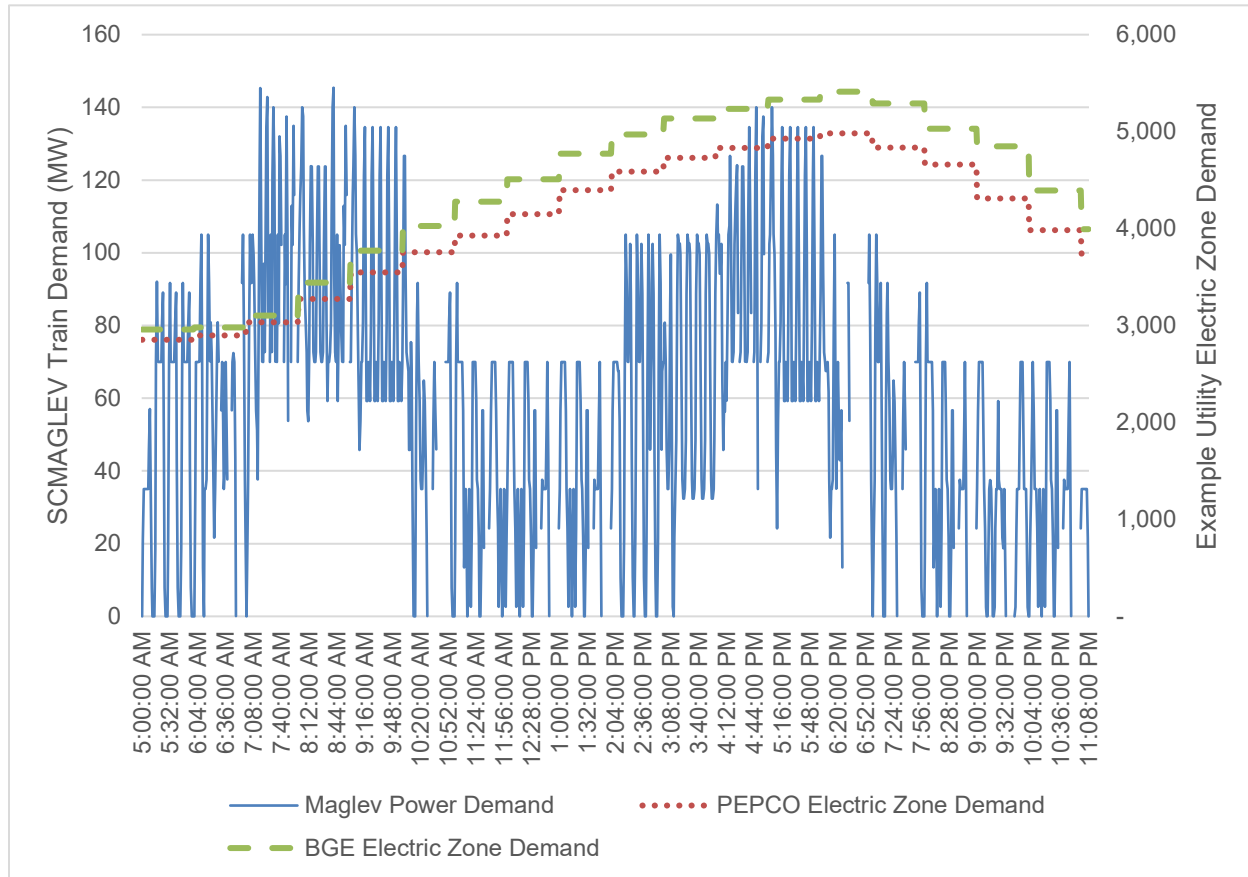
Figure 4.19-4: PJM Day-Ahead Congestion Costs¹⁶



SCMAGLEV's power needs are particularly complex given the minute-to-minute fluctuations in demand during operations. **Figure 4.19-5** visualizes the power demands of the SCMAGLEV trains during a standard weekday operating schedule. Demand cycles rapidly as trains accelerate; these fluctuations are largest where several trains are accelerating simultaneously. The period of largest demand for SCMAGLEV Project is from 4:00 to 6:00 PM, which coincides with the period of peak demand for the local utilities.

¹⁶ http://www.monitoringanalytics.com/reports/PJM_State_of_the_Market/2020/2020q1-som-pjm-sec11.pdf

Figure 4.19-5: Demand Profile on Standard Weekday



PJM has established procedures for accommodating the interconnection of new, high-consumption customers.¹⁷ The Project Sponsor would apply through PJM for long-term transmission service, which will initiate a Transmission Feasibility Study (TFS). This study uses power flow models and other sophisticated modeling tools to determine whether sufficient transmission capability exists to accommodate the requested service. If this analysis indicates that service cannot be granted with existing grid infrastructure, PJM initiates a System Impact Study (SIS) and Facility Studies. The SIS is a comprehensive regional analysis of the impact of the customer's demand on the deliverability of electricity in the immediate area where the project is located. It identifies specific system constraints and any upgrades necessary to accommodate the requested service. The SIS also provides a comprehensive estimate of cost responsibility and construction lead times to complete upgrades.¹⁸ As a final step, the results of the SIS are incorporated into PJM's Regional Transmission Expansion Plan (RTEP). The RTEP is PJM's process for managing and documenting transmission upgrades necessary to ensure operational and economic reliability over a 15-year

¹⁷ See PJM Manual 2: Transmission Service Request, Revision 14 dated April 1, 2018.

<https://www.pjm.com/~media/documents/manuals/m02.ashx>

¹⁸ <https://www.pjm.com/~media/documents/manuals/m14a.ashx>

horizon.¹⁹ Any adverse impacts of the SCMAGLEV system to regional grid reliability will be appropriately identified and mitigated through PJM's planning process, in close cooperation with the local utilities PEPCO and BGE.

4.19.3.3 Short-Term Construction Impacts

The SCMAGLEV Project would have temporary indirect energy impacts resulting from the construction of the terminus stations, guideway, tunnels, and ancillary facilities. FRA estimates that tunnel boring, worker transportation, and construction trucking –will consume 6 trillion Btus. Additional energy will be needed to operate equipment, power lighting, and cool working areas, among other uses. Though the energy consumption of these activities is excluded from this estimate due to data in-availability, FRA expects them to make up only a small percentage of total construction energy use relative to transportation and operation of the TBMs.

The most energy intense construction activity is tunnel boring. The Project Sponsor estimates that it will use 8-9 tunnel boring machines (TBM) during the construction phase, each requiring around 14 MW of power. As demonstrated in **Table 4.19-8**, boring activities alone will consume 4.9 trillion MMBtus during construction activities. BWRR has stated that it plans to meet this demand with temporary standby generation facilities, which will most likely be diesel-powered.²⁰ **Table 4.19-9** and **Table 4.19-10** present estimates of energy consumption from worker transportation and construction-related truck use.²¹

Table 4.19-8: Boring Machine Energy Consumption

Months of Construction ^{a,b}	Working Days per Month ^b	Hours of TBM Operation per Day ^b	Power per TBM (MW/TBM)	Total Annual Energy Consumption (MWh MMBtu)	
172	25	24	14	1,440,600	4,915,327

^a Represents the collective months from all eight boring sites.

^b Source: BWRR, Construction Planning Memorandum, May 14, 2020.

¹⁹ <https://www.pjm.com/planning/rtep-development.aspx>

²⁰ Electrical Coordination Technical Memorandum dated May 8, 2020.

²¹ These estimates assume 17.1 miles per trip for each worker, based on the average commute distance in the D.C. metro region published by the National Capital Region Transportation Planning Board's 2019 State of the Commute Survey Report.²¹ FRA assumes an average light-duty vehicle fuel economy of 22.3 miles per gallon of gasoline based on 2017 statistics from the Bureau of Transportation Statistics.²¹ For construction vehicles, 6.2 miles per gallon of diesel is assumed based on a 2019 report by the International Council on Clean Transportation

Table 4.19-9: Energy Consumption from Worker Transportation

Worker Vehicle Trips ^{a,b}	Average Miles per Trip	Energy Intensity of Transportation (miles/gallon gasoline)	Energy Intensity of Fuel (Btu/gallon gasoline)	Total Annual Energy Consumption (MWh MMBtu)	
3,464,300	17.1	22.3	120,286	93,651	319,537

^a Represents all worker trips needed throughout the duration of construction activities.

^b Source: BWRR, Construction Planning Memorandum, May 14, 2020.

Table 4.19-10: Energy Consumption from Construction Trucking

Worker Vehicle Trips ^{a,b}	Average Miles per Trip ^c	Energy Intensity of Transportation (miles/gallon diesel)	Energy Intensity of Fuel (Btu/gallon diesel)	Total Annual Energy Consumption (MWh MMBtu)	
3,605,466	10	6.8	137,381	234,148	798,912

^a Represents all worker trips needed throughout the duration of construction activities.

^b Source: BWRR, Construction Planning Memorandum, May 14, 2020.

^c Estimate based on distances to spoil disposal and laydown sites indicated in the Construction Planning Memorandum.

Energy use for construction purposes are often benchmarked as a percentage of energy consumption over the lifetime of the project. Assuming that the SCMAGLEV Project would have a minimum service life of at least 50 years, the energy consumption from construction activities quantified in this analysis constitutes less than three percent of lifetime energy consumption.

The impacts from all construction activities will be temporary and geographically distributed across several sites. Much of the construction-related energy needs will be met with gas or diesel rather than electricity from the grid.²² For construction energy needs which do require electricity, the Project Sponsor will submit temporary electric service requests to the utilities. This allows the utilities to take the energy needs of construction into account in their own planning processes and to ensure that there will be no negative impact on grid reliability from the added construction demand.

4.19.4 Potential Mitigation Strategies

FRA estimates that all Build Alternatives will increase overall energy consumption by 3.3-3.4 trillion MMBtu. Energy will be sourced from the regional electricity pool. In order to offset the increase in associated emissions, the Project Sponsor may pursue renewable energy projects to offset any increases in power generation-related emissions. Other mitigation strategies should look to increase SCMAGLEV's energy

²² See Sharrard et al. 2007, Environmental Implications of Construction Site Energy Use and Electricity Generation

efficiency through operational improvements, including increasing train utilization, optimizing number of train cars to ridership demands, and offering a direct Washington-Baltimore route option. Furthermore, an extension of the track northwards to New York City and the New England region would likely improve the overall energy efficiency of the system, provided that the spacing of stations allow the train to reach and maintain its optimum cruising speed for more extended periods of time.

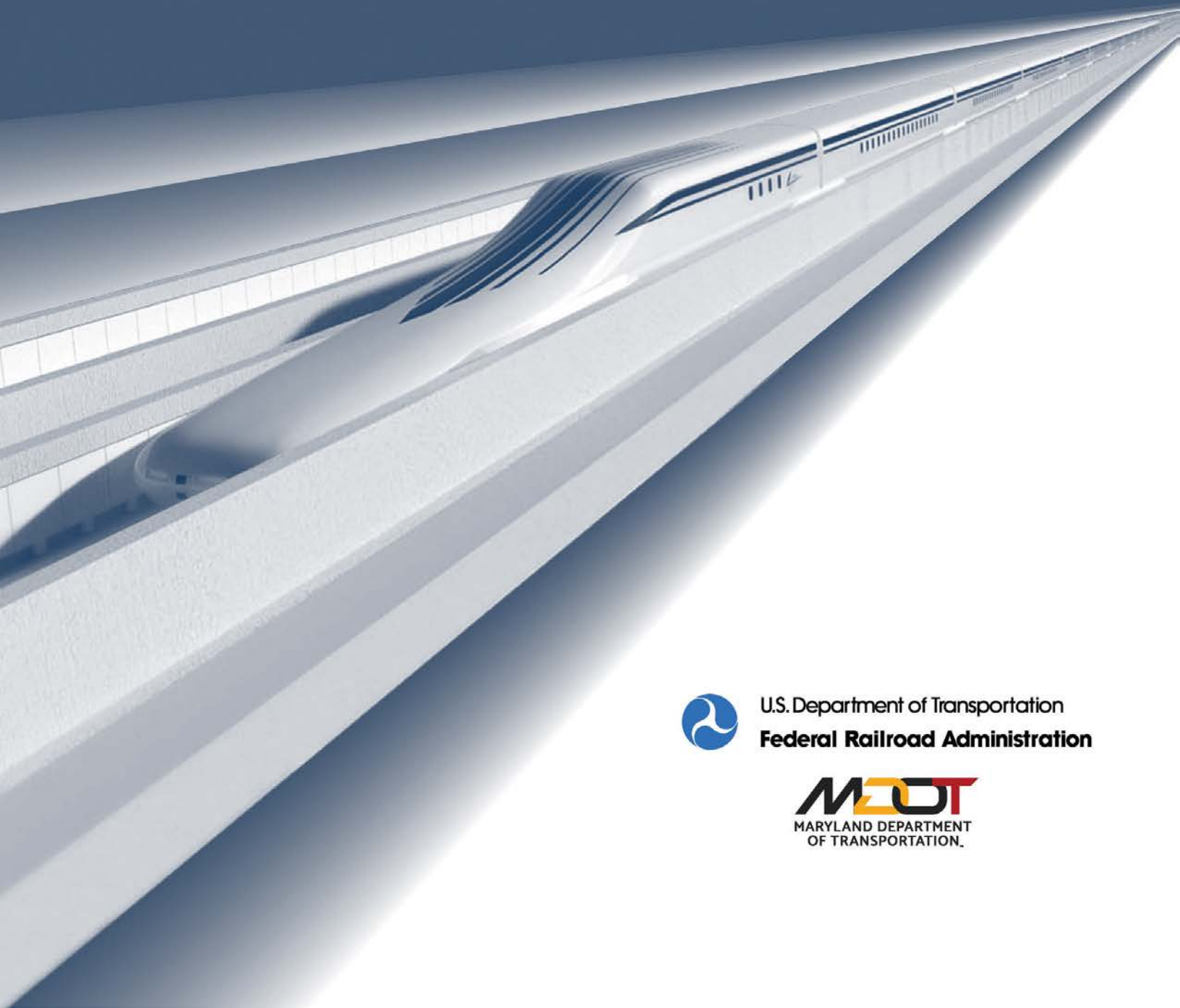
Innovative engineering approaches could also decrease SCMAGLEV's energy consumption. Regenerative braking is an approach commonly used with rail systems to recover kinetic energy that is dissipated during deceleration. Similar to hybrid vehicles, energy is recovered in a regenerative braking system by using an electric motor during braking. This motor is run in reverse during braking, generating electricity which is stored in an on-board energy storage system. This energy is then released during acceleration and offsets electricity which would otherwise be supplied by the grid. Though the magnitude of energy recovered through regenerative braking is often only a fraction of total system energy consumption, the key benefit of this technology is its ability to reduce the system's peak demand.

Section 4.20

Utilities

BALTIMORE-WASHINGTON SUPERCONDUCTING MAGLEV PROJECT

DRAFT ENVIRONMENTAL IMPACT STATEMENT AND
SECTION 4(f) EVALUATION



U.S. Department of Transportation
Federal Railroad Administration



4.20 Utilities

4.20.1 Introduction

This section describes existing utilities within the Superconducting Magnetic Levitation Project (SCMAGLEV Project) Affected Environment, identifies potential physical impacts to utilities from the No Build and Build Alternatives, and presents strategies the Project Sponsor will employ to avoid, minimize, or mitigate potential impacts to utilities. Additional information can be found in the Project Sponsor's Construction Planning Memorandum included in Appendix G.7.

4.20.2 Regulatory Context and Methodology

4.20.2.1 Regulatory Context

In accordance with the National Environmental Policy Act (NEPA), 42 U.S.C. § 4321 et seq., the Council on Environmental Quality (CEQ) regulations, 40 C.F.R. Parts 1500 -1508, and the Federal Rail Administration's (FRA) Procedures for Considering Environmental Impacts, 64 Fed. Reg. 28545 (May 26, 1999) FRA assessed physical impacts to utilities from the construction of the SCMAGLEV Project.

4.20.2.2 Methodology

FRA developed a qualitative assessment of potential effects of the No Build and Build Alternatives on utilities by considering publicly available information from utility companies and localities on existing utilities in the SCMAGLEV Project Affected Environment. FRA also compared the Project Sponsor's preliminary Limit of Disturbance (LOD) anticipated for construction of the SCMAGLEV Project against existing utility infrastructure to identify potential physical impacts. FRA defined utilities to include electrical, natural gas, communications, water, and wastewater facilities.

4.20.3 SCMAGLEV Project Affected Environment

Major public utilities within the SCMAGLEV Project Affected Environment are listed in **Table 4.20-1**.

Table 4.20-1: Major Public Utilities in SCMAGLEV Project Affected Environment

Utility Type	Provider(s)	Location (County/City)
Electrical	Baltimore Gas and Electric (BGE)	Baltimore City, Baltimore, Howard, Anne Arundel, and Prince George's
	Potomac Electric Power Company (PEPCO)	Washington, D.C. and Prince George's
Natural Gas	Baltimore Gas and Electric (BGE)	Baltimore City, Baltimore, Howard, and Anne Arundel
	Washington Gas (WGL)	Washington, D.C. and Prince George's
Communications	Verizon, Comcast, RCN, HughesNet, Viasat, Cyberonic, et al.	Washington, D.C., Prince George's, Baltimore City, Baltimore, Howard, and Anne Arundel
Water and Wastewater	City of Baltimore, Bureau of Water and Wastewater	Baltimore City, Baltimore, Howard, and Anne Arundel
	DC Water	Washington, D.C. and Prince George's
	Washington Suburban Sanitary Commission	Prince George's

Source: Maryland Public Service Commission 2020

4.20.4 Environmental Consequences

4.20.4.1 No Build Alternative

Under the No Build Alternative, the SCMAGLEV Project would not be built, and therefore, no impacts related to the construction or operation of a SCMAGLEV system would occur. However, other planned and funded transportation projects will continue to be implemented in the area and could result in impacts to utilities, but there would be no impacts from the SCMAGLEV Project under the No Build Alternative.

4.20.4.2 Build Alternatives

FRA compared the proposed LOD against the existing transmission lines in the corridor and found two conflicts along the mainline viaduct portion. The existing high tension transmission towers and powerlines that cross the proposed mainline just south of MD 197 would be impacted by all Build Alternatives (J-01 thru J-06 and J1-01 thru J1-06). Also, the existing power transmission lines on the east side of the BWP for approximately 1.1 miles in the vicinity of MD 198 would be impacted with Build Alternatives J-01 thru J-06. However, the impact to the physical infrastructure (the transmission lines and transformers) due to potential power transmission congestion will not be fully known until the Project Sponsor applies for a long-term transmission service through the Pennsylvania-New Jersey-Maryland Power Pool (PJM), the regional transmission organization both PEPCO and BGE belong to in the Mid-Atlantic region. PJM would then initiate a Transmission Feasibility Study (TFS) and a subsequent System Impact Study (SIS), if necessary, in order to update the Regional Transmission Expansion Plan (RTEP). Therefore, the Project Sponsor will continue to coordinate with PJM, BGE and PEPCO as previously discussed in Section 4.19 Energy.

A known major utility along the mainline tunnel portion is the DC Water Combined Sewer System (CSO) Northeast Boundary tunnel (under construction). The CSO tunnel crosses New York Avenue south of Montana Avenue NE at a depth of approximately 90 feet. The Project Sponsor designed the SCMAGLEV tunnel to go under the CSO tunnel and therefore avoiding it completely (see Plan and Profile drawings in Appendix G.2).

The Project Sponsor has included preliminary LOD anticipated to relocate and/or raise/lower the known power transmission lines mentioned above, and for construction of the SCMAGLEV power supply and LOD to connect to proposed SCMAGLEV power substation locations (see drawings in Appendix B.1 and Appendix G.2). The LOD areas for potential utility work are conceptual and the Project Sponsor would continue to refine the utility plan based on continued coordination with utility companies as the design is finalized.

4.20.4.3 Short-Term Construction Effects

The Build Alternatives have the potential to affect utilities during SCMAGLEV Project construction activities. Each major Build Alternative element has the potential to conflict with existing utilities in the SCMAGLEV Project Affected Environment. Given the proximity and similarity of Build Alternatives J-01 thru J-06 and J1-01 thru J1-06, FRA anticipates the type of potential impacts of the Build Alternatives to utilities would be similar.

Since the Project Sponsor plans to construct the mainline tunnels using tunnel boring machines (TBM) at depths of 49 feet or greater, the tunnel portions are generally expected to avoid direct impacts to existing utilities. The mainline viaduct portions have a potential to impact existing utilities on the surface and underground (piers/foundations).

Utility impacts could also occur at the transition portals, the underground guideway switching locations, the underground station locations, and the TBM launch/retrieval sites, where top-down construction methods will be applied. In addition, coordination is on-going between the Project Sponsor and Washington Suburban Sanitary Commission (WSSC) about potentially using one of its maintenance/administrative facilities in Bladensburg, MD as a TBM retrieval site and FA/EE facility.

The precise configuration of stations and Trainset Maintenance Facility (TMF) sites will be determined by the Project Sponsor during final design with concurrence from MDOT MTA and FRA. Underground stations will be constructed using top-down methods to the extent reasonably feasible, and station excavation work has the potential to affect underground utilities. As an initial phase of the construction work, utilities will be relocated, replaced, or, in some cases, supported in place, to allow station excavation to proceed. The above-ground station alternative at Cherry Hill and the TMF sites could also require some utility relocation work, particularly for building foundations. These construction impacts for the above-ground construction are anticipated to be less extensive than for underground facilities. However, impacts could include temporary service disruptions, which may impact nearby operations. At BARC, temporary service disruptions may impact the power needs of BARC facilities. Proposed parking garages

associated with the Baltimore-Washington International Thurgood Marshall Airport (BWI Marshall Airport) and elevated Cherry Hill Stations could also affect existing utilities. The Project Sponsor is in ongoing dialogue with the relevant utility companies to determine whether utility conflicts will be removed, relocated, re-routed, adjusted vertically, or otherwise modified in the final engineering design.

4.20.5 Potential Mitigation Measures

The Project Sponsor will continue to coordinate with utility operators between preliminary engineering and final design and incorporate measures to avoid, minimize, and mitigate potential utility conflicts. Design modifications could be made to avoid utility conflicts, such as modifying viaduct pier locations or tunnel depth where reasonably feasible to avoid underground utilities. For example, the Project Sponsor will design, obtain permits and rights-of-way, and construct the SCMAGLEV Project to avoid the utility conflict at the WSSC CSO tunnel. Prior to completion of final design, the Project Sponsor will develop a utility relocation plan as part of the overall Project construction plan. The utility relocation plan will identify the utilities to be relocated, the procedures for relocation and the responsible parties, and the schedule for utility work. Typically, utility relocations are accomplished in the initial phase of a construction project.

Construction activities will be planned and scheduled to minimize temporary service disruptions to the greatest extent possible. The Project Sponsor will coordinate with utility owners regarding planned outages, and the prior notification of outages to affected utility users.

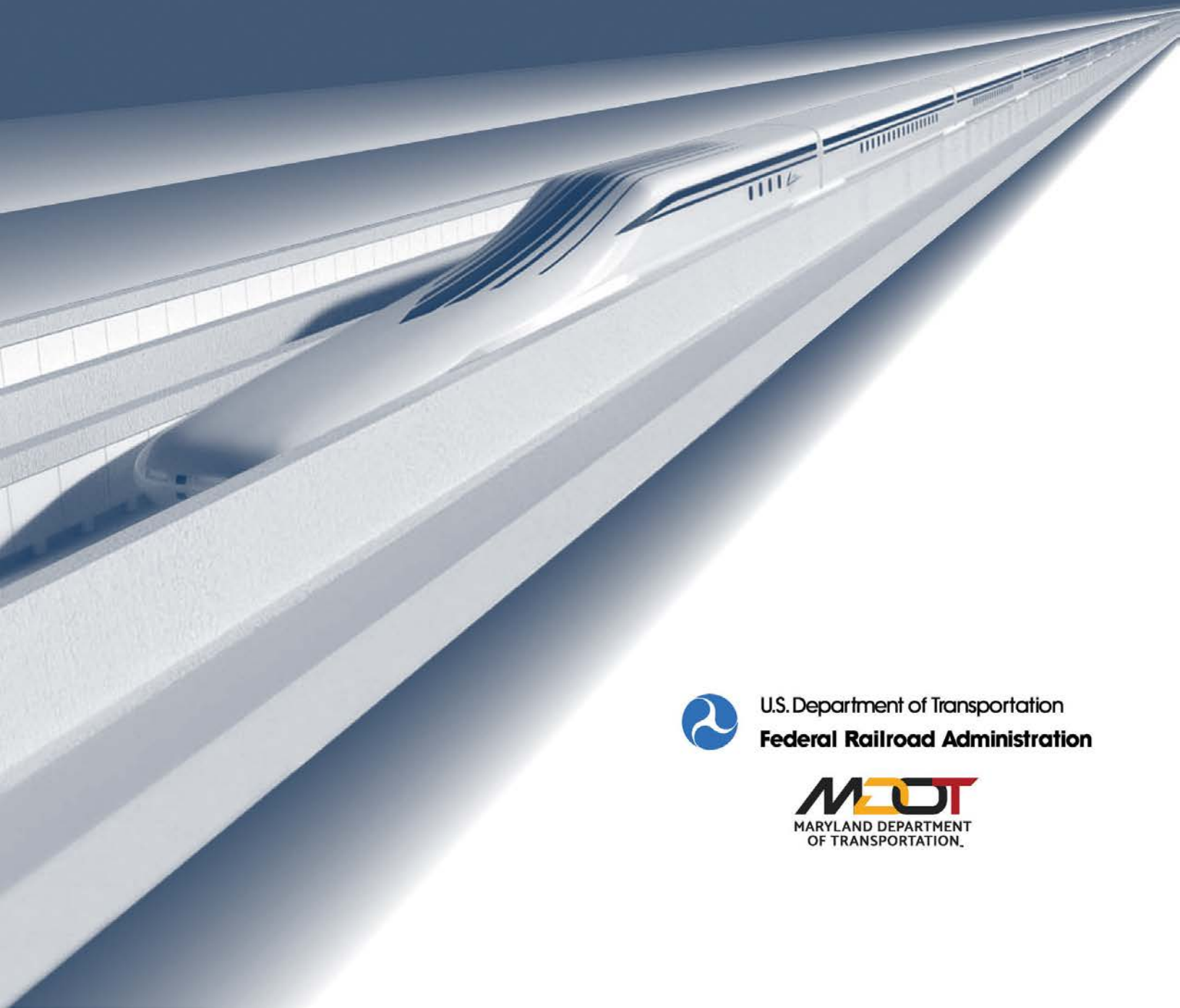
For utility conflicts that cannot be avoided, the Project Sponsor will identify and implement appropriate measures to mitigate conflicts, in coordination with the relevant utilities. Mitigation strategies could include raising, lowering, burying, relocating and protecting utilities.

Section 4.21

Public Health and Safety

BALTIMORE-WASHINGTON SUPERCONDUCTING MAGLEV PROJECT

DRAFT ENVIRONMENTAL IMPACT STATEMENT AND
SECTION 4(f) EVALUATION



U.S. Department of Transportation
Federal Railroad Administration



4.21 Public Health and Safety

4.21.1 Introduction

This section provides a qualitative summary of potential public health and safety risks for the Superconducting Magnetic Levitation Project (SCMAGLEV Project) that may result from the construction and operation of each Build Alternative. This summary considers the potential of the Build Alternatives to result in impacts to human health and safety.

4.21.2 Regulatory Context and Methodology

4.21.2.1 Regulatory Context

In accordance with the National Environmental Policy Act (NEPA), 42 U.S.C. § 4321 et seq., the Council on Environmental Quality (CEQ) regulations, 40 C.F.R. Parts 1500 - 1508, and the Federal Rail Administration's (FRA) Procedures for Considering Environmental Impacts, 64 Fed. Reg. 28545 (May 26, 1999) FRA considered impacts to public health and safety from construction and operation of the SCMAGLEV Project. In addition, the following Federal and state laws, and international guidance provide the regulatory context for FRA's public health and safety analysis:

- 33 USC § 1251 et seq., Clean Water Act
- 42 USC § 300f et seq., Safe Drinking Water Act
- 29 USC § 651 et seq., Occupational Health and Safety Act
- 42 USC § 6901 et seq., Resource Conservation and Recovery Act
- 42 USC § 7401 et seq., Clean Air Act
- 42 USC § 12101 et seq., Americans with Disabilities Act
- International Commission on Non-Ionizing Radiation Protection and World Health Organization Guidelines
- Code of Maryland Regulations (COMAR) 10.19.04 (concerning indoor smoking in public areas)
- COMAR 26.04.02 and 26.04.03 (issuance of building permits; public water and sewer plan review and final plat review)

4.21.2.2 Methodology

FRA qualitatively considered potential public health-related effects that may occur from implementation of the Build Alternatives on public health resources and access (Section 4.4); water resources (Section 4.10); hazardous materials and solid waste (Section 4.15); air quality (Section 4.16); geology (Section 4.13); noise and vibration (Section 4.17); and electromagnetic fields and interference (EMF/EMI) (Section 4.18). Impacts to these resources may also result in potential public health and safety risks. The SCMAGLEV Project Affected Environment for public health and safety includes all of

the SCMAGLEV Affected Environment areas analyzed in the resource sections listed above.

Based on the analysis presented for each resource area in the sections referenced above, FRA identified impacts that could pose a direct risk to public health and safety. For example, degradation of water quality could affect potable water sources which could have an impact on public drinking water and public health. Long-term exposure to noise and vibration could also have an effect on public health. Specific avoidance and minimization measures to reduce or eliminate potential impacts to these resources, thus to public health and safety, have been summarized in this section. FRA assumes that current conditions continue under the No Build Alternative and the effects to public health and safety remain unchanged. Section 4.22 Safety and Security provides information on the safety and security of passengers using the system.

4.21.3 SCMAGLEV Project Affected Environment

The SCMAGLEV Project Affected Environment includes many public health and safety resources identified in the individual resource sections identified in Section 4.21.2.2 Methodology above. These public health resources are located throughout the Affected Environment and include water resources such as aquifers, air quality, public health facilities, and access to these facilities through transportation infrastructure. Potential risks to public health that are located within the Affected Environment include disturbance of hazardous materials, naturally occurring asbestos and radon gas. Certain receptors located within the Affected Environment also have the potential to experience public health and safety related effects from the generation of noise and vibration and electromagnetic field/electromagnetic interference. For further descriptions of these resources within the Affected Environment, refer to Sections 4.4.3, 4.10.3, 4.13.3, 4.15.3, 4.16.3, 4.17.3, and 4.18.3.

4.21.4 Environmental Consequences

4.21.4.1 Public Health Facilities

Impacts to public health facilities include displacement of two resources under each Build Alternative. The Adams Place Emergency Shelter would be displaced under each Build Alternative due to the construction of a substation and FA/EE facility. Under Build Alternatives J-01 through J-03 and J1-01 through J1-03, the Medmark Treatment Centers would be displaced, and under Build Alternatives J-04 through J-06 and J1-04 through J1-06, the Concentra Urgent Care facility would be displaced. The Cherry Hill Station would require displacement of the Medmark Treatment Center while the Camden Yards Station would require displacement of the Concentra Urgent Care. Displacement of these facilities would reduce access to health facilities for surrounding communities. For further information about these effects and the location of these facilities, refer to Section 4.4 Neighborhoods and Community Facilities.

4.21.4.2 Water Resources

The public health and safety impacts to water resources include the degradation or change to the public drinking water supplies as described in Section 4.10 Water Resources. The Build Alternatives would have similar potential risks as with the introduction of new impervious surfaces, resulting in the clearing of vegetation, and having the potential for downstream impacts within the watershed. The runoff from facilities associated with the SCMAGLEV Project could carry pollutants such as heavy metals and bacteria. Impacts to groundwater from the Build Alternatives, particularly Build Alternatives J1-01 through J1-06, could occur in locations of tunnel constructed in both the Patapsco aquifer and Patuxent aquifer (i.e., important sources of water supply in Maryland) in Anne Arundel County, particularly in or near wellhead protection areas (WHPA) (see Sections 4.10.4.2 Water Resources and 4.13 Geology). The most substantial potential impacts could occur in Anne Arundel and Prince George's Counties where tunnel construction is within or near WHPAs, located within the same aquifer. Figure 4.10-2 within Section 4.10 Water Resources illustrates data on WHPAs in aquifers within a one-mile radius of the Build Alternatives. Tunneling below the groundwater table has the potential to induce localized changes to the water table and water pressures within the aquifers, with the potential for a loss of groundwater recharge to these WHPAs.

In addition, access to public drinking water could be disrupted if underground public water distribution piping must be re-routed or temporarily shut-off to accommodate construction of the SCMAGLEV Project. For station excavation, utilities will be relocated, replaced, or, in some cases, supported in place. The above-ground station alternative at Cherry Hill and the TMF sites could also require some utility relocation work, particularly for building foundations. These construction impacts for the above-ground construction are anticipated to be less extensive than for underground facilities. Proposed parking garages associated with the Baltimore-Washington International Thurgood Marshall Airport (BWI Marshall Airport) and elevated Cherry Hill Stations could also affect existing utilities.

4.21.4.3 Hazardous Materials and Solid Waste

Public health and safety risks from contamination associated with hazardous materials could arise as a result of an exposure pathway to the contaminants and a sufficient dose to produce adverse health effects. Risks to workers and to public health could result from an accidental disruption of an existing contaminated site or accidental spill (see Section 4.15 Hazardous Materials and Solid Waste for additional detail on hazardous materials). Health and safety risks would be dependent on the media affected by the release or spill, but could result in airborne contaminants, leaching of contaminants into water and groundwater resources, and direct exposure to humans. The quantity and nature of the use and storage of hazardous materials and generation of solid waste during SCMAGLEV Project construction would be greater in areas that require a higher degree of earth-moving, such as tunnel excavation sites, portals, and underground station construction sites. Build Alternatives J1-01 through J1-06 include a longer tunnel portion than Build Alternatives J-01 through J-06. However, excavations

conducted for Build Alternatives J may have a slightly greater potential to encounter hazardous materials than Build Alternatives J1 due to the higher number of medium-high risk sites, including National Priority List (NPL) sites, identified along the alignment.

4.21.4.4 Air Quality

In Section 4.16 Air Quality, FRA found that during operation of the SCMAGLEV Project, emissions concentrations would be well below the National Ambient Air Quality Standards, which are thresholds for a potential public health concern.

Furthermore, construction activities would be temporary (less than five years at a specific site), and thus potential air quality impacts from construction activities are considered temporary and a quantitative air quality hot spot analysis is not warranted. The predicted worst-case annual construction emissions are below the applicable de minimis levels for each respective pollutant during each construction year. FRA has, concluded that no formal conformity determination is required, and no significant air quality impact will result from the implementation of each Build Alternative during the construction period as well as the period when construction and operation activities would overlap. Any emissions from on-site construction equipment and on-road construction-related vehicles would be mitigated.

4.21.4.5 Geology

The SCMAGLEV Project has the potential to encounter naturally occurring asbestos, most specifically in areas of underground construction where there is bedrock in Washington, D.C. and Baltimore City, (Mount Vernon Square East Station and Camden Yards Station, respectively). According to the Agency for Toxic Substances and Disease Registry (ATSDR), should naturally occurring asbestos be encountered and disturbed during construction, asbestos fibers could be inhaled, putting those who come in contact with these fibers at risk for cancerous and non-cancerous disease involving the lungs.

USEPA recommends reducing concentrations of radon gas that may accumulate in the air in poorly ventilated enclosed spaces. According to the Centers for Disease Control and Prevention (CDC), radioactive particles from radon gas can be breathed in and can get trapped in lungs, which over time, increases the risk of lung cancer. The Build Alternatives pass through only one ZIP Code designation where radon gas concentrations exceed 4 pCi/L3 (i.e., the level at which the United States Environmental Protection Agency recommends mitigating structures). However, this part of the alignment is above ground on elevated track. Furthermore, in Washington, D.C., no radon gas tests near the alignment exceeded 3.1 pCi/L. Thus, it is unlikely that the SCMAGLEV Project would encounter radon gas and affect public health. Details regarding naturally occurring asbestos and radon gas can be found in Section 4.13 Geology.

4.21.4.6 Noise and Vibration

Prolonged exposure to noise pollution and vibration could have an adverse public health effect, such as interrupted sleep, hearing loss, and annoyance. FRA's analyses presented in Section 4.17 Noise and Vibration, identified areas where noise and vibration levels during operation of each Build Alternative would exceed allowable limits within the SCMAGLEV Project Affected Environment. FRA assessed noise and vibration impacts from the SCMAGLEV Project with respect to applicable Federal, state, and local noise standards, including 49 CFR part 210 (FRA noise regulations) and 40 CFR part 201 (USEPA noise regulations), and used FRA's *High-Speed Ground Transportation Noise and Vibration Impact Assessment* guidelines. The public health effects from the proposed Project are addressed with the FTA noise criteria for both long-term operations and short-term construction activities.

Potential sources of noise and vibration include train operations including track, propulsion and aerodynamic noise, general noise at elevated passenger stations, fresh air and emergency egress facilities, electrical power substations, trainset maintenance facility (TMF) sites, and maintenance of way (MOW) facilities. As described in Section 4.17 Noise and Vibration, the primary differences between the Build Alternatives are the different paths and the length of the viaduct. Build Alternatives J1 would have fewer noise impacts than the Build Alternatives J as the majority of the noise impacts are due to aerodynamic train noise along the viaduct which is longer for Build Alternatives J. However, Build Alternatives J1 would have more ground-borne vibration and ground-borne noise impacts than Build Alternatives J as Build Alternatives J1 have a longer tunnel portion and a higher number of residences within 250 feet of the Build Alternatives J1 than the Build Alternatives J.

In addition, construction methods and equipment could result in temporary increases in noise and vibration levels at nearby sensitive receptors described in Section 4.17 Noise and Vibration. FRA predicts no vibration exceedances of FRA Category I or Category II damage thresholds for any of the Build Alternatives. However, FRA predicts that maximum one-hour construction noise levels would range from below the ambient background (less than 45 dBA) to 85 dBA for FA-EE facilities to 91 dBA for the staging/laydown area at tunnel portals to 94 dBA for the viaduct construction to 96 dBA for the station excavation activities. Since construction could occur day or night depending on the activity and urgency to complete, FRA predicts that several of these levels would exceed the daytime limit of 90 dBA and the nighttime limit of 80 dBA. Construction noise levels vary by activity type and location for each of the Build Alternatives. For example, for Build Alternatives J-01, J-02, J-03, J1-01, J1-02, and J1-03, FRA predicted four daytime noise impacts and 21 nighttime noise impacts. For Build Alternatives J-04, J-05, J-06, J1-04, J1-05, and J1-06, FRA predicted four daytime noise impacts and 20 nighttime noise impacts.

4.21.4.7 EMF/EMI

FRA's analysis of EMF/EMI impacts identified that the generation of EMF/EMI from the SCMAGLEV system can result in induced currents in nearby metal structures. These

currents can lead to shock hazards to humans and animals if the metal is ungrounded and touched.

In addition, FRA did not identify any sensitive receptors that may be impacted from EMF/EMI and could pose a risk to public health. However, representatives from, Maryland Department of Transportation Maryland Aviation Administration (MDOT MAA)/ BWI Marshall Airport, National Security Agency (NSA), Fort George G. Meade, National Aeronautics and Space Administration (NASA), and the United States Secret Service (USSS) Rowley Training Center raised concerns regarding sensitive equipment on their properties that could be affected. When the SCMAGLEV system is in operation, the Build Alternatives J-01 through J-06 will be in closer proximity to some of these self-identified government properties and facilities. Additionally, Build Alternatives J-02, J-05, J1-02, and J1-05 have the potential to affect the NASA Goddard Space Flight Center (GSFC) and Goddard Geophysical and Astronomical Observatory (GGAO) due to proximity of the BARC Airstrip TMF. Depending on the type and location of equipment housed within these resources, the facilities may be impacted by operation the SCMAGLEV system. Additional coordination will be required with these agencies to identify impacts, develop appropriate mitigation strategies, and ensure no impacts would have public health effects.

4.21.4.8 Public Safety

Public safety may be at risk temporarily during construction. The design provisions and mitigation strategies outlined in the DEIS for the Build Alternatives would address public safety concerns related to construction activities such as increased construction traffic, equipment, construction methods, changes in traffic patterns that could affect first responder routes or access to critical safety infrastructure such as fire hydrants, changes to pedestrian and bicycle facilities, Americans with Disabilities Act (ADA) compliant detours, and accidental releases of hazardous materials.

Section 4.22 Safety and Security addresses long-term safety of passengers as well as individuals the SCMAGLEV system.

4.21.5 Potential Mitigation Strategies

The Project Sponsor would implement the following measures to avoid, minimize, and mitigate potential risks to public health and safety as a result of implementation of the SCMAGLEV Project.

4.21.5.1 Public Health Facilities

As part of the design process, the Project Sponsor will examine ways to reduce or eliminate property acquisitions where feasible. The Project Sponsor will coordinate with property owners affected by displacement of public health facilities. If the construction of the SCMAGLEV Project receives Federal funding, all activities related to acquisitions and displacements would be conducted in conformance with the Uniform Relocation and Real Property Acquisition Policies Act of 1970 (42 U.S.C. 4601), as amended (the Uniform Act). This statute mandates that certain relocation services and payments be

made available to eligible residents, businesses, and nonprofit organizations displaced as a direct result of projects undertaken by a Federal agency or with Federal financial assistance. The Uniform Act provides for uniform and equitable treatment for persons displaced from their homes and businesses, and it establishes uniform and equitable land acquisition policies. If the SCMAGLEV Project is fully privately funded, the Project Sponsor will be responsible for compensating property owners impacted by property acquisitions.

4.21.5.2 Water Resources

Typical project construction best management practices (BMP) to prevent impacts during construction activities would include the use of erosion and sediment controls such as silt fencing as well as specific techniques such as tunnel boring. Similarly, environmental site design for stormwater management facilities would be used with the goal of avoiding and minimizing impacts to water quality. The Project Sponsor would conduct further groundwater studies and develop construction methods aimed to avoid dewatering, minimize the loss of potential groundwater recharge, and avoid or minimize potential impacts to WHPAs. With regard to potential impacts to water utilities, the Project Sponsor is in ongoing dialogue with the relevant utility companies to determine whether utility conflicts will be removed, relocated, re-routed, adjusted vertically, or otherwise modified in the final engineering design. The Project Sponsor is coordinating with the relevant utility companies to avoid, minimize, and mitigate impacts to utilities through engineering design. Detailed mitigation strategies are listed in Section 4.10 Water Resources and 4.20 Utilities.

4.21.5.3 Hazardous Materials and Solid Waste

With the implementation of all appropriate hazardous material and waste management plans (e.g., Construction Contingency Plan and Hazardous Materials and Solid Waste Management Plan) and mitigation actions documented in Section 4.15 Hazardous Materials and Solid Waste, substantial impacts to workers and public health and safety from hazardous materials during construction activities or operations would be avoided. Additional activities would include conducting environmental site assessments, further site investigations, and consultation with regulatory agencies and other governmental agencies. Mitigation would include but is not limited to remediation activities such as removal of contamination and Activity Use Limitations (AULs), use of design features that provide protection against the potential effects of contamination (e.g., BMPs such as silt fencing), establishment of procedures for proper storage and maintenance of equipment and hazardous materials (including hazardous materials training and RCRA training for SCMAGLEV Project personnel), frequent and routine documented inspections of construction sites, and designation of special storage areas for hazardous materials and hazardous waste.

4.21.5.4 Air Quality

To mitigate the temporary air quality impacts during construction period, to extent practicable, the Project Sponsor would implement various control measures listed in

Section 4.16 Air Quality, including but not limited to dust control, idling restrictions, use of clean fuel, and best available tailpipe (BAT) reduction technologies.

4.21.5.5 Geology

The Project Sponsor would implement proper protections, training, and engineering controls for handling and monitoring naturally occurring asbestos, if found, during SCMAGLEV Project construction. The Project Sponsor will minimize exposure to geologic hazards during construction by conducting future geotechnical investigations, adhering to appropriate building codes, Occupational Safety and Health Administration (OSHA) regulations, and engineering controls. In construction areas where potential naturally occurring asbestos is encountered in bedrock, implementation of proper protection and engineering controls to protect and educate workers on handling and monitoring would be necessary and would be described in a Health and Safety Plan prepared for the SCMAGLEV Project during the design-build phase.

Although the SCMAGLEV Project has low potential to encounter radon gas and affect public health, the use of a tunnel boring machine (TBM), a water-tight segmental lining, and constant ventilation helps ensure that there is no accumulation of radon gas during construction and during the post-construction lifespan of the structures. Radon gas will be monitored in tunnels during construction and, if necessary, additional ventilation or personal protective equipment will be used to minimize health risk. Additional evaluation of radon content of sediments and groundwater will also be conducted at later design phase. Tests will also include the presence of other gases such as methane and hydrogen sulfide.

4.21.5.6 Noise and Vibration

In the impacted areas, appropriate mitigation strategies and measures would be required to reduce public health and safety risks related to exposure to operational noise and vibration. The Project Sponsor has proposed several design features to potentially eliminate most, if not all, operational noise and vibration impacts, identified in Section 4.17 Noise and Vibration. Some of these mitigation measures include sound attenuation hoods or shrouds, sound attenuation walls, and augmented parapet walls. A full list of potential measures to mitigate noise and vibration impacts attributed to operation of the SCMAGLEV Project is provided in Section 4.17 Noise and Vibration. During final design, the Project Sponsor would assess the feasibility and reasonableness of potential mitigation strategies; the final design would incorporate and refine the measures that prove to be effective.

Regarding temporary increases in noise and vibration attributed to construction, the Project Sponsor would prepare and implement noise and vibration control measures during construction to manage and monitor noise and vibration levels, such as installing acoustical curtains or temporary noise shields, placing containers or other barriers between construction activities and nearby residences, and using regional roadways rather than local streets for excavation of spoils and new deliveries. A full list of potential measures to mitigate noise and vibration impacts attributed to the construction of the SCMAGLEV Project is provided in Section 4.17 Noise and Vibration. The control plan

may enable the Project Sponsor to eliminate impacts and minimize extended disruption of normal activities during construction.

4.21.5. 7 EMF/EMI

The Project Sponsor would ensure the SCMAGLEV Project design specifications prescribe a continuous grounding system (electrical continuity) and monitoring the integrity of the grounding systems for all metal equipment surrounding the SCMAGLEV system (such as metal fencing). The Project Sponsor would routinely inspect and replace as necessary the external fencing and any other grounded metallic objects within the system. This would avoid or minimize any corrosion. If, for example, the external metal fencing corrodes and not replaced, it would no longer be effectively grounded and electric shock could become an issue of concern for people or animals.

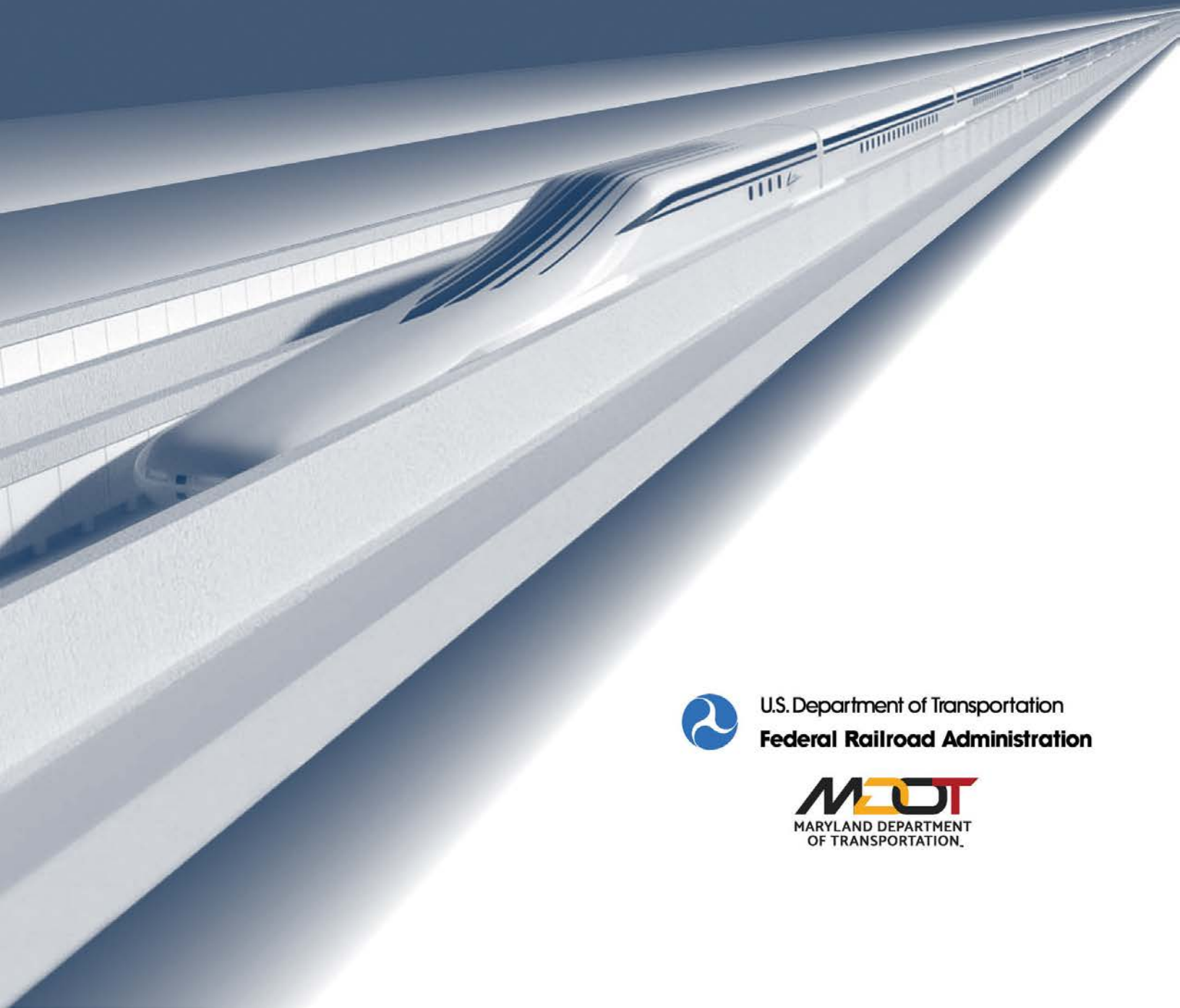
4.21.5.8 Public Safety

The Project Sponsor would develop and implement a Public Safety Plan as part of the SCMAGLEV Project Construction Plan. The Public Safety Plan would include safety practices such as protective fencing around work areas and designated ingress/egress, strategies to adhere to Federal, state, and local government standards, and specific design/construction techniques to protect public safety. The Project Sponsor would use the Public Safety Plan to ensure that potential risks to public safety are considered and addressed through the construction planning and implementation processes. As part of the SCMAGLEV Project Construction Plan, the Public Safety Plan will incorporate, implement, and manage commitments made in the forthcoming Final Environmental Impact Statement (FEIS) and Record of Decision (ROD) for the SCMAGLEV Project to avoid or minimize potential impacts to public safety.

Section 4.22

System Safety and Security

BALTIMORE-WASHINGTON SUPERCONDUCTING MAGLEV PROJECT DRAFT ENVIRONMENTAL IMPACT STATEMENT AND SECTION 4(f) EVALUATION



U.S. Department of Transportation
Federal Railroad Administration



4.22 System Safety and Security

4.22.1 Introduction

This section discusses potential safety and security risks associated with the Superconducting Magnetic Levitation Project (SCMAGLEV Project) system on the surrounding human and natural environment as well as issues that could result from the interference of human or environmental hazards on normal operations.

4.22.2 Regulatory Context

In accordance with the National Environmental Policy Act (NEPA), 42 U.S.C. § 4321 et seq., the Council on Environmental Quality (CEQ) regulations, 40 C.F.R. Parts 1500 - 1508, and the Federal Rail Administration's (FRA) Procedures for Considering Environmental Impacts, 64 Fed. Reg. 28545 (May 26, 1999), the FRA assessed the transportation or use of any hazardous materials which may be involved in the alternatives, and the level of protection afforded residents of the affected environment from construction period and long-term operations associated with the alternatives. is responsible for carrying out the railroad safety laws of the United States, including the safety of non-highway ground transportation that runs on electromagnetic guideways, such as the SCMAGLEV Project. Specific SCMAGLEV elements may also be subject to the jurisdiction of the following:

- Transportation Security Administration (TSA)
- Occupational Health and Safety Administration (OSHA)
- Federal Aviation Administration (FAA)
- Federal Highway Administration (FHWA)
- Maryland Department of Transportation/Maryland Aviation Administration (MDOT/MAA)

The SCMAGLEV Project introduces technology that does not currently operate in the United States. Therefore, FRA may issue a Rule of Particular Applicability (regulations that apply to a specific railroad or a specific type of operation (RPA)) or a Rule of General Applicability, to impose requirements or conditions by order(s) or waiver(s), or take other regulatory action(s) to ensure that the SCMAGLEV Project is operated safely.

As noted above, although the SCMAGLEV Project will not operate on traditional "rail" elements, it will otherwise be subject to FRA safety oversight approval and FRA rules of general applicability. Other Federal requirements expected to apply or guide new Federal regulatory action for the SCMAGLEV Project include TSA's Security Directives RAILPAX-04-01 and RAILPAX 04 02; Rail Safety Improvement Act of 2008; 49 C.F.R. Part 1580 (Rail Transportation Security); Emergency Planning and Community

Right-to-Know Act (42 U.S.C. § 11001-11050); Presidential Policy Directive PPD-8: National Preparedness (PPD-8); The Americans with Disabilities Act (ADA) of 1990 (42 U.S.C. § 12101 et seq.).

In addition to adhering to all state and local fire codes, the following state and local programs and planning documents are relevant to understanding the local framework for risk assessment, coordination, response, and recovery:

Maryland Department of Transportation Rail Safety Oversight Program - The Maryland Department of Transportation (MDOT) Rail Safety Oversight Program is required under the Moving Ahead for Progress in the 21st Century Act (MAP-21) requiring the designation of a state agency for oversight and enforcement of regulations promulgated by the Federal Transit Administration (FTA). Transit Agencies subject to this program include any light, heavy, or rapid rail system, monorail, inclined plane, funicular, trolley, or automated guideway within the state's jurisdiction, assuming two factors: it is not regulated by FRA; and it is included (or declared intent to be included) in FTA's calculation of fixed guideway route miles or formula grant program.

Maryland Emergency Preparedness Program - The Maryland Emergency Preparedness Program (MEPP) was launched in 2013 to provide a risk-based and capabilities-based approach to homeland security and emergency management in fulfillment of the Presidential Policy Directive 8: National Preparedness (PPD-8). The MEPP includes the State Training and Exercise Plan and the State Hazard Mitigation Plan (HMP), which are strategic planning documents that identify goals and objectives and can prioritize resource allocation. The HMP was published in 2016 and includes risk and vulnerability assessments across multiple hazards and counties.

District Preparedness Framework - DC Code § 7-2202.0-2208 established the District of Columbia's Homeland Security and Emergency Management Agency (HSEMA) as the agency responsible for preparing a comprehensive homeland security and emergency management program. HSEMA prepared the District Preparedness Framework, adopted with Mayor's Order 2014-215 in September 2014. The District Preparedness Framework addresses all natural, technological, or human-caused hazards and integrates with Federal civil defense plans for the national capital.

District Prevention/Protection Program - The District Prevention/Protection Program develops the District of Columbia's approach to preventing, avoiding, or deterring an imminent threat or action against people, critical infrastructure, the environment, or the economy. This program assigns prevention and protection responsibilities across District agencies and describes strategies for coordination between agencies.

District of Columbia All-Hazards Mitigation Plan - The objective of HSEMA's District of Columbia All-Hazards Mitigation Plan (HMP) is to reduce loss of life and property by decreasing the impact of disasters and emergencies through support for protection and prevention activities, coordinated response, and recovery initiatives. The HMP fosters resiliency to all hazards by improving the District's capacity to deter, deflect, absorb, or withstand the effects of disasters and emergencies. Mitigation

activities conducted before or after a disaster can reduce the impact of damage sustained by communities and citizens; help to eliminate the repetitive damage cycle; reduce costs to taxpayer; and reduce the resources expended to prepare for, respond to, and recover from future disasters.

District Response Plan - The 2015 District Response Plan (DRP) provides guidance on how District agencies and departments, nongovernmental organizations (NGO), voluntary organizations, and regional and Federal partners respond to disasters in the District of Columbia. The DRP organizes agencies and departments that are involved in homeland security and emergency management into functional areas according to capabilities, skills, resources, and authorities. Using this functional organization, the DRP outlines how resources will be leveraged and implemented and how Federal, regional, private sector, and nonprofit partners will be engaged for support. This plan also describes the mechanism for mobilizing resources in the event of a disaster or emergency.

District Recovery Base Plan (DRBP) - The DRBP documents the capabilities required to promote recovery from all types of disasters and emergencies in the District of Columbia. This plan includes the role of individuals, families, neighborhood leadership, and private or non-profit partnerships in addressing the recovery needs of the community following a disaster or emergency.

4.22.2.1 Methodology

The term safety involves protection of people and property from accidents, while security refers to protection from intentional acts. This analysis includes an assessment of safety hazards and security threats as well as an inventory of emergency service capabilities, critical facilities and vulnerable locations. FRA documented the emergency response capabilities and vulnerable locations for a 500-foot radius around the SCMAGLEV alignments, stations, facilities, and construction limits (SCMAGLEV Project Affected Environment). The analysis of emergency response capabilities includes any fire, medical or law enforcement agency whose service area includes any part of the Safety and Security Affected Environment. In addition, this inventory includes all hospitals within or the nearest available hospital to the 500-foot radius Safety and Security Affected Environment. Appendix B provides geographic context of the Build Alternatives.

This analysis defines a critical facility as any building or public infrastructure which will provide services during an emergency such as hospitals, first responders or governmental entities. Vulnerable locations include sites which, if affected, could amplify safety or security concerns (such as hazardous materials sites) or expose large or vulnerable population centers (such as schools or stadiums). Hospitals and mass transit stations will be both a critical facility (providing care or transportation services in the event of an emergency) and a vulnerable location.

FRA also considered the impacts from severe weather events, transportation hazards, and crime. To best reflect available data and to capture the geographically dispersed

nature of severe weather events, FRA documented natural hazards at the county or district level for Washington, D.C., Prince George's County, Anne Arundel County, Baltimore County, and Baltimore City during the 17-year analysis timeframe¹. Transportation hazards (fatalities by mode of travel) and security threats related to terrorism are described for national and state-level geographies. Local crime rates are reported for potential station locations, portal locations, and trainset maintenance facility (TMF) sites. The SCMAGLEV Project is likely to operate as a closed system, criminal activity in areas where the SCMAGLEV system will pass without stopping is not anticipated to affect the security of passengers, employees, or the general public.

The inventory of hazards, threats, and vulnerable locations relies on the following sources of information:

- National Oceanic Atmospheric Association (NOAA), Storm Events Database, 2000-2017;
- United States Geological Survey (USGS), Earthquake Hazards Program, 2000-2017;
- Bureau of Transportation Statistics (BTS);
- Federal Bureau of Investigation (FBI), Uniform Crime Reporting Program: 2017 Crime in the United States Tables 5, 8, 10, and 11;
- University of Maryland, National Consortium for the Study of Terrorism and Responses to Terrorism (START), Global Terrorism Database, 2000-2017;
- Inventory of hazardous materials sites documented in Section 4.15 Hazardous Materials and Solid Waste and corresponding Appendix D.8;
- Inventory of major utility crossings and substations documented in Section 4.20, Utilities; and,
- Inventory of community facilities documented in Appendix D.3 Socioeconomic Environment Technical Report.

This analysis relies on definitions of weather events and direct damage assessment methodology established by NOAA² and USGS³, uniform crime reporting criteria established by the FBI, and terrorism criteria established by the National Consortium for the START. FRA used these criteria to establish the historic frequency and severity of a particular hazard within assessed geographies. As shown in **Table 4.22-1**, the frequency for a particular hazard is described in terms of the number of events recorded per year and the severity is described in terms of average recorded property damage,

¹ USGS, Earthquake Hazards Program, 2000-2017

² <http://www.nws.noaa.gov/directives/sym/pd01016005curr.pdf>

³ <https://earthquake.usgs.gov/data/comcat/>

injuries, or deaths per event. Severity is classified based on the highest rating across any of the three indicators shown.

Table 4.22-1: Hazard Frequency and Severity Indicators

Frequency	Description	Number of Events (annualized)		
High	Probable occurrence within one year	1.0 or more		
Medium	Probable occurrence within five years	0.2 to 1.0		
Low	Probable occurrence in a timeframe exceeding five years or not at all	0.0 to 0.2		
Severity	Description	Injuries	Fatalities	Damages
High	Average event causes multiple injuries/fatalities or severe damage	>1.0	>1.0	Over \$1 million
Medium	Average event causes occasional injuries/fatalities or moderate damage	0.1 to 1.0	0.1 to 1.0	\$100,000 to \$1 million
Low	Average event rarely causes injuries or fatalities with minimal damage	< 0.1	< 0.1	Under \$100,000

The inventory of critical infrastructure and vulnerable locations is subject to refinement based on ongoing coordination with local emergency services providers and the outcomes of the Project Sponsor's hazards analysis (see Section 4.22.6). For purposes of the DEIS analysis, critical infrastructure is defined to include locations that provide a resiliency, response, or recovery function such as government buildings, emergency services, trunk utilities, and major transportation nodes and segments. Vulnerable locations are places where large or vulnerable population groups may gather, such as schools, stadiums, transit hubs, institutional housing (such as prisons or asylums), or other locally defined places, which will require heightened coordination in the event of an emergency.

Because SCMAGLEV technology does not currently operate in the United States, this evaluation is based on safety and security observations of international operation of SCMAGLEV technology and an analysis of proposed design specifications and safety controls.

This analysis utilizes a three-step process to identify potential safety or security impacts.

1. Establish the risk, in terms of the frequency and severity of historic events and existing conditions, of a particular safety hazard or security threat based on documented events and conditions.

2. Evaluate the proposed technology for its ability to avoid or withstand a particular safety hazard, deter security threats or monitor vulnerabilities.
3. Determine the potential for the SCMAGLEV system to impede or enhance emergency response capabilities.

4.22.3 SCMAGLEV Project Affected Environment

This section describes natural hazards, transportation operational hazards, crime and terrorism, emergency response, and critical or vulnerable locations.

4.22.3.1 Natural Hazards

Across all counties within the Project Study Area, cyclonic weather (hurricanes, tropical storms, and tornados) account for the most severe damage, including weather events originating within and outside of the Project Study Area. Although no hurricanes made landfall from 2000 to 2017, Hurricane Isabel in September 2003 and Hurricane Irene in August 2011 produced tropical storm conditions and flooding inside the SCMAGLEV Project Affected Environment. Tornadoes were more frequent but accounted for less total damage. Flash floods were the highest frequency natural hazards in all counties. Flooding occurred at a high frequency in all but Baltimore City. Blizzards on February 5 and 10, 2010 and January 23, 2016 affected multiple counties, disrupting air and surface transportation, but did not result in any documented damage or casualties.⁴ The potential for seismic activity is low, as noted in Section 4.13 Geology. No earthquakes have originated in the counties crossed by the Build Alternatives over a 17-year analysis timeframe. However, a 3.6 magnitude earthquake occurred near Germantown, MD (approximately 20 miles northwest of the District of Columbia) on July 16, 2010 outside of the SCMAGLEV Project Affected Environment. While many residents within the Safety and Security Affected Environment felt minor ground movement, no injury or damage was recorded.⁵

4.22.3.2 Transportation Operational Hazards

Highway fatalities comprise the vast majority of transportation related fatalities (over 90 percent per year). Railroad and water transportation each account for approximately two percent of all transportation fatalities, while air and transit each account for approximately one percent.⁶ Among transit modes, heavy rail and commuter rail have the lowest accident rate per million vehicle miles of travel, but due to higher passenger loads, they have more fatalities per accident and a higher average fatality rate per million vehicle miles of travel.⁷ A comparison of fatalities per passenger mile reveals that making a particular trip by car increases a traveler's odds of fatality by 30 times compared to making the same trip by mass transit. Motorcycle was the riskiest mode of

⁴ NOAA, Storm Events Database, 2000-2017

⁵ USGS, Earthquake Hazards Program, 2000-2017

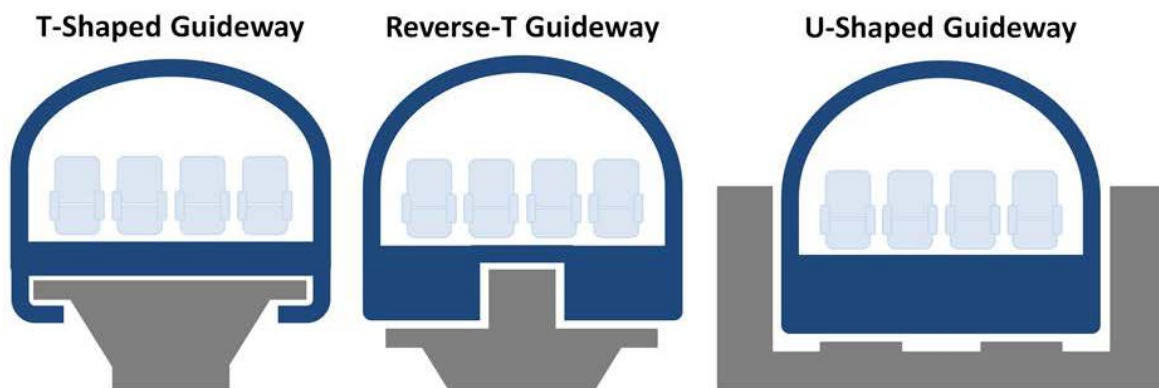
⁶ Bureau of Transportation Statistics, Table 2-1, Transportation Fatalities by Mode

⁷ Bureau of Transportation Statistics, Table 2-33, Transit Safety Data by Mode for All Reported Accidents

travel, with 212 fatalities per billion passenger miles, and commercial air travel was the safest, with a fatality rate of 0.07 per billion passenger miles. It is estimated that the overall fatality rate for cars and trucks is 7.3 and long-haul train service is 0.43 billion passenger miles, respectively.⁸

No comparable fatality data is available as SCMAGLEV technology does not yet operate in the United States. Internationally, SCMAGLEV technology made its first successful test run in 1972 and has been operating for over 50 years on multiple test track facilities in Japan. In 1980, the Miyazaki test track was modified from a reverse T-shaped guideway to a U-shaped guideway which will be utilized for this project, as shown in **Figure 4.22-1**. The combination of the U-shape design and electromagnetic suspension makes it difficult for a vehicle to derail, and as a result no crashes have been recorded. For more information about the SCMAGLEV technology, see Chapter 3 Alternatives Considered.

Figure 4.22-1: SCMAGLEV U-Shaped Guideway



4.22.3.3 Crime and Terrorism

The University of Maryland's Global Terrorism Database identified six terrorism events throughout the state of Maryland and 14 in the District of Columbia between 2000 and 2017. These terrorist activities in Maryland and Washington, D.C. directly affected 17 individuals, including 7 fatalities and 10 injuries, with over \$15 million in property damage. The majority (55 percent) of these events targeted government properties or elected officials. Half (50 percent) involved packages or letters rigged with explosive, incendiary or biological weapons. Over half (57 percent) of all fatalities and 70 percent of all injuries occurred in October 2001, when a series of letters contaminated with anthrax were sent to various elected officials and public figures.

⁸ Savage, Ian, 2013, "Comparing the Fatality Risks in United States Transportation Across Modes and Over Time," Table 2, Passenger Fatalities per Billion Passenger Miles 2000-2009

No incidents of terrorism directed at rail stations or transportation infrastructure have been reported in Maryland or Washington, D.C. At the national level, only five out of 382 events (one percent) were directed at public transit facilities. Two bombing attempts at passenger rail stations, one in Harlem, New York in 2010 and the other in Chester, Pennsylvania in 2011, were both prevented at the respective rail stations, resulting in no injury or property damage. On September 18, 2016, security forces defused four out of five explosive devices near a train station in Elizabeth, New Jersey, resulting in minor property damage but no injury. The fourth incident occurred on October 22, 2017, when a secured area of an Amtrak locomotive was breached which triggered the train's emergency stop but did not lead to any damage or injury. Finally, on December 11, 2017 an attempted suicide bomber caused injury to himself and three others at a Port Authority bus terminal in Manhattan, New York. Records in the University of Maryland database indicate that educational, religious, and governmental facilities are several times more likely to be targeted than transportation facilities.

Table 4.22-2 provides a summary of crime rates by local jurisdictions where station alternatives are proposed. Criminal activity around the proposed Mount Vernon Square Station is approximated using crime rates for Washington D.C. and Baltimore City crime rates correspond with both the Cherry Hill and Camden Yards terminal station options. The proposed Baltimore Washington International Thurgood Marshall Airport Station (BWI Marshall Airport Station) is patrolled by Maryland Transportation Authority (MDTA) police officers and is located within the Anne Arundel County Police Department's jurisdiction. Total crimes are reported for MTA police and the Anne Arundel County Police Department. Crime rates for unincorporated Anne Arundel County are estimated based on the population of Anne Arundel County less the population of the city of Annapolis, the only jurisdiction within the county with a police department that reports known offenses separately to the FBI.⁹

Table 4.22-2: 2017 Offenses known to Law Enforcement for Affected Localities

Offense Type	Murder	Rape	Robbery	Aggravated Assault	Burglary	Larceny Theft	Motor Theft
Known Offenses (Washington, D.C.)	116	443	2,351	3,674	1,808	24,490	2,545
Rate per 10,000 Residents (Washington, D.C.)	1.7	6.4	33.9	52.9	26.1	352.9	36.7
Known Offenses (MDTA)	0	0	1	31	6	143	48
Known Offenses (Anne Arundel)	13	156	556	1,286	1,593	8,598	622

⁹ The FBI maintains a uniform crime reporting system – all local jurisdictions must report crime to FBI and this allows for consistent definitions and reporting criteria from one jurisdiction to the next.

Offense Type	Murder	Rape	Robbery	Aggravated Assault	Burglary	Larceny Theft	Motor Theft
Rate per 10,000 Residents (Anne Arundel)	0.2	2.9	10.4	24.1	29.8	161.0	11.6
Known Offenses (Baltimore City)	342	382	5,879	5,827	8,041	17,008	5,171
Rate per 10,000 Residents (Baltimore City)	5.6	6.2	95.9	95.0	131.1	277.4	84.3

Source: FBI, 2017 Crime in the United States, Table 8, District of Columbia; Table 11, Maryland State, Tribal and Other Agencies and Table 10, Maryland Counties; Table 8, Maryland Cities

The TSA officers provide an extra layer of security between the publicly accessible area of BWI Marshall Airport (including the proposed station) and the secure area restricted to departing and arriving air passengers and airport staff. Operation and construction of the SCMAGLEV Project in this proximity to the BWI Marshall Airport will require compliance with all applicable FAA and TSA rules for airport safety and security.

4.22.3.4 Emergency Response

Emergency response capabilities include law enforcement, fire protection, and emergency medical services. Law enforcement is provided in overlapping layers of Federal, state, county, and local jurisdictions. Federal law enforcement authorities such as the FBI; Drug Enforcement Administration (DEA); Bureau of Alcohol, Tobacco, Firearms, and Explosives (BATFE); Immigrations and Customs Enforcement (ICE); United States Secret Service (USSS); and TSA have statutory authority to enforce certain Federal laws in the SCMAGLEV Project Affected Environment. Washington, D.C. has over 40 law enforcement entities, more than any other location in the United States. In addition to local police departments (i.e., Metropolitan Police of D.C.), there are many Federal law enforcement entities (e.g., U.S. Capital Police, U.S. Marshals, U.S. Park Police). The Maryland State Police have jurisdiction across most of the Safety and Security Affected Environment except the District of Columbia.

Federal agencies that provide medical, fire, or emergency management services such as Federal Emergency Management Agency (FEMA), the National Disaster Medical System (NDMS), U.S. Department of the Interior (DOI), and the U.S. Forest Service will have jurisdiction anywhere in the SCMAGLEV Project Affected Environment in the event of a declared disaster. The Maryland Emergency Management Agency (MEMA) leads emergency response, recovery, and mitigation efforts across the state. Washington's HSEMA leads emergency response, recovery, and mitigation efforts across the District.

The Washington-Baltimore area has one of the largest and most extensive medical systems in the United States. The nearest medical facilities to the SCMAGLEV Project Affected Environment include Howard University Hospital, University of Maryland (UM) Prince George's Hospital Center, Doctor's Community Hospital, UM Laurel Medical

Center, Medstar Harbor Hospital, Medstar Washington Hospital, and University of Maryland Medical Center. Distance to fire departments (FD) and EMS first responders for proposed stations, Fresh Air/Emergency Egress (FA/EE) and other vertical access facilities¹⁰ are shown in **Table 4.22-3**.

Table 4.22-3: First Responders by Vertical Access Locations (Stations and Fresh Air/Emergency Egress Facilities)

Vertical Access Facility (Alternative)	Fire Department	Distance from Facility to Fire Department
Station: Mount Vernon Square (J-01 thru 06 and J1-01 thru 06), Washington, D.C.	DHS Special Ops; D.C. Fire Department E-16	2,000 ft/0.38 mile; 2,400 ft/0.45 mile
FA/EE: Montana Ave. (J-01 thru 06 and J1-01 thru 06), Washington, D.C.	D.C. Fire Department E-26; DC Fire Medical	3,800 ft/0.72 mile; 3,900 ft/0.74 mile
FA/EE: Kenilworth Ave. Vertical Access (J-01 thru 06 and J1-01 thru 06), Prince George's County, MD	Bladensburg FD	2,400 ft/0.45 mile
FA/EE: Riverdale Rd. (J-01 thru 06 and J1-01 thru 06), Prince George's County, MD	West Lanham Hills FD; Riverdale Heights FD	4,700 ft/0.89 mile; 5,300 ft/1.00 mile
FA/EE: Allsworth Ct. (J1), Anne Arundel County, MD	Fort Mead FD; Maryland City FD	9,500 ft/1.80 miles; 17,000 ft/3.22 miles
FA/EE: MD 100/Harmans Rd. (J-01 thru 06 and J1-01 thru 06), Anne Arundel County, MD	Harmans Dorsey FD	3,600 ft/0.68 mile
FA/EE: Telegraph Rd. (J-01 thru 06 and J1-01 thru 06), Anne Arundel County, MD	Harmans Dorsey FD; Severn FD	5,800 ft/1.10 miles; 8,000 ft/1.52 miles
FA/EE: Mathison Way (J and J1) BWI Marshall Airport, Anne Arundel County, MD	BWI Fire & Rescue	2,300 ft/0.44 mile
FA/EE: Camp Meade Rd./Aviation Blvd. (J and J1), Anne Arundel County, MD	Linthicum Vol FD; Ferndale Vol FD	4,100 ft/0.78 mile; 6,700 ft/1.27 miles
Station: Baltimore Washington Thurgood International Marshal Airport (J-01 thru 06 and J1-01 thru 06), Baltimore County, MD	BWI Fire & Rescue; Fire Company 43	7,400 ft/1.40 miles
FA/EE: I-895 (J-01 thru 06 and J1-01 thru 06), Baltimore County, MD	English Consul Vol FD; Landsdowne Vol FD	3,300 ft/0.63 mile; 7,800 ft/1.48 miles
Station: Cherry Hill (J-01 thru 03 and J1-01 thru 03), Baltimore City, MD	Baltimore City FD E-58; Baltimore City FD SS-47	1,500 ft/0.28 mile; 5,350 ft/1.01 miles
Station: Camden Yards (J-04 thru 06 and J1-04 thru 06), Baltimore City, MD	Baltimore City FD S-02	2,400 ft/0.45 mile

4.22.3.5 Vulnerable Locations and Critical Facilities

As described in Section 4.15 Hazardous Materials and Solid Waste, the preliminary analysis identified no high-risk hazardous materials sites (that is no sites with a Risk

¹⁰ Vertical Access Facilities refers to those with elevators and stairways and all associated equipment, facilities, and systems for vertical transportation located through the various floors/levels of the property. At this time only vertical access associated with stations and FA/EE locations have been identified by the Project Sponsor, additional vertical access locations are anticipated for the viaduct as part of the final design and will be incorporated in the Final EIS.

Ranking of 5 or “highest risk”) within the SCMAGLEV Project LOD or Affected Environment. The hazardous materials analysis did identify sites within the SCMAGLEV Project Affected Environment with a Risk Ranking of 3 or 4, which represent the most potential for hazardous materials to be present in the soil and groundwater. These sites pose a greater potential risk to human health and the environment and have been identified by FRA as vulnerable locations. An alternative-by-alternative summary of these sites’ locations relative to proposed project elements, any available information on the suspected hazardous material sources and background history, risk rankings, remediation status, and potential mitigation are detailed in Section 4.15 and illustrated in the Appendix B.3, Natural Resources Mapping.

Other vulnerable locations located within the 500-foot SCMAGLEV Project Affected Environment include the DC Convention Center, National Aeronautics and Space Administration (NASA) Goddard Geophysical and Astronomical Observatory (GGAO), U.S. Department of State Beltsville Information Management Center, Tipton Airport, M&T Bank Stadium, Oriole Park at Camden Yards, Baltimore Convention Center, Federal Reserve Bank of Richmond, Edward A. Garmatz U.S. District Courthouse, transit stations (Washington Metropolitan Area Transit Authority (WMATA) facilities, MDOT MTA Light Rail Transit (LRT) stations, correctional facilities, and multiple schools. Critical facilities located within the 500-foot SCMAGLEV Project Affected Environment include BWI Marshall Airport, National Park Service (NPS) Police Headquarters, District of Columbia Fire Engine #16 Station, Linthicum Fire Station, Beltsville Agricultural Research Center (BARC), NASA Goddard Space Flight Center (GSFC), National Security Administration (NSA) Headquarters, Fort George H. Meade, and the USSS James J. Rowley Training Center facilities.

Three vulnerable locations, the Youth Rehabilitation Services Department, Thomas J.S. Waxters Children’s Center, and the New Beginnings Youth Development Center/Maya Angelou Academy, are in the immediate vicinity of the access ramp associated with the Build Alternatives J1-01 through J-06 to the MD 198 TMF site. The New Beginnings Youth Development Center/Maya Angelou Academy will also be in the immediate vicinity of the alignment access ramps associated with Build Alternatives J-01 through J-06 (see Section 4.4 Neighborhoods and Community Resources for additional information about these facilities).

4.22.4 Environmental Consequences

4.22.4.1 No Build Alternative

The No Build Alternative reflects existing conditions and programmed infrastructure projects and improvements. Under the No Build Alternative, the SCMAGLEV Project will not be constructed, but similar safety and security hazards will exist as those documented in this section. The No Build Alternative assumes that the frequency and severity of some safety and security hazards could increase relative to existing conditions as a result of population growth as follows:

- Natural hazards will likely occur at the same frequency with potential for damage increasing as population density and property values increase.
- Frequency of criminal activity could increase proportionately with population and socio-economic conditions.
- Emergency response times will remain steady, as programmed transportation improvements offset congestion and the number of emergency responders and resources increase to serve an expanding population.
- The demand for law enforcement, fire protection and emergency medical services will increase, relative to frequency of crime, with population and business growth.

4.22.4.2 Build Alternatives

FRA determined that the Build Alternatives will be similar in terms of potential Safety and Security concerns and impacts. Differences are confined to the degree to which roadway modifications may affect emergency response times; the identification of first responders for various station, TMF site and emergency access locations; and specific vulnerable locations and critical infrastructure within proximity of each alternative.

Ability to Avoid/Withstand Existing Environmental Hazards

All Build Alternatives will include elements, such as station facilities, guideway, passenger vehicles, and maintenance facilities, that are at risk from extreme weather or seismic events that will create a need for the safe evacuation of passengers and employees.

Common weather events, such as snow and ice, may pose a risk to passengers and operations on a more regular basis. In areas of the SCMAGLEV system that are at the surface or exposed to weather, daily maintenance will occur to minimize risks to passengers, including snow and ice removal. During overnight hours, crews will conduct inspections for any foreign objects or situations that may affect operations. Maintenance, such as deicing and debris clearance, will occur as needed to continue safe operations.

Adequate drainage along the Build Alternatives and at facilities is the key to preventing safety hazards related to flooding and flash flooding. There are several strategies to reduce the impacts to drainage, including retention of existing elevations, construction of retention/detention ponds, minimization of fill in sensitive areas, and active storm water management, as described in Section 4.10 Water Resources. As a result of implementing these strategies, safety risks due to flooding will not be significantly greater than for the No-Build Alternative. In addition, adequate drainage and stormwater management facilities will also ensure there will be no potential flooding impact associated with soil absorbance displaced by proposed tunnel. It is anticipated that near surface soil absorption of floodwater will not be affected by deep tunnels and where tunnels approach surface levels, will be mitigated by proper stormwater management facilities.

As stipulated by Compliance Measure #3 (see Section 4.22.6), the Project Sponsor will be required to prepare a hazard analysis that will stipulate the required hazard controls needed to sufficiently address identified risks, including risks associated with extreme weather. The hazard controls may include hazard detection equipment, such as rain and temperature gauges, seismographs, or other early warning sensors as necessary. In addition, the Project Sponsor's commitment to the required Emergency Preparedness Plan (see Section 4.22.6, Compliance Measure #4) will specify the conditions under which service will be suspended, such as during or in preparation for extreme weather events as well as emergency communication protocols.

Following a critical weather or seismic event, inspections of guideway, structures, bridges, and other system elements will be a priority; and the necessary repairs and operational precautions, such as service suspension or speed restrictions, will be implemented as necessary and prudent. As outlined in Compliance Measure #2, the Project Sponsor will need to develop, as part of FRA's regulatory approval process, a System Inspection, Testing, and Maintenance Program which will include the protocols for clearing the guideway of any debris and inspecting for and addressing any resulting damages. It will be the Project Sponsor's responsibility to demonstrate that its hazard controls, Emergency Preparedness Plan, and Inspection, Testing and Maintenance Program can adequately address all identified hazards prior to FRA's final regulatory approval and operation of the SCMAGLEV Project. As a result of this process and the Project Sponsor's compliance with the safe operation and hazard controls identified, extreme weather in the proximity of the SCMAGLEV Project is not expected to result in significant environmental impact.

Transportation Operational Safety

Train derailments are not an issue for the SCMAGLEV system as they are with other fixed guideway systems. The U-shaped SCMAGLEV guideway has a concrete base slab with sidewalls that envelop the vehicles and prevent derailments for both tunnel and viaduct segments. Metal coils installed into the sidewalls of the guideway are key to the SCMAGLEV's propulsion, levitation and guidance. The SCMAGLEV technology has never had a collision or derailment in the 50-year history of operation in Japan.

According to the Project Sponsor, extraordinary efforts to avoid accidental collisions are bolstered by the use of a state-of-the-art Control System that mitigates the potential for train-to-train collisions and over-speeding. The signaling system is operational at all speeds and extends into the TMF. The exclusive and dedicated right-of-way (ROW) does not have grade crossings and is equipped with intrusion prevention and detection systems to assure nothing can enter the ROW that could create an unsafe condition.

Additionally, the collision avoidance approach mandates that during trainset operating hours, all maintenance of way (MOW) activities are prohibited and strict temporal separation of MOW activities from passenger service is enforced. The turnout from the MOW facility is locked out, and individuals are prohibited from entering the guideway. During maintenance hours, MOW equipment access to the mainline is permitted through the turnouts from the MOW facility. Maintenance hours will commence as soon

as safe and practicable after the conclusion of revenue service each day. Prior to the operation of the trainsets following maintenance hours, the entire mainline is checked to ensure nothing has been left on the guideway that will create a safety risk.

Operating rules for the SCMAGLEV system are unique. They are simplified in many respects due to the automated, driverless operation, and the dedicated operation that utilizes one specific type of trainset.

The accident avoidance approach also requires a comprehensive training and qualification program for all employees that perform safety-related tasks, which minimizes the potential for human error.

The Project Sponsor will provide documentation of the System Safety Program (SSP) (see Section 4.22.6, Compliance Measure #1) to FRA. The SCMAGLEV Project will import Central Japan Railway Company design safety features, safety culture, and safe operating procedures developed through decades of refinement of industry best practices. Prior to operation of the SCMAGLEV system, the Project Sponsor must demonstrate that its proposed technology and safety program will sufficiently mitigate operational risks.

The Project Sponsor will also develop a System Inspection, Testing, and Maintenance Program (see Compliance Measure #2). Regular inspection and maintenance will help prevent mechanical failures and ensure the safety of the guideway.

System Security

The SCMAGLEV design will control access to the operational corridor by using a combination of tunnel and viaduct sections, with security fencing as needed per the threat/hazard analysis. Specific details regarding proposed intrusion prevention measures (such as fencing specifications, security lighting, Closed Circuit Television (CCTV), and intrusion sensors) may include confidential or sensitive information. These aspects of system security will be developed in consultation with local law enforcement agencies and FRA as part of the required hazard analysis program and implementation of hazard controls (see Compliance Measure #3). Through this process, the Project Sponsor is responsible for demonstrating that its security design is sufficient to address all identified security vulnerabilities prior to operation of the SCMAGLEV Project. The potential for criminal activity, such as theft, vandalism and violence onboard the SCMAGLEV system or at facilities, will be addressed through a System Security Plan (see Compliance Measure #5).

Accordingly, the Project Sponsor has documented the following overview of element-specific security and intrusion protection measures:

- **Maintenance Access:** Access to the guideways is strictly prohibited and prevented when trains are operating, from 5:00 AM to 11:00 PM. During the nighttime maintenance hours, 11:00 PM to 5:00 AM, guideway access is limited to maintenance personnel entering from the MOW facilities or other facilities or

stations. Details of monitoring systems, security lighting, and other deterrents will be developed in the future.

- Viaducts: Focus on the protection of the ROW from external threats such as vandalism, launching of objects onto the ROW, and trespassers. Viaduct sections are generally a minimum of 10 meters (33 feet) above ground level. In certain areas fencing will be installed at the right-of-way line, protecting a total width of 22 meters (72 feet). The fencing will be a minimum of 3 meters (10 feet) high. Security lighting is not planned along the entire viaduct section. Security lighting will be provided at the following locations:
 - Where SCMAGLEV facilities are sited under or adjacent to the viaduct.
 - Where the viaduct profile grade line (guideway level) is less than 10 meters (33 feet) above the ground.
- Tunnels: Access to tunnel sections is physically limited to the following entrance points, where access will be strictly controlled: Passenger stations; FA/EE facilities; Tunnel portals.
- Tunnel Transition Portals: As with viaduct sections, the focus will be to ensure the integrity of the ROW at tunnel transition portals, where the guideway changes from tunnel to viaduct, and the protection of the ROW from external threats such as vandalism, launching of objects onto the ROW, and trespassers. Fencing will be installed at the right-of-way line to prevent access. The right-of-way width at portals is 24 meters (79 feet). Right-of-way fencing will be a minimum of 3 meters (10 feet) high. Security lighting will be provided around the perimeter.
- Open Cut Sections: At some tunnel transition portals, there will be a section of open cut tunnel, where the guideway depth is as much as 35 meters (115 feet) below ground level. As with viaduct and portal sections, the Project Sponsor will ensure the integrity of the ROW. Security follows these key concepts: protection of the ROW from external threats such as vandalism or terrorism, launching of objects onto the ROW, and trespassers. Protective measures such as fencing, cameras and security lighting will be provided around the open cut section as determined in the final design.
- Stations and Facilities: Access to restricted areas in station and facilities will be strictly controlled to prevent entry by any unauthorized personnel. Fencing, cameras and security lighting will be provided as incorporated in the final design.

Cyber threats exist for railway systems. Of particular concern are computer-based train systems operations, signal and control systems, and other communications. The Project Sponsor will incorporate measures, such as installing software that monitors and protects the system from cyber threats. As planning for the SCMAGLEV Project progresses, more detailed planning to protect against cyber threats will occur.

Passenger Safety

Measures of passenger safety will be included within the SCMAGLEV Project design, construction, and operation as described below. The SCMAGLEV Project will be

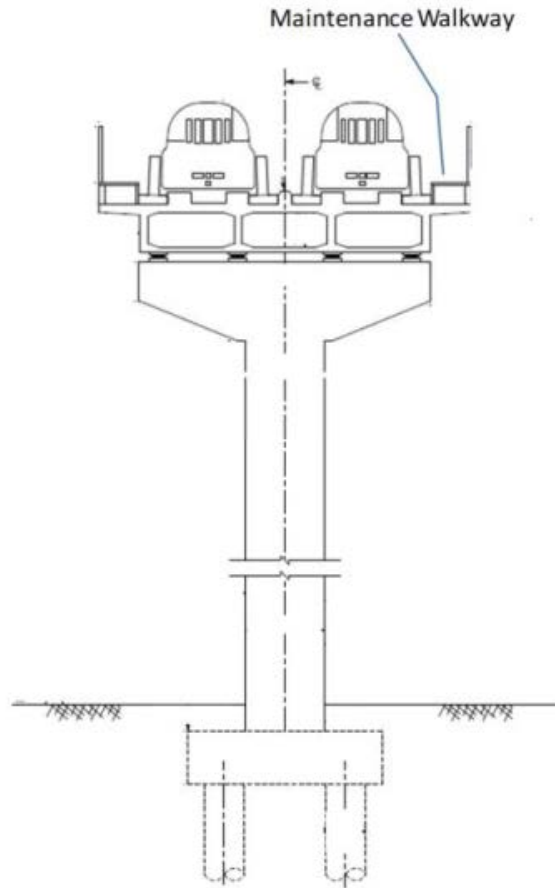
designed to meet applicable municipal, state, and Federal fire safety requirements. Materials used in constructing the interior will meet applicable Federal, state, and local flammability and smoke emission characteristics and testing standards.

The need for emergency services to access the SCMAGLEV facilities or ROW will consist primarily of non-preventable incidents such as a passenger medical emergency. SCMAGLEV Project design features will minimize the potential for train accidents; therefore, the need for emergency response to incidents will be extremely rare. Notwithstanding, the Project Sponsor will collaborate with local responders and FRA to develop an Emergency Preparedness Plan (see Section 4.22.6, Compliance Measure #4) which will facilitate emergency response in case of severe weather, power outages, medical, fire, or other emergencies.

In the event of an onboard emergency, the SCMAGLEV system will provide for emergency communication between the passengers and on-board crew or General Control Center staff. This could be used for either a medical emergency or a security threat, such as an act of terrorism. Trainsets will be outfitted with a clearly marked “SOS” button, located at one end of each vehicle. When activated, the “SOS” button sends a signal directly to the onboard crew and the General Control Center and allows passengers to speak directly to on-board crew or General Control Center staff.

Emergency access will be provided at station areas and at vertical access points collocated with ventilation shafts or FA/EE facilities as specified for each alignment alternative in this section. On average, full vertical access at ventilation shafts will be spaced at approximately three-mile intervals. The emergency operations procedures will attempt to stop the train near a FA/EE. At typical operating speeds, this will take less than a minute. If a train is unable to stop at a designated location, passengers will alight from the train and use the maintenance walkway on either side of the viaduct structure to walk to a designated egress location with stairs and emergency response access. Maintenance walkways are shown on **Figure 4.22-2**. Designated egress locations for the will be coordinated with local emergency response organizations and documented in the Final Environmental Impact Statement (FEIS).

Figure 4.22-2: Viaduct with Maintenance Walkways



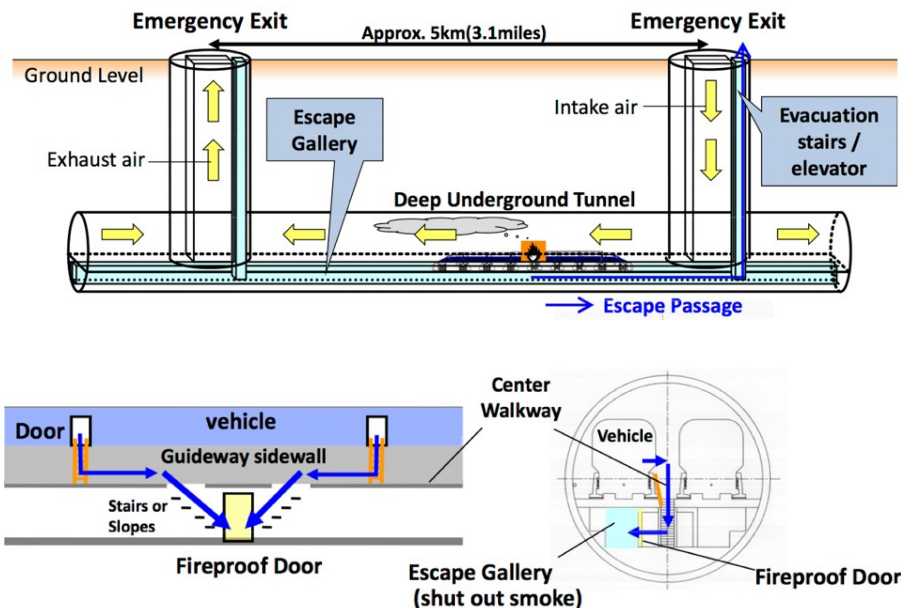
Where this is not feasible, passengers can access a more secure escape gallery located below the guideway running level. FA/EE vertical access between the guideway running level and the escape gallery will be spaced approximately every 800 feet. Once reaching the escape gallery, passengers will be separated from the guideway by fireproof doors in an independently ventilated corridor and will be out of immediate danger in the event of an emergency (see **Figure 4.22-3**). Optimum walk time (if a vehicle should stop between FA/EE vertical access locations) to reach the surface is estimated at approximately 30 minutes.¹¹

Viaduct sections will include a walkway to reach vertical access at select pier locations adjacent to roadways easily accessible by affected emergency responders. Exact pier locations will be determined through ongoing engineering refinement and coordination

¹¹ Based on 1.5-mile distance to nearest ventilation shaft and 3 mph average walking speed.

with local emergency service providers. All above and below ground emergency access walkways and escape galleries will meet ADA, OSHA and National Fire Protection Association (NFPA) standards for safe and accessible design (see Section 4.22.6, Compliance Measure #6.

Figure 4.22-3: Emergency Evacuation Exits for Tunnel Sections



Emergency Response Capabilities

The potential for SCMAGLEV operation or construction to impact emergency response capabilities will vary by element being constructed (viaduct, tunnel, or facility). The SCMAGLEV system is grade separated (either in tunnel or viaduct) from the local transportation network which minimizes permanent impacts to emergency response times within the vicinity of the SCMAGLEV system regarding non-system related emergencies. Any temporary or permanent reconstruction or rerouting of public roads must be coordinated with the appropriate local jurisdiction. Through state and local roadway modification permitting requirements, the Project Sponsor will have to demonstrate that proposed modifications will not significantly impact emergency response times. However, the ability to respond to emergencies within the system may require additional time due to limited access areas.

Critical and Vulnerable Facilities

The most notable differences in the presence of a critical or vulnerable facility within the SCMAGLEV Project Affected Environment are associated with the selection of the TMF site and Baltimore terminal station alternative. The MD 198 TMF site will increase the number of critical and vulnerable facilities (three) in proximity to the SCMAGLEV Project and the degree of transportation modifications and potential emergency service disruption, as BARC Airstrip (two) and BARC West TMF sites (two). The Camden Yards

Station terminal option, as compared to the Cherry Hill Station terminal option, will increase the number of critical and vulnerable locations in proximity of the SCMAGLEV Project and may result in longer emergency response times to the station, given its location in a higher density location with increased traffic conditions.

4.22.4.3 Short-Term Construction Effects

Construction of the SCMAGLEV Project will include activities such as digging and tunneling using multiple tunnel boring machines (TBM), ground clearing, pile driving, excavating, grading, and the stockpiling of soil, muck, and materials. All construction impacts are anticipated to be short-term in duration and will cease upon completion of construction. Construction is estimated to take just under seven years.

The potential health effects of construction vehicle and equipment emissions are documented in Section 4.16 Air Quality, Section 4.15 Hazardous Materials and Solid Waste, and Section 4.21 Public Health and Safety. If not properly operated, secured, and maintained, construction equipment could also create a risk to the physical safety of employees, contractors or other individuals authorized to be present on construction sites. In addition, movement of vehicles or equipment to a site or between sites could present additional hazards to nearby traffic or pedestrian movements. Potential construction safety impacts can be reduced through compliance with local construction permitting requirements.

Temporary roadway closures and rerouting during construction are likely. This could affect emergency responses times. As planning for the SCMAGLEV Project progresses, detailed maintenance of traffic plans will be prepared in accordance with local requirements. The Project Sponsor will have to demonstrate that temporary closures or rerouting will not significantly impact emergency response times. Section 4.2 Transportation contains information on maintenance of traffic plans generated by the Project Sponsor; however, these plans require additional review by and coordination with local emergency responders to determine if there will be impact to response times. The Project Sponsor has stated that they will be conducting this coordination as part of the FEIS.

4.22.5 Safety and Security Compliance Measures and Mitigation

The SCMAGLEV Project, as proposed, will establish a safety and security program which utilizes a combination of preventative design features and other technologies, plans and procedures, and adequate provisions for emergency access to reduce or eliminate potential safety and security impacts at stations, portals, viaducts, fresh air and emergency egress areas, and TMF site. The following crash avoidance design features of the SCMAGLEV system are integral to the minimization of potential safety and security impacts:

- Dedicated ROW that is completely grade separated from freight, automobile and pedestrian traffic;
- No bi-directional service on any segment;

- Security fencing, physical barriers, and an intrusion detection system to secure the entire ROW; and
- Signaling and communications system.

The Project Sponsor will also ensure contractor compliance with approved health and safety plans addressing construction worker safety and issues including fall protection, hearing/eye protection, hazardous materials storage, etc. These issues have also been noted in Sections 4.1, 4.16 Air Quality, and 4.17 Noise and Vibration.

The Project Sponsor will ensure compliance with all applicable safety, inspection, maintenance, training and security requirements as developed through a Rule of Particular Applicability, order(s) or waiver(s), or other regulatory action(s) taken by FRA to ensure the system is operated safely. Prior to operating the SCMAGLEV system, the Project Sponsor in coordination with TSA will develop the following compliance measures for review and approval from FRA.

Compliance Measure #1: System Safety Program (SSP)

The Project Sponsor will commit to and submit an SSP Plan to FRA for review and approval, prior to operation of the SCMAGLEV system. The purpose of the SSP Plan is to systematically evaluate safety hazards and manage risks through on-going preventative and corrective actions, including a risk-based hazard management program and hazard analysis. The SSP Plan shall address the following:

- Safety philosophy, culture and program goals;
- Safety roles and responsibilities within the organization, including the lines of authority used to manage safety issues;
- SSP implementation process and milestones;
- Maintenance, repair, and inspection program (see Compliance Measure #3);
- Operating and safety rules and maintenance procedures, as well as techniques used to verify compliance of staff and contractors with these rules and procedures;
- SSP training requirements for employees and contractors; and,
- Description of hazard management program (see Compliance Measure #2).

After FRA approval of the SSP Plan, the Project Sponsor shall annually assess implementation of and compliance with the SSP Plan and report findings and improvement plans to FRA. The Project Sponsor shall be responsible for ensuring employees have received the appropriate level of training for their position and documenting all required safety training events as part of its safety program. FRA may conduct audits of the SSP for compliance with the approved SSP plan.

Compliance Measure #2: Hazard Analysis

The Project Sponsor will make a commitment to establish a risk-based hazard management program and conduct hazard analyses. This hazard management program will establish the process used to identify and analyze hazards; methods for determining frequency, severity, and corresponding risk of identified hazards; procedures for identifying hazard controls or mitigating actions; and risk management roles and responsibilities within the organization. A preliminary hazard analysis submitted with the SSP Plan will identify hazards and appropriate follow-up actions for the Project Sponsor to implement to reduce or eliminate risks. The Project Sponsor will perform additional hazard analysis accompanying any significant operational changes, system extensions, modifications, or other circumstances impacting safety of the SCMAGLEV Project.

Compliance Measure #3: Inspection, Testing, and Maintenance

Although specific testing and maintenance requirements for the SCMAGLEV Project are still under development, the Project Sponsor will make a commitment to develop a system inspection, testing and maintenance program, based on best practices developed through operation of Central Japan Railway Company's SCMAGLEV test track. This plan will be submitted to FRA in conjunction with the SSP. The Project Sponsor will be responsible for ensuring that the proposed standards, maintenance protocol, and schedules for regular inspection and cleaning will be sufficient to address identified hazards and promote safe, reliable operations.

Compliance Measure #4: Emergency Preparedness Plan

The Project Sponsor will prepare an Emergency Preparedness Plan and submit to FRA for review and approval. The plan will include:

- On-board and control center communication protocol;
- Employee emergency preparedness training, including a schedule for initial and periodic training within the first 180 days of passenger service and procedures for testing an individual who is employed by the railroad, under a contract or subcontract with the railroad, or employed by a contractor or subcontractor to the railroad for emergency preparedness qualifications;
- Procedures involving operations on elevated structures and in electrified territory;
- Program for communication and training for any local emergency responders who could reasonably be expected to respond during an emergency situation. This program shall include participation in emergency simulations and distribution of the Emergency Preparedness Plan;
- Inventory and location of emergency equipment with schedule of maintenance for replacement of first-aid kits, on-board emergency equipment, and on-board emergency lighting;
- Program for passenger awareness of emergency procedures, to enable passengers to respond properly during an emergency; and

- Procedures regarding passengers with disabilities.

The Emergency Preparedness Plan should reflect local emergency management guidance. The Project Sponsor will solicit coordination with and feedback from potentially affected emergency responders in order to demonstrate that its plan adequately addresses concerns regarding emergency response capabilities.

Compliance Measure #5: System Security Plan

The Project Sponsor will develop a System Security Plan, in consultation with the TSA, prior to operation of the system. At minimum, the System Security Plan will document the processes for mitigating and/or eliminating the security threats, vulnerabilities, and risks to safeguard the personal security of passengers and employees. The passenger and employee screening procedures developed through the System Security Plan will comply with all applicable state and Federal regulations, including TSA's RAILPAX-04-01 and RAILPAX-04-02. The System Security Plan will also demonstrate how the SCMAGLEV Project's planned security protocols at the proposed BWI Marshall Airport Station will comply with all TSA and FAA rules regarding airport security.

Compliance Measure #6: Compliant Facility Design

During final design, the Project Sponsor or its contractual designee will ensure that the design of stations, guideway, and maintenance facilities meet all applicable Federal and state requirements. This includes providing sufficient access to walkways and corridors which meet ADA standards, facilities which meet OSHA, NFPA standards, fire life safety, and compliance with any other applicable state or local building codes.

Compliance Measure #7: Liability Coverage

The Project Sponsor will be responsible for maintaining insurance liability coverage as required in accordance with applicable law.

As the SCMAGLEV Project design is further refined, additional mitigation measures may be implemented to further reduce impacts associated with the construction and operation of the SCMAGLEV system, including:

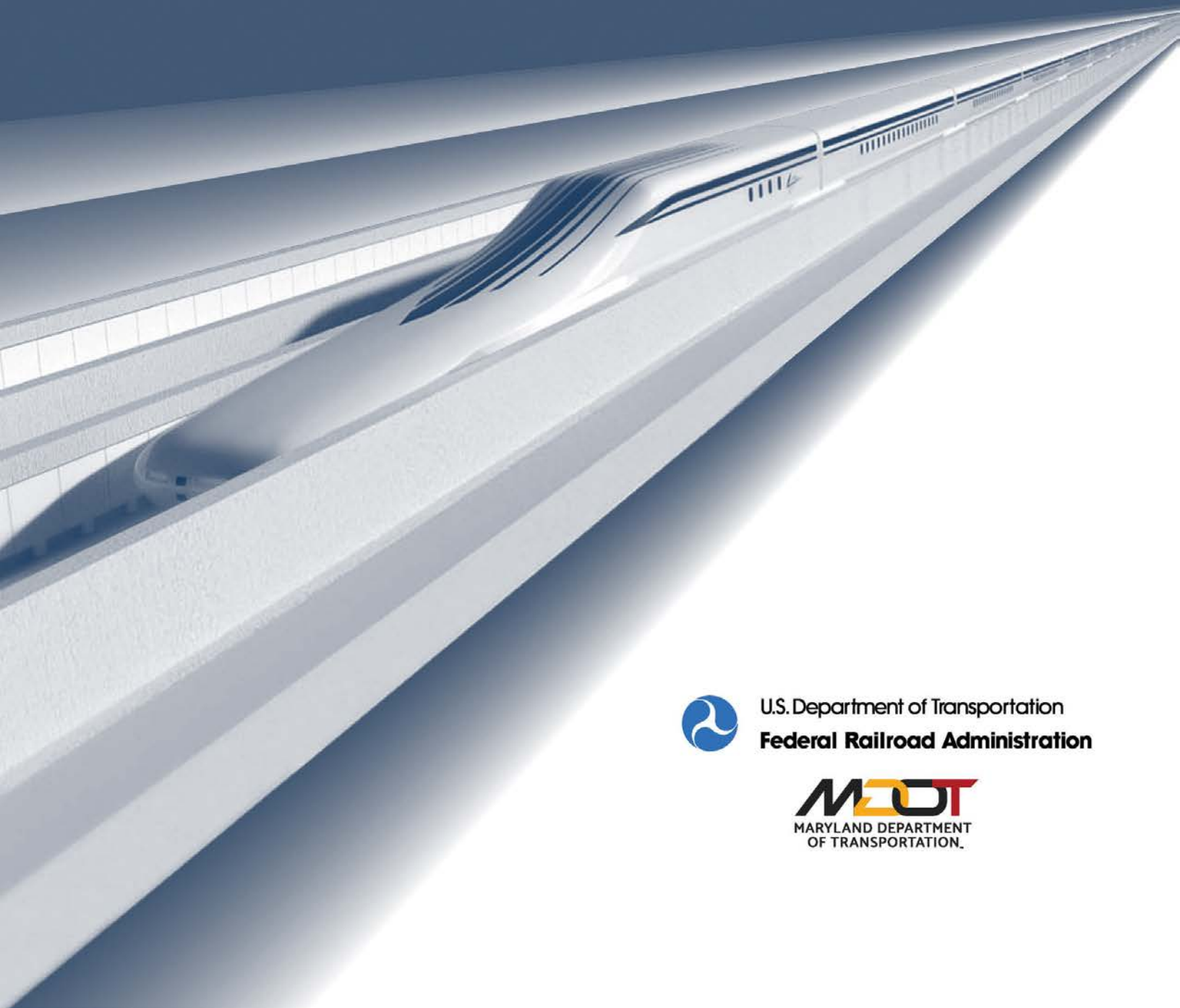
- Modeling of potential response time impacts associated with the SCMAGLEV Project construction; and
- Enhanced coordination with specific emergency service providers.

Section 4.23

Indirect and Cumulative Effects

BALTIMORE-WASHINGTON SUPERCONDUCTING MAGLEV PROJECT

DRAFT ENVIRONMENTAL IMPACT STATEMENT AND
SECTION 4(f) EVALUATION



U.S. Department of Transportation
Federal Railroad Administration



4.23 Indirect and Cumulative Effects

4.23.1 Introduction

This section identifies and describes the potential indirect (secondary) and cumulative effects of the Build Alternatives.

Indirect effects are defined as “effects which are caused by the action and are later in time or farther removed in distance but are still reasonably foreseeable. Indirect effects may include growth inducing effects and other effects related to induced changes in the pattern of land use, population density or growth rate, and related effects on air and water and other natural systems, including ecosystems” (40 CFR 1508.8(b)).

Cumulative effects are defined as the “impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time” (40 CFR 1508.7). Cumulative effects include the direct and indirect impacts of a project together with the past, present, and reasonably foreseeable future actions of others.

4.23.2 Regulatory Context and Methodology

4.23.2.1 Regulatory Context

In accordance with the National Environmental Policy Act (NEPA), 42 U.S.C. § 4321 et seq., the Council on Environmental Quality (CEQ) regulations, 40 C.F.R. Parts 1500-1508, and the Federal Railroad Administration’s (FRA) Procedures for Considering Environmental Impacts, 64 Fed. Reg. 28545 (May 26, 1999) FRA assessed potential indirect and cumulative impacts from implementation of the Superconducting Magnetic Levitation Project (SCMAGLEV Project). The assessment follows CEQ’s 1997 *Considering Cumulative Effects under the National Environmental Policy Act* to address the following:

- Identify resources/topics of interest, such as noise, historic properties and wetlands;
- Establish geographic and temporal boundaries;
- Determine past, present, and reasonably foreseeable future projects to be assessed as part of the indirect and cumulative effects analyses; and
- Assess indirect and cumulative effects to resources of interest within the defined geographic and temporal boundaries.

4.23.2.2 Methodology

Market demand, local planning, and transportation-oriented development policies, land availability, and support infrastructure are factors that determine the location and type of growth in the indirect effects assessment. The indirect effects assessment focuses on the proposed SCMAGLEV Project station areas because transit-oriented development (TOD) potentially occurs around stations. The cumulative effects assessment considers planned and programmed transportation projects and non-transportation land development projects that are programmed or anticipated to occur independently of the SCMAGLEV Project. The cumulative effects assessment evaluates the role of the Build Alternatives in the cumulative effects of past, present and reasonably foreseeable future projects on the natural and human environment. When the potential effects of each Build Alternative are similar, the discussion in this section refers to the SCMAGLEV Project in general. Where effects differ among the Build Alternatives, specific discussion of each is provided.

This assessment relies on data sources described throughout Chapter 4 that focus on:

- demographic data and projections;
- land use/land cover data;
- local land use plans;
- information on planned development projects; and
- resource mapping.

4.23.2.3 Resources of Interest

As noted above, indirect effects result from changes in the natural environment or socioeconomic conditions that are caused by the Build Alternatives but occur later in time or farther removed in distance. FRA evaluated these effects as impacts to the natural and human environments. Resources selected for analysis are those that would be affected directly by the Build Alternatives, those that would be affected by potential SCMAGLEV Project-related indirect development associated with the station areas, and those that are particularly susceptible to effects from other foreseeable projects over time that, in aggregate, could result in a cumulative effect. Transportation is presented in this analysis in terms of the role it plays in affecting other resources. The resources assessed in the indirect and cumulative effects analysis are:

- Transportation
- Human Environment
 - Acquisitions and Displacements
 - Economics
 - Neighborhoods and Community Facilities
 - Parks, Recreational Land and Open Space

- Historic properties and archaeological sites
- Visual and Aesthetic Resources
- Air Quality
- Noise and Vibration
- Environmental Justice
- Utilities
- Energy
- Natural Environment
 - Water Resources
 - Wetlands
 - Forests
 - Ecological Resources

4.23.2.4 Geographic Study Area Boundaries

In general, many of the indirect impacts of the Build Alternatives would be localized at and around the station areas because potential indirect effects are from the access to the transportation service provided at the SCMAGLEV stations. This would include the areas within walking distance of a station, generally approximated as being within a half-mile radius. However, potential development could also occur outside of the local station area. The geographic boundary for indirect effects thus includes the jurisdictions of Washington, D.C., Anne Arundel County, and the City of Baltimore, in which the stations are located.

The cumulative effects geographic boundary differs from the indirect effects analysis because it encompasses resources that are potentially affected by multiple projects considered in aggregate. FRA examined the effect of multiple projects on community resources, including parks, at the municipal level to determine the effect of all projects on the inventory and availability of those resources to residents in that municipality. To appropriately assess these resources, FRA defined the cumulative effects geographic boundary as encompassing the following geographic areas, as shown in **Figure 4.23-1** and described below:

- The Preliminary Alternatives Screening Report (PASR) Project Study Area – The PASR Project Study Area extends approximately 57 miles from Washington, D.C. to Baltimore, MD, and is approximately 20 miles wide. The PASR Project Study Area was used during the development and evaluation of early alternatives and is the regional context for considering potential SCMAGLEV Project benefits and effects to human and natural resources, such as transportation, property acquisitions and displacements, historic and archaeological resources, visual impacts, and noise and vibration impacts. The PASR is located at <http://bwmaglev.info/index.php/project-documents/reports>.

- The Watershed Boundary – The SCMAGLEV Project traverses eight watersheds within four larger drainage basins¹ as shown in Section 4.10, Figure 4.10-1. FRA examined the potential impacts of the SCMAGLEV Project and other projects on a watershed to evaluate the potential for cumulative change or loss of natural resource functions in that watershed.
- The Metropolitan Washington Council of Governments and Baltimore Metropolitan Council Boundaries² – The councils are the sources for data on vehicle trips. This is used as the source of travel data within the cities and counties within which the SCMAGLEV Project would be located.

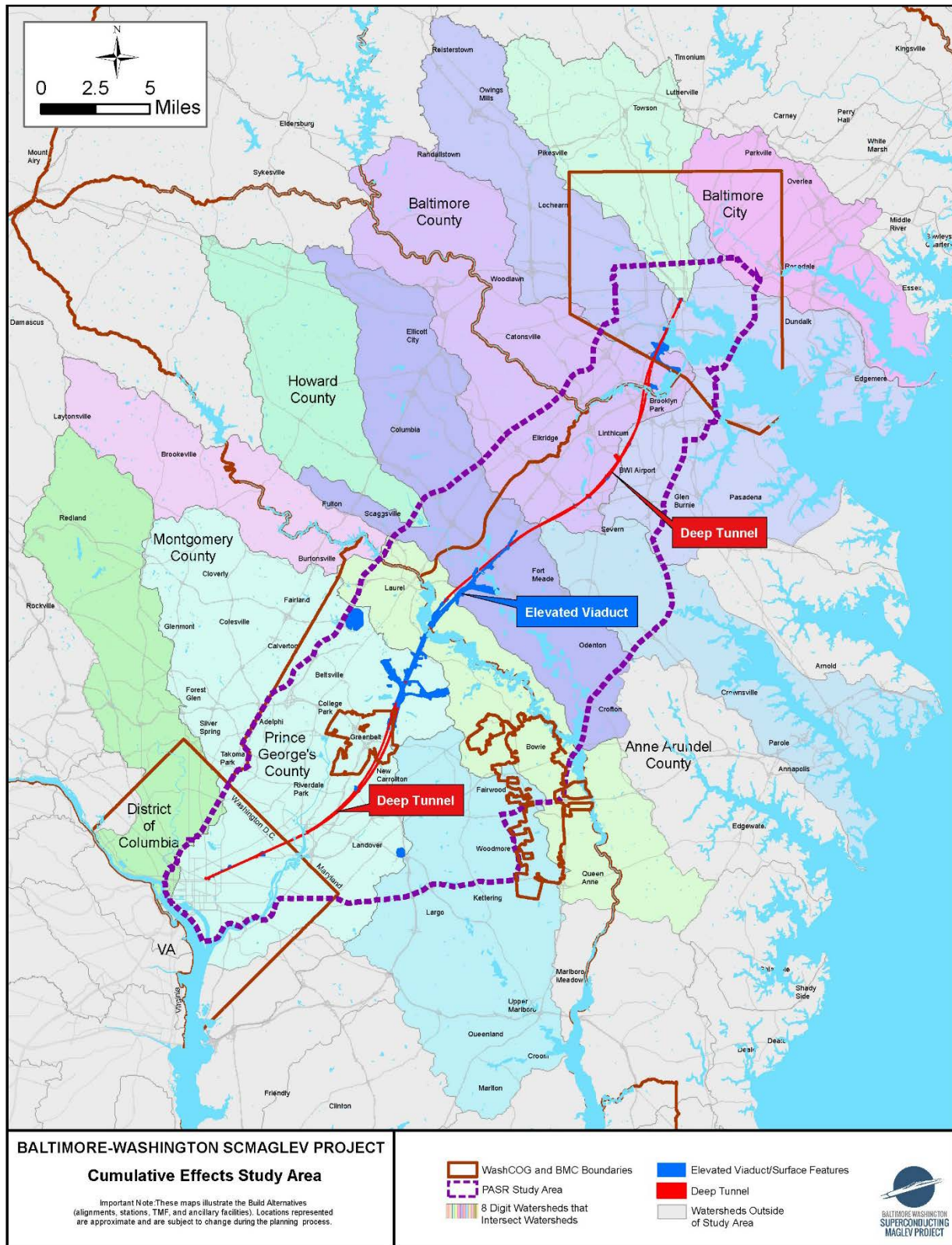
4.23.2.5 Past, Present, and Reasonably Foreseeable Future Actions

Following the end of World War II in 1945, the nationwide suburban housing boom led to significant outmigration from Washington, D.C. and Baltimore, MD to surrounding areas. In the 1950s, large Federal properties within the cumulative effects geographic boundary, such as the National Aeronautics and Space Administration (NASA) Goddard Space Flight Center, the National Security Agency (NSA) headquarters and the Baltimore-Washington Parkway (BWP), were developed. Suburban development in central Maryland and northern Virginia continued to increase in the 1950s and 1960s. Initially, transportation access constraints limited growth, but significant efforts by Federal and state agencies began to improve regional mobility. These efforts included expanding both roadway and public transit networks such as roadways encompassing the Project Study area, the Washington Metrorail system, Amtrak and Maryland Area Regional Commuter (MARC) operations, and improved access to and allowed the development of agricultural and undeveloped properties. With better transportation access, residential development increased and will continue to increase as evidenced by the population data in Section 4.5 Environmental Justice.

¹ Both tributary basins and watersheds are areas of land that drain to a water body (e.g., lake, stream, or river). The term watershed is used to describe a smaller area of land that drains to a smaller stream, lake, or wetland.

² The Metropolitan Washington Council of Governments includes the following Project Study area locales: Washington, D.C., Prince George's County, the City of Greenbelt and the City of Bowie. The Baltimore Council of Governments includes the following locales: Anne Arundel County, Baltimore County and Baltimore City.

Figure 4.23-1 Cumulative Effects Geographic Boundary



Foreseeable future actions include planned and programmed transportation and non-transportation projects within the geographic boundaries of the indirect and cumulative effects analysis, and temporally out to the SCMAGLEV Project horizon year 2045.

Table 4.23-1 provides a list of other transportation and non-transportation projects that show present and reasonably foreseeable future actions within the geographic boundaries. FRA qualitatively assessed the potential effects associated with these actions.

Land Development Projects

Due to the already developed nature of most land within the geographic boundaries of the indirect and cumulative effects analysis, the primary type of development activity occurring today and planned for the foreseeable future is infill and redevelopment of lands previously converted to human uses. Focal points for development and redevelopment activity are near Baltimore-Washington International Thurgood Marshall Airport (BWI Marshall Airport) and in the cities of Washington, D.C. and Baltimore, MD. As development and redevelopment occurs, the stock of residential and non-residential uses in the analysis area would increase, as would the demand for transportation services.

Table 4.23-1: Representative Present and Reasonably Foreseeable Future Actions

Category	Representative Actions (jurisdiction)
Transportation: Aviation	- Tipton Airport Development and Runway Extension (Anne Arundel County) - BWI Marshall Airport Improvements (Anne Arundel County)
Transportation: Transit	- Metrorail Extension to Dulles Airport (Washington, D.C.) - Purple Line (Montgomery and Prince George's Counties) - Bus Rapid Transit to BWI Marshall Airport (Anne Arundel County) - Penn Line and Camden Line Service Improvements (Washington, D.C. Anne Arundel, Prince George's and Baltimore Counties, City of Baltimore)
Transportation: Freight	- National Gateway Freight Rail Corridor (Washington, D.C./various MD counties) - Howard Street Tunnel (Baltimore City)
Transportation: Maritime	- Dundalk Marine Terminal, Phase 1 Rehabilitation (Baltimore City) - Masonville Berth Construction (Baltimore City)
Transportation: Rail	- Washington Union Station Master Plan (Washington, D.C.) - Camden Yards Train Station (Baltimore City) - Northeast Corridor (NEC) FUTURE Program (Washington, D.C./various MD counties)

Category	Representative Actions (jurisdiction)
	- Long Bridge Project (Washington, D.C.) - Washington, D.C. to Richmond Southeast High Speed Rail (DC2RVA) Project (Washington, D.C./various VA counties) - B&P Tunnel (Baltimore City) - BWI Marshall Rail Station Improvements and Fourth Track Project (Anne Arundel County and Baltimore County)
Transportation: Highway	- Washington, D.C. to Baltimore Loop Project (Washington, D.C. Anne Arundel, Prince George's and Baltimore Counties, City of Baltimore) - I-495 & I-270 Managed Lanes Study (Fairfax County, VA and various MD counties) - Maryland Traffic Relief Plan (projects in Prince George's and Anne Arundel Counties) - MD 198/BWP Interchange improvements (Anne Arundel County) - I-95 John F. Kennedy Memorial Highway Interchange improvements and Express Toll Lanes (various MD counties) - US 40, Pulaski Highway Improvements (MD) - US 1 Baltimore Avenue Reconstruction (MD) - MD 100, MD 175, and MD 198 Widening (various MD counties) - MD 193 Intersection Improvement (Prince George's County) - Good Luck Road Widening (Prince George's County)
Non-Transportation	- Mount Vernon Triangle and Chinatown, Large-scale Commercial and Residential (Washington, D.C.) - Odenton Town Center Master Plan (Anne Arundel County) - Demolition of 22 Buildings at the Henry A. Wallace Beltsville Agricultural Research Center (Prince George's County) - U.S. Department of the Treasury Construction and Operation of a Currency Production Facility at the Beltsville Agricultural Research Center (Prince George's County)

Sources: FRA, 2016 *NEC Future Tier 1 Final Environmental Impact Statement*; FHWA, 2019 Washington, D.C. to Baltimore Loop Project Draft Environmental Assessment; *baltimoremagazine.com*; *bizjournals.com*; *nps.gov*; *urbanturf.com* <https://495-270-p3.com/>

4.23.3 Indirect Effects Assessment

The new SCMAGLEV service provided by the Build Alternatives may enhance and encourage development and redevelopment near stations because of the connections,

convenience and reliability the new service would provide. This development could include new residences and businesses. The location of indirect development activity could be within one-half mile of the stations to attract walking riders as well as development greater than one half mile from the stations to attract riders who would drive and park at the stations. Development activities would be guided by existing and future planning and zoning as follows:

- Baltimore City's Urban Renewal Plan provides a framework for redevelopment in the Downtown Business District where the proposed Camden Yards Station would be located. The Plan is an overlay to the City's zoning and land use requirements. The framework guides the types, scale and density of development.
- Baltimore City planning and zoning provisions guide development in the Cherry Hill Station area. In similar fashion to the City's Urban Renewal Plan, these provisions guide the types, scale and density of development that occurs.
- The Mount Vernon Triangle, in Washington, D.C., is in the redevelopment planning stage in the area around the Mount Vernon Square East Station. The District of Columbia's Comprehensive Plan and zoning provisions will guide this development.
- Development around the BWI Marshall Airport Station is guided by planning and zoning provisions of Anne Arundel County (Referenced in Section 4.3 Land Use and Zoning). The County generally provides for commercial uses closest to the airport, while residential and other uses form a more distant, outer ring. The BWI Marshall Airport Master Plan and Airport Layout Plan (April 2011, with an Update Narrative Report January 2015) also identifies airfield, terminal and landside development to accommodate projected increases in future aviation travel demand.

4.23.3.1 Human Environment

The SCMAGLEV Project would contribute to social and economic forces that transform the areas around stations over time. The effects of development and redevelopment could include property premiums (see Section 4.6 Economic Resources), decreases in affordable housing opportunities, increased employment opportunities, greater availability of consumer goods and services, changes to business revenues and operations, changes in neighborhood character (such as visual change), changes in demand for community facilities, threats to historic and archaeological sites, and utilities impacts. These potential impacts could be felt more acutely by Environmental Justice populations because these populations tend to be sensitive to changes in housing values, changes in their business revenues and operations, and the availability of employment and public transportation. These impacts are discussed in detail in Section 4.5 Environmental Justice.

4.23.3.2 Natural Environment

The use of and impacts to water and ecological resources are regulated by Federal, state and local laws, which are described in Sections 4.10 through 4.14. Impacts to the natural environment from additional development have the potential to occur. Additional

development would require additional energy, thereby increasing local energy demand. Development can impact water resources by increasing stormwater runoff, negatively affecting water quality, reducing groundwater infiltration because of additional impervious surfaces, and cause impacts to streams, waterways and floodplains.

4.23.4 Cumulative Effects Assessment

Past and present land use patterns located within the cumulative effects geographic boundary tend to be urban in character within Washington, D.C. and Baltimore City, and suburban outside of these cities. Although foreseeable future development and infrastructure projects are expected to occur independently of the SCMAGLEV Project, it may have a catalytic effect on the pace, scale and geographic extent of development near proposed stations. The following resources are those that would be susceptible to cumulative effects as a result of being directly or indirectly affected by the Build Alternatives and other past, present, and reasonably foreseeable projects. In summary, the SCMAGLEV Project would reduce potential cumulative adverse effects on air quality at the regional level by diverting roadway traffic to train travel. For all other resources, including localized air quality around station locations, impacts from the SCMAGLEV Project have the potential to result in cumulative impacts when combined with past, present and reasonably foreseeable actions, as further described below.

4.23.4.1 Transportation

Increased local travel demand, traffic congestion, and demand for passenger rail and transit services are anticipated to occur. Past and present transportation projects have formed a network of local and regional roadways designed to connect Washington, D.C. and Baltimore City as focal points of activity. Each Build Alternative would help to satisfy future travel demand and divert riders from other modes (i.e., auto, rail, bus, taxi/rideshare) as shown in Section 4.2 Transportation. Other reasonably foreseeable future actions would primarily serve to accomplish similar objectives by addressing congestion and constraints in the existing roadway network and the Northeast Corridor (NEC). However, facilities proposed under the SCMAGLEV Project may also result in localized traffic effects in certain areas that could coincide with other adjacent reasonably foreseeable future actions. Directly west of the BARC West trainset maintenance facility (TMF) on property currently within BARC, the U.S. Department of the Treasury is proposing a new currency production facility. According to the U.S. Department of the Treasury, Construction and Operation Production Facility at the Beltsville Agricultural Research Center Draft EIS, the proposed facility would result in significant traffic impacts.

The SCMAGLEV Project construction activity has the potential to occur at the same time as some planned transportation projects, such as roadway improvements and advancement of the NEC FUTURE program. SCMAGLEV Project construction activity also has the potential to occur at the same time as other large-scale commercial and residential projects in Washington, D.C. and the City of Baltimore, and this may have a cumulative effect on traffic on major roadways (i.e., New York Avenue NE/US 50 in Washington, D.C.). Multiple projects

that are simultaneously in the construction phase have the potential to create more disruption to transportation services than that caused by a single project. In some instances, travelers may choose alternative transportation to carry out their daily commutes. How travelers will choose to travel is unknown and would be influenced by their commuting patterns and ongoing construction of other transportation projects.

The Project Sponsor would, as a component of construction planning, consider and factor in the potential effects of SCMAGLEV Project construction activity and other transportation projects that would also be in the construction phase. The Project Sponsor would coordinate construction planning with the sponsors of the other projects, with the goal of minimizing potential cumulative construction phase impacts to the extent reasonably feasible.

4.23.4.2 Acquisitions and Displacements

As described in Section 4.3 Land Use and Zoning, each Build Alternative would require full and partial property acquisitions and displacements. The Build Alternatives would require full permanent acquisitions from a range of 114 to 120 parcels. Additional acquisitions and displacements could also occur as a result of induced growth around SCMAGLEV Project station areas.

Cumulative impacts could result where impacted properties coincide with parcels impacted by other reasonably foreseeable future actions. For example, acquisitions that may be required for the MD 198 widening may need to be coordinated with acquisitions required for the MD 198 TMF. Similarly, temporary acquisitions needed for the temporary tunnel laydown area in the vicinity of the Purple Line Beacon Heights-East Pines station may need to be coordinated with any Transit-Oriented Development (TOD) that may occur around this proposed Purple Line station. Acquisitions necessary for the BARC West TMF would need to be coordinated with the demolition of 22 buildings at BARC, some of which coincide with the location of the BARC West TMF. Likewise, cumulative impacts to neighborhoods could occur where properties within the same neighborhood are impacted by multiple projects. For example, neighborhoods in the vicinity of the MD 197/BWP interchange would be directly impacted by the SCMAGLEV Project. If those neighborhoods are impacted by other projects, such as other noted transportation projects, then they would experience cumulative effects.

4.23.4.3 Socio-Economics

The Build Alternatives would each have similar socio-economic benefits and impacts, as described in Section 4.6 Economic Resources. The SCMAGLEV Project would create jobs and wages, and traveler benefits. In addition, the SCMAGLEV Project would likely increase the potential for TOD near station locations. Negative economic effects are similar among the Build Alternatives and include potentially higher traveler costs and increased property costs around stations, which could negatively affect affordability.

Generally, other reasonably foreseeable future actions in the vicinity of the SCMAGLEV Project are anticipated to produce additional economic benefits and impacts. The

SCMAGLEV Project, in combination with these other reasonably foreseeable future actions, has the potential to result in cumulative economic impacts and influence economics in the region.

4.23.4.4 Neighborhoods and Community Facilities

As shown in Section 4.4 Neighborhoods and Community Resources, construction and operation of the SCMAGLEV Project would result in permanent adverse impacts to some neighborhoods and community facilities. Impacts would include one or more of the following: property acquisition (ranging from partial to full acquisitions), disruption to community cohesion or use of community facilities, aesthetics and visual appearance, noise and vibration, air quality, health and safety, and/or changes to access and mobility. In addition, SCMAGLEV Project-induced development around stations could incrementally increase pressure on public infrastructure and services. County and local land use plans and regulations serve to direct future growth and limit excessive pressure on public facilities and services.

Generally, other reasonably foreseeable future actions in the vicinity of the SCMAGLEV Project are anticipated to produce additional impacts on neighborhoods and community facilities, in particular commercial and residential development projects and transportation projects that may bisect communities and impact community cohesion, such as road widening projects, as well as result in additional changes in aesthetics and visual appearance, noise, and access and mobility.

The SCMAGLEV Project would have direct and indirect effects on neighborhoods, that in combination with other reasonably foreseeable future actions, would contribute to cumulative effects. Cumulative effects would be felt most in neighborhoods closer to the SCMAGLEV Project, such as communities along the BWP and around TMFs and stations.

4.23.4.5 Parks, Recreational Land and Open Space

As described in Section 4.7 Recreational Facilities and Parklands, the Build Alternatives J1 would result in a higher number and slightly more acreage of permanent impact to public recreational facilities and parklands than the Build Alternatives J. All Build Alternatives would have impacts that would be difficult to mitigate to the following parks: the BWP, Patuxent Research Refuge (PRR), Greenbelt Forest Preserve, and Patuxent River Park 1. The I-495/I-270 Managed Lanes Study would result in an Adverse Effect on the BWP. This impact combined with the proposed improvements of the SCMAGLEV Project would result in cumulative effects on the BWP.

Similar to community facilities, SCMAGLEV Project-induced development could incrementally increase demand and capacity pressure on public parks and recreation facilities around stations as well. However, development or redevelopment plans could also occur around stations, and parks could be programmed into these plans to provide capacity for additional demand. Related to the development decisions to be made at the county and

local levels, the effect on parks, recreational land and open space must also be considered as the county and local review individual development applications.

Generally, other reasonably foreseeable future actions in the vicinity of the SCMAGLEV Project could produce additional direct and indirect impacts on parks and recreational land, in particular transportation projects that may encroach on parkland to obtain additional right-of-way.

4.23.4.6 Historic Properties

As described in Section 4.8 Cultural Resources, all Build Alternatives would result in adverse effects to Mount Vernon Square Historic District and Addition, The New York, Martins Woods, the Beltsville Agricultural Research Center (BARC), and the BWP. All Build Alternatives J1 would have an adverse effect to the Greenbelt Historic District, a National Historic Landmark (NHL). Four Build Alternatives that propose the BARC Airstrip TMF would result in adverse effects to the Goddard Space Flight Center (GSFC). Eight Build Alternatives, those that include the MD 198 TMF, would result in adverse effects to the D.C. Children's Center-Forest Haven District. Build Alternatives that end at Cherry Hill Station would have an adverse effect on the Westport Historic District by being above grade, while those ending at Camden Yards Station (below grade) would have an adverse effect on the Otterbein Church. The Build Alternatives J1 would have an adverse effect to a smaller number of below-ground resources and to lower acreages of High-Moderate archaeological potential than the Build Alternatives J. Adverse effects on historic and archaeological resources could also occur as a result of induced growth around station areas.

The SCMAGLEV Project, in combination with other reasonably foreseeable future actions, would result in cumulative impacts to historic properties. Among the other reasonably foreseeable future actions, improvements to roadways and the NEC have the potential to impact historic properties, particularly where the right-of-way (ROW) expansion is planned and where induced development and redevelopment caused by those projects may occur. The proposed U.S. Department of the Treasury Currency Production Facility on property currently within BARC would result in significant adverse effects to the BARC Historic District due to visual changes. In addition, the Washington, D.C. to Baltimore Loop Project also has the potential to impact historic properties. Although Loop tunnels would be constructed approximately 30 to 90 feet below the surface to avoid these resources and tunnel boring machine launch shafts and Loop Stations would not require the demolition of existing historic buildings, adverse effects could occur if a permanent surface structure (e.g., ventilation shaft sites) were to be sited within or adjacent to a historic property. Section 106 of the National Historic Preservation Act (NHPA) regulates protection of historic properties and state, county and local regulations, where present, also provide for such protection; therefore, adverse cumulative effects can be minimized through compliance with these various regulations.

4.23.4.7 Visual and Aesthetic Resources

Each Build Alternative has the potential to result in high visual impacts in the vicinity of many resources, including but not limited to BARC, the BWP, Greenbelt, the United States Secret Service James J. Rowley Training Center, the Patuxent River and associated parks/refuge, and downtown Baltimore (see Section 4.9 Aesthetics, Visual Quality, and Light Emissions). Visual impacts could also occur as a result of induced growth around station areas.

The assessment of potential cumulative visual and aesthetic impacts focused on the SCMAGLEV Project in combination with other reasonably foreseeable future actions within the same viewshed. The analysis was focused on the portions of viaduct, station and facilities in the shared viewsheds because the tunnels would not cause visual impacts. Generally, other reasonably foreseeable future actions in the vicinity of the SCMAGLEV Project are anticipated to produce additional visual impacts, in particular projects that would result in a greater loss of trees and vegetation, for example by the addition of roadway travel lanes for the BWP widening and other roadway widening projects, and the proposed U.S. Department of the Treasury Currency Production Facility on property currently within BARC. The SCMAGLEV Project, in combination with these other reasonably foreseeable future actions, has the potential to result in cumulative visual impacts.

4.23.4.8 Air Quality

The SCMAGLEV Project has the potential to divert some existing and future road-based travelers to the SCMAGLEV service, thereby reducing vehicular emissions and benefiting air quality. However, there could be a slight increase in emissions around new stations due to increased traffic accessing the station locations.

Other reasonably foreseeable future projects include roadway improvements to address congestion and capacity improvements along the BWP and NEC. Each of these other projects would have incrementally positive or negative effects on air quality. However, since the SCMAGLEV Project would generally benefit regional air quality, it would reduce any potential cumulative adverse effects on air quality.

4.23.4.9 Noise and Vibration

As described in Section 4.17 Noise and Vibration, the Build Alternatives would have noise and vibration impacts on sensitive resources in proximity to the SCMAGLEV Project. Potential sources of noise and vibration include train operations including track, propulsion and aerodynamic noise, general noise at elevated passenger stations, fresh air and emergency egress facilities, electrical power substations, TMF sites, and maintenance of way (MOW) facilities. In addition, construction methods and equipment could result in temporary increases in noise and vibration levels at nearby sensitive receptors. Noise and vibration effects could also occur as a result of induced growth around station areas.

Generally, other reasonably foreseeable future actions in the vicinity of the SCMAGLEV Project are anticipated to produce additional noise and vibration, in particular projects that add capacity to the existing transportation system, such as airport runway extensions, new rail infrastructure, and other roadway widening projects as identified in **Table 4.23-1**. These road widenings would increase roadway capacity, which could increase noise and vibration levels. Airport improvements and runway extensions would make it feasible for larger and louder aircraft to take off and land in the area, and new rail infrastructure could allow for faster trains and a higher number of trains which could increase noise and vibration levels along the Northeast Corridor.

The SCMAGLEV Project, in combination with these other reasonably foreseeable future actions, has the potential to contribute cumulatively to noise and vibration impacts. Cumulative noise and vibration impacts would also result if construction activities for the SCMAGLEV Project and adjacent projects occur concurrently. However, during construction planning, the Project Sponsor will coordinate with other responsible parties to develop a SCMAGLEV Project construction plan that considers cumulative noise and vibration effects and identifies and implements mitigation strategies to the extent feasible. In addition, mitigation measures identified in Section 4.17 Noise and Vibration would reduce noise and vibration impacts from the SCMAGLEV Project to a large extent.

4.23.4.10 Environmental Justice (EJ)

As described in Section 4.5 Environmental Justice (EJ), FRA considered the location of block groups with EJ and non-EJ populations in relation to effects of the Build Alternatives by environmental resource. Impacts would occur along the length of the SCMAGLEV Project corridor particularly in proximity to the portions of the SCMAGLEV Project that would be constructed aboveground, including the stations, viaduct, tunnels, TMF sites, and ancillary facilities. Most environmental resources would experience some degree of direct impacts from the Build Alternatives. Generally, similar concentrations of impacts within EJ population areas would occur for each Build Alternative, as the large majority of SCMAGLEV Project Affected Environment qualifies as EJ and the Build Alternatives are in proximity of one another relative to the size of the block groups. In addition, SCMAGLEV Project-induced development could result in additional impacts on EJ populations in and around station areas.

Since the large majority of block groups surrounding the SCMAGLEV Project qualify as EJ, other reasonably foreseeable projects could have benefits and/or impacts on these populations. Potential benefits and impacts include acquisition and/or displacement, increasing or decreasing affordable housing opportunities, changing employment opportunities, affecting business operations, changing neighborhood character and access to community and park resources, visual, noise, and/or vibration effects, changing the availability of consumer goods and services, changing public health and safety conditions, changing access to transit, increasing or decreasing congestion on roadways, and air quality impacts. For example, the proposed U.S. Department of the Treasury Currency

Production Facility directly west of the BARC West TMF has been identified as having significant adverse impacts on EJ populations as a result of increased traffic.

The SCMAGLEV Project, in combination with these other reasonably foreseeable future actions, has the potential to result in cumulative impacts on EJ populations due to the high concentrations of EJ populations within the SCMAGLEV Project Affected Environment.

4.23.4.11 Utilities

As further described in Section 4.20 Utilities, each Build Alternative would require relocation, replacement, or support of existing utility infrastructure to accommodate SCMAGLEV Project elements, including viaduct, tunnel, and station and TMF construction. Such relocation would be done by and in coordination with the utility operators. In addition, SCMAGLEV Project-induced development could result in additional impacts on existing utilities in and around station areas.

All other reasonably foreseeable actions listed in **Table 4.23-1** would likely have impacts on existing utilities as they include large infrastructure and development projects and road widenings which often result in utility relocation. Thus, the SCMAGLEV Project, in combination with these other reasonably foreseeable future actions, has the potential to result in cumulative impacts on utilities. These additional effects on utility infrastructure and the need to relocate utilities must be considered in coordination with the utility operators as well as in coordination with other project sponsors where projects are co-located or affect the same infrastructure.

4.23.4.12 Energy

Suburbanization within the cumulative effects boundary and the increase in demand for housing since the end of World War II has increased energy needs to power and heat buildings, fuel automobiles and buses, and provide communications. As described in Section 4.19 Energy, the SCMAGLEV Project is expected to divert some existing and future travelers, particularly travelers that would otherwise drive. Thus, although the SCMAGLEV Project would incur an energy expenditure of approximately 4.3 trillion Btus/year, the net energy use after subtracting the 929 million – 1.025 trillion Btus/year reduction by traveler diversion would be nearly 3.3 – 3.4 trillion Btus/year. In addition, construction of the SCMAGLEV Project would consume 6 trillion Btus and additional energy may be expended as a result of SCMAGLEV Project-induced growth.

Currently committed transportation projects, other than the SCMAGLEV Project, are primarily focused on accommodating existing and future road-based and NEC rail travel. Growth in the number of automobiles and other road-based vehicles would increase demand for fuel. Foreseeable future development, such as those near the Mount Vernon Triangle in Washington, D.C, would incur greater energy demands than those experienced today.

The SCMAGLEV Project, in combination with these other reasonably foreseeable future actions, has the potential to result in cumulative impacts on energy as operation of the SCMAGLEV Project would add over 40 percent to regional transportation energy use which would also increase with the implementation of reasonably foreseeable projects as described above.

4.23.4.13 Natural Environment

Past and present development in the cumulative effects geographic boundary has impacted natural resources by converting forests, undeveloped land, and water resources including wetlands to manmade uses. Examples of impacts of past and present development impacts on the natural environment include the development and expansion of BWI Marshall Airport and its vicinity. Previously undeveloped land was converted to transportation and commercial uses, resulting in new impervious surfaces and placement of waterways in underground pipes under pavement. These actions, as well as other conversions of natural areas to human uses have reduced the area of natural floodplains and ecosystems that manage flooding, support good water quality and sustain natural productivity.

As described in Section 4.10 Water Resources, the SCMAGLEV Project would contribute to further reduction of natural areas where SCMAGLEV Project elements would be placed in undeveloped or pervious areas. Each Build Alternative would directly and permanently impact watersheds as a result of grading, vegetation clearing, new structures, and conversion of pervious to impervious surfaces. Permanent watershed impacts range from approximately 900 acres to 1,100 acres of overall watershed impact. Each Build Alternative would also introduce new impervious surfaces to the landscape, result in clearing of vegetation, and have the potential for downstream impacts within the watershed, specifically to water quality. Impacts to groundwater would also occur, particularly resulting from areas of deep tunnel in the Patapsco aquifer and Patuxent aquifer within or near well-head protection areas (WHPA) and the MD 198 and BARC Airstrip TMFs which are also located within identified WHPAs. Impacts to floodplains would occur primarily due to above ground viaduct, long-term construction laydown areas associated with the Cherry Hill Station, and construction of the MD 198 and BARC Airstrip TMFs. The Patuxent River, a state Scenic River, would be impacted by a viaduct span over the river and associated piers, and the viewshed would be altered due to clearing of vegetation and construction of viaduct and piers. Impacts to Chesapeake Bay Critical Area would also occur due to stations within the City of Baltimore and fresh air emergency egress (FA/EE) in the vicinity of the Anacostia and Patapsco Rivers. As further detailed in Section 4.11 Wetlands and Waterways, although impacts to wetlands would occur throughout many areas where surface features exist, a large amount of wetland impacts and Nontidal Wetlands of Special State Concern (NTWSSC) impacts can be attributed to the MD 198 TMF and BARC Airstrip TMF.

As described in Section 4.12 Ecological Resources, the greatest potential impacts on ecological resources would occur in areas where permanent structures would replace habitat, in areas of vegetation removal or alteration of habitat (e.g., shading of normally open areas or forest fragmentation), and destruction of individual plants or animal habitats

during construction. Depending on Build Alternative, many of the effects would occur within the PRR, City of Greenbelt property, and Maryland-National Capital Parks and Planning Commission (M-NCPPC) park property. The three TMF options would result in substantial impacts to forests, forest interior dwelling species (FIDS) habitat, and Sensitive Species Project Review Areas (SSPRA).

Other reasonably foreseeable actions listed in **Table 4.23-1**, particularly those that expand existing roadways and develop new land uses (such as the proposed U.S. Department of the Treasury Currency Production Facility at BARC), would further reduce natural areas and their functions by creating new impervious surfaces and potentially impacting water and ecological resources.

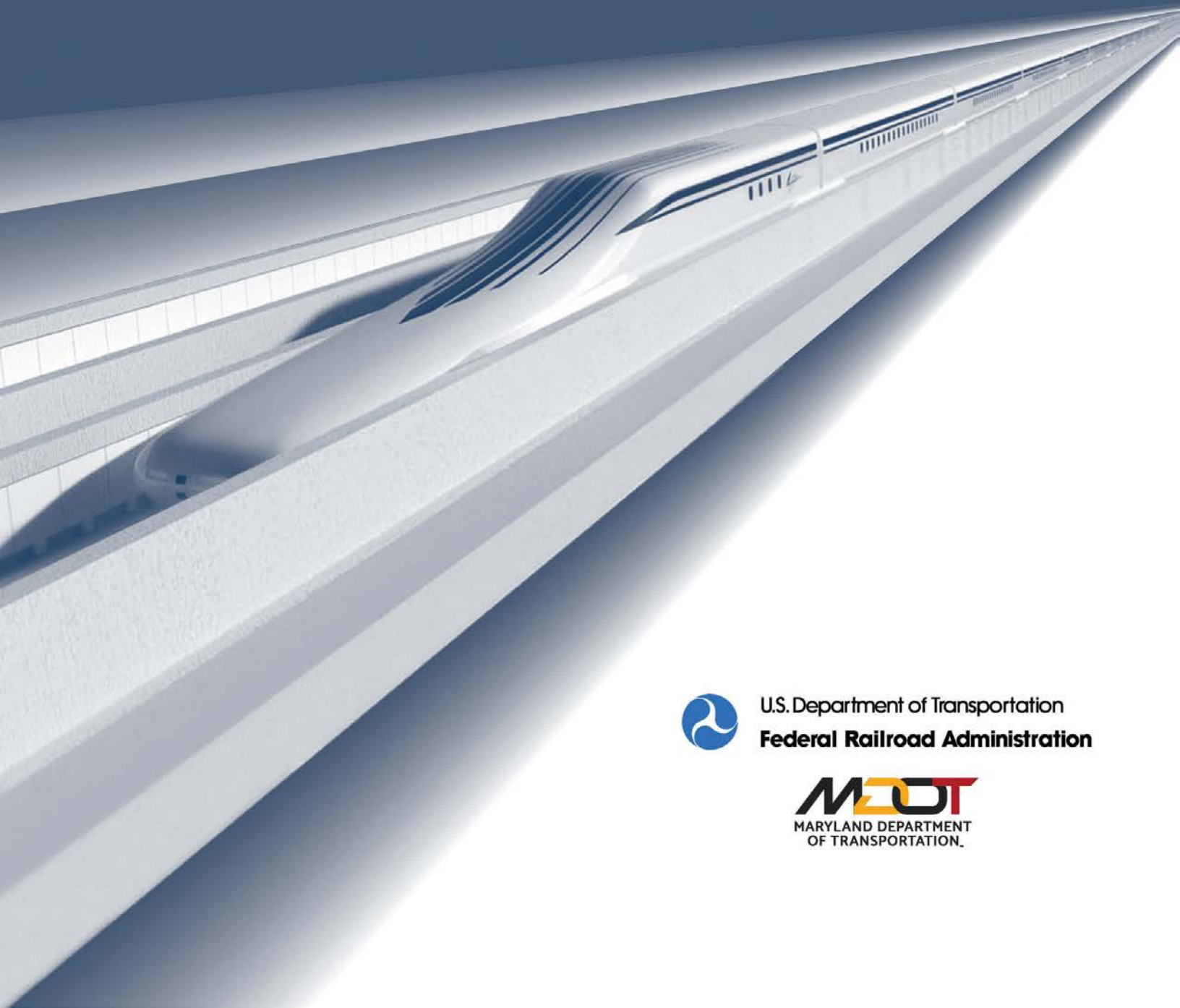
The SCMAGLEV Project, in combination with these other reasonably foreseeable future actions, has the potential to result in cumulative effects on natural resources although the SCMAGLEV Project would be compliant with Federal, state and local laws and regulations. Potential impacts on natural resources such as forests, waterways and wetlands are governed by these laws and regulations, which are intended to guide development to prevent or minimize degradation or loss of natural resources on which human health and welfare depend. As the SCMAGLEV Project design advances, and in consultation with regulatory agencies, the Project Sponsor would examine ways to avoid or minimize natural resources impacts and would mitigate SCMAGLEV Project-related impacts as required by Federal and state laws.

Section 4.24

Irreversible and Irretrievable Commitment of Resources

BALTIMORE-WASHINGTON SUPERCONDUCTING MAGLEV PROJECT

DRAFT ENVIRONMENTAL IMPACT STATEMENT AND
SECTION 4(f) EVALUATION



U.S. Department of Transportation
Federal Railroad Administration



4.24 Irreversible and Irretrievable Commitment of Resources

In accordance with the National Environmental Policy Act (NEPA), 42 U.S.C. § 4321 et seq., the Council on Environmental Quality (CEQ) regulations, 40 C.F.R. Parts 1500 - 1508, and the Federal Rail Administration's (FRA) Procedures for Considering Environmental Impacts, 64 Fed. Reg. 28545 (May 26, 1999), FRA assessed any irreversible and irretrievable commitments of resources which would be involved in the proposed action should it be implemented. An irreversible and irretrievable commitment of resources results in the permanent loss of a resource for future uses (or alternative purposes) as the resources cannot be replaced or recovered.

If implemented, the Superconducting Magnetic Levitation Project (SCMAGLEV Project) would result in irreversible and irretrievable commitments of resources. Resources considered scarce or rare, such as ecologically sensitive areas and historic resources are of particular concern. The No Build Alternative would not require an irreversible and irretrievable commitment of resources as related to this Project. Construction of any of the Build Alternatives would require the irreversible and irretrievable commitment of identified natural and cultural resources as well as energy.

4.24.1 Commitment of Resources

Chapter 4 provides an overview of all resources that could be impacted by the SCMAGLEV Project. Scarce and rare resources identified in the SCMAGLEV Project Affected Environment include natural resources (i.e., wetlands, ecologically sensitive areas, forests), historic resources (i.e., architectural/archaeological resources), and energy. The following provides a qualitative assessment of the types of effects that would result in irreversible and irretrievable commitments of resources. These effects would include impacts to both above and below ground resources due to surface and underground Project elements.

4.24.1.1 Natural Resources

As described in Sections 4.10 through 4.12, the Build Alternatives would permanently impact forests, ecologically sensitive areas, and water resources, including wetlands, streams, and floodplains. Forest clearing, grading, and land development associated with the Build Alternatives would directly impact these resources, most notably along the surface components of each Build Alternative. Natural resource impacts occur primarily where Build Alternative elements would be on undeveloped land on the following properties: National Park Service (NPS) Property, Beltsville Agricultural Research Center (BARC), the Patuxent Research Refuge (PRR), and Fort George G. Meade. Degradation of resource quality, fragmentation, and/or loss of these natural resources as a result of the impacts is irreversible.

The Project Sponsor proposes a mix of underground deep tunnel and aboveground elevated guideway (viaduct) in each Build Alternative to avoid or minimize impacts to natural resources. However, impacts to natural resources cannot be completely avoided. To address impacts, FRA considered avoidance, minimization, and mitigation

measures. In addition, the Project Sponsor will coordinate with agencies having jurisdiction over the affected natural resources to examine ways to further reduce impacts to natural resources and to develop appropriate and specific mitigation strategies.

Permanent increases in impervious surfaces from construction of the Build Alternatives would result in additional stormwater runoff, which can and will be mitigated by compliance with Washington, D.C.'s and Maryland's stormwater management requirements. Impacts to freshwater wetlands and waters of the U.S. will require a permit under Section 404 of the Clean Water Act, and associated mitigation measures. Mitigation strategies are typically resource-specific and could include such measures as use of best management practices (BMPs) during construction, observing time of year activity restrictions for sensitive natural resources, and providing replacements or enhancements to the impacted natural resources.

Additional, construction-related impacts to natural resources related to staging and work areas used temporarily by construction crews could be irretrievable. Construction work areas at waterway crossings and ancillary facilities would be larger in size than the footprint of the permanent structures. The Project Sponsor would restore temporarily disturbed areas to the original state, to the extent feasible to minimize the irretrievable commitment of resources related to temporary construction impacts.

4.24.1.2 Cultural Resources

Permanent impacts/displacements of cultural resources would be an irretrievable commitment of resources. As described in Section 4.8, Cultural Resources, each Build Alternative has the potential to impact cultural resources. Permanent and temporary construction impacts to cultural resources have been identified as occurring from proposed earthmoving activities, removal of existing structures, and visual changes that change the context of a historic setting. Once physically disturbed, cultural resources cannot be replaced.

FRA is coordinating with Washington, D.C. and Maryland state historic preservation officers to identify potential effects of the Build Alternatives and to identify avoidance, minimization and mitigation strategies. A Draft Programmatic Agreement (PA) has been prepared and coordinated with the consulting parties. [The Draft PA is included in Appendix D.8 for public review and comment.]

4.24.1.3 Energy

The Build Alternatives would require in an irreversible commitment of energy resources. The direct energy consumption of each Build Alternative during operation of the SCMAGLEV train and ancillary facilities is estimated to be 4.3 trillion British thermal units (BTUs) annually, an expected net increase in energy consumption of 3.3-3.4 trillion BTUs over the No Build Alternative (see Section 4.19, Energy). While energy sources such as fossil fuels are not currently considered rare, once used, they cannot readily be replaced. During construction activities, energy usage and consumption of gas and diesel fuel may increase, but it would not be a permanent increase. Section 4.19, Energy, provides further discussion on the potential use of renewable energy sources and energy efficiencies to mitigate impacts and decrease energy use.

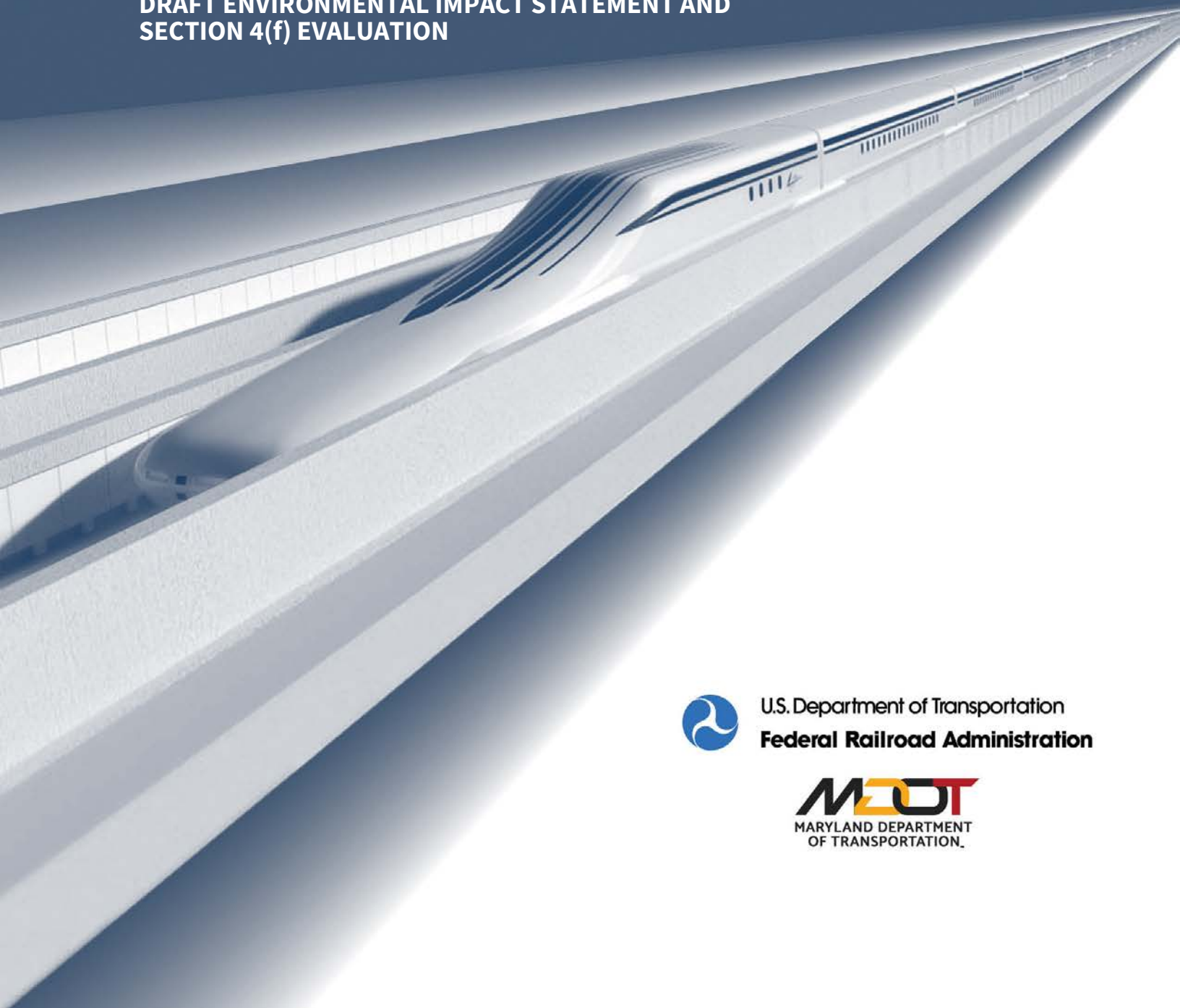
4.24.1.4 Mitigation

Additional specific mitigation measures related to each of resources discussed above can be found in their respective chapters.

Chapter 5

Public Involvement and Agency Coordination

BALTIMORE-WASHINGTON SUPERCONDUCTING MAGLEV PROJECT DRAFT ENVIRONMENTAL IMPACT STATEMENT AND SECTION 4(f) EVALUATION



U.S. Department of Transportation
Federal Railroad Administration



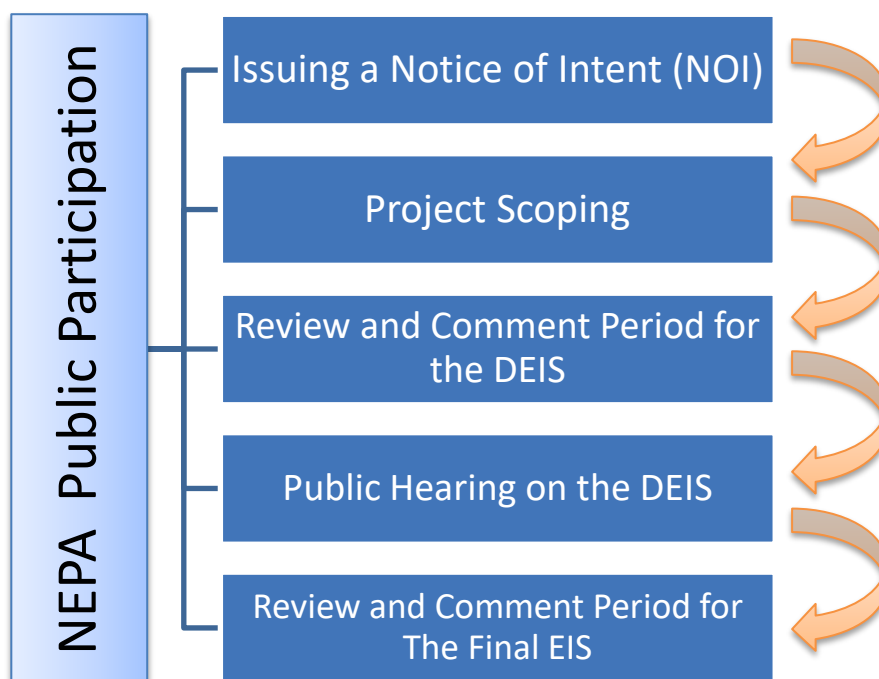
Chapter 5: Public Involvement and Agency Coordination

Members of the public, elected officials, regulatory agencies, and community organizations play an important role in the National Environmental Policy Act (NEPA) process. The Federal Railroad Administration (FRA) gathered public and agency input throughout the duration of this study and has used their input to guide the development of project scoping, Purpose and Need, alternatives development, and the identification of potential impacts and areas of special concern.

This chapter reviews the public involvement and agency coordination efforts conducted by FRA as part of this Draft Environment Impact Statement (DEIS). All public and agency comments received to date have been recorded and included as part of the formal record. FRA will continue to solicit and consider all additional comments received throughout the remainder of the NEPA process.

The NEPA regulations require that the public have access to project information and are provided opportunities to work with FRA to better understand Superconducting Magnetic Levitation Project (SCMAGLEV Project) affects and ultimately communicate with decision makers to voice support and/or opposition to proposed project elements and impacts. **Figure 5.0-1** provides an overview of public involvement opportunities.

Figure 5.0-1: The Five Key Steps for NEPA Public Participation Council on Environmental Quality (CEQ) NEPA Regulations (40 C.F.R. 1501.7)



In preparing this document, FRA engaged elected officials, agency stakeholders, community groups, business organizations, environmental justice communities, local

media, and the public, to solicit feedback on the SCMAGLEV Project. FRA engagement activities included, but were not limited to, the following:

- Prepared and distributed of informational materials (e.g., newsletters, maps, and data) and reports;
- Developed and maintained a SCMAGLEV Project website which included project documentation, information, and interactive online mapping with an integrated commenting tool;
- Hosted Public Scoping Meetings;
- Hosted Public Purpose and Need and Initial Alternatives Meetings;
- Hosted Public Preliminary Alternative Screening Meetings;
- Hosted Public Open House Meeting in Cherry Hill/Patapsco Avenue area of Baltimore City;
- Hosted meetings with community associations upon request;
- Hosted resource and regulatory agency meetings;
- Hosted meetings with local and state elected officials;
- Conducted Environmental Justice outreach and coordination with Environmental Justice community officials; and,
- Provide notification and circulation of this DEIS, which will be followed by public hearings to receive formal testimony from residents, business owners, and elected officials.

5.1 Notice of Intent

FRA published the Notice of Intent (NOI) to prepare an Environmental Impact Statement (EIS) in Volume 81, Number 227 of the *Federal Register* on Friday, November 25, 2016. The notice included the following:

- A brief description of the SCMAGLEV Project;
- Contact information for members of the Project Team Members;
- An explanation of Project Team Member roles;
- A list of applicable laws and executive orders;
- Project funding information;
- The Project's Draft Purpose and Need Statement;
- Background on NEPA and the scoping process; and,
- Dates of public scoping meetings.

The full NOI is included in Appendix E.1.

5.2 Public Communication

5.2.1 Public Involvement Activities

The SCMAGLEV Project included an open, participatory environmental review process. FRA informed and solicited early feedback from the public; encouraged open discussion of SCMAGLEV Project details and issues throughout DEIS development; and provided opportunities for public and agency comments and questions. See **Table 5.2-1** for a summary of public involvement milestones and associated outreach efforts.

Table 5.2-1: Public Involvement by NEPA Milestone

	Milestone							
	NOI	Scoping	Initial Alternatives	Preliminary Alternatives	Retained Alternatives	DEIS	FEIS	ROD
Website https://www.bwmaglev.info/	✓	✓	✓	✓	✓	✓	✓	✓
Social Media	✓	✓	✓	✓	✓	✓	✓	✓
Mailing List	✓	✓	✓	✓	✓	✓	✓	✓
News and Print Media	✓	✓	✓	✓	✓	✓	✓	✓
Public Meetings (PM) and Hearings (H)	-	✓ (PM)	✓ (PM)	✓ (PM)	✓	✓ (H)	-	-
Presentations to Stakeholder Groups and Businesses	-	-	✓	✓	✓	✓	✓	-
Advertisement using MDOT MTA Outreach Tools	-	-	✓	✓	-	✓	✓	✓
USDOT Permitting Dashboard https://www.permits.performance.gov/	-	-	-	-	-	✓	✓	✓

5.2.2 Communicating with the Public

FRA and Maryland Department of Transportation (MDOT) Maryland Transit Administration (MTA) developed a public involvement plan which includes several outreach tools and activities to involve the public. The following is a list of activities:

- **Permitting Dashboard**

FRA added the SCMAGLEV Project to the United States Department of Transportation's (USDOT) Permitting Dashboard for Federal Infrastructure Projects (www.permits.performance.gov), an online tool for Federal agencies, project

developers and interested members of the public to track the Federal government's permitting and review process for large or complex infrastructure projects.

- **SCMAGLEV Project Website**

FRA and MDOT MTA launched the SCMAGLEV Project website on November 25, 2016 which can be found at www.bwmaglev.info. The website includes an overview of the SCMAGLEV Project and information on superconducting magnetic levitation technology, the NEPA process, SCMAGLEV Project documents, past and upcoming public meeting dates and locations, and public meeting displays and materials (**Figure 5.1-1**). The

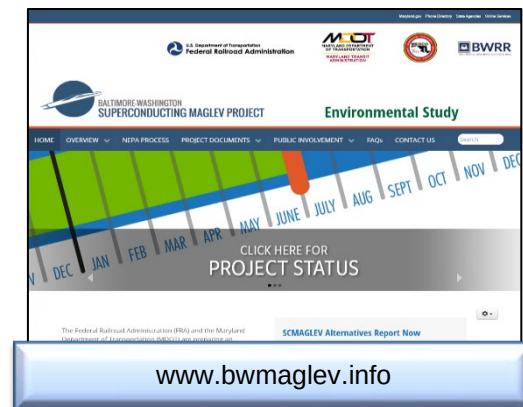
SCMAGLEV Project website allows interested parties to become involved in the NEPA process by joining the mailing list and locating contact information to reach out to Project Team Members. The SCMAGLEV Project website is the main source of SCMAGLEV Project information for the public and is updated as appropriate. The website provides critical published Project documents, interactive graphic Information System (GIS) mapping, a public survey/questionnaire, FAQ's, a Project milestone schedule, and a portal for concerned citizens to provide comments. SCMAGLEV Project information developed for the website and social media platforms has been formatted for optimized viewing on mobile devices. All public meeting advertisements and additional public outreach materials contain the website address and encourage readers to visit the site.

In addition to the SCMAGLEV Project website, other Federal, regional, and local jurisdictions and transportation agencies' websites, including websites for Maryland Department of Transportation, Maryland Transit Administration (MDOT MTA), FRA, Washington Metropolitan Area Transit Administration (WMATA), and District Department of Transportation (DDOT), have been used to periodically post project information such as meeting dates and locations for upcoming SCMAGLEV Project milestones.

- **Social Media**

The use of social media platforms is an effective way to disperse information quickly to a large audience. FRA and MDOT MTA used social media platforms to increase SCMAGLEV Project and superconducting magnetic levitation technology awareness, as well as provide information such as important dates, documents, and SCMAGLEV Project milestones. Social media can also be a powerful tool to solicit feedback from the public. FRA and MDOT MTA utilized social media to advertise public meetings and currently posts updates on the MDOT MTA's Facebook, Twitter and Instagram social media outlets.

Figure 5.1-1: Screen Capture of Project Website



- **Mailing List**

FRA and MDOT MTA developed a comprehensive mailing list that includes stakeholders such as community groups, chambers of commerce, neighborhood associations, interested residents, and elected officials. This list was used to announce the DEIS Publication and corresponding Public Hearings. FRA and MDOT MTA sent out postcards announcing the scoping meetings in December 2016 and preliminary alternatives open house meetings in April 2017, October 2017, December 2018. FRA continues to refine the process for reaching additional interested parties such as the wider general public and businesses through a constantly updated electronic mailing list using buffer areas surrounding the proposed alternatives for bulk mailings instead of using zone areas for bulk mail. The mailing list is used to inform interested parties about the SCMAGLEV Project status and meeting notifications. Stakeholders may request to be added to the mailing lists at public or interagency meetings, via the website or email. FRA and MDOT MTA will continue to add stakeholders to the list throughout the completion of the NEPA process.

- **SCMAGLEV Project Fact Sheets**

FRA developed SCMAGLEV Project fact sheets (in both English and Spanish) at key milestones for the SCMAGLEV Project, for the purposes of informing the general public about this EIS process, providing information on the SCMAGLEV Project, announcing public participation opportunities, and providing SCMAGLEV Project contact information.

- **Mass Email Distribution**

Mass email distribution (email blasts) have been used to inform the public, elected officials, and agency representatives about upcoming meetings and significant milestones in the NEPA process. Mass email blasts will be used for future meeting updates and SCMAGLEV Project activities and to disseminate announcements electronically.

- **Local Government and Stakeholder Briefings**

FRA has briefed the appropriate local government entities and stakeholders to provide information, answer questions, and receive feedback.

- **News and Print Media**

In addition to social media and the SCMAGLEV Project website, FRA and MDOT MTA used additional media outlets to advertise public meetings. FRA and MDOT MTA advertised the public scoping process, scoping meetings, and preliminary alternatives meetings in a variety of local media sources, including featured advertisements on afro.com, patch.com, the *Latin Opinion*, desktop and mobile pages for Anne Arundel County and Takoma Park, the *Prince George's County Sentinel*, *Baltimore Sun* desktop and touchscreen pages, the Transportation Research Board (TRB) iPad and mobile applications, and The *Washington Post* desktop and mobile pages. Additional media platforms, including print, internet,

radio, television, and billboards will be considered as the SCMAGLEV Project progresses through the completion of the NEPA process.

- **Meeting Fliers**

Meeting announcement fliers, in English and Spanish, have been mailed and/or emailed to the SCMAGLEV Project mailing list. Fliers have also been distributed to libraries, public community centers, and other community gathering places. Additional fliers may be provided announcing future meetings as the SCMAGLEV Project completes the NEPA process.

- **Mass Transit Advertisements**

FRA and MDOT MTA coordinated SCMAGLEV Project advertisements for potential use with regional and local mass transit agencies that operate within the Project Study Area. The advertisements are formatted to be featured in bus and train stations and stops, airports, and on vehicles and trains. The advertisements were used to inform current transit users about the SCMAGLEV Project and direct the public to the SCMAGLEV Project website for additional information regarding this EIS and public involvement process.

- **Environmental Justice Outreach**

The intent of the SCMAGLEV Project outreach is to ensure that stakeholders are provided opportunities to be heard and to participate meaningfully from the outset of the SCMAGLEV Project and throughout all phases of project development. Preliminary research has identified potential Environmental Justice communities in the Project Study Area. As part of the NEPA process, potentially impacted Environmental Justice communities within the Project Study Area have been included in the public outreach process so that they can participate meaningfully in review of the SCMAGLEV Project and its potential effects on the human environment.

Additional details about the Environmental Justice outreach efforts can be found in Section 4.5 of this document.

- **Limited English Proficiency (LEP) Outreach**

Individuals who do not speak English as their primary language and who have a limited ability to read, speak, write, or understand English are considered “limited English proficient,” or LEP. Federal laws concerning language access rights and obligations include Title VI of the Civil Rights Act of 1964 and Executive Order (EO) 13166, “Improving Access to Services for Persons with Limited English Proficiency”. The EO states that people with LEP should have meaningful access to federally conducted and funded programs and activities. The EO requires Federal agencies to examine the services they provide, identify any need for services to those with LEP, and develop and implement a system to provide those services so LEP persons can have meaningful access to them.

FRA has taken steps to provide meaningful access to those LEP individuals expected to be most regularly encountered. This includes providing SCMAGLEV Project materials and meeting notices in Spanish, advertising accommodations for LEP individuals, including the ability for LEP individuals to have translation services available at public meetings upon advance request. Language interpretation and translation needs in the Project Study Area predominantly involve Spanish speaking individuals. In addition, instantaneous web-translation of the SCMAGLEV Project website is available on-line in multiple languages.

- **Americans with Disabilities Act (ADA) and Section 508 Compliance**

To the extent possible, and in accordance with Federal, state, and local regulations, public outreach materials and events have been generated to comply with ADA and Section 508 requirements to accommodate disabled and/or elderly citizens. The ADA and Section 508 of the Rehabilitation Act guarantee that all people have equal access to goods, services, and communication. Section 508 regulations apply specifically to “information communication technology” for Federal government agencies and services. In addition, all meeting materials and communications have been designed with the intent to fully accommodate people with hearing and/or visual impairments (i.e., written transcripts, closed captioning, adjustable text size, and compatibility with computer automated screen readers). FRA and MDOT MTA also offer additional assistance through the Office of Customer and Community Relations at 410-767-3999 or 866-743-3682 or TTY 410-539-3497, through which sign language interpreters, foreign language interpreters, and assistance for the visually impaired are available upon request.

- **Public Comments**

Comment periods are required as part of the NEPA process during the NEPA Scoping phase and after the publication of the DEIS. Comment periods are advertised prior to the beginning of the commenting period and extend at least 30-45 days after they are announced. Comments received during the required comment periods are subsequently addressed in future iterations of the EIS.

In addition to these required commenting periods, FRA solicits feedback and comments from the public throughout the planning phase of the SCMAGLEV Project. The SCMAGLEV Project website includes comment forms and contact information for Project Team Members. During all scheduled public meetings and all SCMAGLEV Project meetings with citizens, businesses, advocacy groups and other stakeholders, feedback and comments are actively solicited from participants via onsite paper and electronic comment cards. For comments received outside of advertised comment periods, FRA collects and files the comments in a database. Comments are filed by category based on technical subject matter (e.g., wetlands, parklands, noise, etc.). Comments seeking response from FRA are filed as “response needed” and forwarded to the correct Project Team Members discipline lead for a response.

5.3 Public Outreach

Four rounds of public meetings have been held to date for the following: Scoping, informational public open houses for Purpose and Need and initial alternatives, informational open houses for preliminary alternatives screening, and an informational open house for the proposed station and trainset maintenance facility in the Cherry Hill/Patapsco Avenue area of Baltimore. FRA and MDOT MTA held the public scoping meetings in December 2016, the purpose and need and initial alternatives open house meetings in April 2017, the preliminary alternatives screening public open house meetings in October 2017, and the Cherry Hill/Patapsco Avenue Baltimore meeting in December 2018.

Following publication of this DEIS, FRA will host a series of public hearings. The public hearing(s) would include an open house, a presentation, and an opportunity for oral testimony recorded by a stenographer. FRA will not respond to the oral testimony at the meeting, and conversations with Project Team Members during the open house portion of the meeting would not be reflected in the SCMAGLEV Project record.

5.3.1 Public Scoping Process, Meetings and Comments – December 2016

Public notification of the SCMAGLEV Project and the NEPA process began in November 2016. The NOI published in the *Federal Register* on November 25, 2016 marked the official beginning of the scoping outreach process and comment period. FRA held a series of public scoping meetings in December 2016, and the associated public scoping comment period ended on January 9, 2017 (after 45 days). However, feedback from the public and any stakeholder is accepted throughout the NEPA process.

Scoping outreach and notification conducted by FRA include the NOI published in the *Federal Register*; the SCMAGLEV Project website; social media (i.e., Facebook, Instagram, etc.); postcard mailings to community groups, chambers of commerce, and neighborhood associations; letters and phone calls to elected officials; and flier distribution at community centers, recreation centers, libraries, and community organizations. Outreach and notification activities utilized U.S. Census and GIS data from the geographic extent of the defined Project Study Area to develop a coordinated mailing list that would emphasize communication with EJ communities.

FRA and MDOT MTA sent a total of 669 postcard mailings to community groups, chambers of commerce, and neighborhood associations in early December 2016. FRA defined the mailing list based upon proximity to proposed alternative alignments

FRA sent letters to elected officials whose jurisdictions intersect the Project Study Area. These included:

- U.S. Senators and representatives;

- State of Maryland senators and delegates;
- Anne Arundel, Baltimore, Howard, and Prince George's County executives and councilmembers;
- Councilmembers and mayors that represent 23 cities and towns, including Baltimore City, MD and Washington, D.C.; and,
- District of Columbia Advisory Neighborhood Commission (ANC) chairpersons.

Letters to elected officials featured a description of the SCMAGLEV Project, a list of relevant laws, the deadline for sending scoping comments, Project Study Area map, information on the upcoming public scoping meetings, and addresses (both e-mail and physical) for comments. A sample letter sent to elected officials is included in Appendix E.3. Follow-up phone calls and/or e-mails were made each state-wide, district-wide, and county-wide elected official within the Project Study Area, as well as to at least one elected representative for each town, municipality, and ANC (in Washington, D.C.), during the week of December 5, 2016.

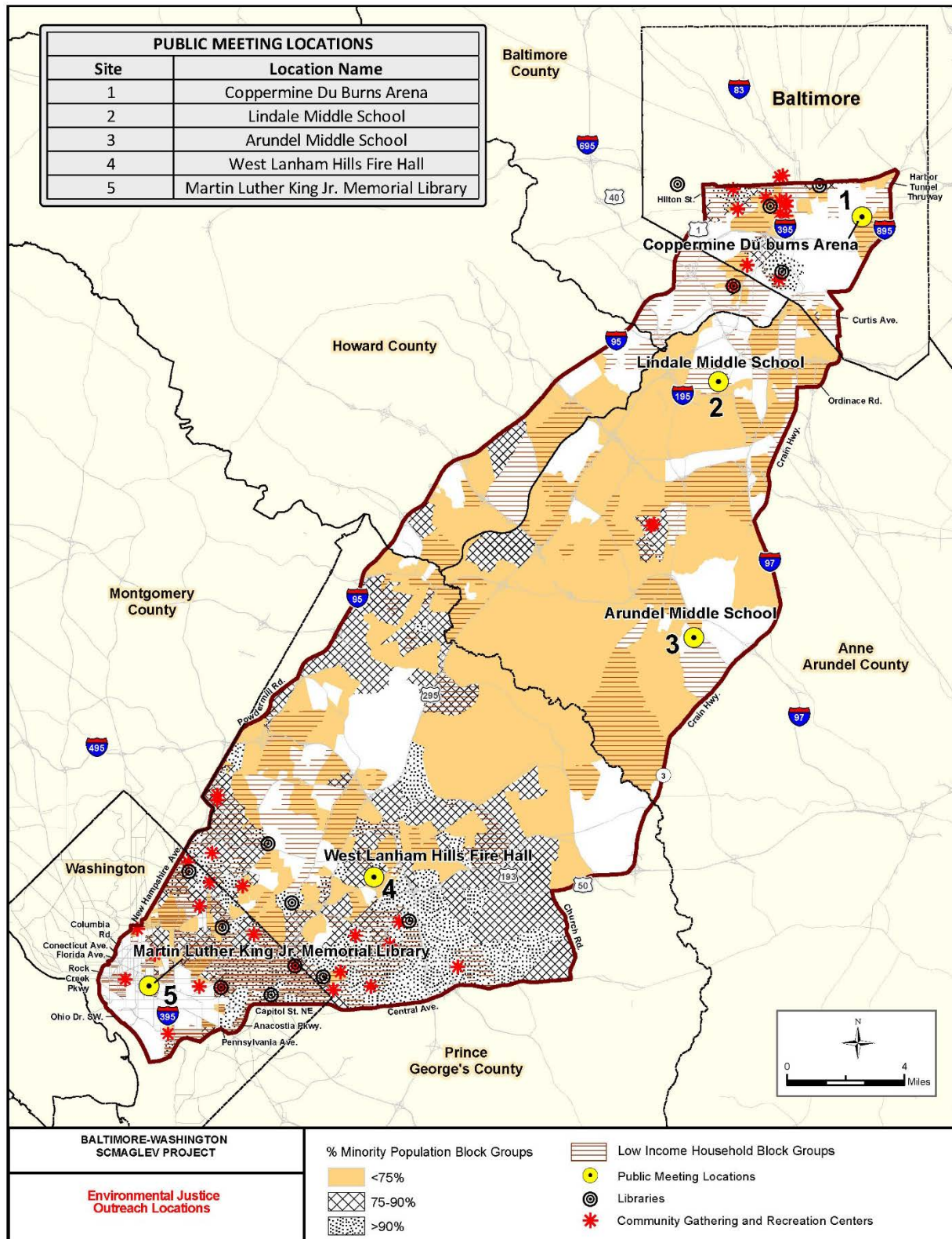
FRA and MDOT MTA advertised the public scoping process and scoping open house meetings in a variety of local media sources. FRA featured advertisements on the MDOT MTA's Instagram and Facebook pages; afro.com; the patch.com; desktop and mobile pages for Anne Arundel County and the City of Takoma Park; the *Prince George's County Sentinel*; *The Baltimore Sun* desktop and touchscreen pages; the Transportation Research Board (TRB) iPad and mobile applications, and *The Washington Post* desktop and mobile pages. These advertisements garnered over 500,000 impressions.

EJ communities, populations with high concentrations of minority and/or low-income individuals, may be less likely to view online communications. To reach these communities, on December 5, 2016 FRA and MDOT MTA distributed hard copy fliers in person or via mail to the 58 different locations, listed by type in **Table 5.3-1** and shown **Figure 5.3-1** (the addresses of the flier distribution locations are provided in Appendix E.3).

Table 5.3-1: Scoping Flier Distribution

Location Type	District of Columbia	Prince George's County	Anne Arundel County	Baltimore City/County	Total
Community Organizations	5	2	0	4	11
Libraries	6	4	0	5	15
Community Centers	0	10	0	0	10
Recreation Centers	8	1	1	2	12
Health Centers	0	1	0	1	2
Transit Stops	0	0	0	8	8
Total	19	18	1	20	58

Figure 5.3-1: Environmental Justice Communities and Scoping Flier Distribution Locations



5.3.2 Scoping Public Open House Meetings – December 2016

FRA conducted five public open house meetings throughout the Project Study Area in mid-December 2016. These open house meetings provided opportunities for members of the public and elected officials to learn about the SCMAGLEV Project by speaking with the Project Team Members and viewing the display boards shown in Appendix E.5. Attendees could also submit their comments and concerns via comment forms and survey cards. Approximately 150 people attended the open houses and 57 people submitted comments at the meetings, as shown in **Table 5.3-2**.

In addition to the 57 comments submitted at the public meetings, 16 comments were submitted via the SCMAGLEV Project e-mail and two comments were submitted via mail, for a total of 75 comments. All 75 public comments are provided in Appendix E.3. The Project Team Members categorized these comments into 20 topics, as shown in **Table 5.3-3**.

Table 5.3-2: Scoping Public Open House Meeting Dates and Times

Date	Time	Location	Address	Sign-Ins	Comments
Saturday, December 10, 2016	10 am – 12 pm	Lindale Middle School	415 Andover Road, Linthicum, MD 21090	44	32
Monday, December 12, 2016	5 pm – 7 pm	Arundel Middle School	1179 Hammond Lane, Odenton, MD 21113	29	11
Tuesday, December 13, 2016	5 pm – 7 pm	Coppermine Du Burns Arena, Harbor Side Hall	3100 Boston Street, Baltimore, MD 21224	37	7
Wednesday, December 14, 2016	5 pm – 7 pm	Martin Luther King, Jr. Memorial Library	901 G Street, NW, Washington, D.C. 20001	24	5
Thursday, December 15, 2016	5 pm – 7 pm	West Lanham Hills Fire Hall	8501 Good Luck Road, Lanham, MD 20706	18	2
Total				152	57

Table 5.3-3: Comments by Topic

Topic	Number of Comments*	Percent of Comments*
Alignment	19	25%
Cost (total project cost or ticket price too high)	18	24%
Station Locations/Number of Stations	17	23%
Support Project	16	21%

Topic	Number of Comments*	Percent of Comments*
Oppose Project	16	21%
Outreach	15	20%
Improve Existing Infrastructure	13	17%
Financing (Public vs. Private funding, Federal vs. State funding, etc.)	13	17%
Safety	10	13%
Wildlife	8	11%
Noise	7	9%
Technology	6	8%
Traffic	5	7%
Parking	4	5%
Operations	4	5%
Air Quality (includes climate change-related concerns due to carbon emissions)	2	3%
Floodplains, Wetlands, and Waterway	2	3%
Construction	2	3%
Environmental Justice	1	1%
Aesthetics	1	1%

*Number of comments totals more than 75 because many comments addressed more than one topic. Similarly, percent of comments total greater than 100 percent. Percentages are rounded to the nearest 1 percent.

5.3.3 Purpose and Need and Initial Alternatives Public Open House Meetings – April 2017

The Project Team Members encouraged agency and public input throughout the SCMAGLEV Project Purpose and Need development and the development of the initial alternatives. The Project Team Members facilitated two agency and five public meetings and maintained a SCMAGLEV Project website and SCMAGLEV Project e-mail account. Input from these meetings informed the *Preliminary Alternatives Screening Report* and was used to identify potential impacts for further research.

FRA and MDOT MTA informed the public of the SCMAGLEV Project Purpose and Need and initial alternatives outreach phase via the SCMAGLEV Project website (www.bwmaglev.info) and via notices posted in local and major newspapers; at community and neighborhood organizations; and sent to Federal, state, county, and local officials. FRA and MDOT MTA also distributed fliers to community centers.

FRA and MDOT MTA held a series of five public open houses, shown in **Table 5.3-4**, throughout the Project Study Area. The open houses included 20 display boards focused on the SCMAGLEV Project Purpose and Need and preliminary alternatives

screening process. Preliminary alternatives mapping was available for review and Project Team Members were present to explain the boards and answer questions.

Table 5.3-4: Purpose and Need and Initial Alternatives Open House Meetings

Date	Time	Location	Address	Sign-Ins	Comments
Monday, April 3, 2017	5:30 pm – 7:30 pm	Baltimore War Memorial	101 N. Gay Street Baltimore, MD 21202	8	1
Tuesday, April 4, 2017	5:30 pm – 7:30 pm	Lindale Middle School	1179 Hammond Lane, Odenton, MD 21113	23	4
Wednesday, April 5, 2017	5:30 pm – 7:30 pm	Bowie Community Center	3209 Stonybrook Drive Bowie, MD 20715	97	41
Thursday, April 6, 2017	5:30 pm – 7:30 pm	Cheverly Town Hall	6401 Forest Road Cheverly, MD 20785	14	1
Saturday, April 8, 2017	10:00 am – 12:00 pm	Courtyard Marriott	1325 2nd Street, NE Washington, D.C. 20002	13	5
Total				155	52

Using the same process as the Public Scoping Open House Meetings, FRA and MDOT MTA advertised the Purpose and Need and Initial Alternatives public open house meetings in a variety of local media sources. Advertisements were featured on the MDOT MTA's Instagram and Facebook pages; afro.com; the patch.com; desktop and mobile pages for Anne Arundel County and the City of Takoma Park; the *Prince George's County Sentinel*; *The Baltimore Sun* desktop and touchscreen pages; the Transportation Research Board (TRB) iPad and mobile applications, and *The Washington Post* desktop and mobile pages.

Keeping consistent with the approach used for the scoping public open house meetings, FRA and MDOT MTA distributed hard copy fliers to EJ communities and areas with high concentrations of minority and/or low-income individuals in March 2017 in person or via mail to the 58 different location types listed in **Table 5.3-5**.

Table 5.3-5: Purpose and Need and Initial Alternatives Open House Flier Distribution

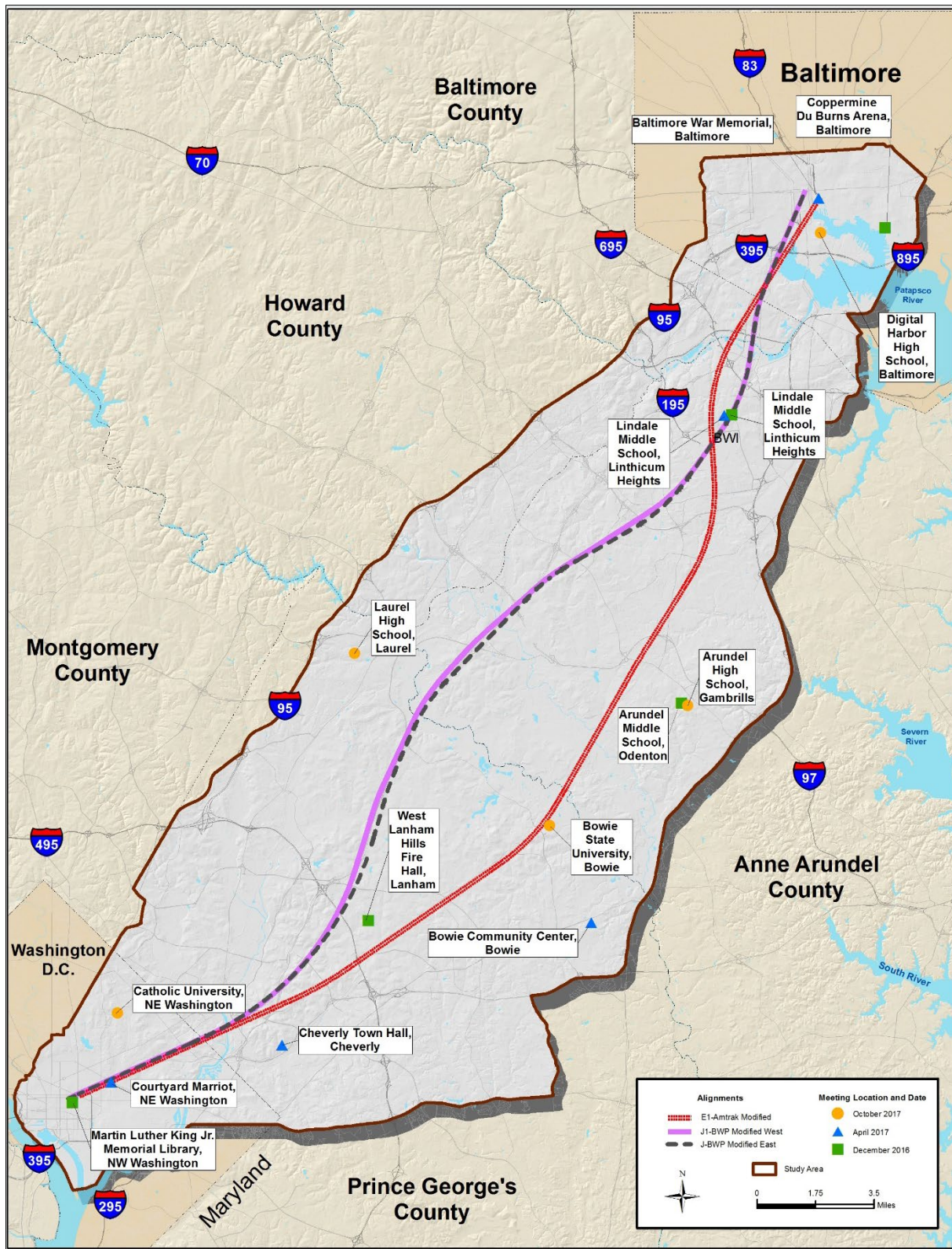
Location Type	District of Columbia	Prince George's County	Anne Arundel County	Baltimore City/County	Total
Community Organizations	5	2	0	4	11
Libraries	6	4	0	5	15
Community Centers	0	10	0	0	10
Recreation Centers	8	1	1	2	12
Health Centers	0	1	0	1	2
Transit Stops	0	0	0	8	8
Total	19	18	1	20	58

5.3.4 Preliminary Alternatives Screening Public Open House Meetings – October 2017

Similar to the prior public meetings, FRA and MDOT MTA informed the public of the revised Draft SCMAGLEV Project Purpose and Need and preliminary alignments during outreach via the SCMAGLEV Project website (<http://www.bwmaglev.info>) and notices posted in local and major newspapers; on-line social media and advertisements; notices posted at community and neighborhood organizations; and notices sent to Federal, state, county, and local officials. FRA and MDOT MTA also distributed Fliers to community centers and to EJ sensitive locations. FRA and MDOT MTA held a third round of five public open houses to present the findings of the draft Preliminary Alternatives Screening Report (PASR) in October 2017. See **Figure 5.3-2** for a map illustrating the locations of the public open house meetings and the preliminary alternatives presented at that time.

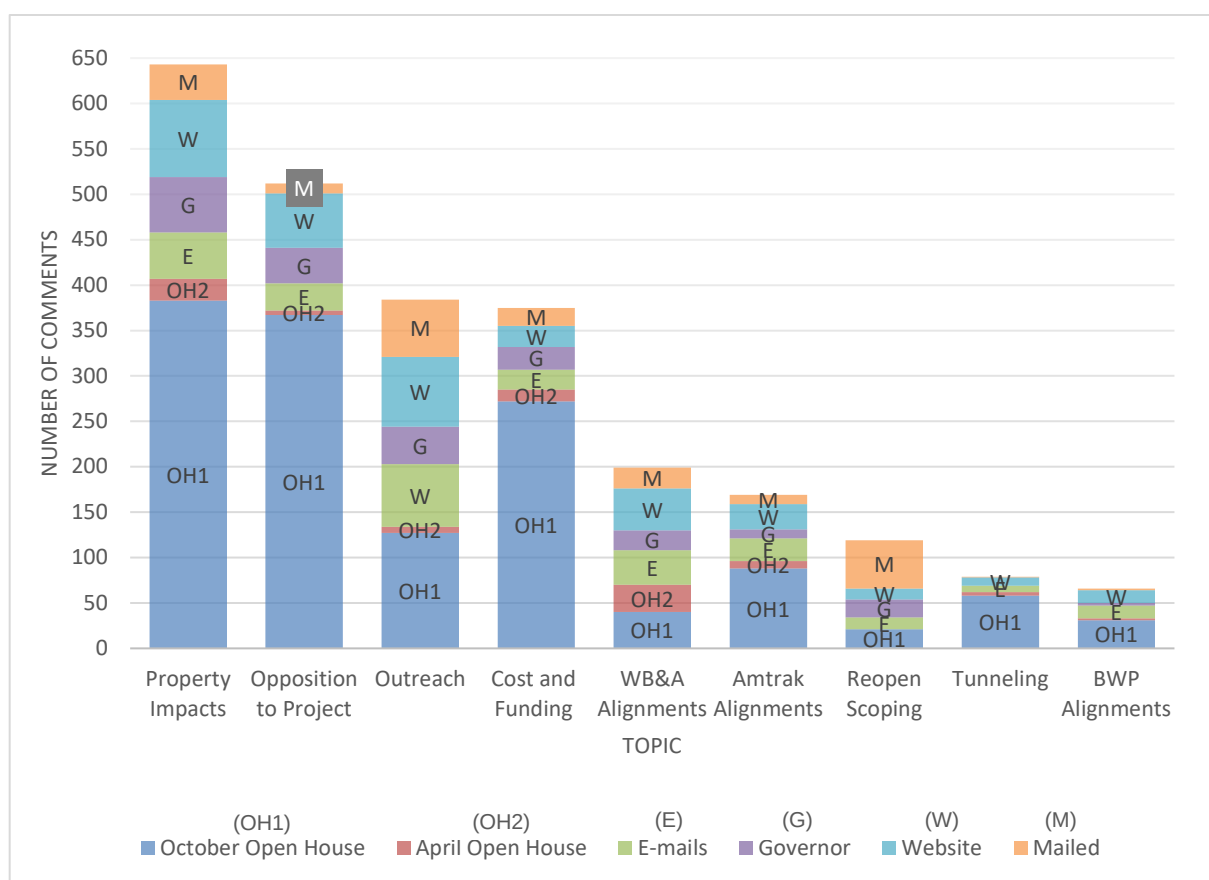
In October 2017, the open houses focused on the draft PASR results, with large (1" = 600' scale) maps of the three alignments recommended for further study on tables for viewing. Project Team Members were present to explain the maps, boards, answer questions, and also encourage the public to comment on the SCMAGLEV Project. A total of 1,526 people signed in at the five preliminary alternative screening public open house meetings and submitted 653 comments.

Figure 5.3-2: Preliminary Alternative Alignments and Public Open House Meeting Locations



In addition to comments received at the Purpose and Need and preliminary alternative screening public open house meetings (April 2017 and October 2017), FRA and MDOT MTA also received 210 comments via the SCMAGLEV Project website comment form; 161 comments via the SCMAGLEV Project e-mail account (info@bwmaglev.info) or e-mail accounts of individual Project Team Members; 99 comments via the Governor's Office e-mail account; and 64 comments via mail; for a subtotal of 1,239 comments. **Figure 5.3-3** provides a summary of public comments and topics.

Figure 5.3-3: Summary of Public Comments from April 2017 and October 2017 Purpose and Need and Preliminary Alternatives Screening Open House Meetings



FRA and MDOT MTA analyzed written comments leading up to and including the second round of public meetings in mid-April 2017 through the completion of the third round of public meetings in late October 2017. This period coincided with the development and screening of preliminary alignments. The top comment types are noted below:

- Property Impacts – 643 or 52 percent of comments addressed property impacts, including property devaluation and use of eminent domain. Property impacts are the public's top concern, and this sentiment has grown, particularly in the Bowie

area since the April meetings.

- Opposition to the SCMAGLEV Project – 512 or 41 percent of comments expressed direct opposition to the SCMAGLEV Project (not just specific alignments).
- Outreach – 384 or 31 percent of comments addressed public outreach, including 119 or 10 percent specifically requesting re-opening the scoping process due to “insufficient notification.”
- Cost and Funding – 375 or 30 percent of comments addressed SCMAGLEV Project cost and funding, including ticket price, taxes, and overall cost of the SCMAGLEV Project.
- Washington, Baltimore & Annapolis Trail Alignments (WB&A) – 199 or 16 percent of comments addressed the WB&A Alignments, including opposition to the alignments and questions or comments about how resources (particularly homes) would be impacted by the alignments.
- Amtrak Alignments – 169 or 14 percent of comments addressed the Amtrak Alignments. Further analysis of the comments regarding Amtrak Alignments showed 24 or 2 percent are in support of the Amtrak Alignments, while 87 or 7 percent are in opposition.
- Tunneling – 79 or 6 percent of comments addressed tunneling, including potential impacts from construction and vibration.
- Baltimore-Washington Parkway (BWP) Alignments – 66 or 5 percent of comments addressed the BWP Alignments. Further analysis of the comments regarding BWP Alignments showed 48 or 4 percent are in support of the BWP Alignments while 13 or 1 percent are in opposition.

Other comments included:

- Large numbers of attendees at the October meetings in Bowie and Gambrills (approximately 1,160 of the total 1,526 attendees that signed in) expressed concerns citing direct impacts to historic “old town” Bowie, Odenton, and surrounding areas.
- Although 6 percent of comments expressed concern with the impacts of tunneling, review agencies and some members of the public appeared to favor alignments with greater underground (tunneling) lengths as compared to alignments that would be above ground (elevated).
- Some meeting attendees and review agencies expressed concerns regarding impacts to natural and environmentally sensitive areas including Patuxent Research Refuge (PRR), Fran Uhler Natural Area, Saw Hill Creek, and Midland Park.
- Meeting attendees also raised concerns regarding a viaduct structure and Rolling Stock Depot (now referred to as Trainset Maintenance Facility or TMF) facility altering the landscape surrounding Bowie State University, which is a

historically black university and on the National Register of Historic Places.

- Meeting attendees also noted that Alignment E1 would impact Odenton Volunteer Fire Company, the only fire station in Odenton, and Bowie Assisted Living, Inc., the only proximate facility of its kind according to residents. Some meeting attendees and review agencies noted that Fort George G. Meade gun range and a closed sanitary landfill would be traversed with Alignment E1.

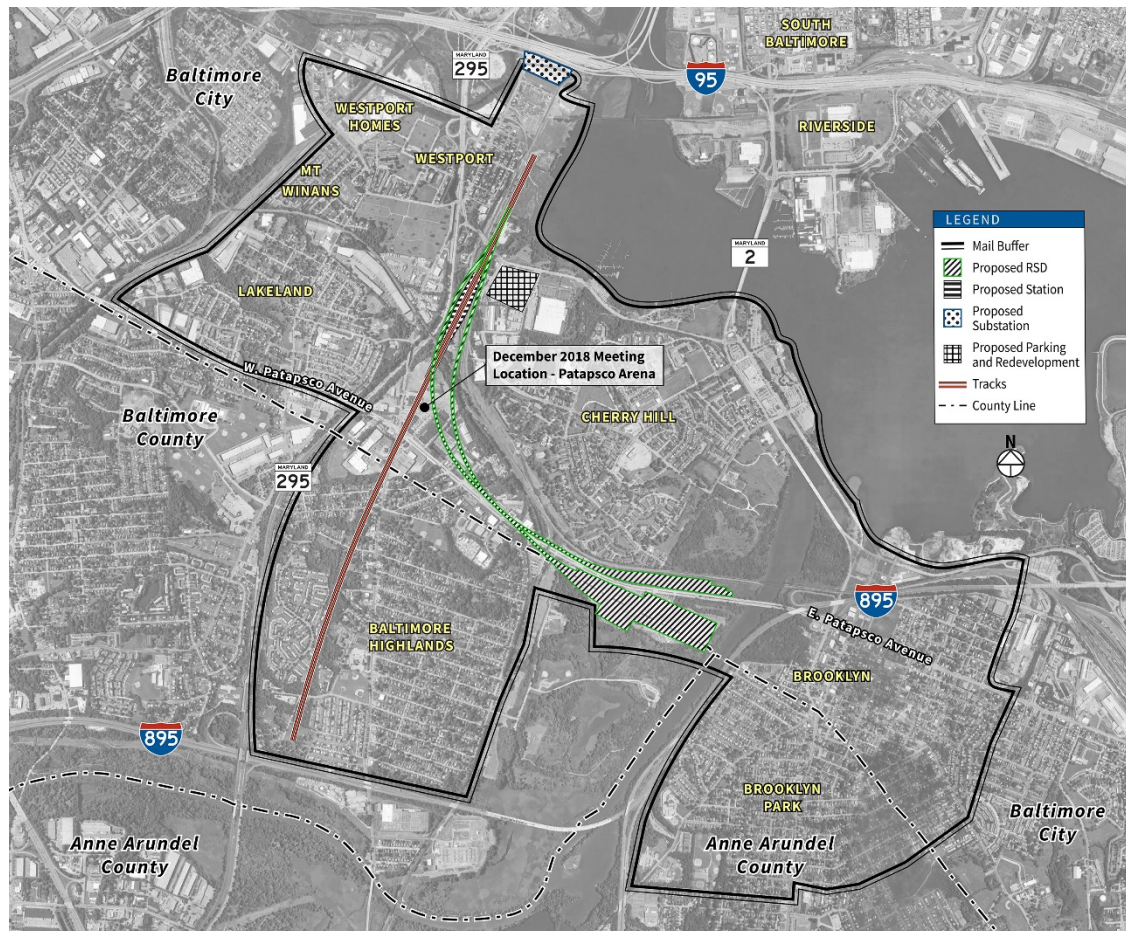
Including the 80 comments on specific alignments during the previous (April 2017) phase of SCMAGLEV Project outreach on initial alternatives, plus the 1,239 comments received during the development and screening of preliminary alignments for a total of 1,246 comments (as of November 2, 2017). Comments not received or compiled in time for the PASR were accepted and recorded/considered for future documents/phases. The SCMAGLEV Project website (<http://www.bwmaglev.info>) includes responses to the most common questions under the Frequently Asked Questions (FAQs) page, as well as meeting materials, interactive maps and reports.

5.3.5 Cherry Hill/Patapsco Avenue, Baltimore City Public Open House Meeting – December 2018

As the Project Team Members progressed through the development and refinement of the proposed alternatives and coinciding with the public publication of the draft Alternatives Report (posted to the SCMAGLEV Project website on November 15, 2018), FRA identified additional improvement options. These new proposed improvement options included refined station and trainset maintenance facility locations and configurations within the Cherry Hill/Patapsco Avenue areas of southern Baltimore City. **Figure 5.3-4** is an approximate depiction of the meeting mailing area and the proposed Cherry Hill Station and proposed Patapsco Avenue trainset maintenance facility (note that the proposed Camden Station is not shown in this figure, however FRA presented and discussed the Camden Station as part of this meeting. For more information see the meeting display boards in Appendix E.5).

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 and the elimination of others. Specifically, since the December 2018 meeting, the proposed Patapsco Avenue TMF has been eliminated due to inconsistencies with the latest design requirements. In addition, the proposed Cherry Hill Station has been modified to include additional operations and maintenance facilities and no longer has ramps connecting to the Patapsco Avenue TMF. For more information on the Alternatives Development Process and the changes effecting Cherry Hill/Patapsco Avenue, see Appendix C.

Figure 5.3-4: Cherry Hill/Patapsco Avenue Mailing Area and Proposed 2018 Elements



Disclaimer: The above Figure 5.3.4 does not reflect the current design options under considerations.

FRA and MDOT MTA informed the public of the Cherry Hill/Patapsco Avenue area Baltimore City Open House via the SCMAGLEV Project website, mailed postcards, and via advertisements posted in local print and on-line publications; at community and neighborhood organizations; and sent to Federal, state, county, and local officials. FRA and MDOT MTA also distributed fliers to public community centers and local gathering places.

FRA and MDOT MTA held one public open house meeting, shown in **Table 5.3-6**. The open house included 20 display boards focused on the SCMAGLEV Project Purpose and Need and preliminary alternatives screening process. An interactive display with alternatives mapping (also found on the SCMAGLEV Project website) was provided so that attendees could zoom in on areas of concerns and see how the proposed improvement options could potentially affect their community or other areas of interest. Project Team Members were present to explain the boards and answer questions.

Table 5.3-6: Cherry Hill/Patapsco Avenue, Baltimore City Open House

Date	Time	Location	Address	Sign-Ins	Comments
Thursday, December 13, 2018	5:30 pm – 7:30 pm	Patapsco Arena	3301 Annapolis Road Baltimore, MD 21230	26	7

Using the same process as was done for the previous public open house meetings, FRA and MDOT MTA advertised the Cherry Hill/Patapsco Avenue Baltimore City Open House in a variety of local media sources. FRA and MDOT MTA also featured advertisements on the SCMAGLEV Project website and on digital and print versions of the Afro American (afro.com); the Patch (patch.com); and the *Latin Opinion*.

FRA and MDOT MTA distributed hard copy fliers to EJ communities and areas with high concentrations of minority and/or low-income individuals in March 2017. Distribution was done in person or via mail to the 25 different locations listed in **Table 5.3-7**.

Table 5.3-7: Cherry Hill/Patapsco Avenue, Baltimore City Open House Flier Distribution

Location	Address	English Fliers	Spanish Fliers
Salvation Army	2250 Gable Avenue	✓	✓
LA Mart	2159 W Patapsco Avenue	✓	✓
Big Laundromat – Lavandería	2123 W Patapsco Avenue	✓	✓
Cinco de Mayo Grocery	1490 W Patapsco Avenue	✓	✓
Patapsco Discount Liquors	1400 W Patapsco Avenue	✓	
Cherry Hill Senior Manor	901 Cherry Hill Road	✓	
St. Veronica Catholic Church	806 Cherry Hill Road	✓	
Cherry Hill Community Presbyterian Church	819 Cherry Hill Road	✓	
First Baptist Church of Cherry Hill	823 Cherry Hill Road	✓	
Community Baptist Church	827 Cherry Hill Road	✓	
Created for so Much More Worship Center	701 Cherry Hill Road	✓	
Cherry Hill Mart	661 Cherry Hill Road	✓	
Happy Family Mart	700B Cherry Hill Road	✓	
Cherry Hill Town Center/Enoch Pratt Library-Cherry Hill	606 Cherry Hill Road	✓	
Coin Laundromat & Cleaners	618 Cherry Hill Road	✓	
South Harbor Pawn Shop	3438 Annapolis Road	✓	✓
Gold Brokers Pawn Shop	2135 W Patapsco Avenue	✓	✓
Sudsville Laundry Inc	3460 Annapolis Road	✓	
Enoch Pratt Library-Brooklyn Branch	300 E Patapsco Avenue	✓	✓
Mama Rosa Grill	3321 Annapolis Road	✓	✓

Location	Address	English Fliers	Spanish Fliers
SaveMart	3901 Hollins Ferry Road	✓	✓
Geely Laundromat	3903 Hollins Ferry Road	✓	✓
Guacamole Mexican Restaurant	3307 Annapolis Road	✓	✓
Cherry Hill Light Rail Station	Cherry Hill Road	✓	✓
Cherry Hill Community Coalition/Cherry Hill Development Corporation	806 Cherry Hill Road	✓	✓

There were approximately 30 public attendees (26 sign-ins) and eleven (11) comments (seven comment cards and four emails) received at the December Cherry Hill/Patapsco Avenue public open house. In subsequent months, between December 2018 and March 2019, the Project Team Members also received an additional 32 comments via the SCMAGLEV Project website comment form, Governor's Office, and the SCMAGLEV Project e-mail account (info@bwmaglev.info) for a total of 43 comments.

The comments received focused on safety, security, hazardous materials, potential negative environmental impacts, transportation connectivity, economic constraints, appropriation of Federal and state funding, station location, ticket pricing, and possible effects on Baltimore City – both potentially positive and negative.

5.3.6 Other Stakeholder Involvement Activities

FRA has encouraged the involvement of community leaders, elected officials, and other stakeholders in the Project Study Area. These individuals and organizations have assisted FRA in understanding and addressing local concerns, including those of the EJ communities that could be affected by the SCMAGLEV Project. Stakeholder involvement activities have included:

- **Elected Officials Briefings:** FRA briefed elected officials and other key stakeholders prior to events such as the public scoping meeting and other public meetings and events related to the production of the DEIS. These were informal meetings where discussions on various topics are coordinated between the Project Team Members and elected officials.
- **Section 106 Consulting Party Participation:** See description below (Section 5.6.1).
- **Environmental Justice Outreach:** FRA has included outreach efforts specifically targeted to reach EJ communities located in the Project Study Area (Section 4.5).
- **Stakeholder Meetings:** Meetings have been held with individuals or small groups to discuss specific SCMAGLEV Project considerations.
- **Project Website GIS Commenting Application:** An interactive mapping application with survey questions was launched in July 2020 on the Project website to gather feedback on Build Alternatives and other aspects of the

project. As of December 2020, 111 respondents have submitted comments on a range of issues, including proposed alternatives and potential economic and environmental impacts of the SCMAGLEV Project. Responses are a mix of positive and negative support for the project.

5.4 Agency Coordination

5.4.1 Cooperating and Participating Agency Coordination

FRA has and will continue to collaborate with Cooperating and Participating Agencies in defining the SCMAGLEV Project's Purpose and Need and range of alternatives; developing impact assessment methodologies; assessing impacts; identifying avoidance, minimization and mitigation measures; and preparing for future permit applications.

Agency representatives have been and will be notified of the availability of key SCMAGLEV Project documents, including the Scoping Report, PASR, Alternatives Report, DEIS, FEIS and ROD, and given appropriate comment opportunities. After release and circulation of this DEIS for public comment, and following issuance of the FEIS and subsequent ROD, the Project Sponsor would consult the appropriate agencies to complete any necessary permits for the SCMAGLEV Project.

5.4.2 Agencies, Roles, and Responsibilities

There are many Federal, district, state, regional, and local agencies with varied interests in the SCMAGLEV Project. In accordance with 40 CFR 1501.5 and 23 U.S.C. § 139, agency roles and responsibilities are defined below.

5.4.2.1 Lead Agencies and Project Sponsor

For projects subject to NEPA, the Lead Agencies are responsible for ensuring that the environmental review process is conducted properly and in accordance with all applicable environmental regulations. FRA is the Lead Federal Agency for the SCMAGLEV Project, and MDOT MTA, as the grantee, is the Joint Lead Agency. As the Lead Federal Agency, FRA is responsible for identifying, inviting, and proactively involving Cooperating and Participating Agencies as well as the public.

Baltimore-Washington Rapid Rail (BWRR), as the private Project Sponsor and developer of the proposed SCMAGLEV system, is working with FRA to carry out preliminary engineering throughout the NEPA process.

5.4.2.2 Cooperating Agencies

According to CEQ regulations (40 CFR § 1508.5), a Cooperating Agency is defined as “any Federal agency other than a lead agency which has jurisdiction by law or special expertise with respect to any environmental impact involved in a proposal (or a reasonable alternative) for legislation or other major Federal action significantly affecting

the quality of the human environment.” A state or local agency of similar qualifications or when the effects are on a reservation, an Indian Tribe may, by agreement with the lead agency, become a Cooperating Agency. At this time the SCMAGLEV Project only has Federal Cooperating Agencies, and no state or local agencies or Indian Tribes have been granted Cooperating Agency status.

In accordance with (CEQ) regulations (40 CFR § 1501.6 and 23 USC § 139), each Cooperating Agency shall:

- Participate in the NEPA process at the earliest possible time;
- Participate in the scoping process;
- Assume, at the request of the Lead Agency, responsibility for developing information and preparing environmental analyses including portions of the environmental impact statement concerning which the Cooperating Agency has special expertise;
- Make available staff support at the Lead Agency’s request to enhance the latter’s interdisciplinary capability; and,
- Normally use its own funds. However, the Lead Agency shall, to the extent available funds permit, fund those major activities or analyses it requests from cooperating agencies. Potential Lead Agencies shall include such funding requirements in their budget requests.

A Cooperating Agency may, in response to a Lead Agency’s request for assistance in preparing the EIS, reply that other program commitments preclude any involvement, or the degree of involvement requested in the action that is the subject of this EIS. A copy of this reply shall be submitted to the CEQ.

5.4.2.3 Participating Agencies

Participating Agencies are Federal, state, or local agencies or federally recognized tribal governmental organizations with an interest in the SCMAGLEV Project. According to FHWA definition for participating and cooperating agencies, “The standard for participating agency status is more encompassing than the standard for cooperating agency status. Therefore, cooperating agencies are, by definition, participating agencies”¹. However, not all Participating Agencies are designated as Cooperating Agencies. Cooperating agencies have a higher degree of authority, responsibility, and involvement in the environmental review process than participating agencies.

As the Lead Federal Agency, FRA considered the distinctions noted above in deciding whether to invite an agency to serve as a Participating Agency.

¹ FHWA

https://www.environment.fhwa.dot.gov/legislation/authorizations/safetealu/reviewProcess_faq.aspx#faq_1

The role of Participating Agencies is to:

- Provide input on defining the SCMAGLEV Project's Purpose and Need, the range of alternatives to be considered, and the methodologies and level of detail required in the alternatives' analysis;
- Participate in coordination meetings and joint field reviews, as appropriate;
As requested by FRA, provide timely review and comments on certain pre-draft or pre- final environmental documents; and,
- Provide timely comments on unresolved issues.

5.4.2.4 Concurring and Commenting Agencies

The Project Team Members for the SCMAGLEV Project is using a modified version of Maryland's Streamlined Environmental and Regulatory Process to establish concurrent coordination of Section 106, Endangered Species Act, Clean Air Act, and Clean Water Act Section 404. This streamlined process helps to ensure the appropriate agencies have been provided an opportunity to communicate necessary information to the team and to review and comment on the preliminary findings of the NEPA studies.

Concurring agencies review, comment and provide formal concurrence at three key milestones for issuance of required wetlands and waterways permits following the NEPA phase. Milestones are:

1. Purpose and Need,
2. Alternatives retained for detailed study; and
3. Preferred Alternative/Conceptual mitigation.

Concurring agencies provide agreement to the decisions made at key milestones, unless there are substantial changes to the proposed action or significant new circumstances or information relevant to the environmental concern. Cooperating and Participating Agencies would review and provide formal comments at the above three milestones. Both Concurring and commenting agencies work closely with other Federal, state, and local resource agencies during the NEPA phase of the SCMAGLEV Project.

While consensus is not required in the development of impact assessment methodologies, FRA has and will continue to consider the views of the agencies with relevant interests before deciding on a particular assessment methodology and related decisions. After collaboration associated with this DEIS has taken place, FRA will determine the appropriate methodology and level of detail to be used as part of the decision-making process.

5.4.2.5 Summary

FRA has invited applicable Federal, state, county, and local government regulatory and jurisdictional agencies within the Project Study Area to be Cooperating and Participating

Agencies. As study alternatives are developed and potential property impacts are determined, additional public landowners would be invited to participate in the NEPA process.

Table 5.4-1 lists the Lead Agencies as well as the agencies that have been invited and agreed to serve as Cooperating and/or Concurring or Participating Agencies for the SCMAGLEV Project, with their responsibilities associated with the applicable area of jurisdiction or expertise. Any Federal agency that is invited by the Lead Agency to participate in the environmental review process for a project shall be designated as a Participating Agency by the Lead Agency unless the invited agency declines in writing; other state and local agencies must accept in writing.

Table 5.4-1: Lead Agencies and Invited Cooperating and Participating Agencies

Agency	Accepted Invitation	Responsibilities
Lead Agencies		
Federal Railroad Administration (FRA)	NA	Manage environmental review process; prepare EIS and NEPA decision document; provide opportunity for public and agency involvement; arbitrate and resolve issues.
Maryland Department of Transportation (MDOT)	NA	Administer Federal grant funding in amount of \$27.8M; oversee environmental studies and preliminary engineering being performed by other state agencies, including MEDCO and the MTA for BWRR's proposal; and oversee the public outreach process.
Maryland Department of Transportation, Maryland Transit Administration (MDOT MTA)	NA	Oversee EIS documentation, which is being prepared by the Environmental Consultant, AECOM.
Cooperating Agencies		
Federal Agencies		
Federal Aviation Administration (FAA)****	Yes	Regulatory authority over Baltimore/Washington International Thurgood Marshall Airport (BWI Marshall Airport). Consultation related to airport planning and FAA Form 7460-1, Notice of Proposed Construction or Alteration. FAA has approval authority over BWI Marshall Airport layout plan pursuant to 49 U.S.C. § 47107(a)(16)(B).
Federal Transit Administration (FTA)	Yes	Consultation related to transit services and facilities including MDOT MTA Commuter Bus, Commuter Rail and Light Rail and Washington Metropolitan Area Transit Authority (WMATA) Metrorail and Commuter Bus services.

Agency	Accepted Invitation	Responsibilities
National Capital Planning Commission (NCPC)	Yes	Approval authority over Federal projects within the District, including all land transfers and physical alterations to Federal property, pursuant to the National Capital Planning Act of 1952. Federal properties noted within the Project Study Area include the Baltimore-Washington Parkway (BWP), Greenbelt Park, Kenilworth Park and Aquatic Gardens, U.S. National Arboretum; Anacostia Park; Beall's Pleasure, and the L'Enfant Plan Reservation 173 & 174.
U.S. Department of Interior (USDOI)-National Park Service (NPS)	Yes	NPS is responsible for managing the National Park System, including permitting on NPS land. The NPS has jurisdiction over Federal park land in the Project Study Area including BWP, Kenilworth Park, and Anacostia Park. There are several National Register of Historic Places (NRHP)-listed properties in the Project Study Area, including L'Enfant Plan (Reservation 173), the Baltimore and Washington Parkway, Greenbelt.
Surface Transportation Board (STB)	Yes	STB has not determined if it has jurisdiction over construction of the SCMAGLEV Project. If the STB finds that it does have jurisdiction, then it would become a Cooperating Agency.
U.S. Army Corps of Engineers (USACE)****	Yes	Review and permitting for impacts to rivers, streams, and wetlands under Rivers and Harbors Act, Section 10, and Clean Water Act (CWA) Sections 401, 404, and 408. Oversees selection of the Least Environmentally Damaging Practicable Alternative (LEDPA) pursuant to CWA Section 404 before the NEPA process is completed. Oversees review/approval for tunnel crossings beneath Federal flood control project at the Anacostia River pursuant to CWA Section 408.
U.S. Coast Guard (USCG)***	No	Consultation on the permitting of bridge construction in or over navigable waterways (Patapsco River, Anacostia River).
U.S. Department of Agriculture (USDA)–Beltsville Agricultural Research Center (BARC)	Yes	Provide protection to human health and the environment of BARC and the U.S. National Arboretum (USNA) through compliance with all environmental related management requirements; specifically, through complying with Executive Order 13693.
U.S. Environmental Protection Agency (EPA)****	Yes	NEPA Compliance, Hazardous Materials, Environmental Justice, Air Quality, Water Quality.
National Aeronautics and Space Administration, Goddard Space Flight Center (NASA/GSFC)	Yes	Consultation related to impacts to their property and operations.
National Security Agency (NSA)	Yes	Consultation related to impacts to their property and operations including potential impacts from SCMAGLEV's electromagnetic fields.

Agency	Accepted Invitation	Responsibilities
U.S. Fish and Wildlife Service (USFWS)****	Yes	Consultation related to Federally Listed Threatened & Endangered Species, Jurisdiction of Patuxent Research Refuge.
Participating Agencies		
Federal Agencies		
Federal Highway Administration (FHWA)*	Yes	Provides consultation related to the planning, construction, and maintenance of roadways within the Project Study Area.
Fort George G. Meade (U.S. Army)**	Yes	Consultation related to potential impacts to their property. Fort George G. Meade is a Participating Agency, but if an alternative impacting their property is in the DEIS, they will become a Cooperating Agency.
Federal Emergency Management Agency (FEMA)	Yes	Consultation related to resilience and floodplain issues.
U.S. Secret Service (USSS)**	Yes	Consultation related to impacts to their property and operations.
U.S. Commission of Fine Arts (CFA)	Yes	Review design proposals for public and private properties in the National Capital, as they affect the Federal interest and preserve the dignity of the nation's capital.
National Oceanic and Atmospheric Administration (NOAA) - National Marine Fisheries Service (NMFS)	Yes	Consultation related to the Federal management of United States fisheries under the Magnuson-Stevens Fishery Conservation and Management Act (MSA) and regarding management plans and regulations.
General Services Administration (GSA)	Yes	Consultation related to properties and Federal lands operated and maintained by the GSA
Department of Labor (DOL)	Yes	Consultation related to properties leased and operated by the DOL.
State Agencies		
Maryland Aviation Administration (MAA)	Yes	Consultation related impacts for compliance with requirements of FAA Order 1050.1F.
Maryland Department of Natural Resources (DNR) - Maryland Park Service - Wildlife and Heritage Service - Maryland Environmental Trust	Yes	Consultation related to development within Chesapeake Bay Critical Area; resources regulated by Maryland's Forest Conservation Act; the presence of state listed rare, threatened and endangered species and critical habitat; and significant fisheries resources. Consultation related to Patapsco Valley State Park. Consultation related to rare, threatened, and endangered species. Consultation related to environmental easements.
Maryland Department of Planning (MDP)	Yes	Consultation related to comprehensive plans, ordinances, and state and county level geographic information.
Maryland Department of the Environment (MDE)	Yes	Consultation related to compliance with Maryland's National Pollutant Discharge Elimination System (NPDES) requirements; Erosion and Sediment Control/Stormwater Management requirements; and Tidal and Nontidal Wetlands, Waterways and Floodplains.

Agency	Accepted Invitation	Responsibilities
Maryland Historical Trust (MHT)	Yes	Part of the MDP, the MHT serves as Maryland's State Historic Preservation Office (MD SHPO) pursuant to the National Historic Preservation Act (NHPA) Section 106 for compliance.
Maryland Public Service Commission (PSC)***	No***	Consultation related to compliance with requirements for operation of rail passenger services in Maryland.
Maryland Department of Transportation State Highway Administration (MDOT SHA)	Yes	Consultation related to SHA's transportation system including its infrastructure, operations, safety, public space, and right of way.
Regional Agencies		
Baltimore Metropolitan Council (BMC)	Yes	Administers the Baltimore region's Transportation Improvement Program (TIP), Constrained Long Range Transportation Plan (CLRTP), and Clean Air Act (CAA) compliance. BMC provides oversight for the regional transportation network and programming.
Metropolitan Washington Council of Governments (MWCOC)	No (declined)	Administers the region's TIP, CLRTP, and CAA compliance. MWCOC provides oversight for the regional transportation network and programming.
Washington Metropolitan Area Transit Authority (WMATA)	Yes	Consultation related to Metrorail facilities within the Project Study Area, including its station facilities, rail alignments, ridership statistics, and future plans.
County Agencies		
Anne Arundel County Transportation Division	Yes	Consultation related to planning and engineering for SCMAGLEV Project and its impact to County transportation operations and adequate public facilities requirements.
Baltimore County Planning Office	No (declined)	Consultation related to County's land uses, development, and neighborhood planning.
Howard County Department of Planning and Zoning	Yes	Consultation related to County's land uses, development, and neighborhood planning.
Maryland-National Capital Park and Planning Commission (M-NCPPC) - Community Planning - Countywide Planning - Park Planning and Development	Yes	Consultation related to proposed impacts to Prince George's County parks, trails and recreations facilities. Consultation related to plans and studies used to guide future growth and physical alterations throughout the County, i.e. Master Sector Plans. Consultation related to transportation (bicycle/pedestrian/roadway) policies that guide growth and development while providing a countywide perspective. Consultation related to the subdivision review, site plan review, and review of zoning applications related to parks and recreation.
Prince George's Public Works and Transportation	Yes	Consultation related to the county-maintained roadway network impacts and transit connectivity.
Local Agencies		
Baltimore City Department of Planning	Yes	Consultation related to City's land uses, development, and neighborhood planning.

Agency	Accepted Invitation	Responsibilities
Baltimore City Department of Transportation (BCDOT)	Yes	Consultation related to City's transportation system including its infrastructure, operations, safety, public space, and right of way.
District of Columbia Department of Transportation (DDOT)*	Yes	Consultation related to DDOT's transportation system including its infrastructure, operations, safety, public space, and right of way.
District of Columbia Department of Energy & Environment (DOEE)	Yes	Consultation related to wildlife and habitat review; compliance with the CWA; regulatory review of stormwater management, sediment and erosion control, and floodplain management; oversight and compliance with Underground Storage Tank regulations (Risk Based Corrective Action process) and the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA).
District of Columbia Department of Public Works (DPW)	Yes	Consultation related to District waste management, parking enforcement, and fleet management.
District of Columbia State Historic Preservation Office (DC SHPO)	Yes	Review for NHPA Section 106 compliance in the District.
District of Columbia Office of Planning (DCOP)	Yes	Consultation related to District land uses, development, and neighborhood planning.
District of Columbia Public Service Commission	No (declined)	Regulatory agency responsible for landline telephone, electricity, and gas utility companies operating within the District.

* Agency was sent a Cooperating Agency invitation but chose to be designated as a Participating Agency instead.

** Agency was sent an invitation to upgrade from a Participating Agency to a Cooperating Agency since they are impacted by proposed alternatives; however, they did not respond as of the time of this writing.

*** Agency was sent a Cooperating or Participating Agency invitation, and they did not respond as of the time of this writing.

**** Agency is also a Concurring Agency.

FRA sent letters in late November 2016, inviting agencies to be either Cooperating or Participating Agencies and to participate in scoping for the SCMAGLEV Project (see Appendix E.3 for a sample of this letter). The invitations requested written responses by December 23, 2016.

5.4.3 Agency Scoping

FRA invited the agencies listed above in **Table 5.4-1** to attend two agencies scoping meetings. One meeting was held via webinar on January 18, 2017 as part of MDOT SHA's monthly Interagency Review Meeting. Another meeting was held in-person on January 31, 2017 at the NPS National Capital Region Headquarters in Washington, D.C. The purpose of these meetings was to provide an opportunity for the early identification of significant issues related to the SCMAGLEV Project. Attendees at the agency scoping meetings included representatives from the following agencies:

- Amtrak

- Anne Arundel County Transportation Division
- Baltimore City Department of Planning (BCDP)
- Baltimore City Department of Transportation (BCDOT)
- Baltimore Metropolitan Council (BMC)
- District of Columbia Department of Energy and Environment (DOEE)
- District of Columbia Department of Public Works (DPW)
- District of Columbia Department of Transportation (DDOT)
- District of Columbia State Historic Preservation Office (DC SHPO)
- Federal Aviation Administration (FAA)
- Federal Highway Administration (FHWA)
- Federal Railroad Administration (FRA)
- Federal Transit Administration (FTA)
- Howard County Office of Transportation
- Maryland Aviation Administration (MAA)
- Maryland Department of the Environment (MDE)
- Maryland Department of Natural Resources (MDNR)
- Maryland Department of Planning (MDP)
- Maryland Department of Transportation (MDOT)
- Maryland Economic Development Corporation (MEDCO)
- Maryland Historical Trust (MHT)/Maryland State Historic Preservation Office (MD SHPO)
- Maryland-National Capital Park and Planning Commission (M-NCPPC)
- Maryland Transit Administration (MTA)
- Metropolitan Washington Council of Governments (MWCOG)
- National Oceanic and Atmospheric Administration (NOAA)
- National Park Service (NPS)
- U.S. Army Corps of Engineers (USACE)
- U.S. Army, Fort George G. Meade
- U.S. Environmental Protection Agency (USEPA)
- U.S. Federal Emergency Management Agency (FEMA)

See Appendix E.3 for a copy of the presentation given at the agency scoping meetings. Sign-in sheets from the meetings are also provided.

Comments and questions were received from agencies at the agency scoping meetings. Agencies were also able to submit comments via the same methods as the public, including the SCMAGLEV Project website, the SCMAGLEV Project e-mail address, and the SCMAGLEV Project mailing address. The Project Team Members received comments regarding the scope of the EIS from the following agencies: the DDOT, NCPC, USACE, USEPA, MDNR, FAA, MAA, NPS, USFWS, Amtrak, and Howard County Office of Transportation. When answers were known, FRA responded with available information during the meeting. Many other comments and questions will be responded to as the SCMAGLEV Project continues through the NEPA process. Questions and comments from the agencies are summarized in Appendix E.3.

5.4.4 Section 106 Consultation

Section 106 of the National Historic Preservation Act (36 CFR Part 800) (NHPA) requires Federal agencies to consider the effects of their undertakings on historic properties that are listed or meet the eligibility criteria for listing in the National Register of Historic Places (NRHP). A Federal undertaking is defined as a project, activity, or program funded, permitted, licensed, or approved by a Federal agency. The Section 106 process has a specific public involvement component. In particular, the implementing regulations require that FRA, in consultation with the SHPOs (in this case, the MD SHPO and DC SHPO) as applicable, identify appropriate points for seeking public input regarding the identification of historic properties in the SCMAGLEV Project's Area of Potential Effects (APE), assessment of the SCMAGLEV Project's effects to those properties, and resolution of any adverse effects. Additional detailed information regarding the Section 106 process can be found in Section 4.8 Cultural Resources.

Public outreach for purposes of NEPA satisfies Section 106 public outreach requirements, by providing information regarding the SCMAGLEV Project's effects on historic properties at NEPA public meetings and in the EIS. Consistent with Section 106, the public and consulting parties have an opportunity to comment and have concerns taken into account on findings identified in Section 106 survey and effects documents via attendance at public meetings where they can submit comments on the information presented, as well as access the Section 106 documents via email requests to FRA or on the SCMAGLEV Project website. The public is given the opportunity to provide FRA with comments on the identification and evaluation of effects to historic properties during the DEIS public comment period. Members of the public with a demonstrated interest in the SCMAGLEV Project (due to the nature of their legal or economic relation to the undertaking or affected properties, or their concern with the undertaking's effects on historic properties) may participate as Section 106 Consulting Parties.

See Section 4.8 Cultural Resources and Appendix D.5 for more detail about the methodology and more information about the parties participating in the Section 106 Consultation process.

5.4.5 Section 4(f) Coordination

FRA has provided opportunities for coordination and comment to the official(s) with jurisdiction (OWJ) over any Section 4(f) resource that may be affected by the SCMAGLEV Project as well as to the USDOT, and as appropriate, the USDA and the Department of Housing and Urban Development. Resources protected under Section 4(f) include public parks, wildlife refuges, and historic resources. Section 4(f) resources were identified through the Section 106, NEPA and Section 4(f) processes, in consultation with MD SHPO, DC SHPO, OWJs and any other relevant Consulting Parties or resource agencies. The public has and will continue to be provided an opportunity to review and comment on the SCMAGLEV Project's Section 4(f) Evaluation in coordination with the NEPA public review periods. Additional details about the Section 4(f) coordination efforts can be found in Appendix F of this document.

5.4.6 Additional Agency Involvement Activities

The following meetings have been or will be held to engage agency participation in the SCMAGLEV Project:

- Interagency Review Meetings;
- Joint Evaluation Meetings;
- Field Meetings; and,
- One-on-one Meetings.

FRA has and will continue to meet regularly with agencies via Interagency Review Meetings and Joint Environmental Committee (JE) meetings through the completion of the EIS. These meetings will be held at NEPA milestones in both Maryland and Washington, D.C. Locations and format (in-person and webinar) will vary depending on agency availability and preference. FRA, in coordination with the Project Team Members, has and will send the meeting invitations to Lead Agencies, Cooperating Agencies, and Participating Agencies. For those who cannot attend, the meetings will be conducted via a webinar, when possible. The presentation and meeting summary have and will be emailed following each meeting. The purpose of Interagency Review Meetings is to provide agencies an opportunity to:

- Provide comments, responses, or insight on those areas within the special expertise or jurisdiction of the agency;
- Provide meaningful input at SCMAGLEV Project milestones;
- Keep abreast of the SCMAGLEV Project's progress and schedule; and,
- Provide timely review and comment on environmental documentation.

Cooperating and Participating Agencies have and will be provided an opportunity to comment on and/or concur upon the following SCMAGLEV Project documents:

- The Draft Purpose and Need (Comment and Concur*);
- Preliminary Alternatives Screening Report (Comment during Interagency Review Meeting);
- Alternatives Report (Comment and Concur*);
- Environmental Analysis Methodology and Technical Reports (Comment Only);
- DEIS (Comment Only);
- Final EIS (Comment Only); and,
ROD.

*Concurring Agencies listed in **Table 5.4.1**, above, are required to comment and/or concur (or not concur).

Table 5.4-3 is a list of meetings held between FRA, the Project Team Members, and Agency representatives.

Table 5.4-3: List of Agency Meetings

Meeting Title	Meeting Date
FAA & MDOT MAA Meeting	4/5/2017
USFWS, PRR, BARC, NPS Meeting	4/19/2017
USACE and MDE Meeting	5/3/2017
Anne Arundel County Planning Meeting	5/25/2017
NSA Meeting	5/30/2017
BARC, NASA Meeting	6/1/2017
USDA Meeting	6/1/2017
Interagency Review Meeting	6/12/2017
M-NCPPEC - Prince George's County Meeting	6/13/2017
Secret Service Meeting	6/13/2017
Fort George G. Meade Meeting	6/14/2017
USACE and MDE Meeting	6/15/2017
Joint Evaluation Meeting	6/28/2017
Agency Field Review Meeting	7/19/2017
Agency Field Review Meeting	7/26/2017
NPS Meeting	8/28/2017
USACE and MDE Meeting	8/29/2017
Joint Evaluation Meeting	8/30/2017
Interagency Review Meeting	10/3/2017
NPS Meeting	11/20/2017
Interagency Review Meeting	12/7/2017
Joint Evaluation Meeting	12/20/2017
NPS/FRA Workshop	1/30/2018
USACE Meeting	2/6/2018

Meeting Title	Meeting Date
MDOT SHA Meeting	2/20/2018
NASA Meeting	2/27/2018
National Historic Preservation Act Section 106 Consulting Party Meeting #1	3/14/2018
DNR Meeting	3/19/2018
Secret Service Meeting	3/20/2018
Baltimore City Planning Department Meeting	3/26/2018
M-NCPPC - Prince George's County Meeting	3/27/2018
NPS, USDA/BARC, USFWS Meeting	3/29/2018
Anne Arundel County Planning Meeting	4/2/2018
DDOT, Planning, Energy and Environment Meeting	4/3/2018
NSA Meeting	4/10/2018
Interagency Review Meeting	4/17/2018
Fort George G. Meade Meeting	4/19/2018
MDOT MAA Meeting	5/2/2018
USEPA Meeting	5/10/2018
Interagency Review Meeting	5/15/2018
DOI, NPS, USDA/BARC, USFWS Meeting	6/4/2018
FAA Meeting	6/18/2018
Interagency Review Meeting	6/19/2018
MDOT MTA Engineering – Station Meeting	6/21/2018
DC Agency Coordination Meeting	6/27/2018
Baltimore City Planning Department Meeting	7/9/2018
Interagency Review Meeting	7/17/2018
M-NCPPC - Prince George's County Meeting	7/24/2018
FAA Meeting	7/30/2018
MDOT MTA Engineering – Follow-up Meeting	8/20/2018
Interagency Review Meeting	8/21/2018
USDA Meeting	8/21/2018
NCPC/CFA/HPO/DDOT Meeting	9/11/2018
National Historic Preservation Act Section 106 Consulting Party Meeting #2	9/17/2018
Interagency Review Meeting	9/18/2018
SCMAGLEV Agency Field Review Meeting.	9/20/2018
SCMAGLEV Agency Field Review Meeting	9/25/2018
National Historic Preservation Act Section 106 Consulting Party Field Review Meeting	10/3/2018
Fort George G. Meade Meeting	10/10/2018
SCMAGLEV FRA Field Review Meeting	10/15/2018
Interagency Review Meeting	10/16/2018
FAA Meeting	10/16/2018
DDOT Meeting	10/22/2018

Meeting Title	Meeting Date
NPS 4(f) Meeting	10/23/2018
USFWS/Natural Resources Field Review Meeting	10/29/2018
Fort George G. Meade Meeting	10/30/2018
Interagency Review Meeting	11/20/2018
Cherry Hill Community Coalition Meeting	12/6/2018
NPS 4(f) Meeting	12/11/2018
Interagency Review Meeting	12/12/2018
Elected Officials Webinar	12/12/2018
Secret Service Meeting	1/24/2019
NCPC Meeting	2/7/2019
USACE Meeting	2/21/2019
Interagency Review Meeting	2/26/2019
NPS 4(f) Meeting	2/26/2019
Baltimore City Meeting	4/18/2019
DDOT Meeting	4/22/2019
FWS Meeting	4/29/2019
USDA-BARC Meeting	5/2/2019
DNR Meeting	5/6/2019
NSA Meeting	5/8/2019
MDOT SHA Meeting	5/10/2019
FAA Meeting	5/13/2019
Baltimore County DRP Meeting	5/15/2019
Secret Service Meeting	5/17/2019
FTA Meeting	5/20/2019
Interagency Review Meeting	5/21/2019
NPS Meeting	5/23/2019
EPA Meeting	5/28/2019
Baltimore City DRP	5/29/2019
Fort George G. Meade Meeting	6/3/2019
Prince George's County Planning Board Meeting	6/6/2019
DC DRP Meeting	6/6/2019
NCPC Meeting	6/10/2019
USACE Meeting	6/11/2019
Natural Resources Conservation Service (NRCS) Meeting	6/12/2019
US Commission of Fine Arts Meeting	6/26/2019
NASA Meeting	7/10/2019
Fort Meade Project Restart Meeting	6/9/2020
USDA BARC Project Restart Meeting	6/9/2020
NSA Project Restart Meeting	6/10/2020
USFWS Project Restart Meeting	6/10/2020
NASA Project Restart Meeting	6/12/2020

Meeting Title	Meeting Date
NPS Project Restart Meeting	6/15/2020
US Secret Service Project Restart Meeting	6/18/2020
USACE Project Restart Meeting	6/19/2020
Interagency Review Meeting	6/23/2020
National Historic Preservation Act Section 106 Consulting Party Meeting #3	7/20/2020
FAA and MAA Meeting	7/29/2020
NSA/Fort Meade Update Meeting	8/3/2020
M-NCPPC Project Restart Meeting	8/4/2020
USACE Meeting	10/8/2020
Interagency Review Meeting	10/14/2020
US Department of Labor Meeting	10/28/2020
USACE Field Review Meeting	11/2/2020