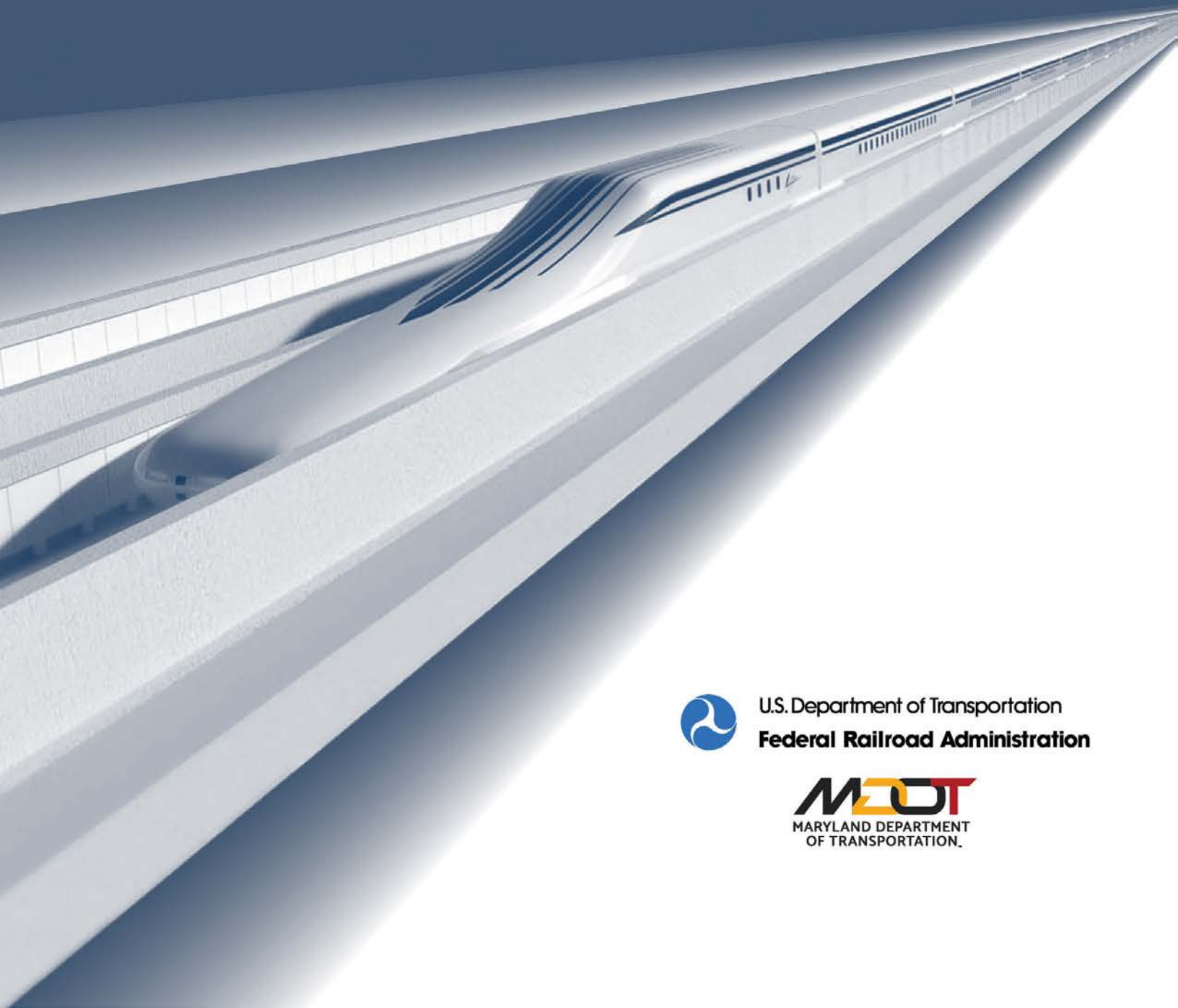
# Section 4.10

## Water Resources

## BALTIMORE-WASHINGTON SUPERCONDUCTING MAGLEV PROJECT

### DRAFT ENVIRONMENTAL IMPACT STATEMENT AND SECTION 4(f) EVALUATION



U.S. Department of Transportation
Federal Railroad Administration

MARYLAND DEPARTMENT OF TRANSPORTATION

# 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

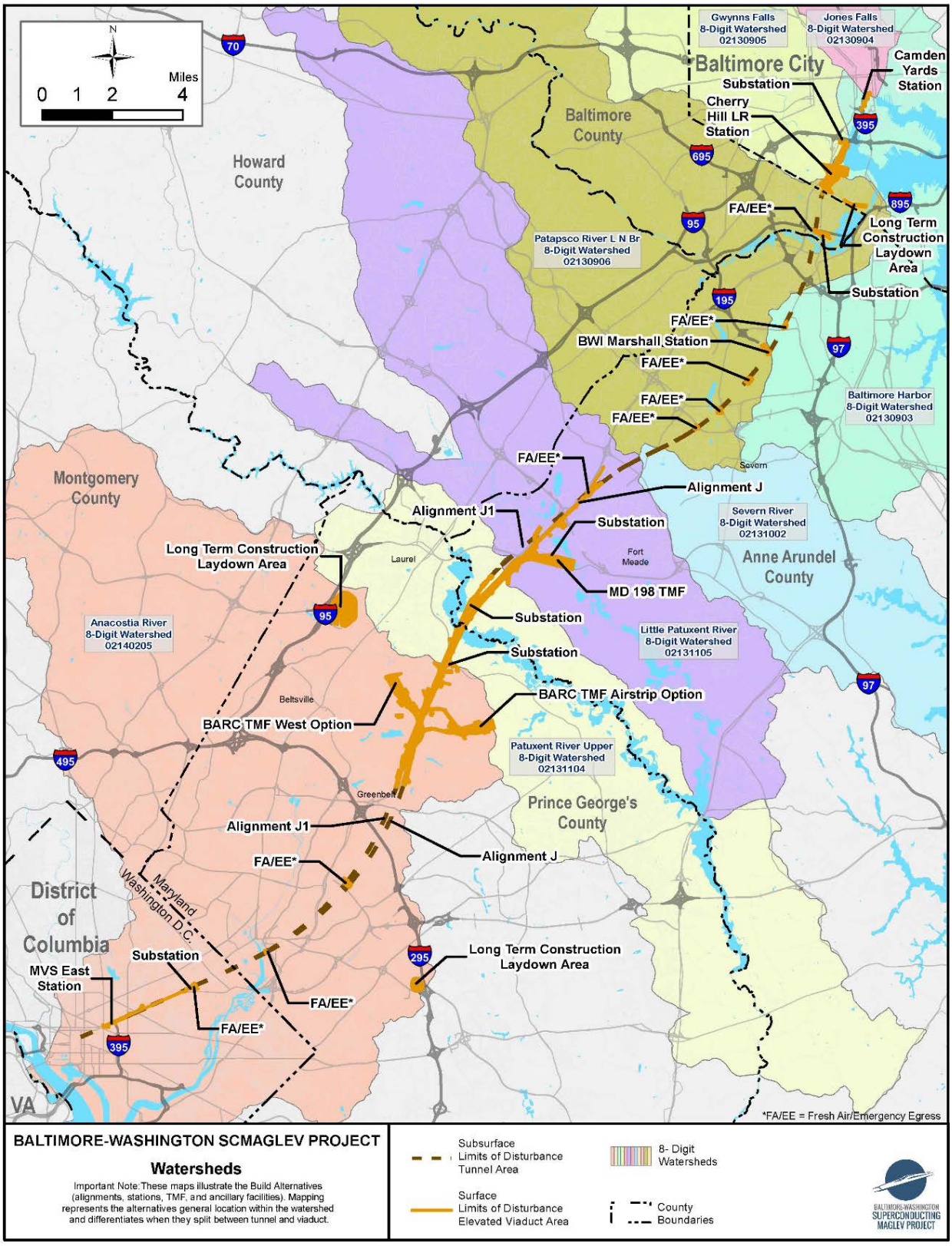
[4] https://www.epa.gov/urbanwaterspartners/urban-waters-and-anacostia-watershed-washington-dcmaryland

## 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.

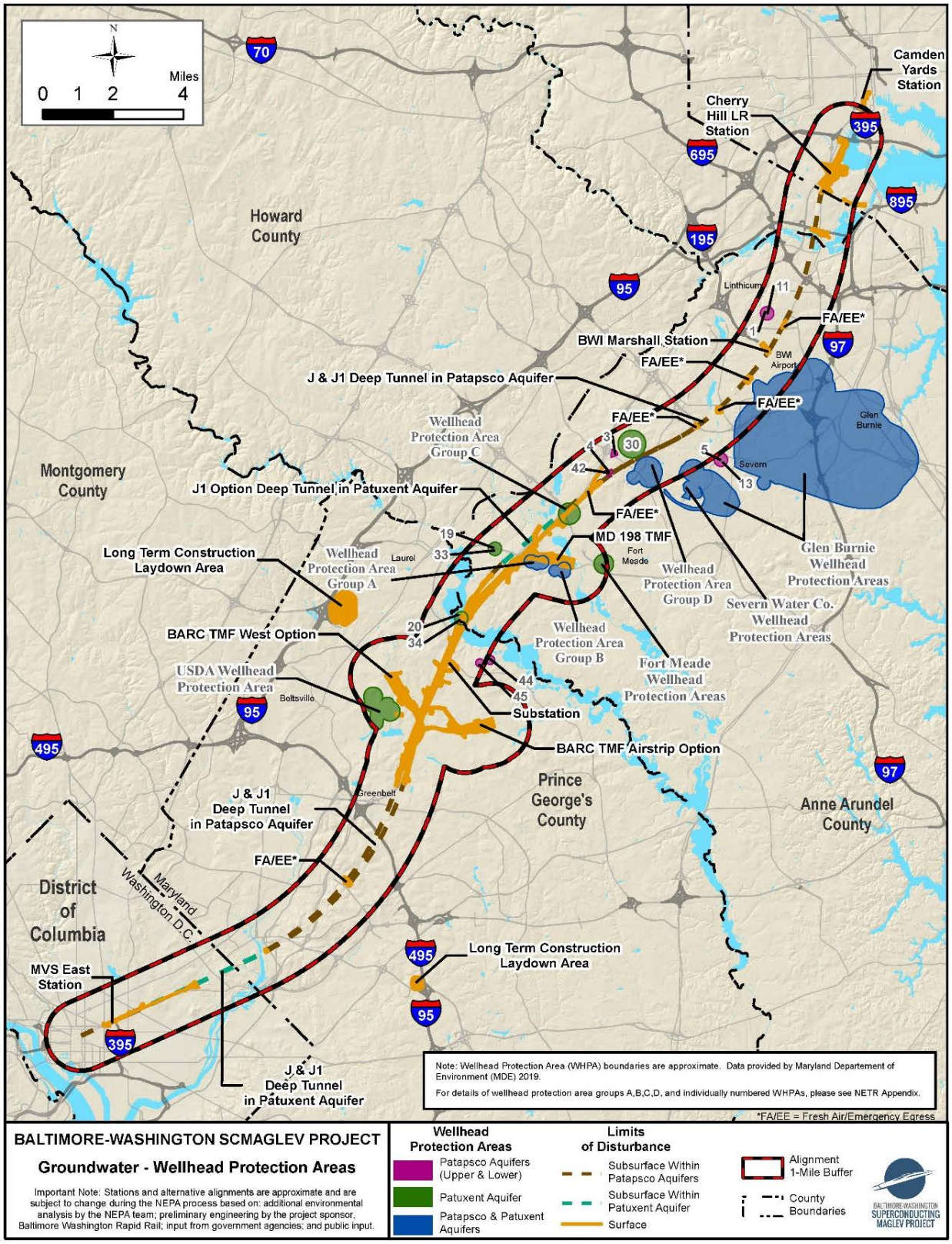
**Figure 4.10-2** illustrates data on WHPAs in aquifers within a one-mile radius of the Build Alternatives. Additional information regarding sites of potential contamination is provided in Section 4.15 Hazardous Materials and Solid Waste. Identified sites within the SCMAGLEV Project Affected Environment 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 withing 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 watersheds 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 configurations[7] 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 landscape[8]. 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 then 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 directedinto 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 Restrictions[10] 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.

[10]Time-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).