1 Introduction

The Federal Railroad Administration (FRA), in coordination with the Maryland Department of Transportation (MDOT), is preparing an Environmental Impact Statement (EIS) for the proposed Baltimore-Washington Superconducting Magnetic Levitation (SCMAGLEV) Project[1] between Baltimore, Maryland, and Washington, DC. FRA has prepared this Purpose and Need Statement as part of its EIS in compliance with the National Environmental Policy Act (NEPA) of 1969 (42 United States Code [USC] 4321 et seq.), the Council on Environmental Quality (CEQ) NEPA Regulations (40 Code of Federal Regulations [CFR] 1500-1508), FRA Procedures for Considering Environmental Impacts (64 Federal Register [FR] 28545 [May 26, 1999]), and FRA's Update to NEPA Implementing Procedures (78 FR 2713 [January 14, 2013]) and Section 1304 of the Fixing America's Surface Transportation (FAST ACT) (Pub I. No. 114-94, December 4, 2015) (23 USC 139).

Congress has expressed its intent that the SAFETEA-LU funding for this project "be used to directly advance and result in construction of a maglev project."[2] In March 2015, FRA issued a Notice of Funding Availability (NOFA) under the Maglev Deployment Program[3] (MDP) to solicit applications for construction of high speed rail between Baltimore and Washington, DC. The MDP was established in the Transportation Equity Act for the 21st Century (TEA-21) with the purpose of demonstrating the feasibility of Maglev technology. The State of Maryland selected Baltimore Washington Rapid Rail's (BWRR) SCMAGLEV proposal, and 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 and Washington, DC. The SCMAGLEV Project would be capable of 311 mph (500 kph) operating speed, with state of the art safety, signaling, and automated train control systems. In 2016, FRA awarded a $27.8 million Maglev grant to MDOT to perform the preliminary engineering (PE) and NEPA study for the SCMAGLEV Project. These funds were authorized as part of the Safe Accountable Flexible Efficient Transportation Equity Act: A Legacy for Users (SAFETEA–LU). BWRR is a private corporation and as the project sponsor and developer of the proposed SCMAGLEV service, will provide a 20 percent fund match for this study and work with Federal and state agencies, including FRA and MDOT, to provide preliminary engineering and technical assistance.

The SCMAGLEV Project has independent utility between Baltimore, Maryland and Washington, DC which is addressed in this EIS. However, BWRR envisions this project as the beginning "of a high-speed ground transportation corridor."[2] Evaluation of potential station location and interim termini in Washington and Baltimore, and the design and size of the stations, will consider the potential for future

[1] For purposes of this study, Magnetic levitation (Maglev) is defined as an advanced transportation technology in which magnetic forces lift, propel, and guide a vehicle over a specially designed guideway. This study proposes to implement superconducting maglev (SCMAGLEV) technology, which differs from other maglev systems (such as the German Transrapid system) in that SCMAGLEV accelerates and decelerates through an electromagnetic force generated between superconducting magnets on the vehicle and reaction coils on the guideway sidewalls. The superconducting magnetism is much stronger than ordinary normal conducting electromagnets. Additionally, SCMAGLEV uses inductive magnetic reactions with no active control and rides in a U-shaped guideway; whereas, the German Transrapid system uses attractive reactions that need active controls and rides in a T-shaped guideway.

[2] The first project eligibility requirement in the NOFA: "The project must: (1) Involve a segment or segments of a high-speed ground transportation corridor. BWRR's "Response to the NOFA", dated April 17, 2015, states "The Project involves the Baltimore, MD – Washington, DC segment of the New York, NY – Washington, DC federally designated high-speed ground transportation corridor."

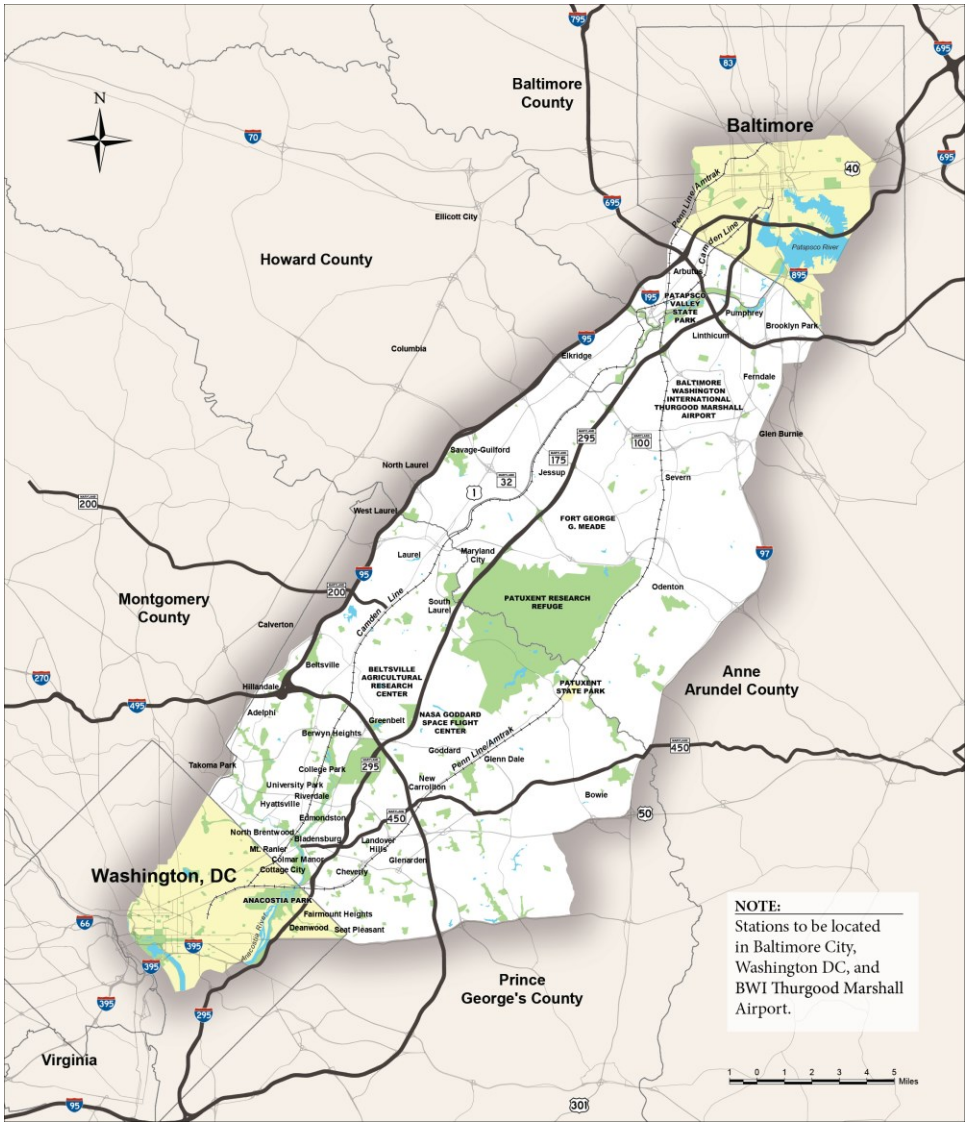
[3] The Maglev Deployment Program, as authorized by Congress under TEA-21, encourages the development and construction of an operating transportation system employing magnetic levitation.

extension of the SCMAGLEV system. If successfully deployed between Washington, DC and Baltimore, SCMAGLEV has the potential to be incrementally extended north to Boston, Massachusetts, and south to Charlotte, North Carolina. Such extensions, which would be subject to additional NEPA studies conducted by FRA in coordination with the respective states through which the extensions would run, and are not part of this EIS.

2 Project Study Area

FRA and MDOT are examining a Project Study Area approximately 40-miles long and 10-miles wide, that includes portions of the City of Baltimore; Baltimore, Howard, Anne Arundel, and Prince George's counties in Maryland; and Washington, DC (see **Figure 1**). In addition, the Project Study Area includes station locations in Washington, DC, Baltimore, and near Baltimore/Washington International Thurgood Marshall (BWI Marshall) Airport. There are also areas for a rolling stock depot (RSD) and other required facilities in the Project Study Area.

Figure 1: Project Study Area



3 Project Background and Related Studies

3.1. Previous Maglev Studies

In 2001, FRA published a Record of Decision (ROD) following completion of a Programmatic Environmental Impact Statement (PEIS) for the MDP. The purpose of this action was to demonstrate Maglev technology by identifying a viable Maglev project in the US, and 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's Maryland Transit Administration (MTA), FRA prepared and circulated a Draft Environmental Impact Statement (DEIS) in 2003, for a Maglev project linking downtown Baltimore, BWI Marshall Airport, and Union Station in Washington, DC. 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 as well as the benefits of the project alternatives.

In 2007, FRA prepared a Final Environmental Impact Statement (FEIS); however, the FEIS was not finalized.

The 2001 PEIS, 2003 DEIS, and 2007 FEIS considered earlier iterations of Maglev technology, different from the Japanese SCMAGLEV technology to be studied in this EIS.

FRA is now undertaking this new NEPA study, in part because of the commitment of private funding for the NEPA study, design, and construction of a SCMAGLEV project.

3.2. 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 rail line between Washington, DC and Boston, including the SCMAGLEV study area. The NEC is the rail transportation spine of the Northeast and the most heavily utilized rail network in the United States. The purpose of the NEC FUTURE program is to upgrade aging infrastructure and to improve the reliability, capacity, connectivity, performance, and resiliency of passenger rail service on the NEC for both intercity and regional trips, while promoting environmental sustainability and economic growth.

Regional population and employment growth, combined with changes in travel preference, cannot be supported by the existing, aging NEC infrastructure that results in congestion and delays for daily commuters, regional and interregional travelers, and freight services. FRA will develop a Service Development Plan (SDP) for the NEC to establish a framework for future investment in the corridor to meet the future needs of NEC's passenger and freight markets.

The NEC FUTURE study 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 proposed a long-term vision and investment strategy that is being documented in a Tier 1 EIS[4] and SDP. FRA published the Tier 1 DEIS in November 2015 and a Tier 1 FEIS in December 2016. The Tier 1 FEIS included evaluation of steel-wheel on rail technologies as a way to serve the passenger and freight rail needs of the region.

[4] A Tier 1 EIS analyzes a program or project on a broad scale. A Tier 1 EIS may be followed by a Tier 2 EIS, which focusses on the project or program in greater detail.

FRA did not incorporate advanced guideway options or similar new technologies, such as magnetic levitation technology, in the alternatives development process for the NEC FUTURE study. However, *Section 9.22 Technology Considerations* of the NEC FUTURE FEIS, states such technologies could be studied separately, and are not precluded as a future transformation investment in the regional transportation system.

4 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 needed for a SCMAGLEV system, the 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, DC.
- 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.

Further discussion of the project needs and objectives are included in the following section.

5 Project Needs

FRA selected the Baltimore-Washington corridor as the location of the first Maglev project due to the area's high level of congestion, economic importance, increased development, and the need for connectivity between the two cities. Section 1307 of the SAFETEA-LU Act (P.L. 109-59, 2005) authorized funding for the project. The 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.

- **Growing demands on the existing transportation network**: Travel demand will continue to increase in the study area along major roadways and railways, including Interstate 95, the Baltimore-Washington Parkway, MD 295, I-295, US 29, US 1, and the NEC.

- **Inadequate capacity of the existing transportation network**: All of the major roadway corridors between Baltimore and Washington, DC include roadway segments that experience level of service (LOS) E/F (heavy congestion) or LOS F (severe congestion) during AM and PM peak hours. Such heavy congestion within the peak AM and PM hours is likely to spill over to non-peak hours as a result of travelers shifting 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.[5]

  Likewise, the NEC FUTURE Tier 1 FEIS documented the increasing demand for improved rail service between Baltimore and Washington, DC. It also demonstrated that multiple portions of the NEC, including those in the SCMAGLEV study area, are experiencing congestion and delays due to capacity constraints and other maintenance needs.

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

  Transit travel time between Baltimore and Washington, DC is more consistent than vehicular travel based on scheduling and the dedicated transit right-of-way. However, emergency repairs, deferred maintenance, and heavy use of the NEC have affected on-time performance.[6] Bus service in the corridor, specifically Metrobus B30 from Greenbelt Metrorail Station to BWI Marshall Airport, has less consistent travel times, related to congestion issues along the Baltimore-Washington Parkway.[7]

  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, the total travel time for all modes is anticipated 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 are needed to help support the predicted population and employment growth and to sustain the economic health of the region.

Each of the project needs is described in more detail below.

[5] 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.
[6] AMTRAK. (September 2015). *AMTRAK: Top Management and Performance Challenges – Fiscal Year 2016 and Beyond.*
[7] Washington Metropolitan Area Transit Authority. (May 2011). Metrobus Service Evaluation Studies 2011: Display Boards for Public Meetings.

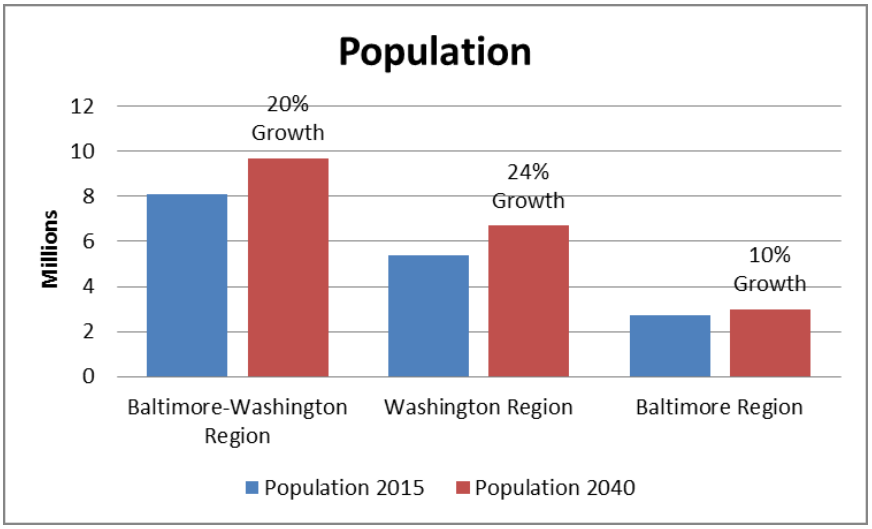
5.1. Increasing Population and Employment

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). TPB and BRTB are staffed and coordinated through Metropolitan Washington Council of Governments (MWCOG) and Baltimore Metropolitan Council (BMC) respectively. The metropolitan Washington region, as defined by MWCOG, includes Washington, DC, Montgomery, Charles, Frederick, and Prince George's Counties in Maryland, and Arlington, Fairfax, Loudoun, and Prince William Counties in Virginia, and the incorporated cities within these counties. The Baltimore region, as defined by BMC, includes the City of Baltimore, Anne Arundel, Baltimore, Carroll, Harford, Howard, and Queen Anne's Counties in Maryland.

By 2040, the population in the Baltimore-Washington region is expected to increase from 8.1 million to 9.7 million, an increase of approximately 20 percent over 2015 estimates.[8]

The population in the metropolitan Washington region is expected to grow approximately 24 percent, between 2015 and 2040 (see **Figure 2**). In the Baltimore region, between 2015 and 2040, population is expected to grow approximately 10 percent.

Figure 2: Population



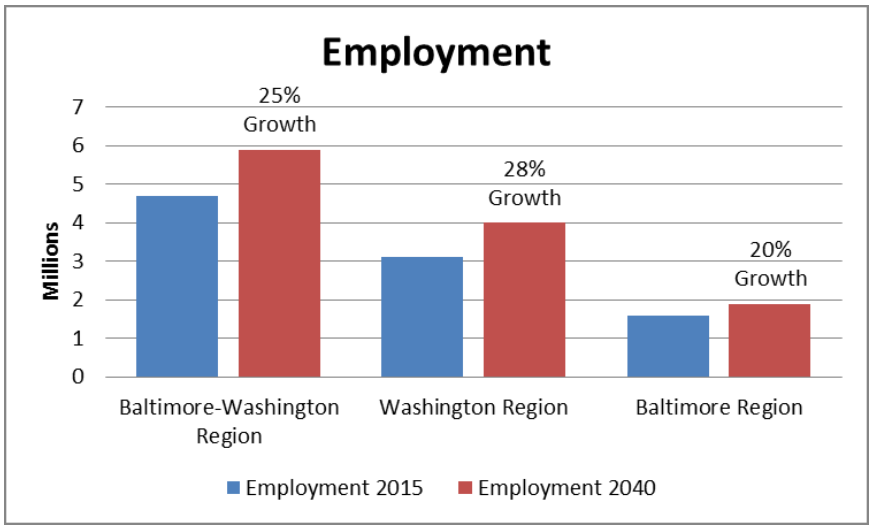
Employment workforce in the Baltimore-Washington region is expected to increase approximately 25 percent from 4.7 million jobs in 2015 to 5.9 million jobs by 2040 (see **Figure 3**).

Based on projections by the MWCOG, employment in the metropolitan Washington region will increase from 3.1 million jobs in 2015 to 4.0 million jobs by 2040, an increase of approximately 29 percent.

As estimated by the BMC, employment within the Baltimore region is projected to increase from 1.6 million jobs in 2015 to 1.9 million jobs by 2040, an increase of approximately 19 percent.

[8] 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.

Figure 3: Employment



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.[9] Washington, DC, 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, and Wholesale and Utilities.

There are also several major development and redevelopment projects active or planned in the Baltimore-Washington region. The Washington, DC, Economic Partnership[10] estimates more than $11.8 billion worth of projects are under construction in Washington, DC and an additional $34.8 billion worth of projects are planned to be completed by 2020. For example, northern Prince George's County within the study area is attracting new development, particularly in College Park, Laurel, and Bowie. One such development is the University of Maryland Research Park located in College Park. When complete, the research park will be the largest research park in the state and one of the largest in the country.

Development activities in the Baltimore area that are within the study area include, but are not limited to, the Penn Station redevelopment, Port Covington redevelopment, and expansion of the Port of Baltimore and BWI Marshall Airport concourses. Similarly, Fort George G. Meade in Anne Arundel County continues to expand and is expected to 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, DC. Tourism totaled 21.3 million visitors in 2015, which included two million international travelers, 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, DC, Economic Partnership, 2015 was the sixth consecutive year of record-level visitation to the Nation's Capital. In

[9] Economic Alliance of Greater Baltimore. (2012). Statistics for Government: Federal, State & Local. Retrieved from http://www.greaterbaltimore.org/research/key-industries.aspx.
[10] Washington DC Economic Partnership. (2016). *Washington, DC Development Report.*
[11] Maryland Department of Business and Economic Development. (April 2014). *BRAC and Related Jobs Summary.*

Baltimore, tourism totaled 25.2 million visitors in 2015, according to the *Visit Baltimore Annual Report.*[12] Annual tourism in Baltimore has increased by 2.9 million visitors since 2012.

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

5.2. Growing Demand on the Existing Transportation Network

The Project Study Area includes major transportation facilities that are currently operating at or near capacity.[13] 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 Baltimore-Washington Parkway, MD 295, US 1, and US 29. In 2014, various segments of I-95 and the Baltimore-Washington Parkway ranked within the top ten bottleneck locations in Maryland.[13] 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, 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 boardings. A review of the demand for each mode is described below. A Travel Demand and Revenue Forecast analysis is also underway to augment this discussion. This analysis aims to study different modes.

5.2.1. 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, DC, which includes many Maryland commuters, is fourth in the nation with commuting times on average of 29.9 minutes each way.

In 2014, the Washington, DC 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.[14] The Baltimore metropolitan area was also ranked among the 25 most congested areas.

On average, an automobile commuter in the Washington, DC 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 resulting air quality degradation.

In the Baltimore region, the annual cost due to congestion for the Baltimore region is estimated to be more than $2 billion.[14]

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*[9] (Mobility Report) notes that the

[12] Visit Baltimore. (Fiscal Years 2016 and 2017). *Visit Baltimore Annual Report & Business Plan.*
[13] Maryland Department of Transportation, State Highway Administration. (December 2015). *Maryland State Highway Mobility Report.*
[14] 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.

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 notes that many sections of the highways between Washington and Baltimore have heavy to severe congestion, especially in the afternoon peak period.

5.2.2. Rail and Transit Network

The NEC runs parallel to I-95 in the study area. It is the busiest rail network in the US, with trains carrying passengers and goods north and south through Boston, New York City, Philadelphia, Baltimore, Washington, DC, and beyond to points south. 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[15], almost half of the passenger rail segments on the NEC from Boston to Washington, DC exceed 75 percent of practical capacity, and the plan estimates that by 2030, passenger rail between Baltimore and Washington, DC could realize capacity utilization higher than 100 percent.

Amtrak Service

Amtrak, which owns the NEC, operates intercity passenger rail service on the corridor and has long-term lease agreements with 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, DC region will have approximately 18 million annual regional rail trips, while the Baltimore region will have 4.6 million regional trips in 2040.[16] Anticipated Amtrak intercity ridership between Baltimore and Washington, DC 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, DC, 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. Amtrak services include both local and limited stop trains between Penn and Union Stations.

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. Approximately 27.5 percent of delays on the Northeast Regional service are caused by train interference, including freight, commuter, and other Amtrak passenger trains. Approximately 32 percent of delays on the Acela Express service are related to problems with railroad infrastructure, including tracks or signals, or delays associated with maintenance or reduced speeds to allow for safe operations.[17]

[15] The NEC Master Plan Working Group consisted of FRA, Amtrak, 12 northeast states, and the District of Columbia.
[16] 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.*
[17] AMTRAK. (February 2017). Amtrak Train Route On-Time Performance. Retrieved March 2017 from https://www.amtrak.com/historical-on-time-performance.

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 regional 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, DC – Baltimore segment: Washington Union Station Improvements; Ivy City Yard Facilities Renewal/Service & Inspection Expansion; Grove to Hanson Fourth Track; BWI Marshall Airport Improvements and Fourth Track; and B&P Tunnel Replacement.[16]

Freight Service

One of the busiest CSX freight lines nationally runs through the 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.[18] As freight volumes along this CSX line grow, the corridor uses additional capacity by occupying the tracks between Baltimore and Washington DC.

MARC Service

MARC commuter trains share the NEC with Amtrak passenger rail and freight operations. In 2014, MARC commuter service was estimated to serve 9.2 million riders.[19] 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.

MTA expects at least 70 percent of all MARC system stations to be at capacity by 2025.[20] MARC currently provides weekday service southbound on the NEC from Penn Station in Baltimore to Union Station in Washington, DC with 15 trips in the AM and 12 trips in the PM. MARC provides weekday service northbound from Union Station to Penn Station with 11 trips in the AM and 17 trains 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. MARC services include both local and limited stop trains between Penn and Union Stations.

Because of the high volume of AMTRAK trains, especially during the heaviest travel times of the day, 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 is likely to grow.

MARC also currently provides weekday service on the Camden Line southbound from Camden 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 Station with four trains in the AM and six trains in the PM.

[18] Maryland Port Administration. (July 2016). State Officials Welcome First Big Container Ship to Arrive at Port of Baltimore through the Newly Expanded Panama Canal.
[19] The Baltimore Metropolitan Council. (October 2015). *The Transit Question: Baltimore Regional Transit Needs Assessment*.
[20] Maryland Department of Transportation, Maryland Transit Administration. *MARC Growth and Investment Plan Update 2013 to 2050.* Retrieved from https://mta.maryland.gov/sites/default/files/mgip_update_2013-09-13.pdf.

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.

MTA Commuter Bus Service

MTA provides commuter bus service within the Baltimore-Washington region. In 2015, this service had an approximate annual ridership of 4.0 million[21]; 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.

WMATA Services

The Washington Metropolitan Area Transit Authority (WMATA) provides bus service, the B30 line, between the Greenbelt Metrorail Station and BWI Marshall Airport. In 2014, this service had an approximate average weekday ridership of 525[22]; and between 2011 and 2014, experienced a 33 percent reduction in average daily ridership.[23] The decrease in ridership is likely an indicator of long travel times and delays experienced by buses running in heavy traffic on the Baltimore-Washington Parkway and MD 295 corridors. These conditions result in the need for more reliable transportation choices in the Baltimore-Washington corridor.

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

5.2.3. Airports

The number of air passengers who begin their trips in the Baltimore-Washington region is at the highest level since 2005.[24] Baltimore and Washington, DC 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 (including both enplaned and deplaned passengers) at BWI Marshall Airport increased by 5.5 percent between 2015 and 2016, based on the BWI Marshall Airport summary of air

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

[22] Washington Metropolitan Area Transit Authority. (May 2014). Metrobus Monthly Ridership.

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

[24] National Capital Region Transportation Planning Board. (December 2016). 2015 Washington-Baltimore Regional Air Passenger Survey Geographic Findings.

traffic and passenger statistics.[25] 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 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.[26] 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.

According to the *2014 State of NEC Report*[27], 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.

5.3. 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. To improve the level of service, additional infrastructure capacity is needed.

5.3.1. Roadway Network

According to SHA's 2013 Congestion Assessment Maps[28], all four of the main roadway corridors (US 29, I-95, US 1 and Baltimore-Washington Parkway) between Baltimore and Washington, DC area experience heavy and/or severe congestion during peak hours. US 29 is a major travel corridor between the Baltimore and Washington, DC region. The corridor is located outside the study area but travel in the corridor is impacted by many of the same factors described for study area roadways.

5.3.2. 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 (July 2017), includes infrastructure improvements in Maryland and Washington, DC in the SCMAGLEV study area that support operations necessary to meet market growth. These projects include chokepoint relief at New Carrollton, Odenton and BWI Thurgood 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 Thurgood Marshall Airport station expansion and high density signaling from Washington, D.C. to New Carrollton and from Seabrook to West Baltimore.

[25] 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.

[26] Federal Aviation Administration. (January 2017). *APO Terminal Area Forecast Detail Report: Forecast Issued January 2017.* Federal Aviation Administration. January 2017.

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

[28] Maryland Department of Transportation State Highway Administration Congestion Assessment Maps published in January 2015. 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.

5.4. Increasing Travel Time

Travel time between Baltimore and Washington, DC continues to increase on the roadways within the study area, adding to commuting time as well as travel time to and from transit stations and BWI Marshall Airport. This increase in travel time is directly related to the degradation in level of service on the transportation network.

5.4.1. Roadway Network

According to the 2015 *Maryland State Highway Mobility Report*[13], 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, DC. 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. 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.

5.4.2. Transit Travel Time

The Baltimore Metropolitan Council 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.[19]

5.4.3. MTA Commuter Bus Service

MTA provides eight commuter bus routes within the Baltimore-Washington area[29], 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 MTA commuter bus passengers in the corridor on an average weekday.[30]

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

For example, the MTA 305 route that travels the US 29 corridor from Columbia, MD into Washington, DC carries 724 riders per day. The current scheduled trip time for this commuter bus route averages 108

[29] Maryland Department of Transportation, Maryland Transit Administration. (2017). Maryland Transit Administration Commuter Bus Website. Retrieved from https://mta.maryland.gov/commuter-bus.
[30] Maryland Department of Transportation, Maryland Transit Administration. (Fiscal Year 2015). Transit Ridership Weekday Averages.

minutes in the AM peak period, and 116 minutes in the PM peak period. As level of service decreases on US 29, MTA estimates that each trip will take an additional 30 minutes or more in 2040.

5.4.4. Airports

Based on the results of the 2015 Air Passenger Regional Survey, BWI Marshall Airport continues to have the highest proportion of regional enplanements (compared to Dulles and Reagan National Airports) and experienced record-high passenger volumes.[31] 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 peak hours. During non-recurring congestion, (i.e., an unexpected incident), travel times from Washington, DC to BWI Marshal Airport by automobile sometimes approach 90 minutes or more. Similar to the NEC and 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.

5.5. 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 level of service 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, DC corridor, the need for transportation choices is important. With increased demand on the existing transportation network that comprises of a variety 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 volume and congestion along the major corridors such as I-95, the Baltimore-Washington Parkway, 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.

5.6. 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 growth[32], including the retention of, and an increase in jobs in the region.

[31] Transportation Planning Board. (December 2016). 2015 Washington-Baltimore Regional Air Passenger Survey.
[32] The National Economic Council and the President's Council of Economic Advisers. (July 2014). *An Economic Analysis of Transportation Infrastructure Investment.*

6 Summary

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.

The project needs are related to the limited capacity of existing roadway, transit, rail, and freight systems; increasing travel time; and reduced reliability and mobility in the study area.

Congress has expressed its intent that the SAFETEA-LU funding for this project "be used to directly advance and result in construction of a maglev project."[2] This goal can only be achieved if the NEPA EIS evaluation concludes that SCMAGLEV is a safe, reliable, high-speed, revenue-producing Maglev system that:

- Can help meet the capacity and ridership needs of the Baltimore-Washington region; and
- Meets FRA operational and safety requirements by including infrastructure, vehicles, and operating procedures for the SCMAGLEV system and an alignment which allows the highest practical speed that can be attained by SCMAGLEV technology at a given location under required conditions.

The Baltimore-Washington region is one of the largest and densest population centers in the United States. Over the next 25 years, the population in the region is projected to increase by approximately 20 percent with employment workforce increasing approximately 25 percent. Similarly, the number of visitors to the region is also projected to increase with tourism serving as a significant driver of the economy in both the City of Baltimore and Washington, DC. As the population, workforce, and tourism continue to grow, the demand on the transportation infrastructure between Baltimore and Washington, DC will continue to increase along major roadways and railways including I-95, the Baltimore-Washington Parkway, MD 295, US 29, US 1, and the NEC, thereby degrading the regional transportation system level of service, reliability, and mobility.

The conditions above translate into the need to evaluate and implement an improved mobility option of travel between the Baltimore and Washington, DC metropolitan areas utilizing SCMAGLEV technology that achieves optimal operating speed and minimizes impacts to the human and natural environment.

References

AMTRAK. (September 2015). *AMTRAK: Top Management and Performance Challenges – Fiscal Year 2016 and Beyond.*

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

Economic Alliance of Greater Baltimore. (2012). Statistics for Government: Federal, State & Local. Retrieved from http://www.greaterbaltimore.org/research/key-industries.aspx.

Federal Aviation Administration. (January 2017). *APO Terminal Area Forecast Detail Report: Forecast Issued January 2017*. Retrieved March 2017 from http://taf.faa.gov/.

Maryland Department of Business and Economic Development. (April 2014). *BRAC and Related Jobs Summary.*

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

Maryland Department of Transportation, Maryland Aviation Administration. (December 2016). *Monthly Statistical Report Summary for the month of December 2016*. Retrieved March 2017 from http://www.bwiairport.com/files/assets/stats/Dec2016.pdf.

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

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

Maryland Depart of Transportation, Maryland Transit Administration. (2017). Maryland Transit Administration Commuter Bus Website. Retrieved from https://mta.maryland.gov/commuter-bus.

Maryland Department of Transportation, State Highway Administration. (January 2015). Congestion Assessment Maps.

Maryland Department of Transportation, State Highway Administration. (December 2015). *Maryland State Highway Mobility Report.*

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

Northeast Corridor Infrastructure and Operations Advisory Commission. (February 2014). *State of the Northeast Corridor Region Transportation System.*

Northeast Corridor Master Plan Working Group. (May 2010). *The Northeast Corridor Infrastructure Master Plan.*

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

The Baltimore Metropolitan Council. (October 2015). *The Transit Question: Baltimore Regional Transit Needs Assessment.*

National Capital Region Transportation Planning Board. (December 2016). 2015 Washington –Baltimore Regional Air Passenger Survey Geographic Findings.

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

Transportation Planning Board. (December 2016). 2015 Washington-Baltimore Regional Air Passenger Survey.

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.*

Visit Baltimore. (Fiscal Years 2016-2017). *Visit Baltimore Annual Report & Business Plan.*

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

Washington Metropolitan Area Transit Authority. (May 2014). Metrobus Monthly Ridership.

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