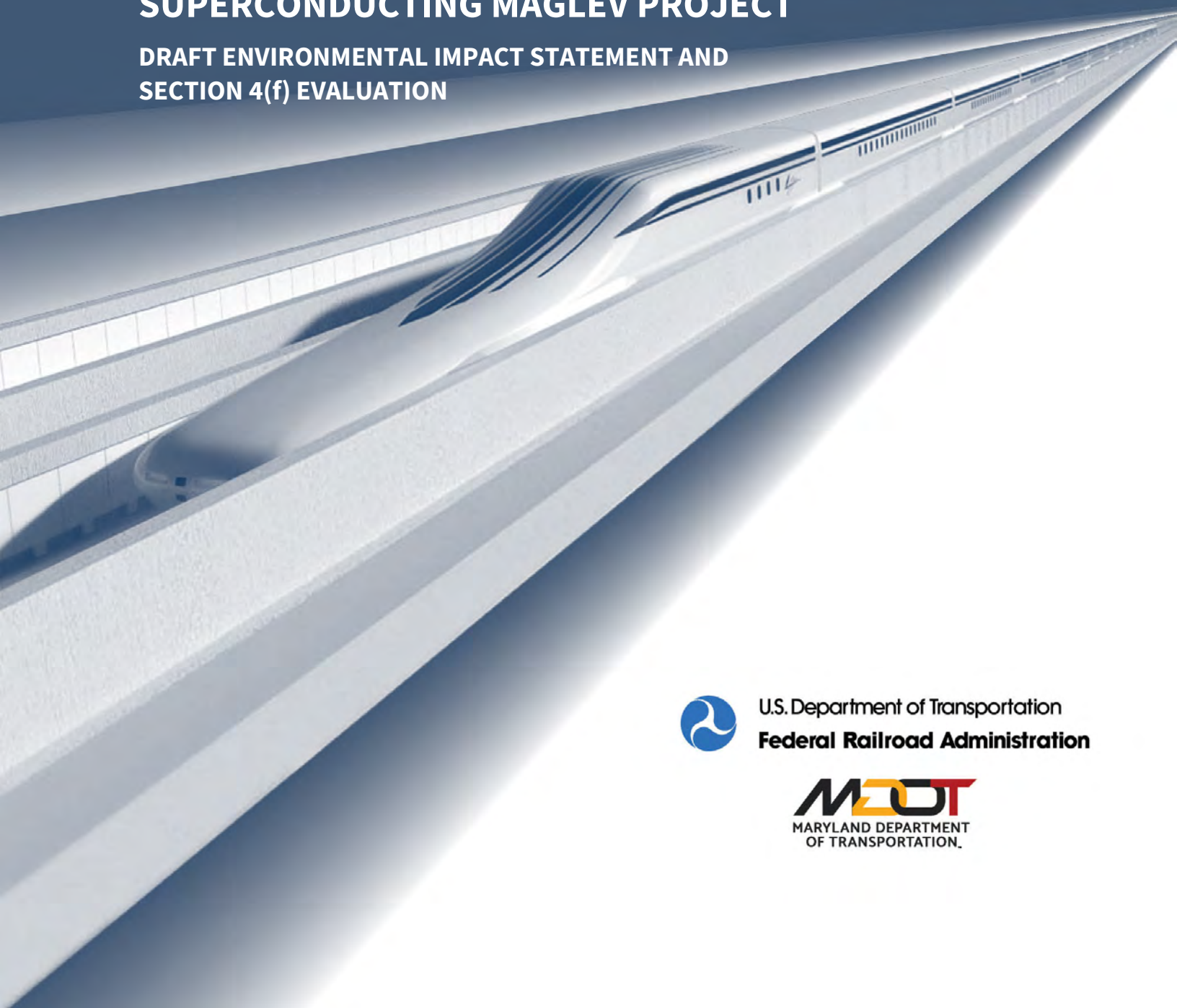
Appendix G3.
Electromagnetic Fields (EMF) Memorandum

Materials Provided by the Project Sponsor

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

BALTIMORE-WASHINGTON SCMAGLEV PROJECT

ELECTROMAGNETIC FIELDS

REVISION: 4

DATE: December 10, 2020

BWRR

BALTIMORE-WASHINGTON RAPID RAIL

BALTIMORE-WASHINGTON SCMAGLEV PROJECT

ELECTROMAGNETIC FIELDS

FRA Deliverable #27

4.3 PRELIMINARY ENGINEERING

REVISION: 4

DATE: DECEMBER 10, 2020

LOUIS BERGER

TABLE OF CONTENTS

TABLES

FIGURES

NOTES/REVISIONS FOR VERSION CONTROL

Revision 1: Noise Vibration EMF, 2017-08-10

Revision 2: Noise Vibration EMF, 2018-02-16

Revision 3: Electromagnetic Fields, 2020-03-31

File Name: LB 4.3 EMF Rev3 20.03.31.docx

Revision 4: Electromagnetic Fields, 2020-12-10

File Name: LB 4.3. EMF Rev4 20.12.10

1. EXECUTIVE SUMMARY

Electromagnetic Forces generated by the SCMAGLEV train are described. Test results from the SCMAGLEV system operating in Japan are provided for adjacent land use and passengers on a train. The test data show that SCMAGLEV exposure levels are far below safe limits established by the International Commission of Non-Ionizing Radiation Protection (ICNIRP). Mitigation measures deployed to keep electromagnetic force exposure levels below acceptable limits are presented.

2. BACKGROUND

The Baltimore-Washington Maglev project will provide new infrastructure, stations and facilities for a Superconducting Maglev (SCMAGLEV) train system between Washington, DC, and Baltimore, MD. The system will use technology developed by the Central Japan Railway Company (JRC) for service between Tokyo and Nagoya. The U.S. Federal Railroad Administration (FRA) is conducting an Environmental Impact Statement (EIS) to evaluate alternatives for the project pursuant to the requirements of the National Environmental Policy Act (NEPA). The project sponsor is Baltimore Washington Rapid Rail (BWRR, or Railroad), working with Maryland Department of Transportation (MDOT) and Maryland Department of Economic Development (MEDCO).

The November 2018 Alternatives Report selected two alignment alternatives for further study in the Draft Environmental Impact Statement (DEIS):

- Alternative J – Baltimore-Washington Parkway East
- Alternative J1 – Baltimore-Washington Parkway West

The alignments are 33 to 35 miles long, depending on terminal station options, with 75 percent to 83 percent of the route in tunnel, and the balance on elevated viaduct.

3. EMF TERMS AND DEFINITIONS

Electric and magnetic fields are generated both naturally and by human activity. Electric fields describe forces that electric charges exert on other electric charges. Magnetic fields describe forces that a magnetic object or moving electric charge exerts on other magnetic materials and electric charges. Naturally occurring EMFs include the Earth's magnetic field, static electricity, and lightning. EMFs also are created by the generation, transmission, and distribution of electricity; the use of everyday household electric appliances and communication systems; industrial processes; and scientific research. Natural- and human-generated EMFs cover a broad spectrum. EMFs that are nearly constant in time are called "DC" (direct-current) EMFs. EMFs that vary in time are called "AC" (alternating-current) EMFs.

AC EMFs are further characterized by their frequency range. Extremely low frequency magnetic fields typically are defined as having a lower limit of 3 to 30 Hz and an upper limit of 30 to 3,000 Hz. Radio frequency (RF) fields resulting from radio and other communications operate at much higher frequencies, often in the range of 500,000 Hz (500 kilohertz [kHz]) to 3 billion Hz (3 gigahertz [GHz]). Typical RF sources of EMF include cellular telephone towers; broadcast towers for radio and television; airport radar, navigation, and communication systems; high frequency and very high frequency communication systems used by police, fire, emergency medical technicians, utilities, and governments; and local wireless systems such as WiFi or cordless telephones.[1]

Electric fields arise from electric charges, are measured in volts per meter (V/m), and are shielded by common materials, such as wood and metal. Magnetic field strength is expressed in units of ampere per meter (A/m). Magnetic flux density is a vector quantity that determines the force on a moving charge or charges (electric current). Magnetic flux density is expressed in tesla (T). There are one thousand millitesla (mT) per tesla. Magnetic fields are not shielded by most common materials and pass easily through them. Both electric and magnetic fields are strongest close to the source and diminish with distance.[2]

[1] California High-Speed Train Project EIR/EIS, Merced to Fresno Section
http://www.hsr.ca.gov/docs/programs/merced-fresno-eir/final_EIR_MerFres3_5Electromag.pdf

[2] http://www.who.int/peh-emf/publications/facts/fs322/en/

4. REGULATORY FRAMEWORK

The International Commission of Non-Ionizing Radiation Protection (ICNIRP), a non-governmental organization that is formally recognized by the World Health Organization, provides guidance on the EMF exposure limit for the general public.[3] For magnetic fields between 1 and 8 Hz, the ICNIRP reference level for general public exposure is $0.04\ T/f^2$ (frequency (in Hz) squared). As an example, for a frequency of 2 Hz, the limit is 0.01 T ($0.04/2^2$) or 10 mT.

Any proposed SCMAGLEV system, including power and communications, would be reviewed relative to applicable requirements relating to electromagnetic interference (EMI) and electromagnetic compatibility (EMC), including:

- U.S. Department of Transportation, FRA, 49 CFR Parts 236.8, 238.225, and 236 Appendix C. These regulations provide rules, standards, and instructions regarding operating characteristics of electromagnetic, electronic, or electrical apparatus, and safety standards for passenger equipment.
- U.S. Department of Commerce, FCC, 47 CFR Part 15. Part 15 provides rules and regulations regarding licensed and unlicensed RF transmissions. Most telecommunications devices sold in the United States, whether they radiate intentionally or unintentionally, must comply with Part 15. However, Part 15 does not govern any device used exclusively in a vehicle, including on trains.
- U.S. Department of Commerce, FCC, Office of Engineering and Technology (OET) Bulletin 65, Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields. OET 65 provides assistance in evaluating whether proposed or existing transmitting facilities, operations, or devices comply with limits for human exposure to RF fields adopted by the FCC.

[3] http://www.icnirp.org/cms/upload/publications/ICNIRPemfgdl.pdf
http://www.icnirp.org/cms/upload/publications/ICNIRPLFgdl.pdf

5. SCMAGLEV DATA COLLECTED

SCMAGLEV generates magnetic fields in the extremely low frequency range (0-12 Hz) as shown in Figure 5.1. The main source of magnetic fields from SCMAGLEV would be from the superconducting magnets on the train. Propulsion coil, levitation and guidance coils, and connecting cables also emit magnetic fields, but on a much smaller scale than the magnetic fields from SCMAGLEV magnets. The overall approach to EMF protection is to provide sufficient shielding in the vehicle and equipment design to meet the applicable guideline criteria.

Figure 5.1 SCMAGLEV in EMF Spectrum

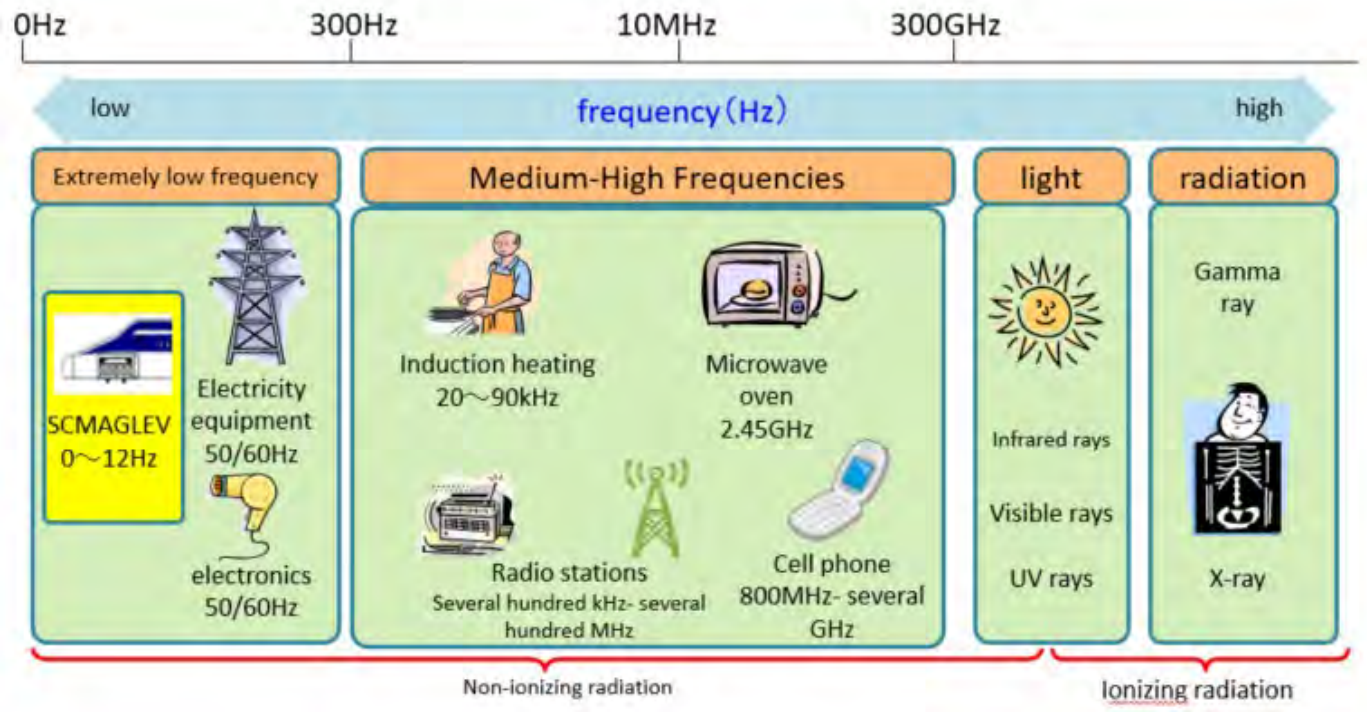


Table 5.1 and

Figure 5.2 show the magnetic flux density measurements performed by JRC for a stationary SCMAGLEV vehicle and a vehicle at passing speed (500 km/h).

Measurements performed inside the train address the potential for passenger exposure. The maximum magnetic flux density due to the train's own magnets was 1.33 mT at 0 Hz measured 0.1m above the floor in the gangway 2.4 m (7.9 feet) from the end of the car. This is below the ICNIRP guideline of 400 mT.

The exposure from passing trains (where there would be two separate fields simultaneously) had a maximum magnetic flux density of 0.11 mT at 12 Hz measured 1.0m above the floor in the cabin seat. This is below the ICNIRP guideline for this frequency of 0.44 mT.

With the relative speed of the two trains at zero, the maximum interior magnetic flux density was 1.33mT (compared to limit of 400 mT). Figure 5.3 illustrates these results.

The results of exterior and interior EMF measurements show that the SCMAGLEV system would meet all ICNIRP magnetic field exposure guidelines, which the World Health Organization recommends.

Table 5.1 SCMAGLEV Magnetic Field Strength Measurements

	STATIONARY TRAIN (0 KM/H)			PASSING SPEED (500 KM/H)		
	Field Strength (mT)	Frequency (Hz)	ICNIRP Limit (mT)	Field Strength (mT)	Frequency (Hz)	ICNIRP Limit (mT)
Test Location 1 Located 4 meters horizontally from the edge of elevated structure at the same elevation	0.19	0	400	0.19	5.7	1.2
Test Location 2 Located at ground level 8 meters below the elevated structure	0.02	0	400	0.021	5.7	1.2

An additional test location at ground level 45 meters above the guideway tunnel had a field strength reading of 0.00015 mT, which is well within applicable guidelines.

Figure 5.2 Magnetic Flux Density Measurements- Exposure of Adjacent Land Uses

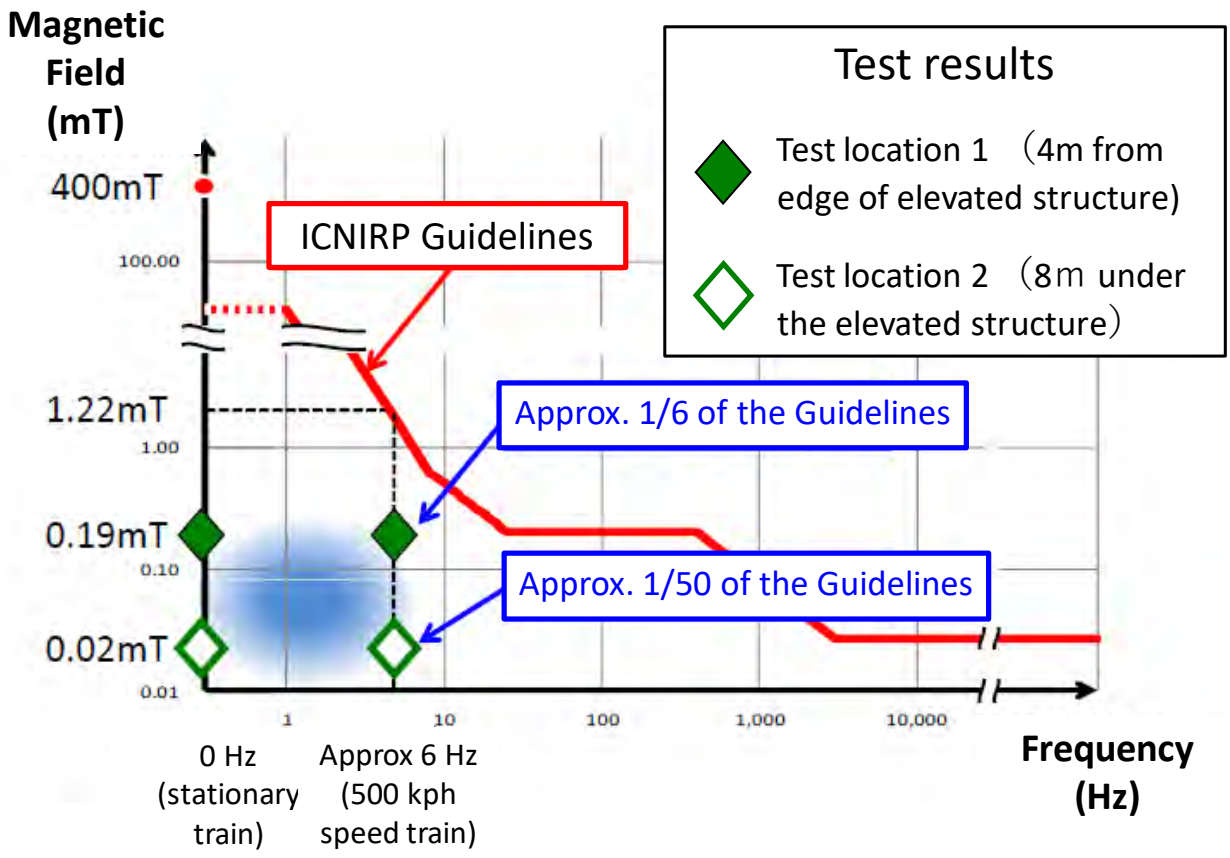
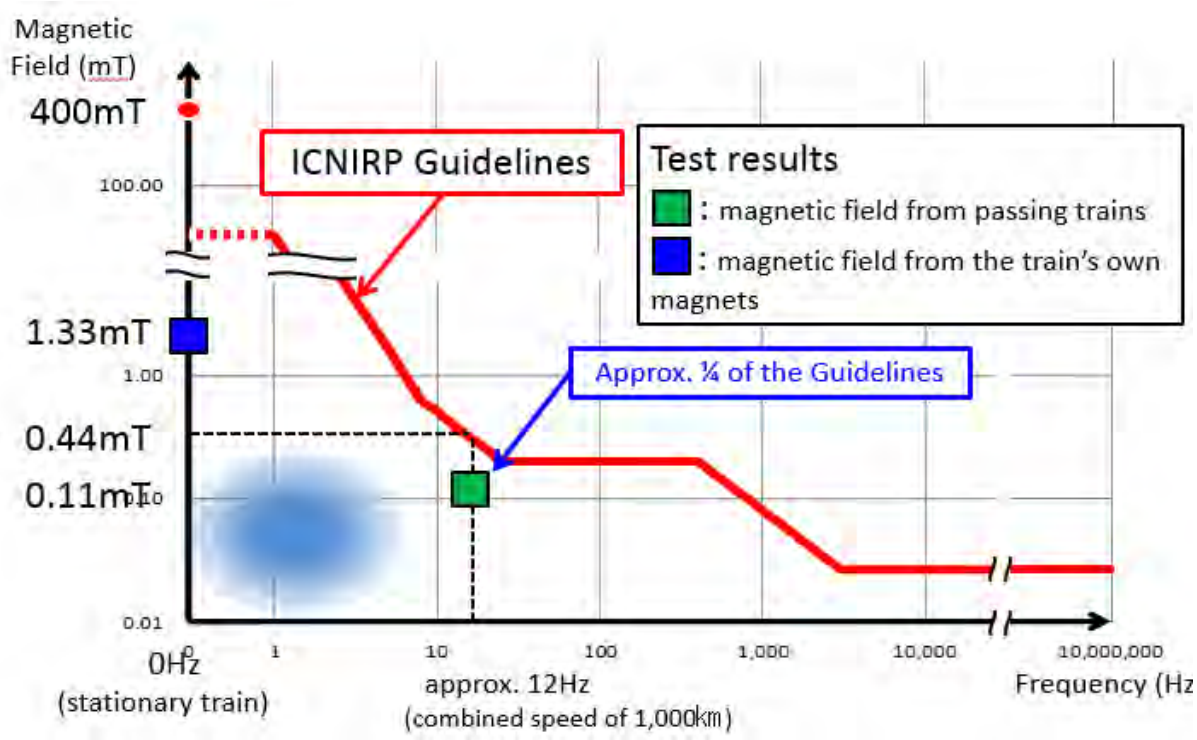


Figure 5.3 Magnetic Flux Density Measurements- Passenger Exposure Assessment



6. MITIGATION MEASURES

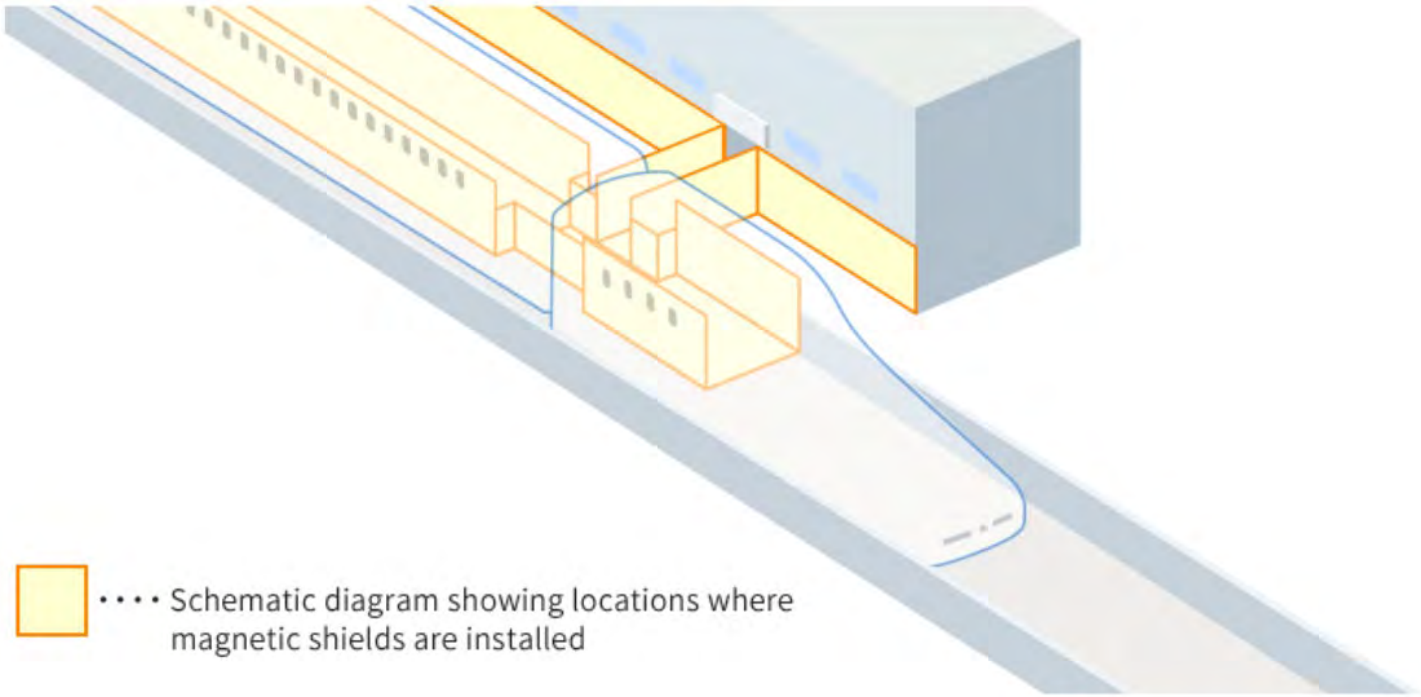
6.1 STATIONS

The SCMAGLEV system does not have conventional station platforms; rather, passengers wait in a boarding area within the station where they are shielded from both magnetic fields and aerodynamic pressures created by operation of the trainsets.

Once a trainset arrives at a station, a boarding bridge extends to each side entrance door from the enclosed station boarding area. When the boarding bridges for all units of the trainset have mated and sealed with the trainset, the side entrance doors on the trainset, and the doors between the passenger boarding area in the station and the boarding bridge, automatically open to allow passengers to board and disembark trainsets. The boarding bridge and seal arrangement are designed to minimize aerodynamic pressure and magnetic field exposure to passengers and crew during boarding and disembarkation.

Figure 6.1 shows a boarding bridge at a station platform.

Figure 6.1 Boarding Bridge at Station Platform



6.2 VIADUCTS

The height of viaduct is generally 10 meters (33 feet) or higher. A 10 meter elevation corresponds to Location 2 in Table 5.1, assuming a person of 2 meter (6 feet 7 inches) height below the viaduct. At this distance, exposure is 0.19 mT, which is well below the ICNIRP Limit of 1.22 mT.

When the viaduct height is less than 10 meters, fencing will be installed at the right-of-way line, providing a protected width of 22 meters (72 feet). The right-of-way fencing will be 4 meters (13 feet) from the edge of the viaduct. The fencing position corresponds to Location 1 in Table 5.1. At this distance, exposure is 0.02 mT, which is well below the ICNIRP Limit of 1.22 mT.

6.3 PORTALS

At the tunnel transition portal, the train emerges from a tunnel and transitions to a viaduct. Fencing will be installed at the right-of-way line, providing a protected width of 24 meters (79 feet). The right-of-way fencing will be over 4 meters (13 feet) from the edge of the portal structure. The fencing position corresponds to Location 1 in Table 5.1. At this distance, exposure is 0.02 mT, which is well below the ICNIRP Limit of 1.22 mT.

6.4 TUNNELS

In tunnels, physical separation from the guideway to any person at ground level is a minimum of 25 meters (82 feet).

6.5 WORKER PROTECTION

Workers and maintenance-of-way (MOW) equipment are prevented from entering the guideway during service hours when trains are running (5:00 AM to 11:00 PM).

During nighttime hours (11:00 PM to 5:00 AM), there are no trains operating on the guideway. When workers enter the guideway to perform inspection and maintenance and, the ground coils and inductive power coils are de-energized, eliminating potential worker exposure to electromagnetic forces.

6.6 EMERGENCY EGRESS PROTECTION

Protocols will be established to protect the riding public from potential electromagnetic force exposure in the event that emergency egress from a train is required between stations.

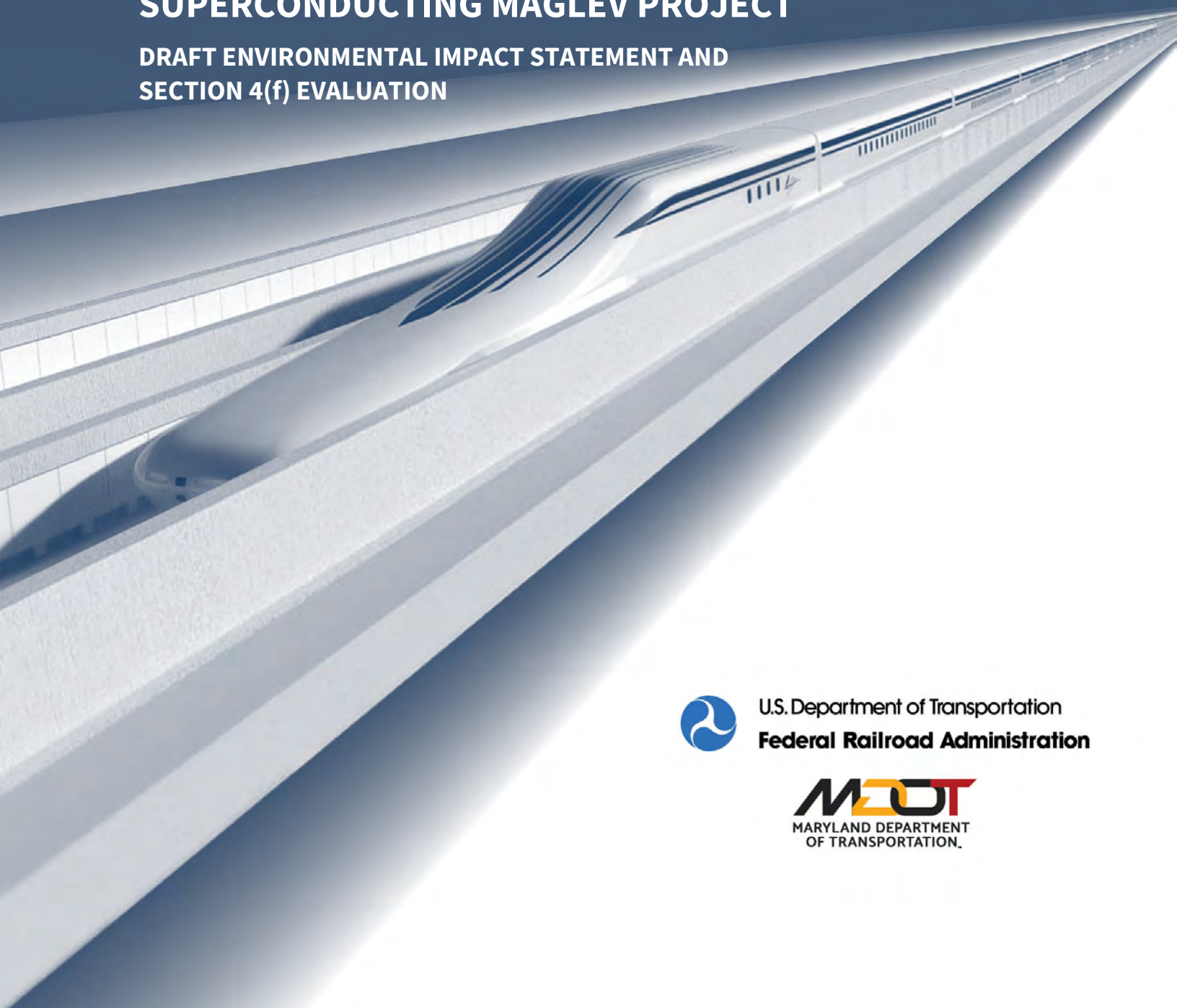
Appendix G4.

Operations Plan Memorandum

Materials Provided by the Project Sponsor

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

BALTIMORE-WASHINGTON SCMAGLEV PROJECT

OPERATIONS PLAN

REVISION: 3

DATE: December 10, 2020

BWRR

BALTIMORE-WASHINGTON RAPID RAIL

BALTIMORE-WASHINGTON SCMAGLEV PROJECT

OPERATIONS PLAN

4.3 PRELIMINARY ENGINEERING

REVISION: 3

DATE: DECEMBER 10, 2020

LOUIS BERGER

TABLE OF CONTENTS

TABLES

NOTES/REVISIONS FOR VERSION CONTROL

Revision 0: 2018-12-10
Revision 1: 2020-02.28
Revision 2: 2020-05.06
File Name: SCMLEV-BWRR-MEM-0003-R2 LB 4.3 BW Operations Plan
Revision 3: 2020-12-10
File Name: SCMLEV-BWRR-MEM-0004-R3 LB 4.3 BW Operations Plan Task 28 20.12.10

1. EXECUTIVE SUMMARY

The proposed Baltimore Washington SCMAGLEV system would provide approximately 15-minute service between Washington, DC and Baltimore, MD, with an interim stop at BWI Airport. The system would operate a 16-car train with up to eight departures per hour in each direction. Service would be provided from 5:00 AM to 11:00 PM 365 days per year.

2. BACKGROUND

The Baltimore-Washington Maglev project would provide new infrastructure, stations and facilities for a Superconducting Maglev (SCMAGLEV) train system between Washington, DC, and Baltimore, MD. The system would use technology developed by the Central Japan Railway Company (JRC) for 500 kilometer/hour (311 mile/hour) service between Tokyo and Osaka. U.S. Federal Railroad Administration (FRA) and the Maryland Department of Transportation (MDOT) are preparing an Environmental Impact Statement (EIS) to evaluate alternatives for the project pursuant to the requirements of the National Environmental Policy Act (NEPA). The project sponsor is Baltimore Washington Rapid Rail (BWRR).

The November 2018 Alternatives Report selected two alignment alternatives for further study in the Draft Environmental Impact Statement (DEIS):

- Alternative J – Baltimore-Washington Parkway East
- Alternative J1 – Baltimore-Washington Parkway West

The alignments are 33 to 35 miles long, depending on terminal station options, with 75 percent to 83 percent of the route in tunnel, and the balance on elevated viaduct.

3. METHODOLOGY

The operations plan was developed as follows:

- Research operational characteristics and procedures developed by JRC for the Chuo Shinkansen SCMAGLEV system.
- Establish operational assumptions.
- Develop service plan.
- Generate notional plan for operations and maintenance for the Baltimore-Washington SCMAGLEV system.

4. OPERATING PLAN ASSUMPTIONS

Table 4.1 presents assumptions for the Baltimore-Washington SCMAGLEV operation.

Table 4.1 Operating Plan Assumptions

No.	Category	Assumptions
1	Revenue Hours of Service	Passenger operation hours of service from 05:00 to 23:00 hours, 365 days per year.
2	Maintenance Hours of Service	Daily inspection and maintenance from 23:00 to 05:00.
3	Trainset Maintenance Facility (TMF)	One TMF between Washington, DC and Baltimore, MD with storage yard, inspection shop, repair shop, and heavy maintenance facility.
4	Service Frequency (Headway)	Headway varies by hour throughout the day depending on ridership requirements. See Table 4.2.
5	Guideways Direction of Travel	Right hand running Is assumed for revenue service, however, both directions will be controlled for bi-directional running in case operating in the reverse direction on a guideway is necessary.
6	Terminal Station Layout for Washington, DC and Baltimore, MD stations	Terminal stations with four guideways. Platforms accommodate 16 car trains. Double crossover and turnouts provide access to and from all terminal platforms.
7	Intermediate Station Layout for BWI Airport Station	Intermediate station with four guideways. Center two guideways without platforms for express (through) trains. Outside guideways for local trains, with platforms for 16-car trains.
8	Station Stops	Trains stop at all three stations. Express service may be considered, with express trains bypassing local trains dwelling at BWI Airport station.
9	Dwell Time at BWI Airport station	Up to 4 minutes but may vary depending on time of day
10	Start-of-Day Train Location	Up to two trains staged at each terminal station. Additional trains enter from the TMF as required.
11	Trainset Make up	16 car trains, 396.2m long (1299.9 feet) • 2 end units, one at each end of the train, 28m long (91.85 feet) • 14 intermediate units, 24.3m long (79.7 feet)
12	One-way Runtime	Approximately 15 minutes with a stop at BWI Airport (time will vary depending on dwell time at BWI).

13	Terminal Station Turnaround Time	The desired turnaround time is 20 minutes. Turnaround time includes passenger unloading and loading, mechanical time for opening/closing doors, terminal check of train, crew change, water and sewerage refreshment and treatment, and light cleaning (parallel activities). The 20 minutes turnaround time is based on an analysis of operations and includes scheduled recovery time. If required, the turnaround time can be reduced to as low as 10 minutes at one terminal station for some trips.
14	Locations of Turnouts and Crossovers	Double Crossovers: • Station 100+900 North end of Washington, DC Station • Station 153+500 South end of Cherry Hill Station alternative • Station 207+000 South end of Camden Yards Station alternative • Within TMF complex and on TMF ramps Single Crossovers: • Station 119+600 (Alt J) For maintenance-of-way vehicle use • Station 118+700 (Alt J1) For maintenance-of-way vehicle use • Station 205+700 For Westport Maintenance-of-way vehicle use for Camden Yards Station alternative • Within TMF complex Turnouts: • Station 100+500 Within Washington, DC Station on upper and lower platform levels • Station 119+800 (Alt J) TMF ramp connections to mainline • Station 118+800 (Alt J1) TMF ramps connecting mainline • Station 143+400 BWI Airport Station local guideway turnouts (south of Station) • Station 146+500 BWI Airport Station local guideway turnouts (north of Station) • Station 153+700 Cherry Hill Station alternative local guideway turnouts (south of Station) • Station 153+800 Cherry Hill Maintenance-of-way facility turnouts for Cherry Hill Station alternative • Station 154+400 Cherry Hill Station alternative local guideway turnouts (north of Station) • Station 205+600 Westport Maintenance-of-way facility turnout for Camden Yards Station alternative • Station 207+100 Camden Yards Station alternative local guideway turnouts (south of Station) • Station 207+700 Camden Yards Station alternative local guideway turnouts (north of Station) • Within TMF complex and on TMF ramps Note: there are no sidings.

5. SERVICE PLAN

The notional service plan for the year 2050 is provided in Table 5.1.

Table 5.1 Service Plan

Hour	Baltimore to Washington	Washington to Baltimore
0500 - 0600	4	4
0600 - 0700	6	6
0700 - 0800	8	8
0800 - 0900	8	8
0900 - 1000	8	8
1000 - 1100	6	6
1100 - 1200	4	4
1200 - 1300	4	4
1300 - 1400	4	4
1400 - 1500	4	4
1500 - 1600	6	6
1600 - 1700	8	8
1700 - 1800	8	8
1800 - 1900	8	8
1900 - 2000	6	6
2000 - 2100	4	4
2100 - 2200	4	4
2200 - 2300	4	4
2300 - 0500 Maintenance Window	0	0

6. MAINTENANCE PLAN

JRC has developed an inspection, testing, and maintenance program specific to the SCMAGLEV. The program addresses all aspects of the system including the guideway, trainsets, infrastructure, etc. BWRR intends to follow the JRC program as closely as possible. An inspection, testing and maintenance program for the Baltimore-Washington SCMAGLEV system will be addressed with FRA in separate System Technical Familiarization (STF) discussions.

The inspection program for the guideway includes visual as well as automated inspections using specialized maintenance of way (MOW) vehicles and equipment. MOW vehicles and equipment are stored, maintained and diesel fueled at the MOW facility. The number and types of MOW vehicles operating on the guideway will vary based the periodicities of different types of inspections. During trainset operating hours, all MOW activities are prohibited and strict temporal separation of MOW activities from passenger service is enforced. The turnout from the MOW facility is locked out, and individuals are prohibited from entering the guideway. During maintenance hours, MOW equipment access to the mainline is permitted through the turnouts from the MOW facility. Maintenance hours will commence as soon as safe and practicable after the conclusion of revenue service each day.

SCMAGLEV trainsets are maintained at the Trainset Maintenance Facility (TMF). A specialized maintenance program for the trainsets has been developed based on many years of operation at the Yamanashi Maglev Line. In addition to periodic maintenance, trainsets are also stored and repaired at the TMF.

Additional periodic inspections are conducted on other aspects of the infrastructure: noise barriers, earth structures, the external surface of hood structures and other facilities such as fences and barriers. Tunnel and internal hood inspections are also conducted. Bridge and viaduct inspections are performed at defined intervals. Special inspections of the right-of-way are also conducted as soon as possible in the event of an earthquake, fire, flood, severe storm, or other occurrence that might have damaged the guideway.

A 6 meter (20 foot) wide access way will be provided under the viaduct within the right-of-way to access viaduct structures and facilities. The access way will connect to the existing roadway network and be discontinuous across wetlands and rivers.

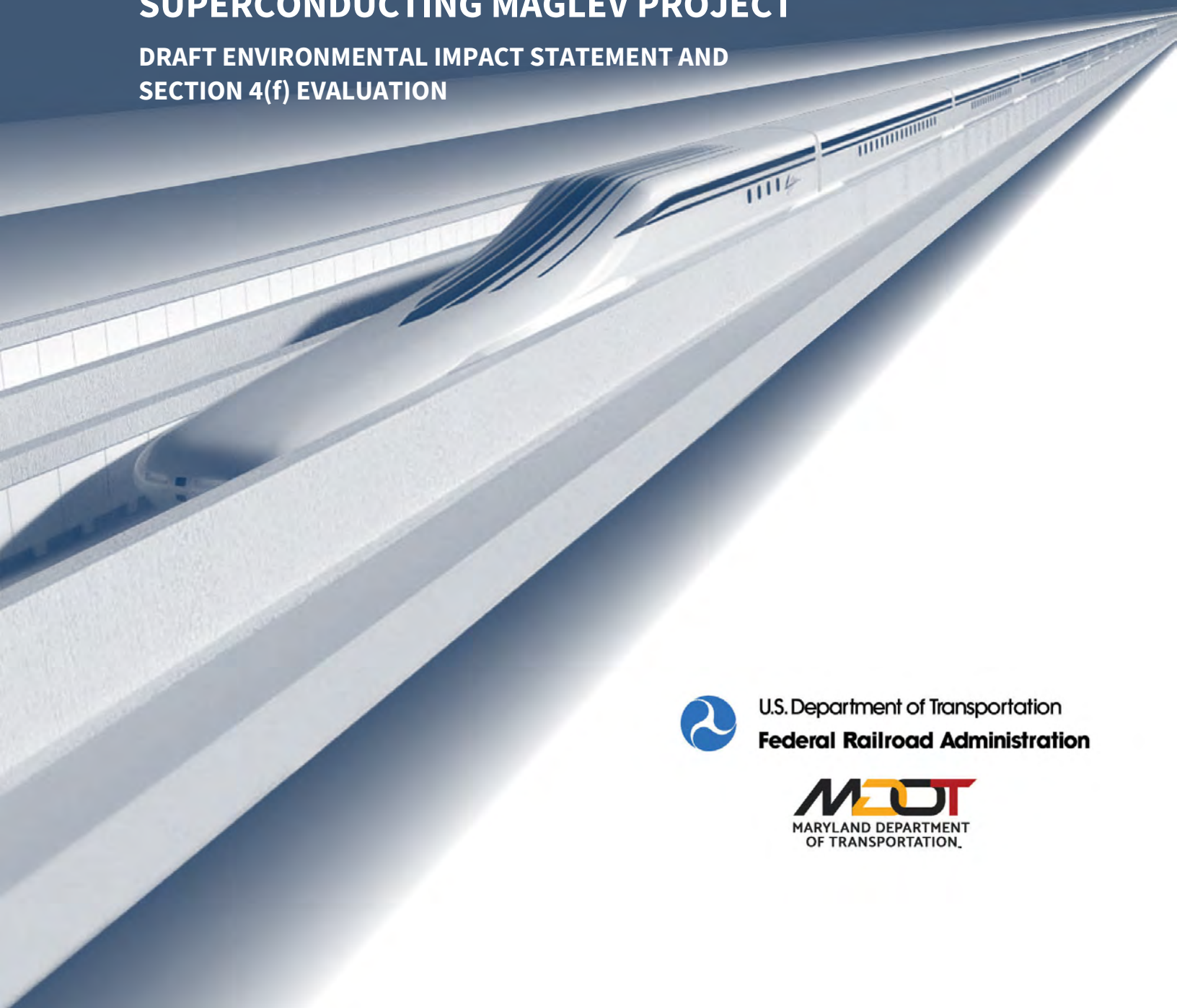
Appendix G5.

Train Speed Profiles Memorandum

Materials Provided by the Project Sponsor

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

BALTIMORE-WASHINGTON SCMAGLEV PROJECT

TRAIN SPEED PROFILES

REVISION: 3

DATE: DECEMBER 10, 2020

BWRR

BALTIMORE-WASHINGTON RAPID RAIL

BALTIMORE-WASHINGTON SCMAGLEV PROJECT

TRAIN SPEED PROFILES

4.3 PRELIMINARY ENGINEERING

REVISION: 3

DATE: DECEMBER 10, 2020

LOUIS BERGER

TABLE OF CONTENTS

TABLES

NOTES/REVISIONS FOR VERSION CONTROL

Revision 0: 2018-06-29

Revision 1: 2020-02-28

Revision 2: 2020-05-06

File Name: SCMLEV-BWRR-MEM-0008-R1 LB 4.3 Train Speed Profiles

Revision 3: 2020-12-10

File name: SCMLEV-BWRR-MEM-0008-R3 LB 4.3 Train Speed Profiles

1. EXECUTIVE SUMMARY

Train speeds were determined for the Baltimore-Washington Maglev project between Washington, DC and Baltimore. The cruising speed of the train is 500 kph (311 mph).

Trains will be traveling at the cruising speed in the central viaduct portion of the alignment, including at the tunnel transition portals. For the Cherry Hill station alternative, trains will slow down to 70 kph (45 mph) at the Cherry Hill portal in order to stop at the station.

2. BACKGROUND

The Baltimore-Washington Maglev project will provide new infrastructure, stations and facilities for a Superconducting Maglev (SCMAGLEV) train system between Washington, DC, and Baltimore, MD. The system will use technology developed by the Central Japan Railway Company (JRC) for service between Tokyo and Nagoya. The U.S. Federal Railroad Administration (FRA) is conducting an Environmental Impact Statement (EIS) to evaluate alternatives for the project pursuant to the requirements of the National Environmental Policy Act (NEPA). The project sponsor is Baltimore Washington Rapid Rail (BWRR, or Railroad), working with Maryland Department of Transportation (MDOT) and Maryland Department of Economic Development (MEDCO).

The November 2018 Alternatives Report selected two alignment alternatives for further study in the Draft Environmental Impact Statement (DEIS):

- Alternative J – Baltimore-Washington Parkway East
- Alternative J1 – Baltimore-Washington Parkway West

The alignments are 33 to 35 miles long, depending on terminal station options, with 75 percent to 83 percent of the route in tunnel, and the balance on elevated viaduct.

3. METHODOLOGY

Train speeds were calculated taking into consideration the following factors:

- customer comfort and safety
- geometric/civil constraints
- trainset characteristics for propulsion and braking

Train speeds are similar for Alignment Alternatives J and J1, and in northbound and southbound directions.

4. RESULTS

Approximate train speeds between Washington, DC and Baltimore, MD are provided in the Table below. The train speeds are similar for Alignment Alternatives J and J1, and in northbound and southbound directions. Train speeds are approximate and will be refined as Project planning advances.

Table 4.1 Approximate Train Speeds

Approximate Location	Infrastructure	Approximate Speed
Washington, DC Station to BWI Station		
MVS East Station	Tunnel	Train stopped
100+000 to 120+000	Tunnel – Viaduct	Accelerate from 0 kph to 500 kph (311 mph)
120+000 to 132+000	Viaduct	500 kph (311 mph)
132+000 to 145+000	Viaduct – Tunnel	Decelerate from 500 kph (311 mph) to 0 kph
BWI Station	Tunnel	Train stopped
BWI Station to Cherry Hill Station Alternative		
145+000 to 153+200	Tunnel	Accelerate from 0 kph to 210 kph (130 mph) Decelerate from 210 kph (130 mph) to 0 kph
153+200 to 154+500	Viaduct	Decelerate from 70 kph (45mph) to 0 kph
Cherry Hill Station	Viaduct	Train stopped
BWI Station to Camden Yards Station Alternative		
145+000 to 157+000[1]	Tunnel	Accelerate from 0 kph to 400 kph (250 mph) Decelerate from 400 kph (250 mph) to 0 kph
Camden Yard Station	Tunnel	Train stopped

[1] Station 157+000 is the approximate location of Camden Yard station using baseline stationing for Alternative J and J1 alignments. Station 157+000 corresponds to Camden Yard alignment extension Station 207+700.

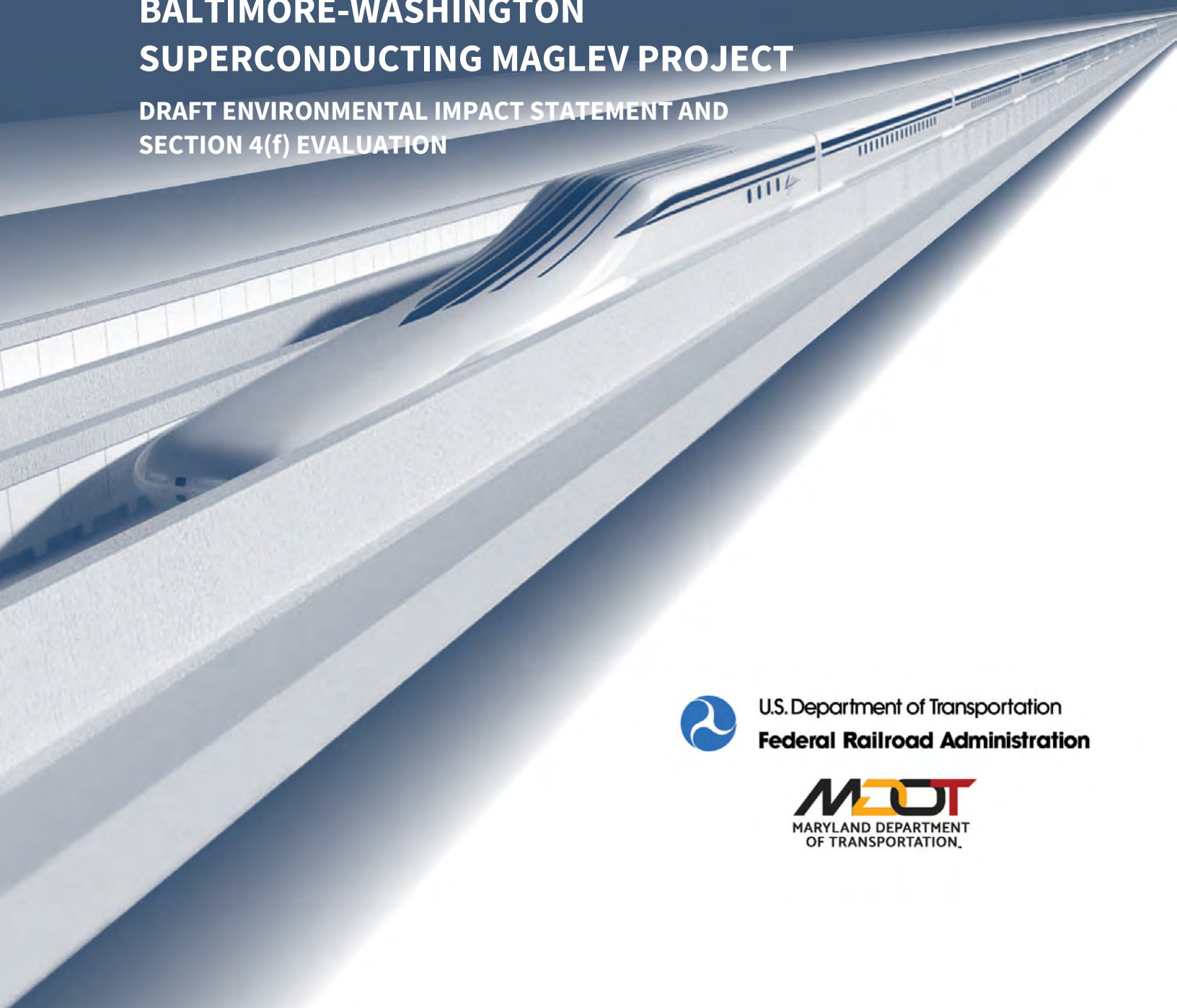
Appendix G6.

Safety and Security Technical Memorandum

Materials Provided by the Project Sponsor

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

BALTIMORE-WASHINGTON SCMAGLEV PROJECT

SAFETY AND SECURITY TECHNICAL MEMORANDUM

REVISION: 2

DATE: December 10, 2020

BWRR

BALTIMORE-WASHINGTON RAPID RAIL

BALTIMORE-WASHINGTON SCMAGLEV PROJECT

SAFETY AND SECURITY TECHNICAL MEMORANDUM

4.3 PRELIMINARY ENGINEERING

REVISION: 2

DATE: DECEMBER 10, 2020

LOUIS BERGER

TABLE OF CONTENTS

FIGURES

NOTES/REVISIONS FOR VERSION CONTROL

Revision 0: 2020-02-28

Revision 1: 2020-05-06

File Name: SCMLEV-BWRR-MEM-0009-R1 Memo-Safety and SecurityRevision 2: 2020-12-10

File Name: SCMLEV-BWRR-MEM-0009-R2 Memo-Safety and Security

1. EXECUTIVE SUMMARY

BWRR is working to bring SCMAGLEV technology to the Northeast Corridor. The design standards developed for the system in Japan by the Central Japan Railway Company (JRC) will be adopted in the U.S., with modifications as required to meet U.S. regulations and codes, such as the Americans with Disabilities Act (ADA). BWRR intends to replicate all key safety aspects of the SCMAGLEV system, modifying only those aspects that are needed for the operational and environmental conditions and that do not adversely affect the safety and performance of the system.

In addition to the SCMAGLEV design specifications, and equally important, are the safety culture and principles guiding the operation. JRC has developed a culture of safety in the Tokaido Shinkansen "Bullet Train" operation through a combination of highly skilled personnel, extensive safety training, sophisticated technology, and continuous safety-related investment. The result has been an unparalleled safety record for more than 50 years. The Tokaido Shinkansen operation has not had an accident resulting in injury to onboard passengers since commencing operations in 1964. Bringing the SCMAGLEV system to the Northeast Corridor not only brings this unique technology to the U.S., it also brings the same safety dedicated culture.

2. BACKGROUND

The Baltimore-Washington Maglev project will provide new infrastructure, stations and facilities for a Superconducting Maglev (SCMAGLEV) train system between Washington, DC, and Baltimore, MD. The system will use technology developed by JRC for service between Tokyo and Nagoya. The U.S. Federal Railroad Administration (FRA) and the Maryland Department of Transportation (MDOT) are preparing an Environmental Impact Statement (EIS) to evaluate alternatives for the project pursuant to the requirements of the National Environmental Policy Act (NEPA). The project sponsor is Baltimore Washington Rapid Rail (BWRR, or Railroad)).

The November 2018 Alternatives Report selected two alignment alternatives for further study in the Draft Environmental Impact Statement (DEIS):

- Alternative J – Baltimore-Washington Parkway East
- Alternative J1 – Baltimore-Washington Parkway West

The alignments are 33 to 35 miles long, depending on terminal station options, with 75 percent to 83 percent of the route in tunnel, and the balance on elevated viaduct.

3. SAFETY

3.1 OVERVIEW

Design, construction, and operations for the Baltimore-Washington Maglev Project will incorporate a strong focus on safety of the traveling public, construction and operations workforce, and adjoining communities. Safety is incorporated in the planning and design of the infrastructure, core systems, facilities, and operating and maintenance practices for the SCMAGLEV system. Measures for safety and security will be addressed in consultation with the Federal Railroad Administration (FRA) Office of Safety and local emergency response units. BWRR intends to apply for a Rule of Particular Applicability ("RPA") specific to the Baltimore-Washington SCMAGLEV system.

3.2 ACCIDENT AVOIDANCE APPROACH

3.2.1 OVERVIEW

The SCMAGLEV system is a stand-alone, high-speed guided ground transportation system that is based on the principles of accident avoidance. Similar to the holistic approach to safety taken by JRC for the Tokaido Shinkansen, which has enjoyed an impeccable safety record for over 50 years, the SCMAGLEV system designs out safety risks by requiring a fully grade separated and dedicated right-of-way (ROW) for the exclusive use of the trainsets. The accident avoidance principles cover all aspects of the system including: system design, operations, inspection, testing, and maintenance, and personnel qualifications and training.

3.2.2 COLLISION AVOIDANCE

Collision avoidance is a key element of the accident avoidance principles employed on the SCMAGLEV system. The backbone of the collision avoidance approach is the use of a state-of-the-art Control System that mitigates the potential for train-to-train collisions and over-speeding. The signaling system is operational at all speeds and extends into the Trainset Maintenance Facility (TMF). The exclusive and dedicated ROW does not have grade crossings and is equipped with intrusion prevention and detection systems to assure nothing can enter the right of way (ROW) that could create an unsafe condition.

Additionally, the collision avoidance approach mandates that during trainset operating hours, all MOW activities are prohibited and strict temporal separation of MOW activities from passenger service is enforced. The turnout from the MOW facility is locked out, and individuals are prohibited from entering the guideway. During maintenance hours, MOW equipment access to the mainline is permitted through the turnouts from the MOW facility. Maintenance hours will commence as soon as safe and practicable after the conclusion of revenue service each day. Prior to the operation of the trainsets following maintenance hours, the entire mainline is checked to ensure nothing has been left on the guideway that would create a safety risk.

Operating rules for the SCMAGLEV system are unique. They are simplified in many respects due to the automated, driverless operation, and the dedicated operation that utilizes one specific type of trainset.

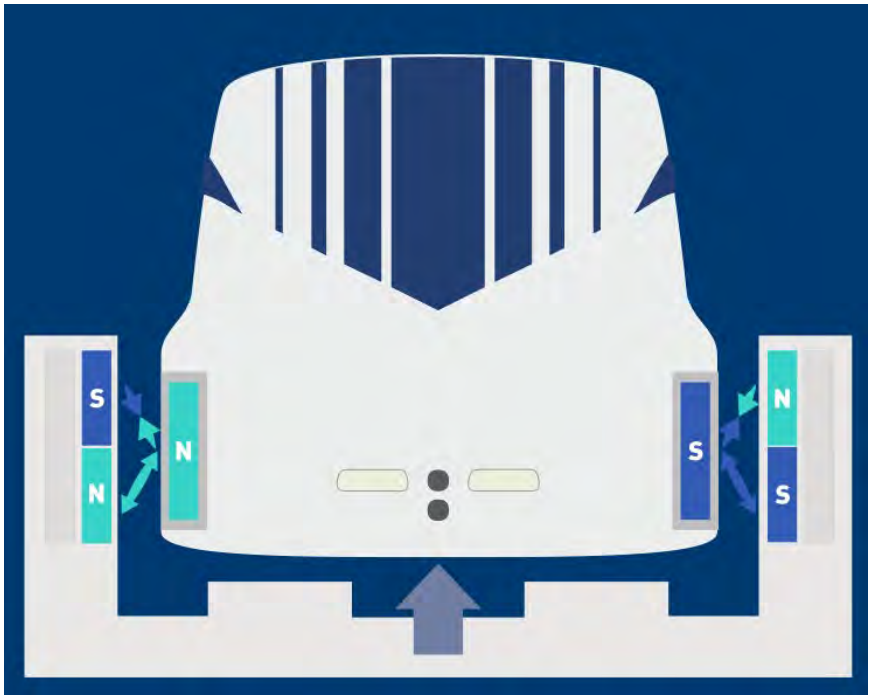
The accident avoidance approach also requires a comprehensive training and qualification program for all employees that perform safety-related tasks, which minimizes the potential for human error.

3.2.3 DERAILMENT PREVENTION

Unlike steel-wheel-on-rail systems, it is not possible for an SCMAGLEV trainset to derail due to the U-shaped design of the guideway and the stable dynamic performance created by the large magnetic forces. The guideway has a concrete base slab with sidewalls that envelop the vehicles and prevent derailments. Metal coils installed into the sidewalls of the guideway create the magnetic forces that keep the trainsets centered. See Figure 1.

Further, the Control System assures that an over-speed cannot occur in a curve or anywhere in the system.

Figure 1. U-Shaped Guideway with Sidewalls and Magnets



3.3 EMERGENCY EGRESS

3.3.1 EMERGENCY EGRESS AT STATIONS

Passenger stations will be designed in accordance with applicable standards to allow emergency egress in the event of smoke, fire or other emergency. Station platforms, concourses, vertical egress facilities and exits will be designed to accommodate emergency evacuation of passengers and workers, as well as access for emergency responders. Emergency lighting, ventilation and signage systems will be provided to ensure safe passage under emergency conditions.

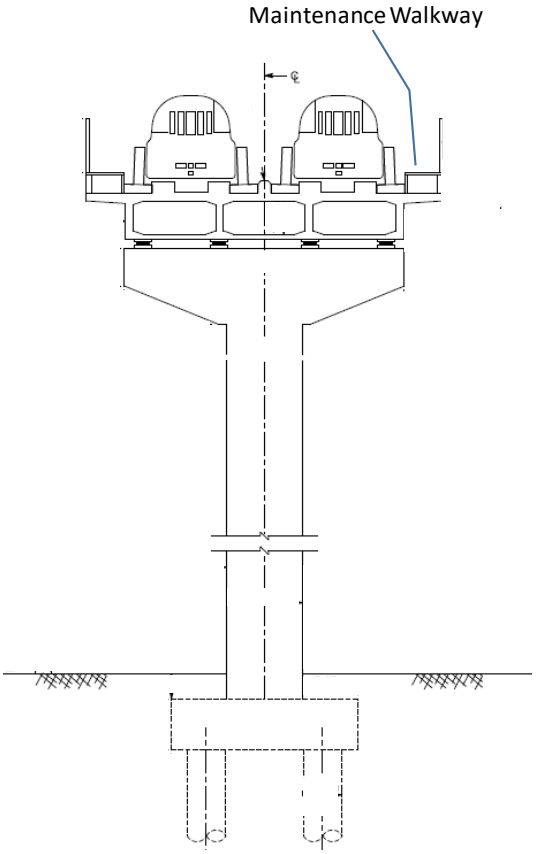
3.3.2 EMERGENCY EGRESS

In case of an emergency, a train will travel to the nearest station or to a designated egress location in open viaduct section where there will be stairs from the guideway to ground level; access and parking will be provided for emergency response vehicles.

If a train is unable to stop at a station or the designated egress location, passengers will alight from the train and be directed to use the maintenance walkway to get to the the nearest maintenance stairs to ground level. Maintenance walkways are shown on Figure 2.

Designated egress locations for the preferred alignment alternative will be coordinated with local emergency response organizations.

Figure 2. Elevated Viaduct with Maintenance Walkways



3.3.3 EMERGENCY EGRESS FROM TUNNELS

Fresh Air/Emergency Egress (FA/EE) facilities will be located along tunnel sections of the alignment. The standard spacing between FA/EEs is approximately every 5 km (3.1 mi), but they may be spaced up to 6 km (3.7 mi) apart. They have multiple functions including tunnel ventilation and emergency passenger evacuation. In case a trainset has stopped in the tunnel and requires immediate passenger evacuation, the passengers are directed by crewmembers to the emergency evacuation walkway that is located

below the guideway. The emergency evacuation walkway has an independent ventilation system with fireproof doors so passengers can safely walk to the emergency exit. See Figures 2 and 3 below.

Figure 3. Emergency Evacuation Exits for Tunnel Sections

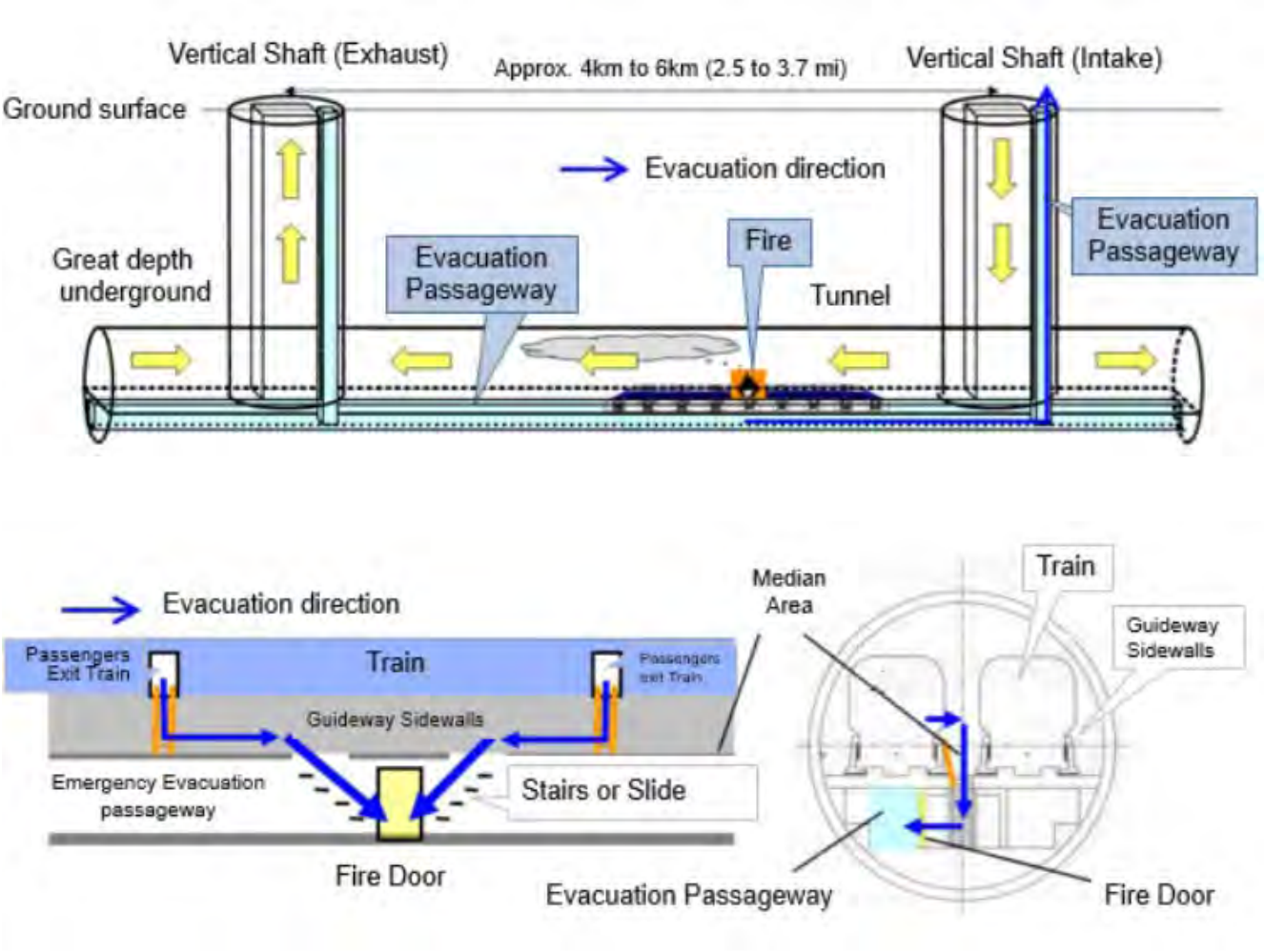
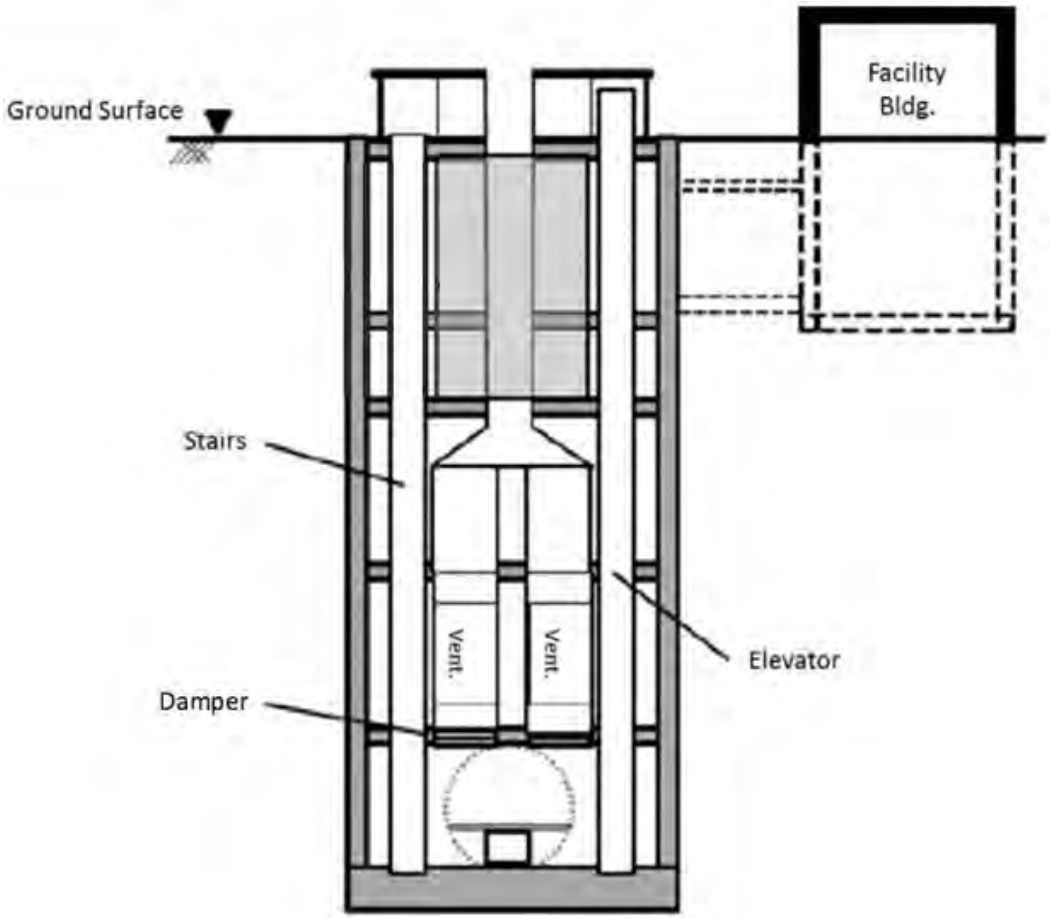


Figure 4. Typical FA/EE Cross-Section



4. SECURITY

BWRR will incorporate security systems into the design and operating and maintenance practices to safeguard passengers, employees, and property. The security strategies and policies will ensure that foreseeable threats and vulnerabilities are identified and properly mitigated or eliminated. As the design advances, the project team will coordinate with local, state and federal law enforcement and emergency response officials.

4.1 INTRUSION PROTECTION

4.1.1 OVERVIEW

The SCMAGLEV guideway is grade separated in tunnel or on elevated viaduct along the full length. Access to the guideways is strictly prohibited and prevented when trains are operating, from 5:00 AM to 11:00 PM. During the nighttime maintenance hours, 11:00 PM to 5:00 AM, guideway access is limited to maintenance personnel entering from the Maintenance-of-Way (MOW) facilities or other facilities or stations. A detailed plan will be developed by BWRR to ensure the integrity of the ROW. Details of monitoring systems, security lighting, and other deterrents will be developed in the future.

4.1.2 VIADUCTS

BWRR will have a plan to ensure the integrity of the ROW. The plan will address the following key concepts: protection of the ROW from external threats such as vandalism, launching of objects onto the ROW, and trespassers.

Viaduct sections are generally a minimum of 10m (33 feet) above ground level. In certain areas fencing will be installed at the right-of-way line, protecting a total width of 22m (72 feet). The fencing will be a minimum of 3m (10 feet) high.

Security lighting is not planned along the entire viaduct section. Security lighting will be provided at the following locations:

- Where SCMAGLEV facilities are sited under or adjacent to the viaduct.
- Where the viaduct profile grade line (guideway level) is less than 10m (33 feet) above the ground.

4.1.3 TUNNELS

Access to tunnel sections is physically limited to the following entrance points, where access will be strictly controlled:

- Passenger stations
- FA/EE facilities
- Tunnel portals

4.1.4 TUNNEL TRANSITION PORTALS

As with viaduct sections, BWRR will have a plan to ensure the integrity of the ROW at tunnel transition portals, where the guideway changes from tunnel to viaduct. The plan will address the following key concepts: protection of the ROW from external threats such as vandalism, launching of objects onto the ROW, and trespassers.

Fencing will be installed at the right-of-way line to prevent access. The right-of-way width at portals is 24m (79 feet). Right-of-way fencing will be a minimum of 3m (10 feet) high. Security lighting will be provided around the perimeter.

4.1.5 OPEN CUT SECTIONS

At some tunnel transition portals, there will be a section of open cut tunnel, where the guideway depth is as much as 35m (115 feet) below ground level. As with viaduct and portal sections, BWRR will ensure the integrity of the ROW. Security follows these key concepts: protection of the ROW from external threats such as vandalism or terrorism, launching of objects onto the ROW, and trespassers. Protective measures such as fencing, cameras and security lighting will be provided around the open cut section as determined in the final design.

4.1.6 STATIONS AND FACILITIES

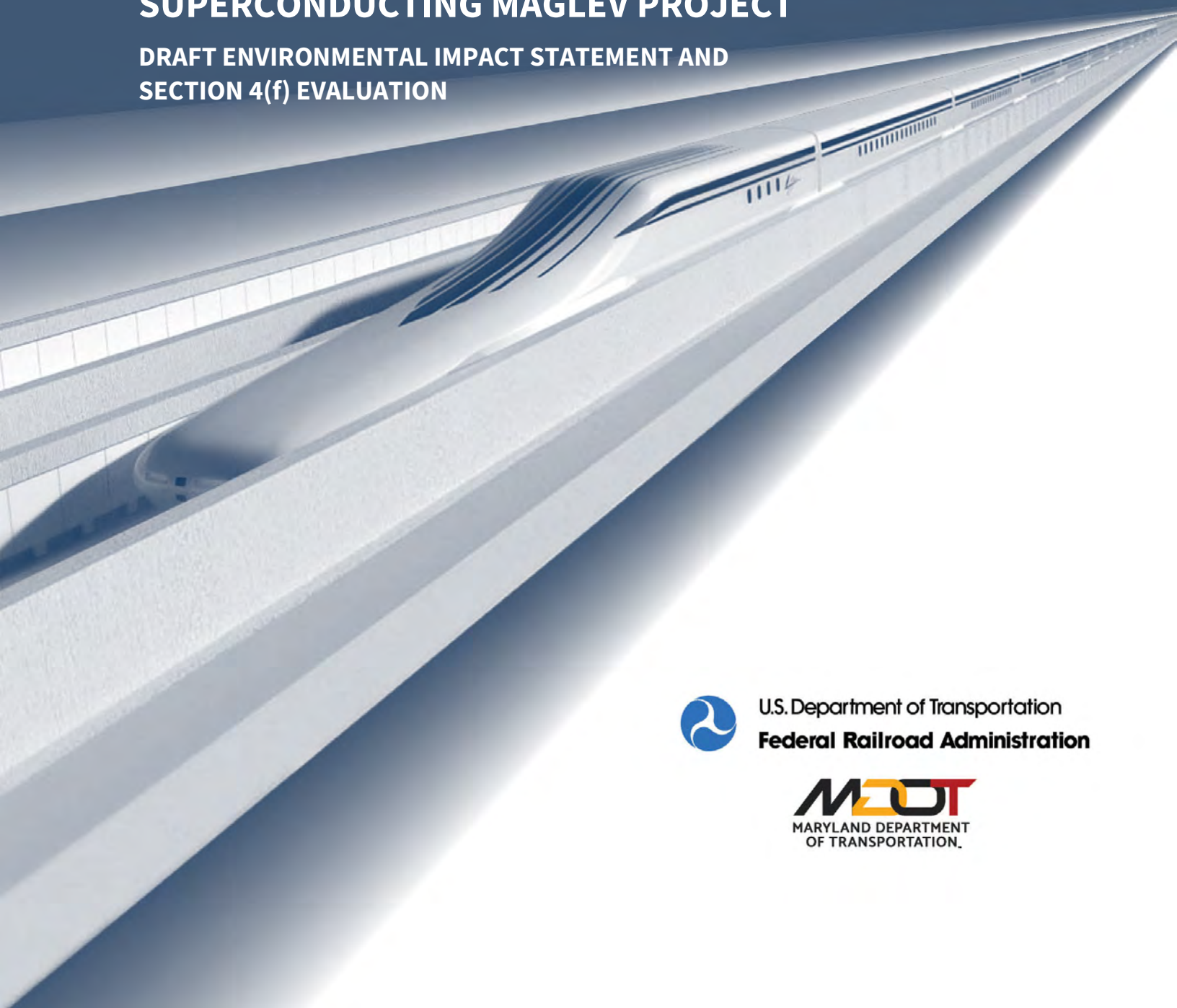
Access to restricted areas in station and facilities will be strictly controlled to prevent entry by any unauthorized personnel. Fencing, cameras and security lighting will be provided as incorporated in the final design.

Appendix G7.
Construction Planning Memorandum

Materials Provided by the Project Sponsor

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

BALTIMORE-WASHINGTON SCMAGLEV PROJECT

CONSTRUCTION PLANNING MEMORANDUM

REVISION: 2

DATE: MAY 14, 2020

(Response to data requests #1, 2, and 26)

BWRR

BALTIMORE-WASHINGTON RAPID RAIL

BALTIMORE-WASHINGTON SCMAGLEV PROJECT

CONSTRUCTION PLANNING MEMORANDUM

4.3 PRELIMINARY ENGINEERING

REVISION.: 2

DATE: MAY 14, 2020

TABLE OF CONTENTS

TABLES

FIGURES

NOTES/REVISIONS FOR VERSION CONTROL

Revision 0: 2018-12-10

Revision 1: 2019-01-09

Revision 2: 2020-05-14

File Name: Construction Plan Rev2 20.05.14

1. INTRODUCTION

The Baltimore-Washington Maglev Project will provide new infrastructure, stations, and facilities for a Superconducting Maglev (SCMAGLEV) train system between Washington, DC, and Baltimore, MD.

The primary elements of the project are:

- SCMAGLEV rolling stock and systems using technology developed by Central Japan Railway Company (JR Central)
- Two guideways, one in each direction, borne by tunnel and viaduct structures
- Three stations:
    - Washington, DC
    - Baltimore-Washington International Thurgood Marshall Airport (BWI)
    - Baltimore, MD

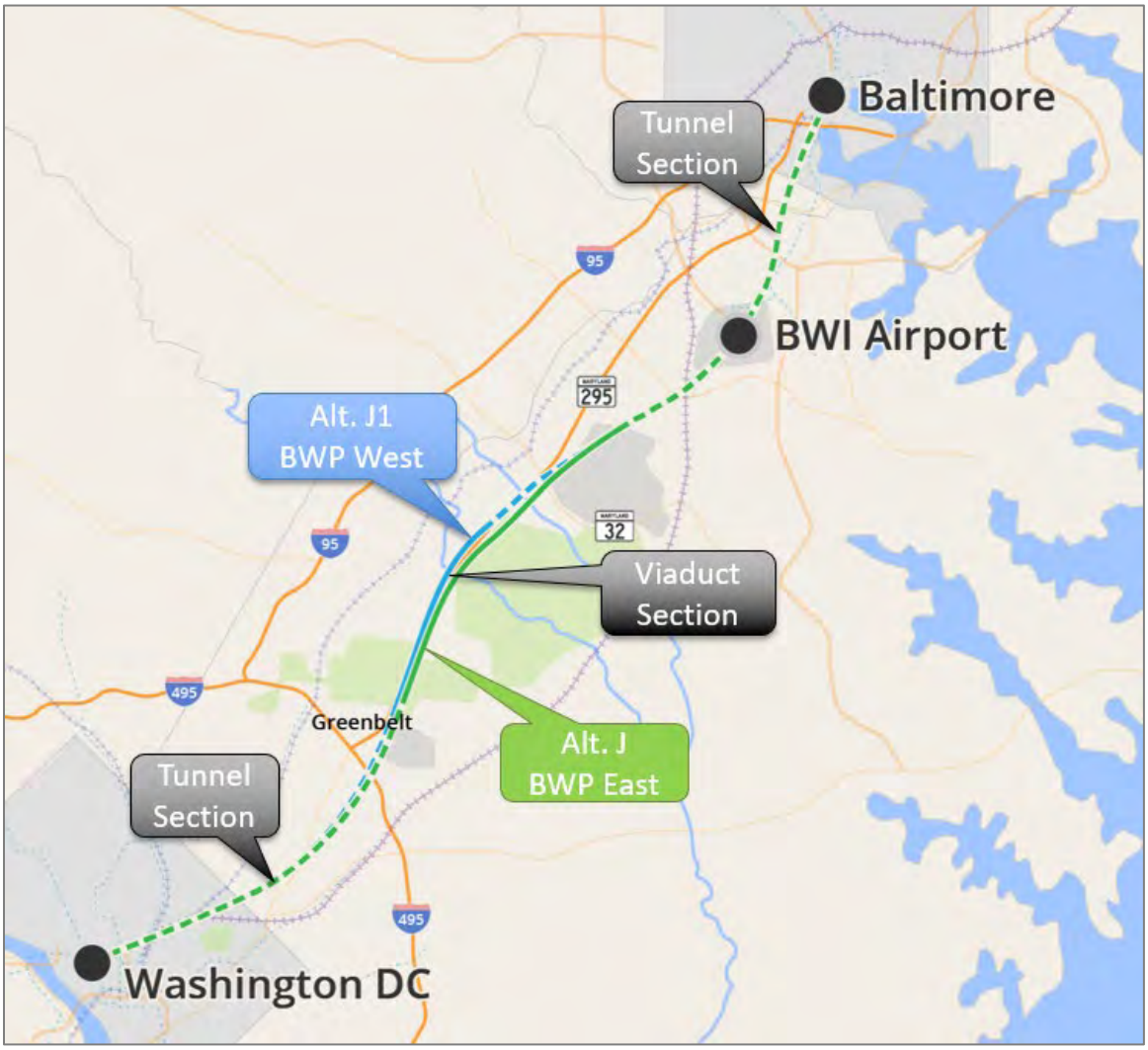
An Environmental Impact Study (EIS) is underway. Two alignment alternatives were retained for further study in the Final Alternatives Report (November 2018). The alignments generally follow the Baltimore-Washington (BW) Parkway corridor as listed in Table 1 and shown in Figure 1.

Table 1. Alignment Alternatives

Alternative	Name
J	BW Parkway Modified–East
J1	BW Parkway Modified–West

This document addresses construction requirements associated with the two BW Parkway alternatives to support the preparation of the Draft EIS (DEIS).

Figure 1. Conceptual Engineering Alignment Alternatives



2. GENERAL

Two alignment alternatives have been identified for further study in the DEIS: Alternatives J (BW Parkway East) and J1 (BW Parkway West). After departing the District of Columbia and Maryland border, alignment generally follows the BW Parkway corridor.

Each alternative is comprised of two main construction configurations: elevated structure and deep bored tunnel. Transition portals provide the connection between the tunnel and viaduct portions of each route. The project will include three passenger stations, one Trainset Maintenance Facility (TMF), two Maintenance of Way (MOW) facilities, substations and associated transmission facilities, ancillary train service/control facilities, Fresh Air / Emergency Egress (FA/EE) locations, tunnel boring machine (TBM) launch/retrieval sites, temporary access roads and permanent parking and related operational space.

3. CONSTRUCTION SCHEDULE APPROACH

A construction schedule was developed as follows:

- Break each alignment alternative into logical contract packages
- Obtain input from general contractors, engineers, architects, and other subject matter experts to determine reasonable durations or production rates for each project element
- Review historic information where available to validate assumptions

The following preconstruction activity efforts will be initiated, and in some cases completed, prior to the start of construction:

Environmental Impact Statement (EIS): The process whereby a project requiring major federal action is evaluated to determine its environmental impacts and the actions that are necessary to mitigate those impacts. An EIS culminates in a Record of Decision (ROD) issued by the lead federal agency.

Preliminary Design: Preliminary engineering for the preferred alternative is prepared to support the EIS. Design will be advanced concurrent with the completion of the EIS to an advanced preliminary phase sufficient to procure construction contracts.

Right-of-Way Acquisition: Parcels along the project alignment will need to be acquired to begin construction of the SCMAGLEV civil infrastructure including the use of easements where applicable. Based on projects of a similar length and magnitude, up to three years may be required to secure all the properties needed for the project. Priority will be given to the right-of-way (ROW) parcels required for initial construction contracts, specifically, construction staging sites, mobilization, and launch/retrieval sites for TBMs. ROW acquisitions can proceed with private money prior to the ROD and continue into construction phases.

Permitting: Several permits and approvals will be required prior to or during the early stages of construction. Some permits relate to the protection of specific environmental resources, for example, wetlands and streams. The permit application process will start during preparation of the EIS and use many of the same analyses and studies being conducted for the EIS. Some permits will need to be finalized by the construction contractors depending upon their chosen means and methods of performing the necessary construction.

Geotechnical Investigation Program: A detailed geotechnical investigation program is required to provide bidders with sufficient data for their proposals. The program, comprising up to 300 boreholes, will be completed prior to or during early stages of the construction contracting.

Procurement: The process of prequalifying, selecting, and negotiating design and construction contracts is anticipated to take approximately two years. The procurements can be initiated prior to completion of the EIS so that the contractor teams are prepared to mobilize personnel, equipment, and material immediately upon issuance of a ROD.

Early Works: Prior to the start of major linear infrastructure works (tunnels and viaducts) and stations, various activities to prepare construction sites are required, including utility relocations, building demolition, preparation of staging sites, and excavation for TBM launch sites. The activities can be accomplished as an initial stage of the major infrastructure contracts, or through separate early works contracts concurrent with the procurement of major construction contracts.

SCMAGLEV System Safety: BWRR expects that a Rule of Particular Applicability (RPA) will be required for the operation of the system. The rulemaking process will likely proceed in parallel with the EIS process. Construction can proceed prior to completion of the RPA, but operations cannot commence without it.

A bar chart schedule is presented in Figure 2. The schedule is similar for alignment Alternatives J and J1, for Cherry Hill and Camden Yards stations, and for both BARC TMF sites.

Acceleration strategies, such as pre-ordering the TBMs during the design phase and overlapping guideway construction, can reduce the overall schedule.

3.1 SCHEDULE DEFINITIONS

The tasks (ID #) identified in the schedule in Figure 2 below are defined/expanded upon with identification of relevant sections herein as follows:

ID 1: TBM Manufacturing and Assembly - The type of TBM necessary for respective tunnel segments will be determined and begin procurement and manufacturing as soon as possible. (See Section 6.0)

ID 2: Launching Gantry Manufacturing and Assembly - Gantry manufacturing for Viaduct construction, as applicable depending on construction method selected. (See Section 7.0)

ID 3: Clearing and Grubbing – Removal of trees, brush and other surface obstructions at construction sites along the alignment (viaducts, portals, TMF, substations, FA/EEs, stations, TBM launch sites, etc.), and at construction laydown areas off the alignment.

ID 4: Utility Diversions / Relocation – Prior to the start of construction, where applicable, a utility effort will be required. (See Section 17.0).

ID 5: TBM Launch / Retrieval Sites - Installation of Support of Excavation (SOE) (e.g. slurry, pile, and lagging, etc.) for TBM launch and retrieval shafts along the alignment. Launch shafts and laydown areas will be larger to accommodate the TBM itself and to handle tunnel spoils, segment storage, etc., while retrieval shafts and laydown areas will be smaller and serve as retrieval locations of TBM. (See Sections 5 and 6)

ID 6: Tunnel Construction - Construction of tunnel segments simultaneously along the project alignment. Baseline assumption for tunnel excavation advance rate used herein is 30 ft per day with as many as 8/9 TBMs (J/J1 alignment, Cherry Hill Station Alternative) or 9/10 TBMs (J/J1 alignment, Camden Yards Station Alternative) boring simultaneously. (See Section 6.0)

ID 7: Viaduct/Ramps Construction - Construction of the Viaduct structure and associated ramps along the project alignment. Assumes construction along multiple fronts by one or more contractors with close coordination and staging to minimize construction time. (See Section 7.0)

ID 8: Portal Construction - Construction of transition portals between TBM tunnels and above-ground structures (e.g. Viaduct, or Cherry Hill Station alternative). Assumed duration from prior experience, anticipated size of excavation and staging to minimize traffic impact at Cherry Hill Station portal alternative. (See Section 9.0)

ID 9: Stations Construction - Construction of stations in Washington, D.C. (Mt. Vernon Square East), at BWI Airport, and Baltimore, MD (Cherry Hill Station or Camden Yards Station). Length of time assumes multiple fronts of construction and carefully coordinated construction staging to for underground stations to maximize productivity and minimize traffic impact. (See Section 8.0)

ID 10: TMF Civil Construction - Construction of Trainset Maintenance Facility (TMF), with three alternatives: (1) BARC West, (2) BARC Airstrip and (3) MD-198. (See Section 10.0)

ID 11: FA/EE Civil Construction – Construction of Fresh Air/Emergency Egress facilities

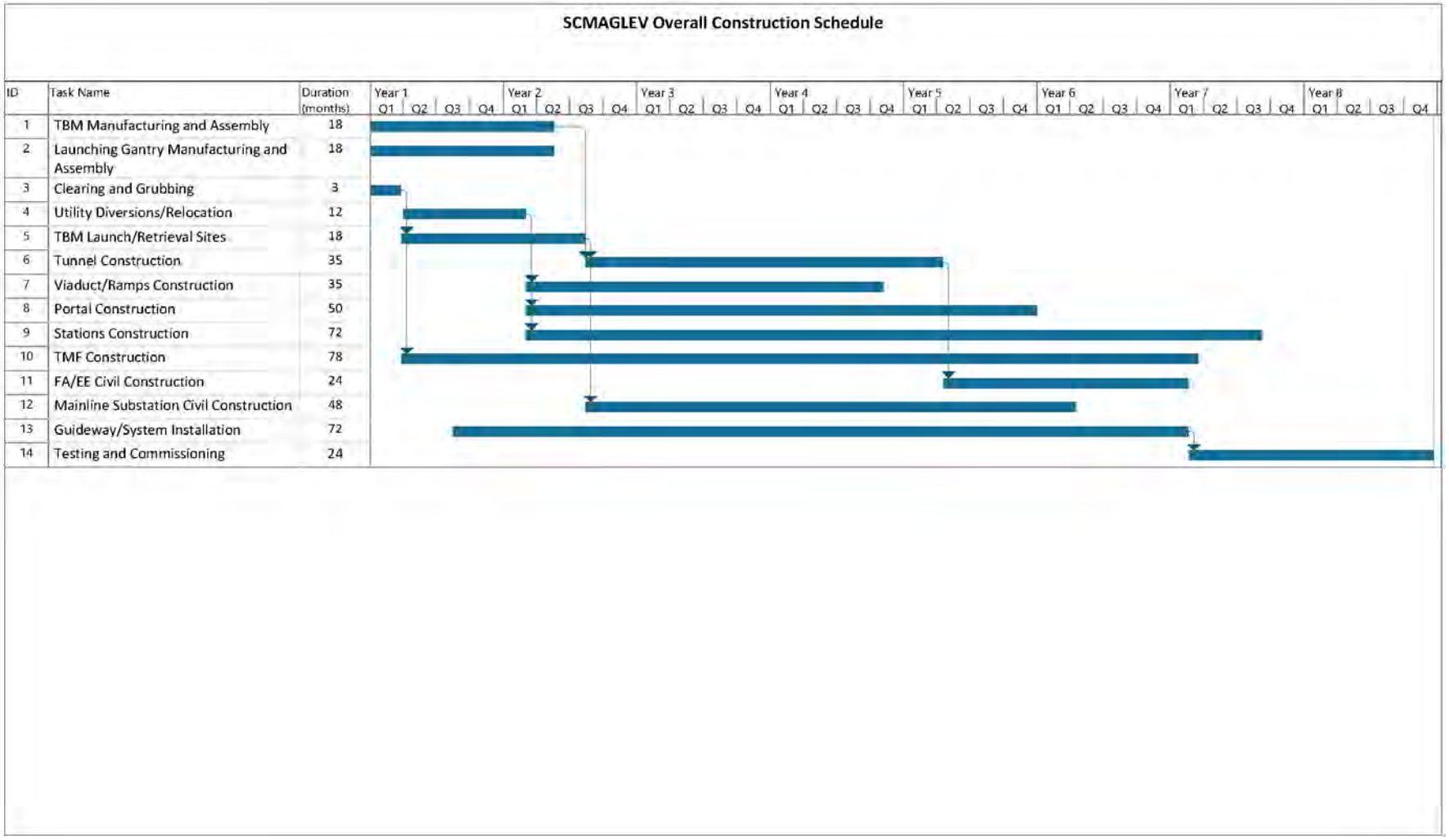
ID 12: Mainline Substation Civil Construction - Construction of substation facilities along the alignment; will also require a study process prior to start of construction. (See Section 11.0)

ID 13: Guideway/System Installation - Installation guideway and systems along the alignment

ID 14: Testing and Commissioning - Testing trainsets and systems leading up to start of service.

The schedule shown in Figure 2 assumes that multiple contracts are awarded and executed concurrently. Constraints on procurement activities, financing, or other factors could prolong the overall schedule beyond what is shown.

Figure 2. SCMAGLEV Overall Construction Schedule



4. START OF SERVICE

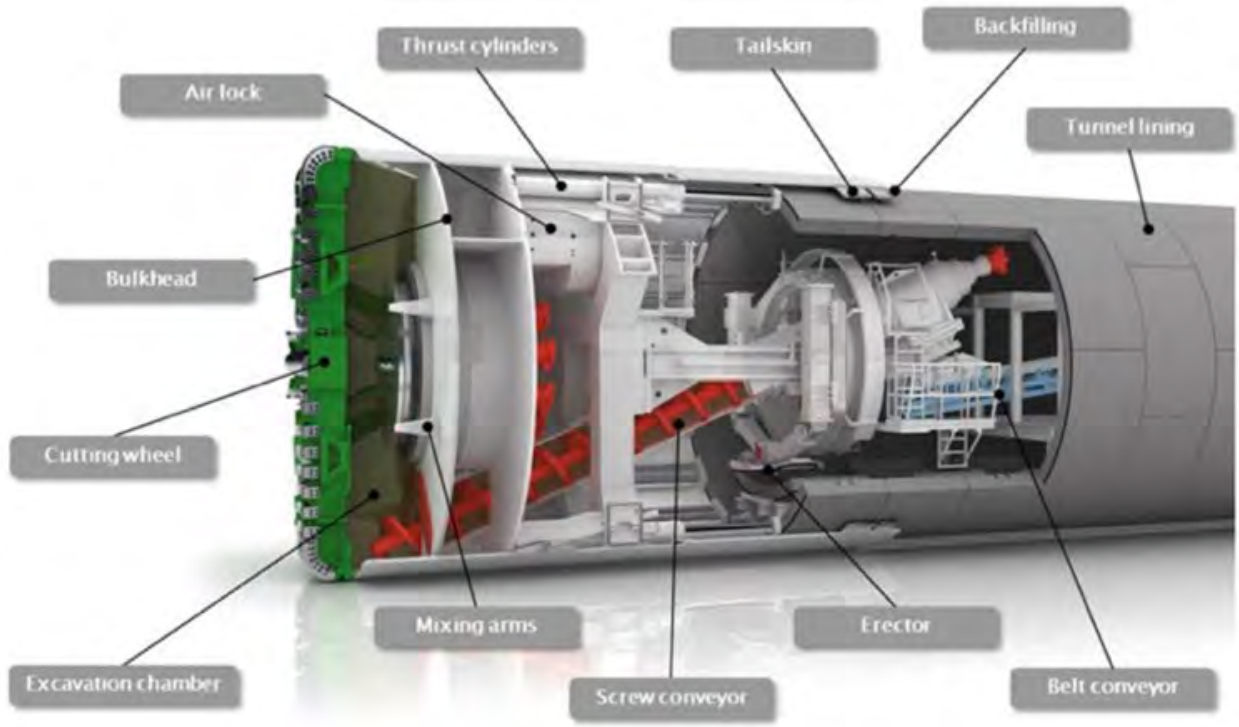
Assuming construction starts in 2022 with a construction duration of just under eight years, Start of Service will be at the end of 2029.

5. UNDERGROUND CONSTRUCTION METHODS

5.1 EARTH PRESSURE BALANCE (EPB) TBMS

In North America, EPB TBMs are the most common and have been used successfully in the project area. They rely on balancing the thrust pressure of the machine against the soil and water pressures from the ground being excavated. EPB TBMs are well suited for boring in soft ground, as expected with most drives on this project. They can also mine through variable soils and groundwater. The excavation method for an EPB TBM is based on tunnel face support provided by the excavated soil itself (Figure 3).

Figure 3. Schematic of EPB TBM (Courtesy of Herrenknecht)

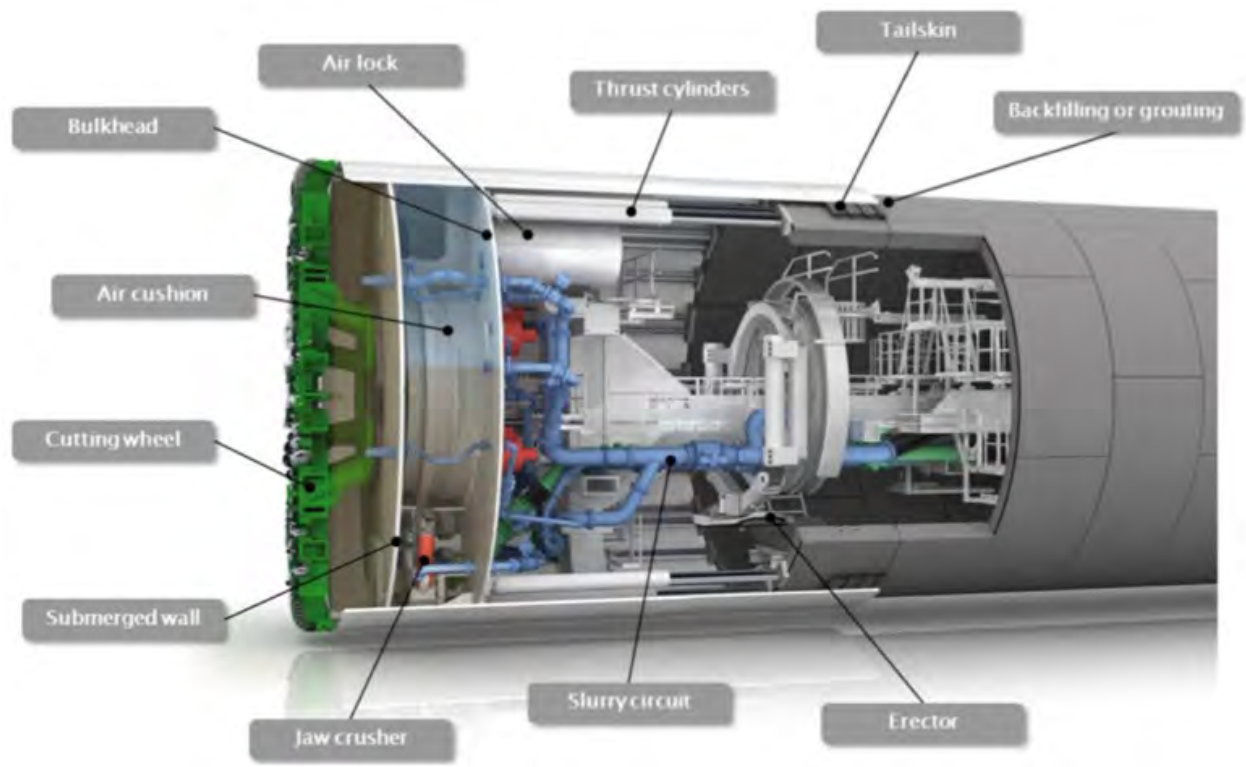


5.2 SLURRY-FACE TBMS

Slurry-face TBMS are typically used for tunneling in heterogeneous geologies and high-water pressure zones, where the addition of the slurry and the closed spoil removal system provides more precise pressure control (Figure 4). A detailed understanding of the local geology and potential high water-pressure zones will be identified during the next phase of the ground investigation program. Slurry-face TBMs add bentonite (clay) slurry in a pressurized environment at the tunnel excavation face. This

combination of pressure and slurry stabilizes and supports the soils during excavation. Depending on the ground encountered, conditioners may be added to the slurry. Excavated soil is mixed with the slurry fluid, pumped out of the tunnel to an above-ground separation plant through an ~18-inch diameter pipeline with in-line booster pumps, and separated from the slurry mixture.

Figure 4. Schematic of SLURRY TBM (Courtesy of Herrenknecht)



Slurry-face TBM tunneling, uses bentonite slurry to apply fluid (hydraulic) pressure to the tunnel face and transport soil cuttings from the tunneling machine's pressure chamber to the surface. The slurry mixed with soil cuttings is processed to separate the soil from the slurry. Separated soil is disposed of at approved locations selected by the tunnel contractor(s) (See Section 14), and the cleaned bentonite slurry is returned to the machine's cutting chamber. The slurry mixed at a surface plant is pumped in and out of the tunnel and the TBM pressure chamber through a series of pipes. As a result, excavated material is kept enclosed and in a fluid state until it reaches the slurry separation plant (Figure 5).

Figure 5. Typical Slurry Treatment Plant (Courtesy of Schauenburg)

This method involves the setup of one or more temporary slurry treatment plants. The slurry treatment plant provides two basic functions: (1) prepares the bentonite slurry by mixing the slurry and (2) treats the used slurry (slurry discharge). The removal process involves settling, use of sieves for separation of large particles, and centrifuges for small particles. Water for the plant is typically stored on-site in storage tanks. The slurry plant is anticipated to require an approximately 1-acre site for the equipment and enclosure. Water removed from the discharge slurry is recycled for use in preparing the bentonite slurry.

5.3 TUNNEL LINING CONSTRUCTION

Precast concrete segments (Figure 6) with gaskets provide initial and final support of the tunnel. Single-pass, double- gasketed, precast concrete segments are the lining system of choice to limit infiltration of water and gas through the final lining. These provide a high-quality lining close behind the TBM.

Precast concrete segments will be fabricated off-site by the contractor and delivered by truck. Several days or weeks of segments may be stored at the work site to ensure uninterrupted supply. A typical precast segment storage area is shown in Figure 7 and will vary in size depending upon the number of segments the contractor prefers to maintain on-site; however, typically 1 to 2 acres will be dedicated to segment storage.

Figure 6. Typical Precast Concrete Segmental Lining (Courtesy of Herrenknecht)

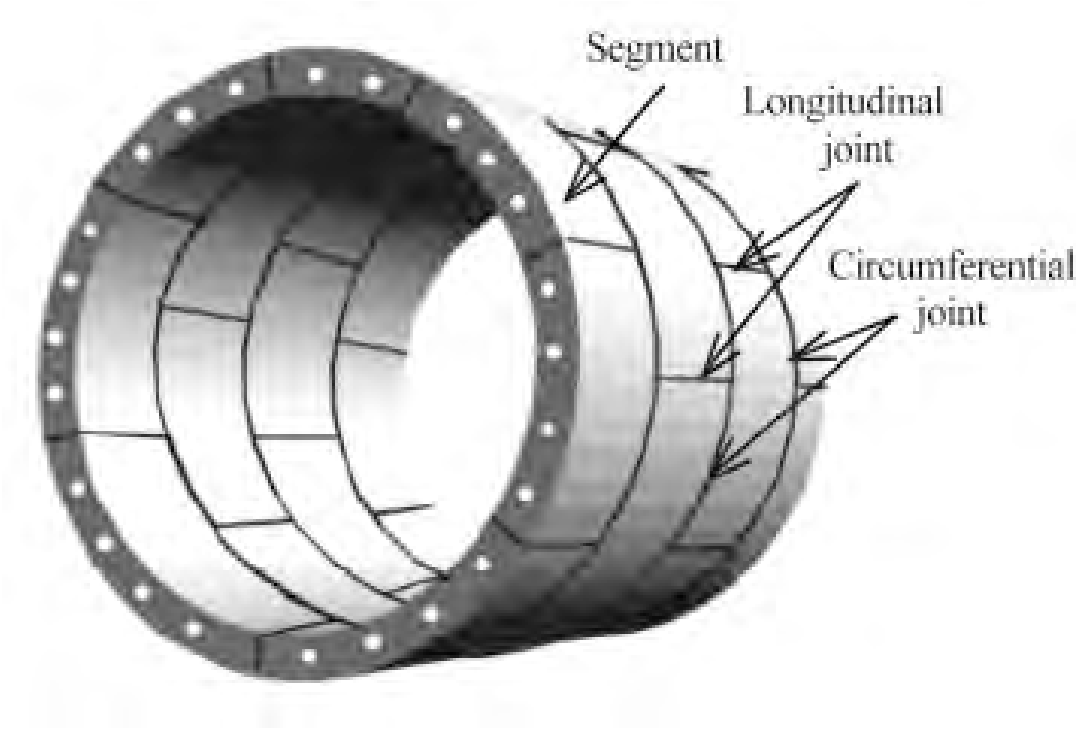


Figure 7. Segment storage for the Alaskan Way Viaduct Tunnel Project, Seattle, WA

5.4 TUNNEL VIBRATION AND SETTLEMENT MONITORING

Baseline noise and vibration, representing the current conditions, will be documented prior to the start of construction, and tunneling. Vibration limits are set to eliminate the possibility of physical damage to buildings and to eliminate or minimize exposure to the public

A Noise and Vibration Control Plan will be prepared by the contractor prior to the start of work. Monitoring points will be established along the alignment during construction and tunneling operations with daily monitoring. Work will not continue where noise and vibration levels have been exceeded until acceptable mitigation measures are deployed.

A surface settlement monitoring program will be implemented during construction and tunneling operations. A pre-construction survey of sensitive structures for existing cracks and damages will be conducted. Tolerance levels are established based on thresholds for buildings, roads, and other sensitive structures to ensure no damage. This includes an Alert Notification System that notifies the responsible personnel when tolerances are exceeded. Instrumentation will likely include Borehole Extensometers, Inclinometers, Tunneling Diameter Measure Device, Structure Monitoring Points, Ground Monitoring points, Utility Monitoring Points, Grid Crack Gauges, Tiltmeters, and Survey Instruments.

5.5 EXCAVATION SUPPORT SYSTEMS

Earth support is an important factor in the construction of deep excavations and is commonly referred to as Support of Excavation (SOE). There are many suitable methods to achieve the needed support. Initial support provides vertical stability while soil is removed from the excavation. This support remains in place for the duration of subsurface work. Support for the station excavation is considered "temporary" over the period of construction. However, most of the materials remain in the ground after the structure is completed.

The final support is provided by the permanent concrete station box structure and includes concrete slabs, walls, and walkways for the station entrances.

Some lateral movement of the excavation walls will occur during soil removal and again during station concreting. The extent of movement depends on the excavation and shoring methods, wall design, and wall height. Project specifications require walls and adjacent ground to be monitored for lateral movement and surface settlement with threshold limits for each.

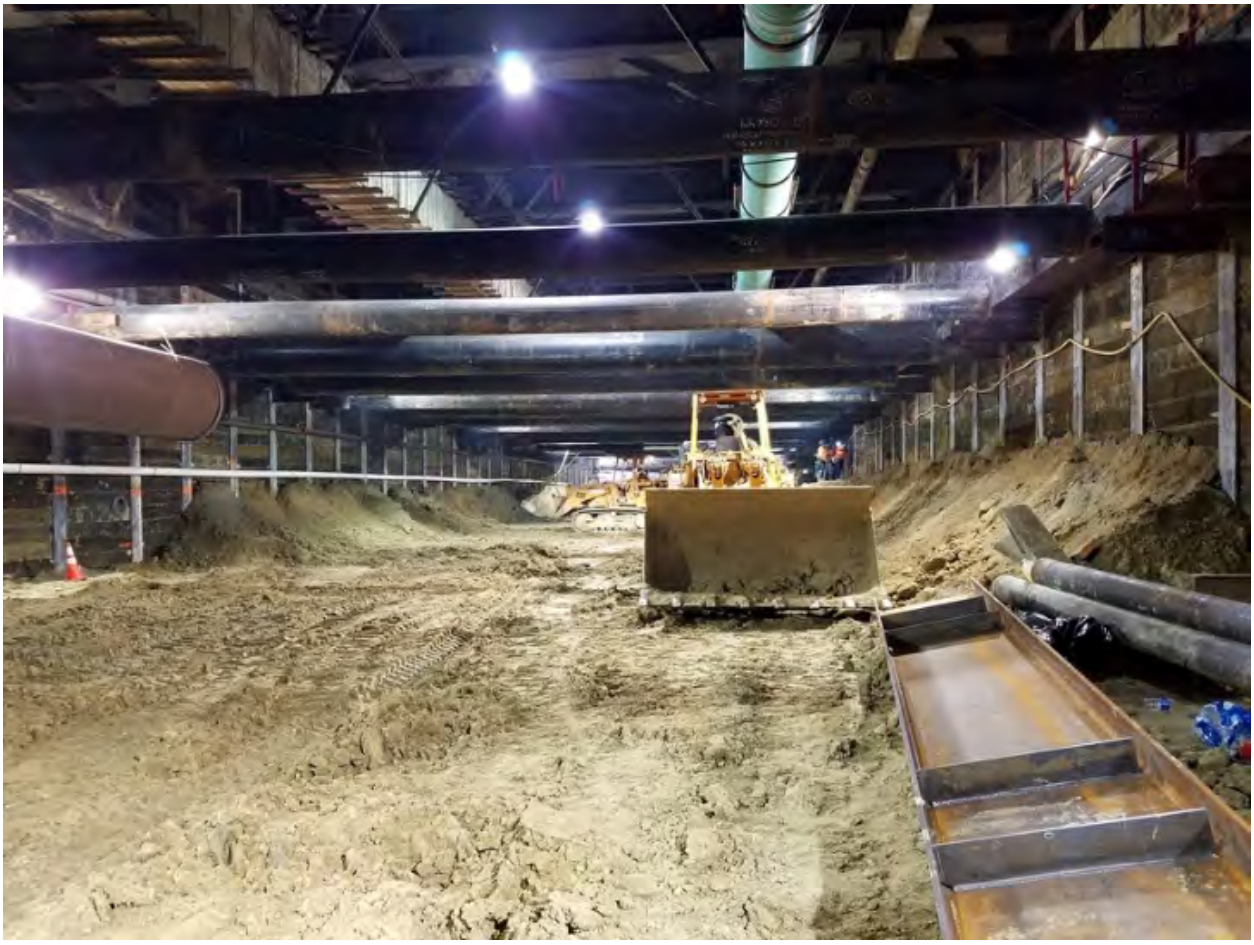
5.6 SOLDIER PILE AND LAGGING

Soldier pile and lagging walls are a type of shoring system typically used along the perimeter of excavation areas to hold back the soil around the excavation. This support system is common for shallower foundations and may be suitable for the top portion of station box construction to allow better flexibility for utility relocations.

Soldier pile and lagging consists of installing vertical steel beams (soldier piles) at regular intervals and lagging, which spans and retains the soil between the piles. Lagging is typically timber or sprayed-on concrete (shotcrete) and is installed progressively as the station is excavated. Soldier piles are installed in pre-augured holes and the annular space between the soldier pile and the holes is then filled with concrete. Pre-auguring allows for more accurate installation of the soldier piles and avoids the noise and vibration associated with pile driving. A soldier pile and lagging excavation and support system is shown in Figure 8.

A soldier pile and lagging system is used where groundwater inflow is not a concern, or where grouting or lowering of the groundwater level (dewatering) can be used to mitigate water seepage between piles. Such locations will be identified after the main project ground investigation program. It is anticipated that soldier piles and lagging may be used where conditions are suitable for underground utility relocations, at tunnel portals, and at TBM launch/retrieval shafts.

Figure 8. Typical soldier pile and lagging system (Wilshire/La Brea Station, Los Angeles, CA)



5.7 TANGENT PILE OR SECANT PILE WALLS

Tangent pile walls consist of contiguous drilled piles that touch each other. These walls provide a better groundwater seal than the soldier pile and lagging system, but some grouting or dewatering is sometimes needed to control leakage between piles. The contractor occupies one side of the street and drill the piles sequentially to form the retaining wall.

A secant pile wall is similar to the tangent pile wall, but the piles have some overlap, resulting in better water tightness and rigidity. This method consists of boring and concreting the primary piles at centers slightly less than twice the pile diameter. Secondary piles are then bored between the primary piles before the concrete can completely set (Figure 9). Because of the close spacing of tangent piles, utilities crossing the wall often require relocation. Construction of tangent or secant pile walls requires lane closures. Tangent pile or secant pile walls may be used as SOE for tunnel portals or launch/retrieval shafts.

Figure 9. Typical Secant Pile Wall (Courtesy of Swiss Boring)

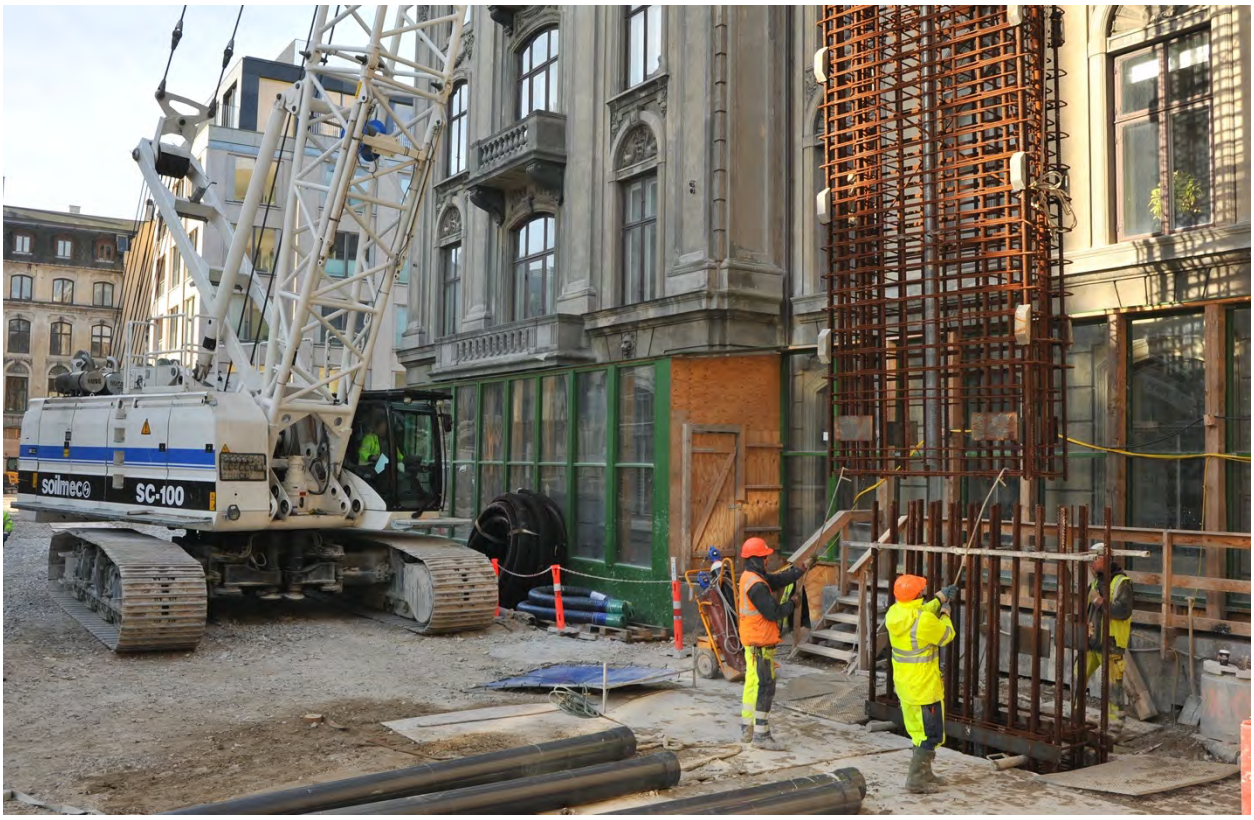
5.8 DIAPHRAGM/SLURRY WALLS

Diaphragm walls (also known as slurry walls) are structural elements used for retention systems and permanent foundation walls. Slurry walls are constructed using deep trenches or panels that are kept open by filling them with a thick bentonite slurry mixture. Bentonite is a natural clay mineral that, when mixed with water, increases its density. The bentonite forms a layer on the trench wall (called a filtercake) that both inhibits slurry loss into surrounding soils and forms a vertical plane for the slurry to exert hydraulic force on the trench walls, stabilizing the soils and trench. After the slurry-filled trench is excavated to the required depth, structural elements (typically a steel reinforcing cage, shown in Figure 10) are lowered into the trench, and concrete is pumped through a tremie pipe from the bottom, displacing the slurry. Tremie concrete is then placed in one continuous operation through one or more pipes that extend to the bottom of the trench. As the concrete fills the trench, the concrete placement pipes are extracted. Once all the concrete is placed and has cured, the result is a structural concrete panel.

Grout pipes can be placed within slurry wall panels to be used later, if groundwater leakage through finished wall sections is observed. The slurry that is displaced by the concrete is collected and stored in tanks on site and reused for subsequent panel excavations. Slurry wall construction advances in discontinuous sections such that no two adjacent panels are constructed simultaneously. Panels are usually 2.5 to 6 meters (8 to 20 feet) wide, with thickness varying from 0.5 to 1.5 meters (2 to 5 feet). Slurry-wall construction occurs in stages, working on one side of the street at a time.

Diaphragm/Slurry walls have been constructed in virtually all soil types and provide a watertight support system with good wall stiffness to control ground movement. Diaphragm/slurry walls will likely be used for construction of the Mount Vernon Square East and BWI Airport Station boxes and potentially at tunnel portals and launch/retrieval shafts where a robust and watertight support system is required due to proximity to existing structures.

Figure 10. Installation of Rebar Cage Segments for Typical Slurry Wall Panel



5.9 DECKING AND CROSS-BRACING

After installation of the temporary shoring (support) system and initial excavation, deck beams can be installed, followed by multiple sequences of excavation and installation of cross-bracing. The deck beams and cross-bracing provide lateral support for the support of excavation walls as the soil is excavated. Deck beams are sized and installed to support utilities (either existing or reconstructed) over the excavation.

In special situations where deck beams and cross-bracing cannot be installed, for example to allow access from above, tieback systems may be used. Tiebacks are strong cable strands or steel bars that are installed and grouted into pre-drilled holes that extend outward and downward from the excavation support wall. After the grout sets and the cables or bars are firmly anchored into the ground, the tiebacks are tensioned to provide lateral support to the wall. The use of tiebacks may require temporary underground easements if they extend into private property.

Decking (Figure 11) is placed on the deck beams to allow traffic and pedestrian circulation to resume after the initial excavation. This decking is typically constructed of precast reinforced concrete and is installed flush with the existing street and sidewalk. The decking and support are designed to withstand anticipated loading and exposure. Decking installation requires temporary street closures and is installed in progressive stages. Decking may be used during construction of the Mount Vernon Square East Station, the BWI Airport Station, and the Cherry Hill tunnel portal crossing at W. Patapsco Avenue.

Figure 11. Street Decking (Purple Line Extension, Los Angeles, CA)

5.10 EXISTING FOUNDATIONS

Underground station excavations will be near existing building foundations that may have to be protected depending on specific foundation details. A typical protection is use of a more rigid excavation support system that can resist the additional loads imposed by the adjacent foundations. In such cases, a stiffer tangent pile, secant pile, or slurry-wall shoring system may be used. Pre-loading of excavation support bracing may also be implemented.

For buildings adjacent to cut-and-cover construction the shoring system in conjunction with internal bracing, will provide rigid temporary support of excavation. Underpinning (added foundation systems) may be used to support the adjacent structures; however, such determination will be made during detailed design when foundations for existing structures are investigated in greater detail.

5.11 TRAFFIC

Traffic flow will be affected during the entire period of construction. Mechanisms available to control and maintain traffic at constricted intersections range from use of temporary street decking, to temporarily replacing pavement and sidewalks or traffic rerouting altogether. Decking typically contains hatches or removable panels to facilitate lowering equipment or materials down into the excavation with minimal traffic disruption.

Cross streets are typically carried through intersections on similar decked structures. Pedestrian access will typically remain open, although portions or sections of sidewalks may be closed temporarily. Where

sidewalks are temporarily removed, pedestrian access will be maintained by bridges, temporary walkways, and other means. Some streets will also be temporarily closed under special circumstances, such as for deck beam and street decking installation.

6. TUNNEL CONSTRUCTION

6.1 TBM DRIVES WITH LAUNCH/RETRIEVAL SITES

Construction will be accomplished through the award of one or more major construction contracts. The work is largely linear, approximately 60 kilometers (40 miles) in length and will be divided into multiple work fronts, with 8 machines for J, 9 machines for J1, and as many as 10 for Camden Yards Station Alternative, operating simultaneously (Figure 12, Table 2, 3).

Figure 12. Proposed TBM Drives with Launch/Retrieval Sites

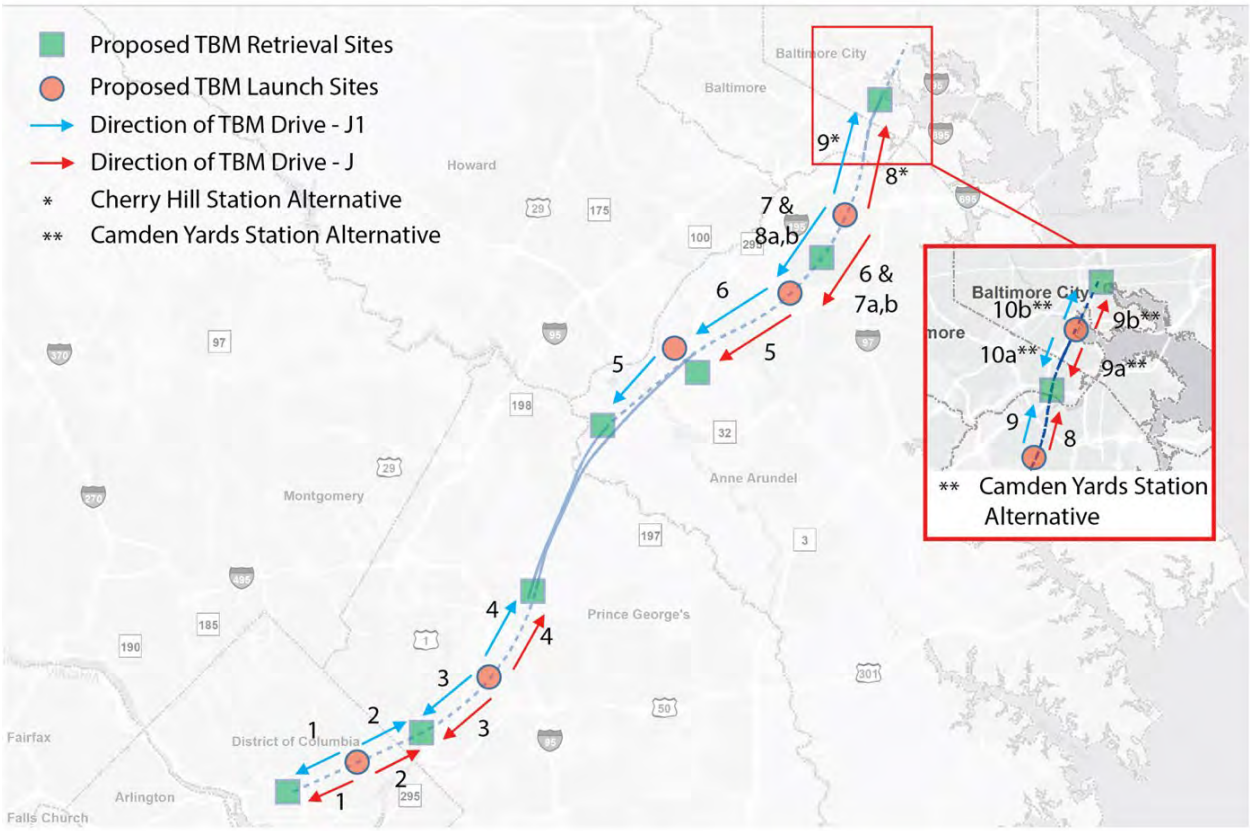


Table 2. Proposed TBM Drives for Underground Portions of Alignment Alternative J

TBM Drive Number	From: Station[4]	From: Surface Access	To: Station[4]	To: Surface Access	TBM Drive Length (km)
1	104+179	Shaft	101+100	MVE Station	3.079
2	104+329	Shaft	108+142	Shaft	3.813
3	113+012	Shaft	108+177	Shaft	4.835
4	113+162	Shaft	118+348	S. Portal	5.186
5	141+517	Shaft	135+175	N. Portal	6.342
6	146+395	N. Switch Box	141+667	Shaft	4.335[1]
7a	143+603	S. Switch Box	146+395	N. Switch Box	2.633[2]
7b	143+603	S. Switch Box	146+395	N. Switch Box	2.633[2]
8	146+626	N. Switch Box	152+820	Cherry Hill Portal	6.194[3]
Camden Yards Station Alternative[4]					
8-Alt	196+538	N. Switch Box	200+990	Shaft	4.452
9a	204+970	MOW Switch Box	201+025	Shaft	3.945
9b	205+199	MOW Switch Box	206+958	Camden Yards Station	1.759[3]

[1] TBM run using a 15 m diameter TBM for the center express tunnel at BWI and from the South Switch Box to the FA/EE at 141+667

[2] TBM runs using a 16.5 m diameter TBM for two outer Platform tunnels for local BWI trains. Two runs (7a, 7b), each from S. Switch Box to the N. Switch Box, or vice versa, with walk-through of station. Distance shown excludes anticipated length of station box.

[3] For total length of tunneling see Table 12.

[4] Stations represent ends of the shafts where tunnel breakthrough would occur.

Table 3. Proposed TBM Drives for Underground Portions of Alignment Alternative J1

TBM Drive Number	From: Station[4]	From: Surface Access	To: Station[4]	To: Surface Access	TBM Drive Length (km)
1	104+175	Shaft	101+100	MVE Station	3.075
2	104+325	Shaft	108+137	Shaft	3.812
3	113+037	Shaft	108+172	Shaft	4.865
4	113+187	Shaft	118+061	S. Portal	4.874
5	134+452	Shaft	128+696	N. Portal	5.756
6	141+553	Shaft	134+602	Shaft	6.951
7	146+431	N. Switch Box	141+703	Shaft	4.335[1]
8a	143+639	S. Switch Box	146+431	N. Switch Box	2.633[2]
8b	143+639	S. Switch Box	146+431	N. Switch Box	2.633[2]
9	146+662	N. Switch Box	152+856	Cherry Hill Portal	6.194[3]
Camden Yards Station Alternative[4]					
9-Alt	196+538	N. Switch Box	200+990	Shaft	4.452
10a	204+970	MOW Switch Box	201+025	Shaft	3.945
10b	205+199	MOW Switch Box	206+958	Camden Yards Station	1.759[3]

[1] TBM run using a 15 m diameter TBM for the center express tunnel at BWI and from the South Switch Box to the FA/EE at 141+667

[2] TBM runs using a 16.5 m diameter TBM for two outer Platform tunnels for local BWI trains. Two runs (8a, 8b), each from S. Switch Box to the N. Switch Box, or vice versa, with walk-through of station. Distance shown excludes anticipated length of station box.

[3] For total length of tunneling see Table 12.

[4] Stations represent ends of the shafts where tunnel breakthrough would occur.

6.2 TBM LAUNCH/RETRIEVAL SITES STAGING AREA

Construction staging areas will be necessary for tunnel construction, similar to what is required for stations and ancillary facilities. Space will be needed for assembly, launch, operation, and retrieval of TBMs. Work zones to support tunnel excavation operations will include areas for processing and removing tunnel spoils, handling precast concrete tunnel-lining segments, and housing tunnel utilities (such as ventilation, water supply, wastewater removal, power supply, etc.).

The launch points of TBMs require a sizeable staging area with a launch shaft excavated to below the depth of the tunnel invert. The TBM will be partially assembled on the surface and lowered into the hole for complete assembly prior to launch. In addition to the cutter head, substantial trailing equipment is necessary to support the operation of the machine, including building of the tunnel lining with precast segments and conveyance of the spoils, or muck, out of the tunnel.

Excluding the launch shaft itself, the laydown area will require a minimum of 1.6 to 2 hectares (4 to 5 acres) to allow for segment storage, TBM laydown and staging, generators, machine shops/workshops, construction personnel parking, construction offices, equipment storage, and tunnel muck storage. Where two TBMs are planned to be launched at one site, a laydown area on the order of 2.8 to 3.2 hectare (7 to 8 acres) minimum is preferable. Retrieval shafts and associated laydown areas will be significantly smaller, with shaft dimensions on the order of 35 meters (115 feet) length, by 35 meters (115 feet) width, and associated laydown area of 0.8 to 1.2 hectare (2 to 3 acres). Laydown areas for retrieval shafts require sufficient space to allow for installation of Support of Excavation (SOE) which in the case of slurry wall construction includes assembly of large rebar reinforcement cages. Estimated shaft dimensions with total anticipated laydown area size are summarized in Tables 4 and 5 below (including dimensions for station boxes, portals, and switch caverns). Note, any space demarcated for future construction (i.e. substations, etc.) will be used as laydown for tunneling operations prior to the need for construction of said structures/facilities. Such additional construction areas are included in the estimated laydown areas noted in Tables 4 and 5 below.

Table 4. Alignment Alternative J Launch/Retrieval Laydown Areas

TBM Launch/Retrieval Sites[4]	Shaft/Box Dimensions (L x W x H) (ft)	Estimated Laydown Area Size (Acres)
Station 101+100 - Retrieve	Washington, D.C. MVE Station[2]	-
Station 104+267 - Launch	500 x 100 x 205[1]	17
Station 108+160 - Retrieve	115 x 115 x 150	3
Station 113+102 - Launch	500 x 100 x 302[1]	16
Station 118+348 - Retrieve	South Portal[2]	-
Station 135+175 - Retrieve	North Portal[2]	-
Station 140+281 – FA/EE Location Alt.	115 x 115 x 186	3.5
Station 141+601 – Launch/Retrieve	500 x 100 x 201[1]	12
Station 143+576 – Launch/Retrieve	S. BWI Switch Box[2]	15.5

TBM Launch/Retrieval Sites[4]	Shaft/Box Dimensions (L x W x H) (ft)	Estimated Laydown Area Size (Acres)
Station 146+481 – Launch/Retrieve	N. BWI Switch Box[2]	10
Station 151+097 – FA/EE Location	115 x 115 x 181	6
Station 152+820 – Retrieve	Cherry Hill Portal[2]	-
Camden Yards Station Alternative[4]		
Station 205+034 – Launch	MOW Switch Box[3]	15
Station 206+958 - Retrieve	Camden Yards Station[2,3]	-

[1] Section of box width must be 35 m wide across a 35 m length to allow for FA/EE construction and required dimensions
[2] Please see respective sections for discussions of Portals and Station Boxes. Retrieval will use viaduct and portal construction laydown.
[3] Camden Yards Station Alternative. Camden Yards Station alignment alternative has separate alignment stationing
[4] Stationing indicates approximate center point of FA/EE facilities, not the launch/retrieval shaft

Table 5. Alignment Alternative J1 Launch/Retrieval Laydown Areas

TBM Launch/Retrieval Sites[4]	Shaft/Box Dimensions (L x W x H) (ft)	Estimated Laydown Area Size (Acres)
Station 101+100 - Retrieve	Washington, D.C. MVE Station[2]	-
Station 104+263 - Launch	500 x 100 x 165[1]	17
Station 108+154 - Retrieve	115 x 115 x 146	3
Station 113+100 - Launch	500 x 100 x 265[1]	18.25
Station 118+061 - Retrieve	South Portal[2]	-
Station 128+696 – Retrieve	North Portal[2]	-
Station 134+482 – Launch	500 x 100 x 140	6.8
Station 140+318 – FA/EE Location Alt.	115 x 115 x 150	3.5
Station 141+638 – Launch/Retrieve	500 x 100 x 175[1]	12
Station 143+612 – Launch/Retrieve	S. BWI Switch Box[2]	15.5
Station 146+517 – Launch/Retrieve	N. BWI Switch Box[2]	10
Station 151+133 – FA/EE Location	115 x 115 x 175	6.3
Station 152+856 – Retrieve	Cherry Hill Portal[2]	-

TBM Launch/Retrieval Sites[4]	Shaft/Box Dimensions (L x W x H) (ft)	Estimated Laydown Area Size (Acres)
Camden Yards Station Alternative[4]		
Station 205+034 – Launch	MOW Switch Box[3]	15
Station 206+958 - Retrieve	Camden Yards Station[2,3]	-

[1]Section of box width must be 35 m wide across a 35 m length to allow for FA/EE construction and required dimensions
[2] Please see respective sections for discussions of Portals and Station Boxes.
[3]Camden Yards Station Alternative; Camden alignment alternative has separate alignment stationing
[4] Stationing indicates approximate center point of FA/EE facilities, not the launch/retrieval shaft

FA/EE sites are generally required at approximately every 5km (though a maximum spacing of 6 km is possible) and will serve as TBM launch/retrieval sites to minimize disruption and streamline construction. The launch sites will be used for stockpiling the spoils excavated from the tunnel by the TBM. The site spacing allows for efficient storage and transport of the spoils to the areas designated for disposal.

The equipment anticipated to construct the launch site will include gantry or boom crane(s), excavator(s), bulldozer(s), pile driver(s), dump trucks, pay loaders, rock drills, sheet pile vibrators/hammers, and/or slurry wall excavator, slurry plant/grouting plant, generators, and concrete trucks. Additional equipment will be necessary to construct the FA/EE when the TBMs are removed. Tables 6 and 7 show the locations of launch/retrieval shafts with estimated duration of shaft construction (Slurry wall construction and shaft excavation and support), hours of operation, and trip generation for trucks and workers for alternatives J and J1, respectively.

TBM components will be delivered to the tunnel staging sites by truck. Several oversize deliveries will be required, some during nights and weekends. However, these large component deliveries are limited to the initial setup and removal period for the TBM, and the TBM parts are designed to limit weight as well as space limitations that may be imposed on deliveries. TBM manufacturers coordinate with the contractors for such restrictions and needs. New access roads to the laydown areas will maintain a grade less than approximately 14% with a crushed stone base, if not currently paved, to permit construction truck traffic to and from the sites including TBM deliveries, spoils removal, and general material/concrete deliveries.

Table 6. Alignment Alternative J FA/EE Shaft Launch/Retrieval Site Construction[1]

TBM Launch/Retrieval Sites[4]	Est. Duration (Months)	Est. Operating Hours	Est. Truck Trips (per day)	Est. Worker Vehicle Trips
Station 104+267 – Launch[2]	15	24-hours per day	130	125
Station 108+160 - Retrieve	12	24-hours per day	35	50
Station 113+102 - Launch	18	24-hours per day	160	125

TBM Launch/Retrieval Sites[4]	Est. Duration (Months)	Est. Operating Hours	Est. Truck Trips (per day)	Est. Worker Vehicle Trips
Station 140+281 – Alt. FA/EE Site[3]	12	24-hours per day	40	50
Station 141+601 – Launch	15	24-hours per day	125	125
Station 151+097 – Retrieval	12	24-hours per day	40	50

[1]For Stations, Switch Boxes, and Portals, please see respective sections
[2]Adjacent to rail line – Potential to use rail line for muck removal
[3]Dimensions of retrieval shaft assumed at this time (35 m x 35 m)
[4] Stationing indicates approximate center point of FA/EE facilities, not the launch/retrieval shaft

Table 7. Alignment Alternative J1 FA/EE Shaft Launch/Retrieval Site Construction[1]

TBM Launch/Retrieval Sites[4]	Est. Duration (Months)	Est. Operating Hours	Est. Truck Trips (per day)	Est. Worker Vehicle Trips
Station 104+263 – Launch[2]	15	24-hours per day	105	125
Station 108+154 - Retrieve	12	24-hours per day	35	50
Station 113+100 - Launch	18	24-hours per day	140	125
Station 134+482 – Launch	15	24-hours per day	90	125
Station 140+318 – Alt. FA/EE Site[3]	12	24-hours per day	35	50
Station 141+638 – Launch	15	24-hours per day	110	125
Station 151+133 – Retrieval	12	24-hours per day	40	50

[1]For Stations, Switch Boxes, and Portals, please see respective sections
[2]Adjacent to rail line – Potential to use rail line for muck removal
[3]Dimensions of retrieval shaft assumed at this time (35 m x 35 m)
[4] Stationing indicates approximate center point of FA/EE facilities, not the launch/retrieval shaft

6.3 TUNNEL MINING

Alignment alternatives J and J1 include approximately 39.05 kilometers (24.26 miles) and 45.16 kilometers (28.06 miles) of tunnels, respectively, with an additional ~3.97 km (2.47 miles) of additional tunnels for the Camden Yards Station alternative. Tunneling will be performed using TBMs with minimal surface impacts except at TBM launch and retrieval sites. Tunnel construction consists of a variety of activities. These include TBM procurement and mobilization, preparation of the work area and assembly of the machine and its components, and tunnel excavation. Tunnel excavation will take approximately 7 months for 1.6 kilometers (1 mile) length at an assumed advance rate of 9.15 meters (30 feet) per day, but varies, depending on the ground conditions encountered, site and work area constraints, and the number of TBMs used. The TBM drives are anticipated to encounter:

- Soft ground along most of the drive, with potential stretches where bedrock may be encountered, depending on station alternative selected in Baltimore, MD.
- High groundwater levels
- Portions under urban areas and major roadways

Considering the soil types and groundwater conditions expected along the tunnel sections, which will require active-face support, a closed-face TBM will be required. Based on the available preliminary information on the geological and hydrogeological conditions and the critical impact of groundwater to the tunneling activities, use of an Earth Pressure Balance Machine (EPBM) or slurry TBM is considered at this stage to be the most appropriate for the anticipated subsurface conditions. Alternatively, a Mix Shield TBM could be used if the final profile includes mixed-face conditions or hard bedrock stretches, which may be encountered in the vicinity of the Washington, D.C. Station, the middle of the alignment where it swings back west, or the Camden Yards Station alternative.

TBM tunnels in soft ground are typically supported by precast segments, which are installed behind the cutter head as the excavation progresses, producing a continuous lining along the tunnel length with a circular, uniform geometry. Additionally, the annulus between the installed lining segments and excavated ground is grouted. Segmental linings are equipped with gasketed joints to inhibit groundwater inflow to the tunnel. The lining segments will be cast remotely and shipped to the site, with sufficient segments stored on-site at all times for a pre-determined period of excavation progress.

A single large-bore TBM tunnel with an outside diameter of approximately 15 meters (~50 feet) will provide optimal advance rate performance while providing the cross-sectional area required for two guideways and emergency egress. Technology and capabilities of present-day TBMs allow for unimpeded tunneling and enhanced risk management. The alignment will be designed such that TBM tunneling will be performed under approximately one tunnel diameter of ground cover to minimize surface impact. Tunnel sections of the alignments will have no surface impacts to utilities.

The excavated materials are removed through the tunnel using conveyor belt systems or closed spoil transport pipelines. A significant effort will be required to manage muck removal for a tunnel of this size. At an estimated advance rate of 9.15 meters (30 feet) per day, soil removal totaling over 2,600 cubic yards per day is be anticipated for each TBM, weighing over 3,900 U.S. tons. This amount of muck requires removal by approximately 200-265 dump trucks per day (250-320 dump trucks per day for 16.5 m diameter TBM at BWI Airport) depending on size of trucks used (10 – 14 cu yard trucks typical; 10 cu yard trucks assumed for all calculations) (Table 8, 9).

A tunnel drive consists of a series of activities. The TBM excavation advance is typically 1.2 to 1.5 meters (4 to 5 feet) by means of hydraulic jacks, which push against the previously installed tunnel lining ring. Following a complete “push” to advance the TBM, the hydraulic jacks are retracted, and the next lining ring is installed. This process is repeated as the tunnel advances from one station to the next. When starting a tunnel drive from a shaft or station excavation, a heavy steel frame is typically erected to allow a rigid structure for the TBM to react against so that it can start to push forward. Temporary precast concrete segmental liners are erected behind the TBM, which allow for continued advancement. The initial tunnel lining segments erected within the shaft are later removed once the TBM is fully “buried” and is tunneling continuously. Following tunnel excavation, the TBMs may be retrieved. An alternative to retrieving the TBM is to dismantle the TBM underground with the shield (outer shell) left in place. Sometimes, from a traffic management standpoint, due to traffic impacts at the retrieval shaft, retrieving the TBM is less desirable than dismantling it. Such a scenario may occur when retrieving the TBM that will break through into the Mount Vernon Square East station.

The pre-cast concrete liners are fabricated off-site and delivered to the site by truck. Truck loads for segments are estimated to be 6 to 10 per day for the duration of tunneling based on an estimated overall excavation rate of 9.15 meters (30 feet) per day. Segments needed for at least several days’ production are generally stored at the work site to allow for continuous tunneling. Tunneling operations are typically continuous, 6 days per week (25 days month) assumed herein for calculations, and typically consist of three 8-hour shifts per day based on schedule and working time restrictions.

The equipment required to support TBM operation will include gantry/boom cranes, erectors for positioning lining segments, excavators, dump trucks and pay loaders. Additionally, a substation and electrical grid connection or generators for the TBM operation will be required as well as a grouting plant for grouting the annulus between the segmental lining and soil. For slurry TBMs, a separation plant will also be required as discussed in section 6.2. Tables 8 and 9 show TBM drives with estimated durations (assuming approximately 300 working days per year), hours of operation, and trip generation for trucks and workers for alternatives J and J1, respectively.

Table 8. Alignment Alternative J Tunnel Boring

TBM Drive Number	Tunnel Boring– Alternative J	Est. Duration (Months)	Est. Operating Hours	Est. Truck Trips (per day)[1]	Est. Worker Vehicle Trips
1	Station 101+100 to Station 104+179	13.5	24-hours per day	200 – 265	150
2	Station 104+329 to Station 108+142	17	24-hours per day	200 – 265	150
3	Station 113+012 to Station 108+177	21	24-hours per day	200 – 265	150
4	Station 113+162 to Station 118+348	23	24-hours per day	200 – 265	150
5	Station 141+517 to Station 135+175	28	24-hours per day	200 – 265	150
6[2]	Station 146+395 to Station 141+667	19	24-hours per day	200 – 265	150
7a, b[3]	Station 143+603 to Station 146+395	23	24-hours per day	250 – 320	150
8	Station 146+626 to Station 152+820	27	24-hours per day	200 – 265	150
Camden Yards Station Alternative[4]					
8-Alt	Station 196+538 to Station 200+990	19.5	24-hours per day	200 – 265	150
9a	Station 204+970 to Station 201+025	17	24-hours per day	200 – 265	150
9b	Station 205+199 to Station 206+958	8	24-hours per day	200 – 265	150

[1] Provided range for 10 to 14 cu yard dump trucks

[2] TBM run using a 15 m diameter TBM for the center express tunnel at BWI and from the South Switch Box to the FA/EE at 141+667

[3] TBM runs using a 16.5 m diameter TBM for two outer Platform tunnels for local BWI trains. Est. duration shown includes both runs (7a, 7b), each from S. Switch Box to the N. Switch Box, or vice versa, with walk-through of station. Distance shown excludes anticipated length of station box.

[4] Stationing for Camden Yards Station Alternative alignment used.

Table 9. Alignment Alternative J1 Tunnel Boring

TBM Drive Number	Tunnel Boring– Alternative J	Est. Duration (Months)	Est. Operating Hours	Est. Truck Trips (per day)[1]	Est. Worker Vehicle Trips
1	Station 104+175 to Station 101+100	13.5	24-hours per day	200 – 265	150
2	Station 104+325 to Station 108+137	17	24-hours per day	200 – 265	150
3	Station 113+037 to Station 108+172	21	24-hours per day	200 – 265	150
4	Station 113+187 to Station 118+061	21	24-hours per day	200 – 265	150
5	Station 134+452 to Station 128+696	25	24-hours per day	200 – 265	150
6	Station 141+553 to Station 134+602	30.5	24-hours per day	200 – 265	150
7[2]	Station 146+431 to Station 141+703	19	24-hours per day	200 – 265	150
8a, b[3]	Station 143+639 to Station 146+431	23	24-hours per day	250 – 320	150
9	Station 146+662 to Station 152+856	27	24-hours per day	200 – 265	150
Camden Yards Station Alternative[4]					
9-Alt	Station 196+538 to Station 200+990	19.5	24-hours per day	200 – 265	150
10a	Station 204+970 to Station 201+025	17	24-hours per day	200 – 265	150
10b	Station 205+199 to Station 206+958	8	24-hours per day	200 – 265	150

[1] Provided range for 10 to 14 cu yard dump trucks
[2] TBM run using a 15 m diameter TBM for the center express tunnel at BWI and from the South Switch Box to the FA/EE at 141+667
[3] TBM runs using a 16.5 m diameter TBM for two outer Platform tunnels for local BWI trains. Est. duration shown includes both runs (7a, 7b), each from S. Switch Box to the N. Switch Box, or vice versa, with walk-through of station. Distance shown excludes anticipated length of station box.
[4] Stationing for Camden Yards Station Alternative alignment used.

6.4 MUCK QUANTITIES AND DISPOSAL

Disposal of excavated soils will require an extensive plan to be developed by the contractor. Options for disposal of the material in a useful manner include use as daily cover at local county landfills, grading for large development/re-development projects, smoothing the grade at SCMAGLEV support facility sites, etc. Estimated volumes for shafts (Table 10, 11), and tunneling (Table 12) for alignment alternatives J and J1 are shown below. These values assume a soil bulking factor of 1.25 for the volume of material.

Soils will not be dewatered and will require testing prior to disposal according to State environmental guidelines and requirements. Transportation of spoils to final destination can be via dump truck or potentially heavy rail (CSX). For total estimated spoils across all elements of the project see Section 14.0.

Table 10. Alignment Alternative J FA/EE Shafts for Launch/Retrieval

Shaft Station (Launch/Retrieve)	Shaft Dimensions (L x W x H) (ft)	Estimated Volume Spoils (yd^3)
Station 104+267 (Launch)	500 x 100 x 165	479,000
Station 108+160 (Retrieve)	115 x 115 x 146	92,000
Station 113+102 (Launch)	500 x 100 x 260	705,000
Station 140+281 (Alt. FA/EE Site)	115 x 115 x 150	114,000
Station 141+601 (Launch)	500 x 100 x 150	470,000
Station 151+097 (Retrieval)	115 x 115 x 175	111,000

[1]For Stations, Switch Boxes, and Portals, please see respective sections

Table 11. Alignment Alternative J1 FA/EE Shafts for Launch/Retrieval

Shaft Station (Launch/Retrieve)	Shaft Dimensions (L x W x H) (ft)	Estimated Volume Spoils (yd^3)
Station 104+263 (Launch)	500 x 100 x 165	386,000
Station 108+154 (Retrieve)	115 x 115 x 146	90,000
Station 113+100 (Launch)	500 x 100 x 265	618,000
Station 134+482 (Launch)	500 x 100 x 138	322,000
Station 140+318 (Alt. FA/EE Site)	115 x 115 x 150	92,000
Station 141+638 (Launch)	500 x 100 x 173	402,000
Station 151+133 - Retrieval	115 x 115 x 175	107,000

[1]For Stations, Switch Boxes, and Portals, please see respective sections

Table 12. Estimated Volume Spoils of Tunneling for Alignment Alternatives

Station Alternative	Tunneling Length (km)	Estimated Total Volume Spoils (yd^3)
ALIGNMENT ALTERNATIVE: J		
Mount Vernon Square East to Cherry Hill	39.05	11,605,000
Mount Vernon Square East to Camden Yards	43.01	12,750,000
ALIGNMENT ALTERNATIVE: J1		
Mount Vernon Square East to Cherry Hill	45.13	13,360,000
Mount Vernon Square East to Camden Yards	49.10	14,505,000

7. VIADUCT CONSTRUCTION

7.1 OVERVIEW

Alignment alternatives J and J1 consist of approximately 14.2 kilometers (8.8 miles) and 7.6 kilometers (4.8 miles) of elevated viaduct, respectively. The Alternative J alignment follows the BW Parkway along the east side through federal lands including the PRR, Fort Meade, and the USDA BARC. The viaduct will run through open and forested lands adjacent to the BW Parkway. Both alternatives cross wetlands for part of the route and have existing residences approximately 25 meters (80 feet) from the right-of-way line for Alt J and 20 meters (65 feet) for Alt J1.

A single viaduct structure approximately 14-meters (46-feet) wide will carry two guideways. The structure will be built with precast concrete superstructure elements supported on precast concrete hammerhead piers with drilled shaft foundations. Concrete straddle bents will be required at some existing roadway and waterway crossings. The typical span of the viaduct structure will be approximately 38 meters (125 feet). Longer spans of approximately 50 meters (165 feet) will be used at locations where the alignment crosses waterway features or existing infrastructure.

Elevated viaduct portions of alternatives J and J1 alignments cross over several existing roadways. The SCMAGLEV viaduct will span over the roadways with a minimum under clearance of approximately 7.62 meters (25 feet) measured to the underside of the viaduct girder. The profile grade line (guideway level) will be 10 meters above the ground. A minimum lateral clearance of 16 meters (52.5 feet) from edge of the travel lane of an existing roadway to the pier columns will be maintained where possible. At locations where the minimum lateral clearance cannot be achieved, the viaduct pier columns will be protected with concrete barriers.

Impacts to the existing roadways will generally be limited to viaduct piers constructed in the existing roadway medians and construction of roadway barriers to protect pier columns adjacent to the existing roadways. Temporary disruptions to traffic, or lane shifting or closures, may be required during the construction of the substructure and the erection of the superstructure at spans over roadways, and for conveyance of material and equipment.

Both alignment alternatives, J and J1, cross wetlands and rivers/creeks at various locations. Span arrangements are selected to minimize impacts.

Elevated viaduct ramp structures are also proposed for the Trainset Maintenance Facilities (TMF) connecting them to the mainline viaduct. Similar to the mainline viaduct structure, precast concrete superstructure supported on precast or cast-in-place concrete piers with drilled shaft foundations are proposed for the ramps.

The ramps for the BARC West TMF alternative connecting to mainline alternative J will require crossing over the BW Parkway and construction in the BW Parkway median. Similarly, the BARC Airstrip and MD 198 TMF alternatives will require ramps crossing the BW Parkway to connect to mainline alternative J1.

7.2 SUBSTRUCTURE

The substructure can be constructed utilizing a combination of conventional and precast construction methods. Based on the predominant soil type and rock elevation within the project limits, drilled shafts are considered the most feasible foundation type. Alternatives of two 3.05 meters (10 feet) shafts, four 1.52 meters (5 feet) shafts, and four 1.83 meters (6 feet) shafts per bent with cast in place pile cap are considered viable. The pier bent columns could be constructed using cast-in-place construction, however the use of precast construction methods is recommended to reduce construction duration. The pier bent columns could be constructed with precast segments, post-tensioned with the pile caps.

The equipment anticipated to construct the foundation, footings and piers for the viaduct structure will include drill rigs, cranes, excavators, dump trucks, pay loaders, bulldozers, rock drills, sheet pile vibrators/hammers, flatbed delivery trucks, concrete trucks, concrete pump trucks, and general construction vehicles.

7.3 SUPERSTRUCTURE

Various methods of construction were evaluated for the superstructure of the elevated viaduct, including Span-by-Span Method (Figure 13), Balanced Cantilever Method (Figure 14), Incremental Launching Method, Full-Span Precast Launching Method (Figure 15), Movable Scaffolding System and conventional Cast-in-Place construction.

Span-by-Span construction for the segmental precast superstructure is considered the most feasible for the proposed span lengths and accessibility to the site.

Balanced Cantilever construction can be used for longer spans for the river and major roadway/interchange crossings; however post-tensioning is required to be performed with each installed segment, which will increase the construction duration.

Incremental Launching Method is not commonly used in the United States and is not considered cost effective for this project site due to requirements of specialized construction equipment and contractor knowledge and experience.

Full-Spans Precast Launching Method will require bigger gantry systems which will add to the project cost; also transporting full span precast superstructure units to the site is not feasible.

Construction with Cast-in-Place concrete superstructure, using construction methods such as the Movable Scaffolding System and conventional forming, is not recommended due to the extensive construction duration.

All of these methods will be reviewed in detail during final design and discussion with contractors. Assuming Span-by-Span construction, precast bridge superstructure segments of a width of 3.17 meters (10.5 feet) will be delivered to the laydown areas on flatbed trucks from one or more precast plants. Precast elements will be transported from the laydown yard to the active work front for installation using trucks and launching gantries mounted on completed viaduct sections.

Figure 13. Span-by-Span Construction Method, Evans Crary Bridge (Courtesy of ASBI)

Figure 14. Balanced Cantilever Construction Method (Courtesy of WSP/Pace)

Figure 15. Full Span Launching Construction Method (Courtesy of SHCG)

7.4 CONSTRUCTION LOGISTICS

For schedule optimization, the elevated viaduct is proposed to be constructed in approximate 2,500 meters (8,200 feet) sections so that some of the major construction activities can be synchronized. One or more contractors will be responsible for building the viaduct structure. Close coordination between crews working in each section and conveyance of material and equipment across sections will be undertaken.

The right-of-way width for the viaduct sections is 22 meters (70 feet). An additional width of 6 meters (20 feet) will be provided for temporary use during construction. A construction access road will be provided on each side of the piers for the conveyance of material and equipment from the local road access points and between the construction sections.

Figure 16. Laydown/Storage Areas (Courtesy of WSP/Pace)

Topsoil/organic material will be stripped and removed prior to construction and disposed offsite. The excavated subsoil from the viaduct foundation can be partially reused within the right of way for grading. The ground within the ROW will need to be stabilized and compacted for the construction equipment and drill rigs to be transported to each substructure unit. Barges and or temporary bridges may be needed to cross water bodies. Stockpiling of spoils, material, and equipment adjacent to the structure pier bents is generally prohibited.

For the J Alignment three work fronts are anticipated, each with access via local roads to an offsite laydown yard of approximately 105 meters by 175 meters (340 feet by 570 feet), or 1.8-hectare (4.4 acres), having a storage capacity of at least a quarter of each 2,500 meters (8,200 feet) construction section.

For the J1 Alignment two work fronts are anticipated, each with access via local roads to a laydown yard of similar area and storage capacity as the J Alignment. Areas for storage/laydown, and potentially segment casting, will be provided for the precast superstructure segments before being trucked to the project site for erection, similar to Figure 16. The following laydown area locations have been identified:

1. Suburban Airport at the project site, Figure 17.
2. Undeveloped commercial land owned by Konterra Associates LLC at I-95/MD Route 200 interchange about 4.8 kilometers (3 miles) west of project site, Figure 18.
3. The open lot/remains of the former Landover Mall owned by Landover Mall LTD Partnership on Brightseat Road at the I-495/MD Route 202 interchange near University of Maryland College campus in Glenarden about 11.3 kilometers (7 miles) south of project site, Figure 19.

These potential storage/laydown areas can also accommodate the storage of the precast substructure elements and other construction material and equipment. The Suburban Airport site is approximately 20.2 hectare (50 acres) and its location is a convenient storage/laydown area due to its proximity to the project site. The mid-section of the viaduct for the J1 alternative can be accessed directly from the Suburban Airport within the ROW and that of the J alternative can be accessed via Brock Bridge Road to

MD Route 197. The northern section of the viaduct can be accessed via Brock Bridge Road to MD Route 198 and MD Route 32, and the southern section can be accessed via Brock Bridge Road to MD Route 197 to local roads as illustrated in Figure 17. The Brock Bridge Road Bridge over the Patuxent River has a posted weigh limit of 5 Tons and a bridge reinforcement or replacement may be required. To avoid local bridge replacement, alternatively the Brock Bridge Road access to MD Route 198.

The undeveloped land owned by Konterra Associates LLC is accessible from I-95 and MD Route 200 and is approximately 65 hectares (160 acres). The access to the project site from the Konterra storage location can be via Contee Road to MD Route 197 towards the mid-section of the elevated viaduct, from I-95 to MD Route 32 and MD Route 198 to access the northern section and via MD Route 197 to local roads to access the southern section as shown in Figure 18.

The former Landover Mall lot is approximately 16.2 hectare (40 acres) and is accessible from I-95 and MD Route 202 (Figure 19). Access to the project site can be via I-95 to MD Route 201 to Powder Mill Road and Beaver Dam Road to the southern. Other routes to access the northern portion of the viaduct from this site can be as indicated for the Konterra storage location.

In addition, smaller construction access and laydown yards will be provided along each alignment for use by the contractors. They are shown on the DEIS drawings, and range in size from 2 acres to 10 acres.

The laydown areas for J alignment include:

- 200 meters by 80 meters open land near Powder Mill Road at STA 122+00
- 200 meters by 90 meters Harley Davidson site at STA 124+500
- 300 meters by 200 meters site near Route 32 Interchange at STA 133+00.

Laydown areas for J1 alignment include

- the storage area at Suburban Airport site
- 200 meters by 100 meters open land near Powder Mill Road at STA 121+500

Figures 17, 18 and 19 show proposed construction access roads to viaduct work zones via local roads. See Section 15 further details on access roads. The access road information is used for preliminary planning and will be further reviewed and potentially modified during final design and in consultation with contractors.

Figure 17. Proposed Haul Routes from Suburban Airport Site

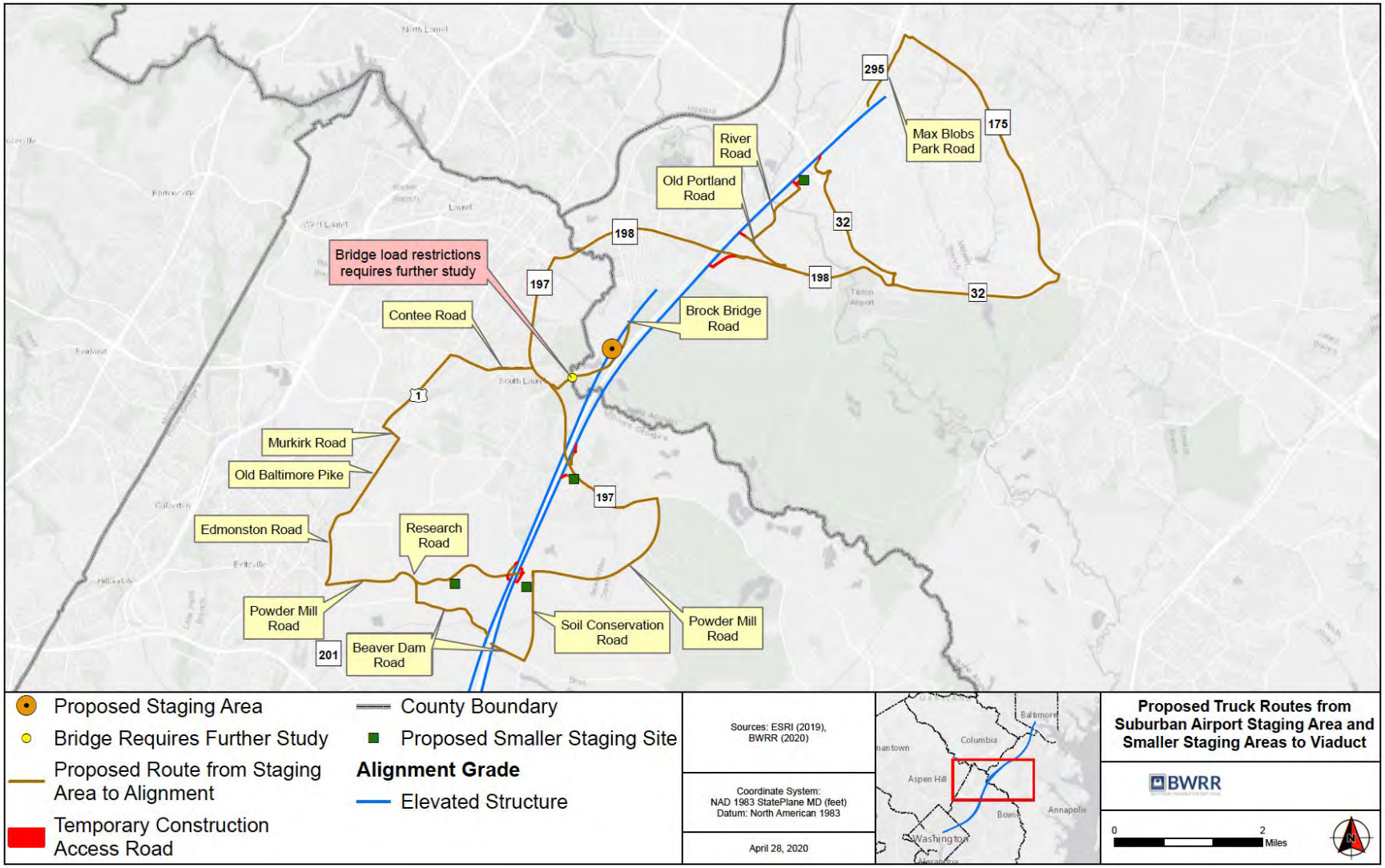


Figure 18. Proposed Haul Routes from Konterra Storage Location

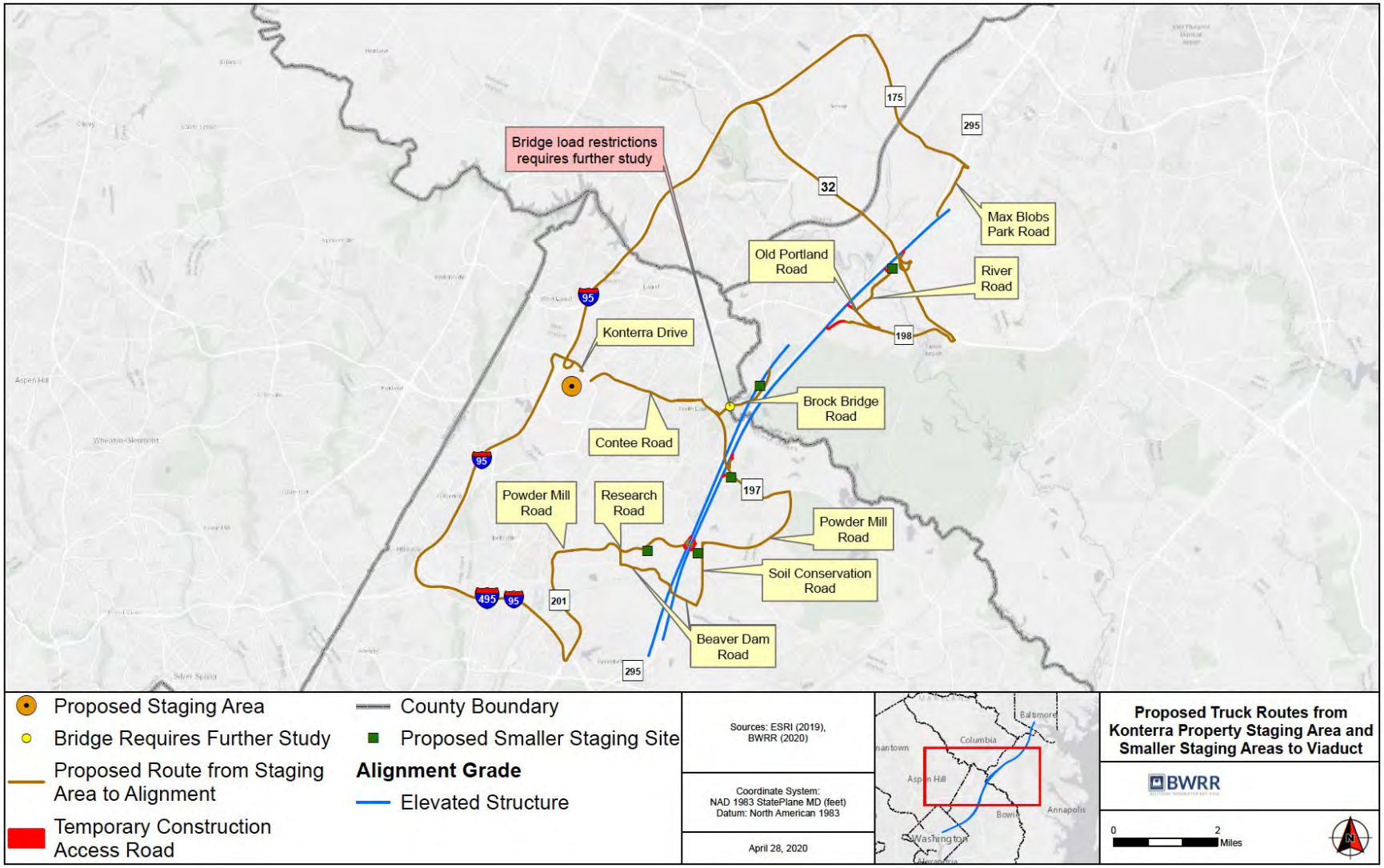
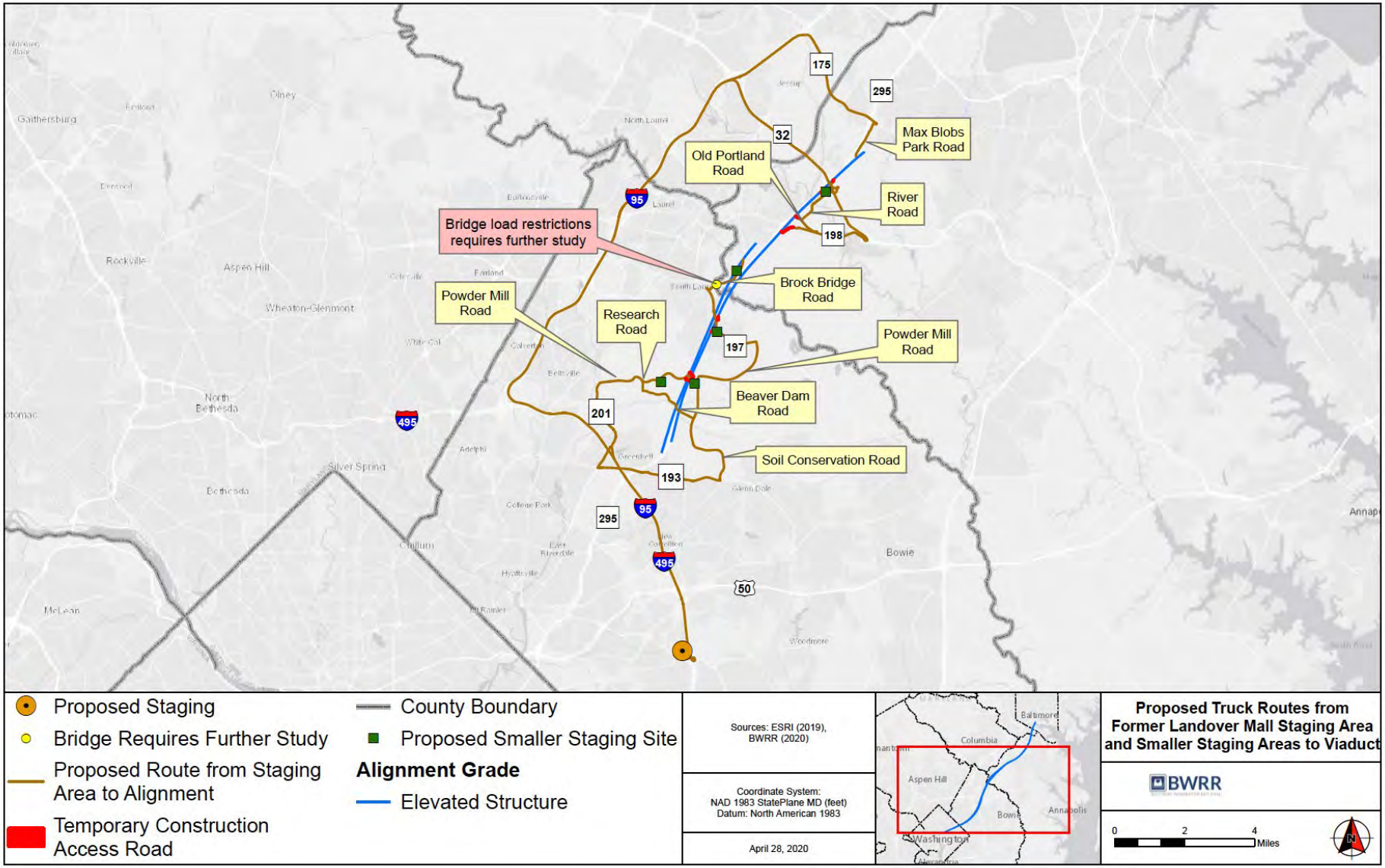


Figure 19. Proposed Haul Routes from Former Landover Mall



7.5 CONSTRUCTION DURATION

The construction of the substructure including drilled shafts, footings and hammerhead bents is estimated to be performed with four (4) crews and that of straddle bents with two (2) crews. For both Alignment Alternatives, the substructure for the all sections of the viaduct can be constructed in parallel with an estimated construction duration of 26 months per section. For each pier, a production rate of 1 week for the drilled shafts, 2 weeks for the footing, 1.5 weeks for the hammerhead bent and 2 weeks for a straddle bent is estimated.

Using precast segmental Span-by-Span construction, 38 meters (125 feet) to 50 meters (165 feet) spans are estimated to be erected at a rate of one span per day and fully constructed at a rate of three spans per week including post-tensioning, grouting and closure pours. Three gantries may be used to erect the superstructure for the J Alignment and two gantries for the J1 Alignment utilizing one gantry per two construction sections. A construction duration of 8 months per 2,500 meters (8,202 feet) section of the superstructure is estimated. Tables 13 and 14 show locations of each viaduct section with total estimated durations, hours of operation, and trip generation for trucks and workers for alternatives J and J1, respectively.

Table 13. Alignment Alternative J Viaduct Construction

Elevated Viaduct Alternative J	Est. Duration (Months)	Est. Operating Hours	Est. Truck Trips (per day)	Est. Worker Vehicle Trips
Station 120+022–Station 122+522	34	7:00 am–4:00 pm	30	60
Station 122+522–Station 125+022	34	7:00 am–4:00 pm	30	60
Station 125+022–Station 127+522	34	7:00 am–4:00 pm	30	60
Station 127+522–Station 130+022	34	7:00 am–4:00 pm	30	60
Station 130+022–Station 132+522	34	7:00 am–4:00 pm	30	60
Station 132+522–Station 134+230	28	7:00 am–4:00 pm	30	60

Table 14. Alignment Alternative J1 Viaduct Construction

Elevated Viaduct Alternative J1	Est. Duration (Months)	Est. Operating Hours	Est. Truck Trips (per day)	Est. Worker Vehicle Trips
Station 120+194–Station 122+694	34	7:00 am–4:00 pm	30	60
Station 122+694–Station 125+194	34	7:00 am–4:00 pm	30	60
Station 125+194–Station 127+836	35	7:00 am–4:00 pm	30	60

Tables 15 and 16 show the location with total estimated durations, hours of operation, and trip generation for trucks and workers for TMF ramp construction. The MD-198 ramps for alternative J1 are longer and have complex crossings of the BW Parkway and the MD-198 interchange, which will take more time. The ramp sections are smaller than those of the mainline viaduct, however the complex geometry and proximity to the BW Parkway, local roads and other facilities is factored into the above durations.

Table 15. Alignment Alternative J TMF Ramps Construction

TMF Site	Elevated Viaduct Alternative J	Est. Duration (Months)	Est. Operating Hours	Est. Truck Trips (per day)	Est. Worker Vehicle Trips
BARC West	NB Station 30+000 to Station 32+355	30	7:00 am–4:00 pm	30	60
BARC West	SB Station 40+000 to Station 42+122	26	7:00 am–4:00 pm	26	52
BARC Airstrip	NB Station 30+000 to Station 32+730	33	7:00 am–4:00 pm	14	30
BARC Airstrip	SB Station 40+000 to Station 42+971	34	7:00 am–4:00 pm	30	60
MD-198	NB Station 200+000 to Station 201+100	14	7:00 am–4:00 pm	14	30
MD-198	SB Station 100+000 to Station 101+700	22	7:00 am–4:00 pm	30	60

Table 16. Alignment Alternative J1 TMF Ramps Construction

TMF Site	Elevated Viaduct Alternative J1	Est. Duration (Months)	Est. Operating Hours	Est. Truck Trips (per day)	Est. Worker Vehicle Trips
BARC West	NB Station 100+00 to Station 102+935	34	7:00 am–4:00 pm	30	60
BARC West	SB Station 200+00 to Station 202+659	32	7:00 am–4:00 pm	30	60
BARC Airstrip	NB Station 100+00 to Station 103+582	Segment 1 – 34 Segment 2 – 10	7:00 am–4:00 pm	30	60
BARC Airstrip	SB Station 100+00 to Station 102+271	28	7:00 am–4:00 pm	28	60
MD 198	NB Station 200+000 to Station 205+500	Segment 1 – 34 Segment 2 – 32	7:00 am–4:00 pm	30	60
MD 198	SB Station 100+000 to Station 101+000 (joins with NB)	14	7:00 am–4:00 pm	28	60

7.6 SITE CONSTRAINTS

Various environmental constraints and restrictions at sensitive sites have been identified along the elevated viaduct structure. Both alignment alternatives run along the BW Parkway which is maintained by the National Park Service (NPS) south of its intersection with MD Route 175 (approximate Station 136+700.00 along the J alignment). No commercial or construction vehicles/trucks will be allowed on the BW Parkway, therefore the access for construction vehicles and delivery trucks for precast segments is alternatively planned for via I-95, I-495, MD Route 200, MD Route 202 and other local roads as previously identified.

Both alignment alternatives run through forested areas and parks owned by the National Park Service (NPS); other federal government land such as PRR, Fort Meade, and the USDA BARC; Maryland National Capital Park and Planning Commission (MNCPPC), and Maryland City Park. In addition, both alignment alternatives cross wetlands, floodways and rivers/creeks including the Beck Branch River, Beaverdam Creek, Patuxent River and Little Patuxent River. Disturbances to these areas will be minimized by locating material and equipment storage and laydown areas off site, reducing construction access, and by optimizing the pier locations where necessary. A reforestation plan for the impacted areas will be coordinated through the EIS as appropriate.

Construction of cofferdams will be required for the in-water pier construction and access through the adjacent properties may require temporary easements.

There are power transmission lines and distribution lines running across the proposed location of the viaduct for both alignment alternatives, J and J1. In some cases, the power lines will need to be relocated prior to viaduct construction. The power lines also may impose constraints on construction equipment and activities. Coordination with Baltimore Gas & Electric (BGE) and Potomac Electric Power Company (PEPCO) is in progress.

Monitoring of vibration and noise will be performed during the construction of the viaduct adjacent to existing structures and sensitive soils/areas, and communities. The structure will be monitored for deflection and post-tension losses and settlement during construction to satisfy strict deflection and settlement requirements for this project.

Potential areas of impact for each Alignment Alternative are provided in Tables 17 and 18.

Table 17. Alignment Alternative J – Potential Areas of Impact for the Viaduct Section

Property Name/Owner	Approximate Limits of Impact	Impact/Restrictions
Residential	Station 118+350 to Station 118+500	Noise Restrictions during Construction
National Aeronautics and Space Administration	Station 118+350 to Station 118+900	Deforestation/Reforestation; ROW impact; Temporary closure of Explorer Road during construction
United States/GSA - USDA Agricultural Land	Station 118+900 to Station 120+500	Deforestation/Reforestation; ROW impact
Beck Branch River/ Wetlands/Floodways	Station 120+000 to Station 120+200	Minimize wetland impact for Pier Construction; ROW impact
Beaverdam Creek/ Wetlands/Floodways	Station 120+400 to Station120+600	Minimize wetland impact for Pier Construction; ROW impact
Baltimore-Washington Parkway/ National Park Services (NPS)	Station 120+300 to Station 122+500	Deforestation/Reforestation; NPS maintained open and forested areas and Parkway Ramps – Access restriction
United States Secret Service James J. Rowley Training Center	Station 122+150 to Station123+050	Deforestation/Reforestation; ROW impact
Baltimore-Washington Parkway/ National Park Services (NPS)	Station 123+050 to Station126+100	Deforestation/Reforestation; NPS maintained open and forested areas and Parkway Ramps – Access restriction

Property Name/Owner	Approximate Limits of Impact	Impact/Restrictions
PEPCO High Tension Transmission Towers/Power Lines	Station 123+850 to Station123+950	Utility Relocation
Washington Sub Sanitary Comm. & Baltimore-Washington Parkway	Station 125+525 to Station126+150	ROW impact
Patuxent River/ Wetlands/Floodways	Station 125+525 to Station126+300	Minimize wetland impact for Pier Construction; ROW impact
United Stated Dept. of Interior/Patuxent Research Refuge	Station 126+150 to Station129+800	Deforestation/Reforestation; ROW impact
Baltimore-Washington Parkway/ National Park Services (NPS)	Station 127+600 to Station133+900	Deforestation/Reforestation; NPS maintained open and forested areas and Parkway Ramps – Access restriction
BGE High Tension Transmission Towers/ Power Lines	Station 129+300 to Station131+200	Utility Relocation
District of Columbia	Station 131+525 to Station 132+675	Deforestation/Reforestation; ROW impact
Little Patuxent River/ Wetlands/Floodways	Station 131+470 to Station131+950	Minimize wetland impact for Pier Construction; ROW impact
National Security Agency (NSA) - Fort Meade	Station 133+225 to Station135+250	Deforestation/Reforestation; ROW impact

Table 18. Alignment Alternative J1 – Potential Areas of Impact for the Viaduct Section

Property Name/Owner	Approximate Limits of Impact	Impact/Restrictions
City of Greenbelt Preserve	Station 118+125 to Station 118+475	Deforestation/Reforestation; ROW impact
City of Greenbelt Ballfields and Observatory	Station 118+475 to Station 118+650	ROW impact

Property Name/Owner	Approximate Limits of Impact	Impact/Restrictions
City of Greenbelt Preserve	Station 118+650 to Station 119+500	Deforestation/Reforestation; ROW impact
United States/GSA - USDA	Station 119+500 to Station 121+500	Open and forested areas – Deforestation/Reforestation; ROW impact
USA GSA/USDA Farm	Station 120+050 to Station 120+200	Open and forested areas – Deforestation/Reforestation; ROW impact
Beck Branch River & Beaverdam Creek/Wetlands/Floodways	Station 120+300 to Station 120+400	Minimize wetland impact for Pier Construction; ROW impact
USA GSA/USDA Farm	Station 120+950 to Station 121+000	Open and forested areas – Deforestation/Reforestation; ROW impact
Baltimore-Washington Parkway/ National Park Services (NPS)	Station 121+200 to Station 125+700	Deforestation/Reforestation; NPS maintained open and forested areas and Parkway Ramps – Access restriction
Residential adjacent to NPS/BW Parkway	Station 123+300 to Station123+800	Forested areas & developed residential - Deforestation/Reforestation; ROW impact
PEPCO High Tension Transmission Towers/Power Lines	Station 123+800 to Station 123+900	Utility Relocation
Residential & Park adjacent to NPS/BW Parkway	Station 123+900 to Station124+500	Open area parks/forested areas & developed residential & park - Deforestation/Reforestation; ROW impact
Commercial adjacent to NPS/BW Parkway	Station 125+500 to Station125+850	Forested areas & developed commercial - Deforestation/Reforestation; ROW impact
Maryland-National Capital Park and Planning Commission (MNCPPC)	Station 125+750 to Station125+925	Forested areas – Deforestation/Reforestation; ROW impact
Patuxent River/ Wetlands/Floodways	Station 125+500 to Station126+200	Minimize wetland impact for Pier Construction; ROW impact
Maryland City Park	Station 126+000 to Station126+500	Forested Area - Deforestation/Reforestation; ROW impact

Property Name/Owner	Approximate Limits of Impact	Impact/Restrictions
Suburban Airport	Station 126+600 to Station127+700	ROW Acquisition
Anne Arundel County Open Space	Station 127+750 to Station 128+350	Forested Area - Deforestation/Reforestation; ROW impact

8. STATION CONSTRUCTION

Alignment alternatives J and J1 include an underground station in Washington, D.C., an underground station at BWI Airport, and underground and above-ground station alternatives in Baltimore, MD. For underground stations, the preferred method of construction uses top-down techniques, where surface access can be maintained, similar to methods used for stations in the Washington Metro system. Support of excavation, typically using slurry walls, is installed around the perimeter of the station footprint; the station area is excavated from street level to the required depth in order to pour the station concrete arch roof and continue excavation under the roof until desired depth is reach and a bottom plug and base slab are constructed; and the station box is constructed. This is typically referred to as top-down, bottom-up construction. Additional support of excavation is provided by temporary cross-lot braces and/or tie backs. The top of the hole will be permanently covered as the construction work continues downward to maintain some degree of surface use. Top-down construction will be phased to minimize lane closures during construction.

Excavated material will need to be removed from the site by trucks. Coordination between the planned excavation, the location of excavation machinery, and the establishment of a route for trucks to enter and exit the site will be undertaken. While the struts bracing the slurry wall will be pre-loaded to design load, if necessary underpinning can be used for buildings in proximity to the station, depending on existing foundations, which will be investigated in greater detail during detailed design. Due to the large station width (up to approximately 31.7m, or 105 feet) in soft ground conditions tunneling techniques such as the New Austrian Tunneling Methods (NATM), also termed Sequential Excavation Methods (SEM), are not viable.

Cast-in-place concrete will be used for all below-grade construction. Below-grade portions of stations and switch boxes will be designed to resist hydrostatic lateral and uplift pressures. They will receive a waterproof membrane system around and under the concrete construction.

In Washington, D.C., the Mount Vernon Square East station will temporarily impact New York Avenue from 7th Street NW to North Capitol Street, with construction to a depth of approximately 46 to 52 meters (150 to 170 feet). This length includes construction of the cross-over cavern for trains entering and exiting the station. The construction will be primarily within soft ground conditions and bedrock at the deepest portion of the station. Station construction will also include a connection tunnel to the Washington, D.C. Convention Center that will cross 7th Street and require top-down construction. Connection of the tunnel at the Convention Center will require further coordination with the Convention Center owners.

The station box for Mount Vernon Square East Station will likely be constructed using slurry walls to provide stiff support of the excavation and prevent groundwater inflow and lowering of groundwater

level, which could result in settlement of the adjacent soft ground. Construction will likely also include a ground improvement/compensation grouting program to further mitigate the potential for surface settlements during construction. Means and methods of station box construction will be at the discretion of the contractor.

The BWI Airport station will be an underground station approximately 64 meters (210 feet) deep. The existing Hourly Garage in the center of the terminal will be demolished to accommodate slurry wall braced, open-cut construction of the station. A new Ground Transportation Center (GTC) will be built above the station. The switch boxes are located towards the northern and southern edges of the BWI property, outside of airport security zones. The switchboxes will be built using open-cut construction, likely using slurry wall support of excavation.

Three TBM tunnels run between BWI Station and the north and south switchboxes. The central TBM tunnel [15 m diameter (49 ft)] will be utilized for express train traffic, while the outer two TBM tunnels [16.5 m diameter (54 ft)] will each carry a local guideway and platform through the station box. It is envisioned TBMs for the three station tunnels will be staged and launched from the north and south switchboxes, with two TBM runs required for the two local guideway and platform tunnels. Each TBM pass will require walking the TBMs through the station box, which entails construction of a special cradle for the TBMs (Figure 20a, b). For the two local TBM runs, the TBM will need to be turned around upon completing its first run and relaunched for the second run. A specialty turntable (Figure 21a) can be used to turn and reposition the TBM for the second run (Figure 21b, c), after which the trailing gear can be removed from the completed tunnel and reattached to the relocated cutter head (Figure 21d). The TBM is able to then relaunch for the second run.

The BWI station box itself will likely be constructed using slurry walls to ensure dewatering and associated settlement does not occur and impact adjacent terminal structures. The BWI station construction will have temporary impacts on the airport terminal circulation road during construction; however, the construction traffic should be controlled such that it will not need to circulate past the terminal entrances. The station will ultimately have at least two underground entrances to airport terminals.

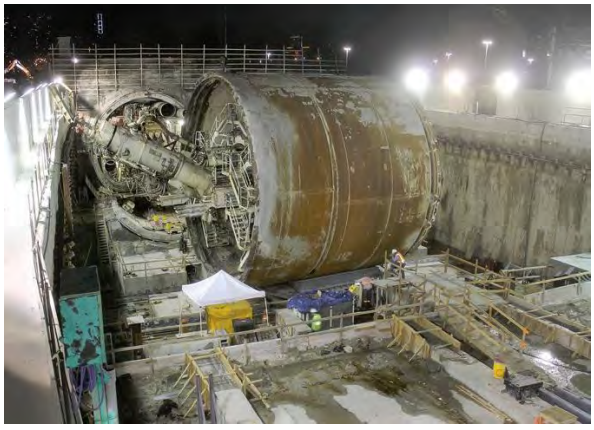
Figure 20. Examples of TBM cradles at a) Beacon Hill Station, Seattle, WA, and b) Automated People Mover Tunnels, Dulles International Airport, Dulles, VA.

a) b)

Figure 21. Use of a turntable (a) to turn the TBM shield (b, c) for the Port of Miami Tunnels and reattached trailing gear (d) for TBM relaunch.

a)

b)



c)

d)

The Baltimore Cherry Hill above-ground station alternative and approaches will be built on elevated structure. It will be constructed using conventional building materials and methods, primarily with a combination of cast-in-place concrete and structural steel. The station crosses over an existing CSX railroad track and MTA light rail station with two tracks. Precast pre-stressed concrete structural elements may be used to minimize disruptions in spanning over the active transportation infrastructure.

The station will require modifications to local roadways and pose temporary traffic disruptions during construction. The bored tunnel will emerge from the ground south of the station via a cast-in-place concrete portal structure and become elevated on a rising concrete viaduct structure. The station will be connected to a new parking garage via an elevated pedestrian bridge and vertical transportation tower. All foundations are expected to utilize deep driven pile or drilled shaft elements.

The Camden Yards SCMAGLEV station alternative in Baltimore is an underground station with a depth of up to 46 meters (150 feet) and a width between approximately 53 meters (174 ft) and over 80 meters

(263 ft) in soft ground conditions, possibly extending into bedrock, with the widest points at the main surface station entrances. The proposed station alignment does not follow the street grid and is too wide to use conventional tunneling techniques such as Sequential Excavation Method (SEM) soft ground under existing buildings. Consequently, the construction requires demolition of all buildings above the station box and switchboxes, for a length of 881 meters (2,890 ft). Buildings to be demolished include:

- Federal Reserve Bank (partial)
- Old Otterbein Church (historic)
- Convention Center (partial)
- Bank of America (full)
- US Courthouse (full)

The station construction will also impact the Martin Luther King (MLK) Boulevard viaduct, possibly requiring piers to be relocated, and will have to carefully thread below the Howard Street tunnel and the MARC train tracks along Howard Street.

Alternative station locations were considered north, south and east of the proposed location; however, no location was found that did not have similar impacts to significant residences, business and/or government facilities due to the alignment orientation that is out of line with the street grid.

The station construction will impose temporary traffic disruptions on Howard Street, MLK Boulevard, Conway Street and Pratt Street, all major thoroughfares in Baltimore.

The equipment anticipated to perform the station construction for the civil and architectural elements will include cranes, excavators, slurry wall excavators, dump trucks, pay loaders, rock drills, sheet pile vibrators/hammers, concrete trucks, generators, and concrete pump trucks. Table 19 provides estimated construction durations, hours of operation, and trip generation for trucks and workers for all station alternatives. Table 20 contains estimated volumes of excavated materials.

Table 19. Station Construction

Proposed Station	Station Construction Alternatives J and J1	Est. Duration (Months)	Est. Operating Hours	Est. Truck Trips (per day)	Est. Worker Vehicle Trips
Washington DC – MT Vernon Square East	Civil	48	7:00 am–4:00 pm	250 - 350	150
Washington DC – MT Vernon Square East	Architectural	24	7:00 am–4:00 pm	100	100
BWI Airport	Civil (Station Box)	42	24-hours per day	220	150
BWI Airport	N. Switch Box	24	24-hours per day	220	50
BWI Airport	S. Switch box	24	24-hours per day	220	50
BWI Airport	Architectural	24	24-hours per day	50	100

Proposed Station	Station Construction Alternatives J and J1	Est. Duration (Months)	Est. Operating Hours	Est. Truck Trips (per day)	Est. Worker Vehicle Trips
Baltimore – Cherry Hill	Civil	30	7:00 am–4:00 pm	150	50
Baltimore – Cherry Hill	Architectural	24	7:00 am–4:00 pm	50	100
Baltimore - Camden Yards	Civil (Station Box)	48	7:00 am–4:00 pm	200 - 250	150
Baltimore - Camden Yards	Cherry Hill MOW Switch Box	18	7:00 am–4:00 pm	100	50
Baltimore - Camden Yards	Architectural	24	7:00 am–4:00 pm	100	100

Table 20. Station Spoils Quantities

Station Location	Station Alternatives J and J1	Dimensions (L x W x D) (ft)	Est. Volume Spoils (yd^3)
Washington DC – MT Vernon Square East	Station Box	1745 x 104 x 150	1,272,000
Washington DC – MT Vernon Square East	Switch Box	1920 x 95 x 170	1,246,000
Washington DC – MT Vernon Square East	Main Station Access/Egress	Varies x Varies x 150	645,000
Washington DC – MT Vernon Square East	Station Egress	Varies x Varies x 160	84,000
Washington DC – MT Vernon Square East	Operational Space	Varies x Varies x 170	75,000
BWI Airport Station – Alt J	Station Box	540 x 220 x 246	2,115,000
BWI Airport Station – Alt J	N. Switch Box	765 x Varies x 245	1,318,000
BWI Airport Station – Alt J	S. Switch Box	765 x Varies x 232	1,251,000
BWI Airport Station Alt J1	Station Box	540 x 220 x 200	1,898,000
BWI Airport Station Alt J1	N. Switch Box	765 x Varies x 187	1,008,000
BWI Airport Station Alt J1	S. Switch Box	765 x Varies x 198	1,068,000

Station Location	Station Alternatives J and J1	Dimensions (L x W x D) (ft)	Est. Volume Spoils (yd^3)
Camden Yards Station	Cherry Hill MOW Switch Box	758 x Varies x 100	433,000
Camden Yards Station	Station Box	2880 x Varies x 125	2,192,000

8.1 GENERAL CONSTRUCTION SEQUENCE

Station construction for Washington, D.C. as discussed above will entail multiple stages for 5 segments (Figure 22) along the station alignment. This staging allows maintenance of traffic flow throughout the construction process. A general breakdown of the anticipated duration of surface impacts for construction of the Washington, D.C. and Camden Yards station are shown in Table 21. The times presented for the Mount Vernon Square East station are estimated duration of surface impact of construction, until the permanent arch is emplaced and road surfaces and pavement restored. Excavation and construction will continue below the restored surface followed by installation of final lining and then architectural works, systems, etc. The construction sequencing in Table 21 is also preliminary and was developed with the intention to minimize traffic impact. A similar construction methodology is assumed for the Camden Yards Station to minimize the duration of surface impacts, particularly with respect to the rail service and I-395. As such, a preliminary staged construction sequence for Camden Yards (Figure 23), similar to Mount Vernon Square East station is also assumed and outlined in Table 21.

Table 21. Construction staging for Mt. Vernon Square East and Camden Yards Station alternative and estimated duration of surface impacts

Preliminary Construction Sequencing					Station Segment(s)	Est. Duration of Surface Impacts (months)
Mo. 1-10	Mo. 11-20	Mo. 21-30	Mo. 31-40	Mo. 41-50	Mount Vernon Square East Station	
α	α				Segment 1	20
β	β				Segment 5	18
	γ	γ	γ	γ	Segment 4	23
		δ	δ		Segment 2	18
				ε	Segment 3	8
					Camden Yards Station	
α	α				Segment 1	18
γ	γ	γ			Segment 4	24
	ε	ε	ε	ε	Segment 3	24
			δ	δ	Segment 2	20

Figure 22. Construction Staging Segments for Mount Vernon Square East Station

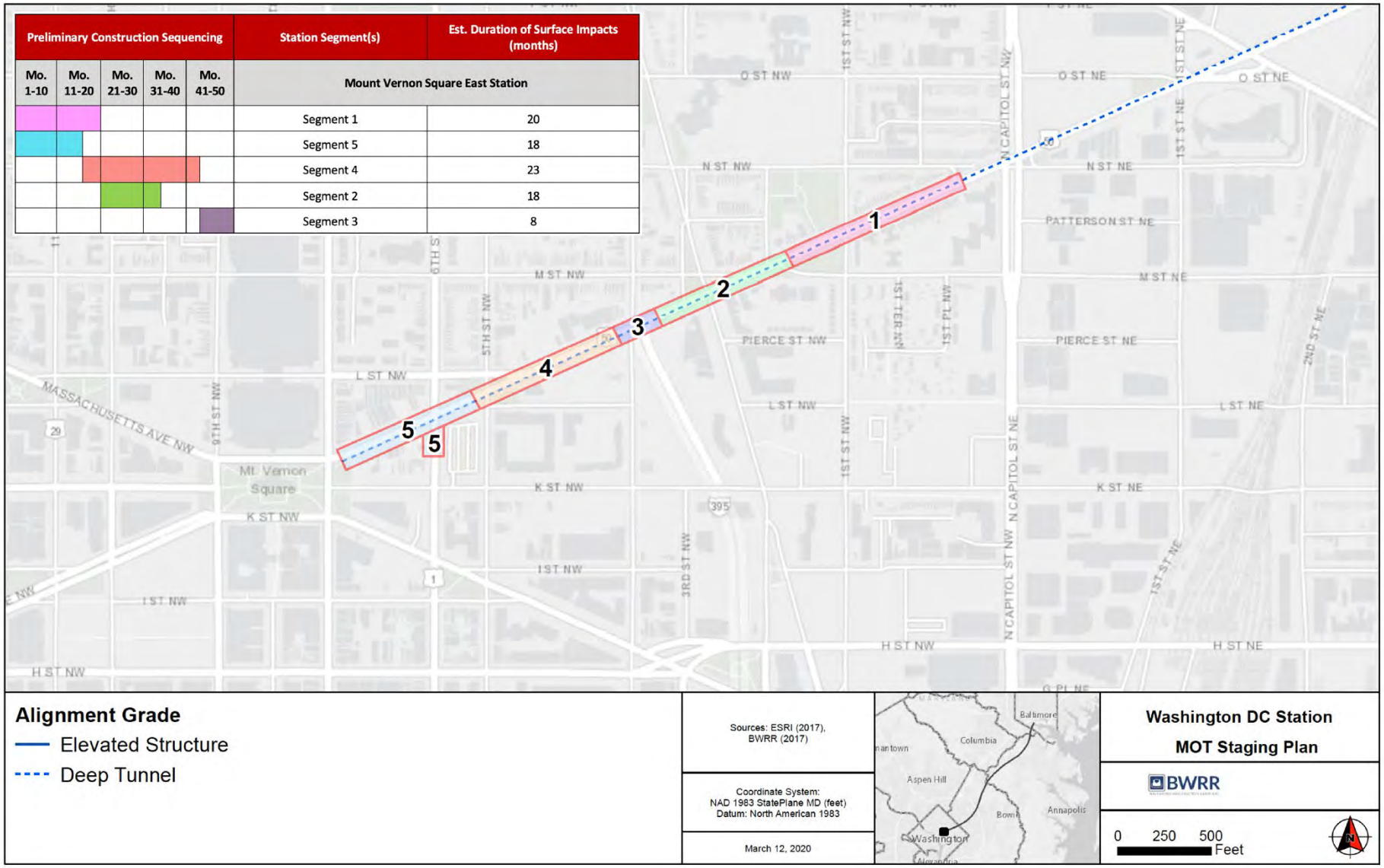
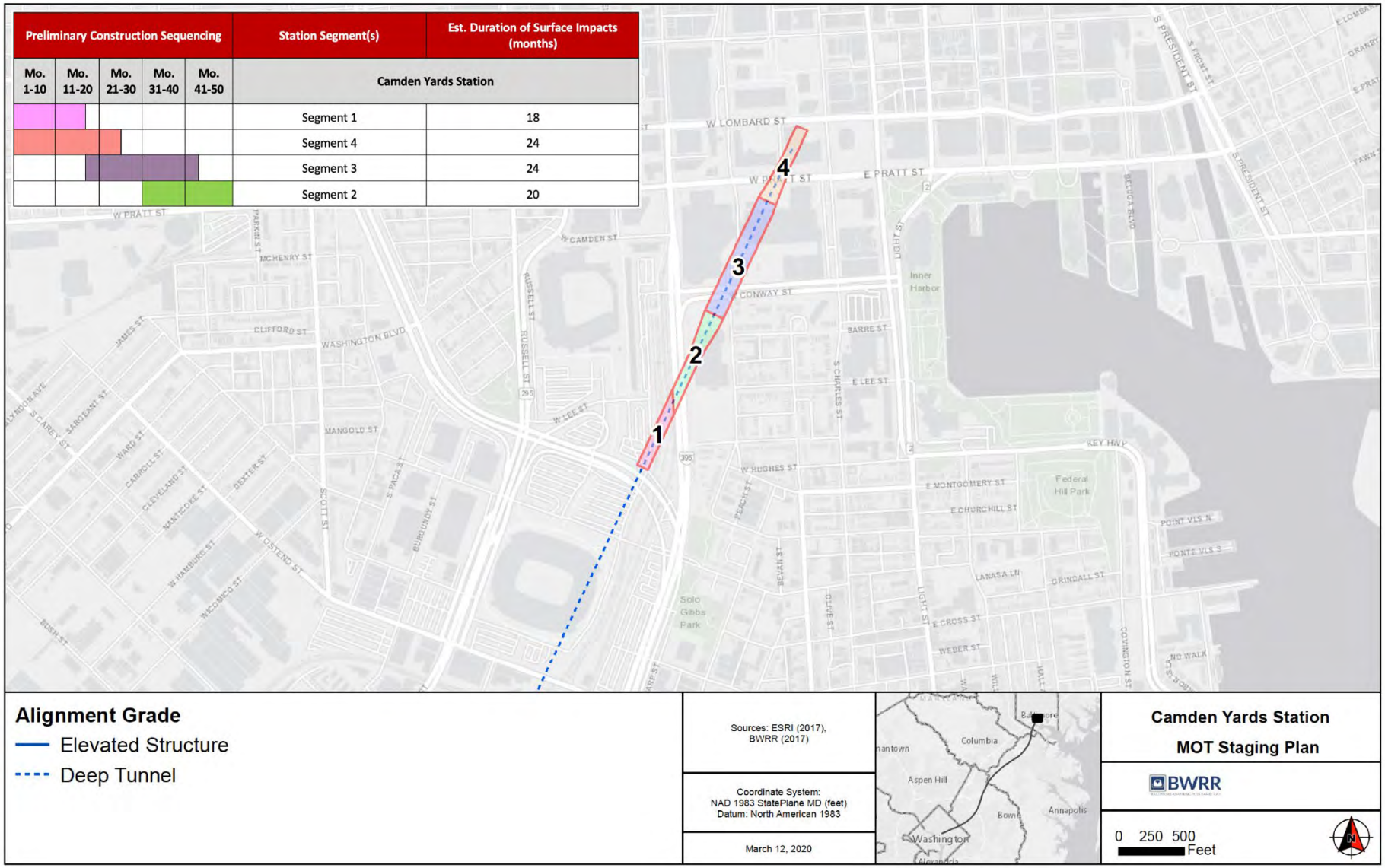


Figure 23. Construction Staging Segments for Camden Yards Station Alternative



9. TRANSITION PORTALS

Short sections of cut-and-cover tunneling and open cut construction will be used for the transitions between the viaduct and TBM tunnel sections and for TBM launch locations located along the deep tunnel. Implementation of cut-and-cover tunneling will require installation of support of excavation (slurry walls, bored pile walls, soldier pile and lagging, or shotcrete) depending on ground conditions and proximity to sensitive structures. Slurry walls or bored pile walls may be used at the Cherry Hill portal. Depending on the limits of disturbance, in general, tieback support or internal strutting will be used for deeper excavations. Open cut construction will be similar to cut-and-cover tunneling, without installation of a roof slab and ground restoration

The equipment anticipated to construct the transition portal will include gantry or boom cranes, excavators, dump trucks, loaders, generators, grouting plant, rock drills, sheet pile vibrators/hammers, concrete trucks, and concrete pump trucks. Tables 22 and 23 identify the locations with estimated durations, hours of operation, and trip generation for trucks and workers for alternatives J and J1, respectively. Estimated total volumes of excavated materials are presented in Tables 24 and 25.

Table 22. Alignment Alternative J Transition Portals Construction

Transition Portals Alternative J	Est. Duration (Months)	Est. Operating Hours	Est. Truck Trips (per day)	Est. Worker Vehicle Trips
Station 118+348	27	24-hours per day	145	150
Station 135+175	16	24-hours per day	100	150
Station 152+820[1]	20	7:00 am – 4:00 pm	100	150

[1]Cherry Hill Station Alternative only

Table 23. Alignment Alternative J1 Transition Portals Construction

Transition Portals Alternative J1	Est. Duration (Months)	Est. Operating Hours	Est. Truck Trips (per day)	Est. Worker Vehicle Trips
Station 118+061	27	24-hours per day	240	150
Station 128+696	16	24-hours per day	75	150
Station 152+856[1]	20	7:00 am – 4:00 pm	100	150

[1]Cherry Hill Station Alternative only

Table 24. Alignment Alternative J Transition Portals Spoils Quantities[1]

Transition Portal	Approximate Dimensions of SOE (L x W x D) (ft)[1]	Est. Volume Spoils (yd^3)
Station 118+348	5046 x 100 x 90	981,000
Station 135+175	1939 x 100 x 102	402,000
Station 152+820[2]	2667 x 100 x 100	480,000

[1]Dimensions are approximate and based on deepest point of the open cut.
[2]Cherry Hill Station Alternative only

Table 25. Alignment Alternative J1 Transition Portals Spoils Quantities[1]

Transition Portal	Approximate Dimensions of SOE (L x W x D) (ft)[1]	Est. Volume Spoils (yd^3)
Station 118+061	6483 x 100 x 128	1,608,000
Station 128+696	1578 x 100 x 106	294,000
Station 152+856[2]	2697 x 100 x 110	485,000

[1]Dimensions are approximate and based on deepest point of the open cut.
[2]Cherry Hill Station Alternative only

10. TRAINSET MAINTENANCE FACILITY (TMF)

The TMF will comprise buildings, guideways, and paved parking lots that will create impervious surfaces requiring retention. The TMF location connects to the main line via guideway ramps that are elevated viaduct. Stormwater retention areas will be contained within the TMF footprint.

The equipment anticipated to construct the footings and piers for the TMF's facilities, storage yards and ramps will include cranes, excavators, dump trucks, pay loaders, rock drills, caisson drill rig, sheet pile vibrators/hammers, flatbed delivery trucks, bulldozers, concrete trucks, and general construction vehicles. Precast bridge deck segments will be installed using trucks or launching gantries. Buildings and parking lots will require additional types of equipment, such as paving machines, rollers, and aerial lifts.

The MD-198 TMF site has a significant variation in existing ground elevation, dropping approximately 30 meters (100 feet) from west to east across the facility. The eastern half of the facility will be constructed on retaining walls up to 30 meters high, surmounted by 20 meter (65 foot) high maintenance shop buildings. The northeast corner of the TMF impacts the Little Patuxent River, which will have to be rerouted in a new channel to the east. The complex site conditions for the MD-198 facility will add a year to the construction duration.

Table 26 shows the estimated durations, hours of operation, trip generation for trucks and workers. Table 27 provides cut and fill quantities. A bulk factor of 1.25 has been applied to all quantities.

Table 26. TMF Alternatives Construction

Trainset Maintenance Facility Alternative	Est. Duration (Months)	Est. Operating Hours	Est. Truck Trips (per day)	Est. Worker Vehicle Trips
BARC West	78	7:00 am–4:00 pm	100	150
BARC Airstrip	78	7:00 am–4:00 pm	100	150
MD-198	90	7:00 am–4:00 pm	100	150

Table 27. TMF Alternatives Cut and Fill Quantities in (in cubic yards)

Trainset Maintenance Facility Alternative	Alternative J Cut	Alternative J Fill	Alternative J1 Cut	Alternative J1 Fill
BARC West	1,469,000	3,197,000	3,065,000	2,341,000
BARC Airstrip	4,241,000	724,000	6,571,000	190,000
MD-198 TMF	0	16,135,000	0	16,135,000

11. SUBSTATIONS

Alignment alternatives J and J1 include 6 above ground open air substations, occupying areas ranging between approximately 2 hectares (5 acres) to 8 hectares (20 acres) each. The substation site locations are listed below:

- One substation in Washington, DC (Station 104+400)
- One substation in viaduct section (Station 124+300 for Alt J and 127+000 for Alt J1)
- One substation in Lansdowne, MD (Station 151+000)
- One substation in Baltimore (Station 155+460)
- Two smaller substations will be required at the site of the TMF Alternatives (BARC West, BARC Airstrip, MD-198)

The equipment anticipated to construct the substations will include cranes, excavators, dump trucks, pay loaders, backhoe, bulldozers, trailer, concrete trucks mixers, concrete pump, and vibrating roller. Tables 28 and 29 indicate the locations with estimated durations, hours of operation, and trip generation for trucks and workers for alternatives J and J1, respectively.

Table 28. Alignment Alternative J Substation Construction

Substation Alternative J	Est. Duration (Months)	Est. Operating Hours	Est. Truck Trips (per day)	Est. Worker Vehicle Trips
Station 104+500	24	7:00 am–4:00 pm	6	100
Station 124+300	24	7:00 am–4:00 pm	6	100
BARC West TMF Alt. (x2)	24	7:00 am–4:00 pm	6	100
BARC Airstrip TMF Alt. (x2)	24	7:00 am–4:00 pm	6	100
MD-198 TMF (x2)	24	7:00 am–4:00 pm	6	100
Station 151+000	24	7:00 am–4:00 pm	6	100
Station 155+460	24	7:00 am–4:00 pm	6	100

Table 29. Alignment Alternative J1 Substation Construction

Substation Alternative J1	Est. Duration (Months)	Est. Operating Hours	Est. Truck Trips (per day)	Est. Worker Vehicle Trips
Station 104+500	24	7:00 am–4:00 pm	6	100
Station 127+700	24	7:00 am–4:00 pm	6	100
BARC West TMF Alt. (x2)	24	7:00 am–4:00 pm	6	100
BARC Airstrip TMF Alt. (x2)	24	7:00 am–4:00 pm	6	100
MD-198 TMF Alt. (x2)	24	7:00 am–4:00 pm	6	100
Station 151+000	24	7:00 am–4:00 pm	6	100
Station 155+460	24	7:00 am–4:00 pm	6	100

12. MAINTENANCE OF WAY (MOW) FACILITIES

Two MOW facilities are required for the project, one in the northern portion of the route and one in the southern portion of the route.

For alignment alternatives J and J1, the northern MOW facility will be located in Cherry Hill for the Cherry Hill station alternative or in Westport for the Camden Yards station alternative. The Cherry Hill MOW ramps connect to the mainline south of the Cherry Hill station. The Westport MOW requires an underground switchbox and tunnel portal to connect to the mainline.

For BARC TMF alternatives, the southern MOW facility will be co-located with the TMF facility. The MOW facility will connect to the mainline using the TMF ramps. For MD-198 TMF alternative, the

southern MOW facility will be located at Station 123+300 for alternative J and at Station 122+600 for alternative J1. Both MOW facilities connect to the mainline ramps that are aerial or at grade.

Equipment, durations, hours of operation, and trip generation for trucks and workers are similar to substations in the previous section.

Cut and fill quantities for the MOW facility sites are provided in Table 30. Earthwork quantities for the MOW facilities co-located with the two BARC TMF alternatives are included in the TMF quantities in Section 10.0. A bulk factor of 1.25 has been applied to all quantities.

Table 30. MOW Facility Cut and Fill Quantities

All quantities are in cubic yards	Location	Cut	Fill
Alternative J1 MOW Facility Associated with MD-198 TMF	Station 122+600	-	165,000
Alternative J MOW Facility Associated with MD-198 TMF	Station 123+300	173,000	-
Cherry Hill MOW Facility for Cherry Hill Station Alternative	Station 153+400	120,000	280,000
Westport MOW Facility for Camden Yards Station Alternative (includes quantities for MOW ramp and associated tunnel portal and switchbox)	Station 204+500	960,000	-

13. ROADWAY RELOCATIONS

Several roads will be relocated or reprofiled as part of the project. The equipment anticipated for this work will include cranes, excavators, dump trucks, pay loaders, backhoe, bulldozers, trailer, concrete trucks mixers, concrete pump, and vibrating roller. Impacted roadways include the following:

- Explorer Road (Alternative J)
- Springfield Road (BARC Airfield TMF)
- Springfield Road (Alternative J1 southern MOW for MD-198 TMF)
- River Road (MD-198 TMF)
- West Patapsco Avenue (Cherry Hill station)
- Annapolis Road (Cherry Hill station)

Cut and fill quantities associated with roadway relocations total approximately 10,000 cubic yards of cut and 85,000 cubic yards of fill, including a 1.25 bulk factor.

14. SPOILS SUMMARY

The estimated volumes of spoils for each Alignment and Station Alternative are summarized in Table 31. A bulk factor of 1.25 has been applied. Cut and fill quantities associated with TMFs, MOW facilities and roadway relocations are not included. Those quantities are provided separately in Sections 10.0, 12.0 and 13.0.

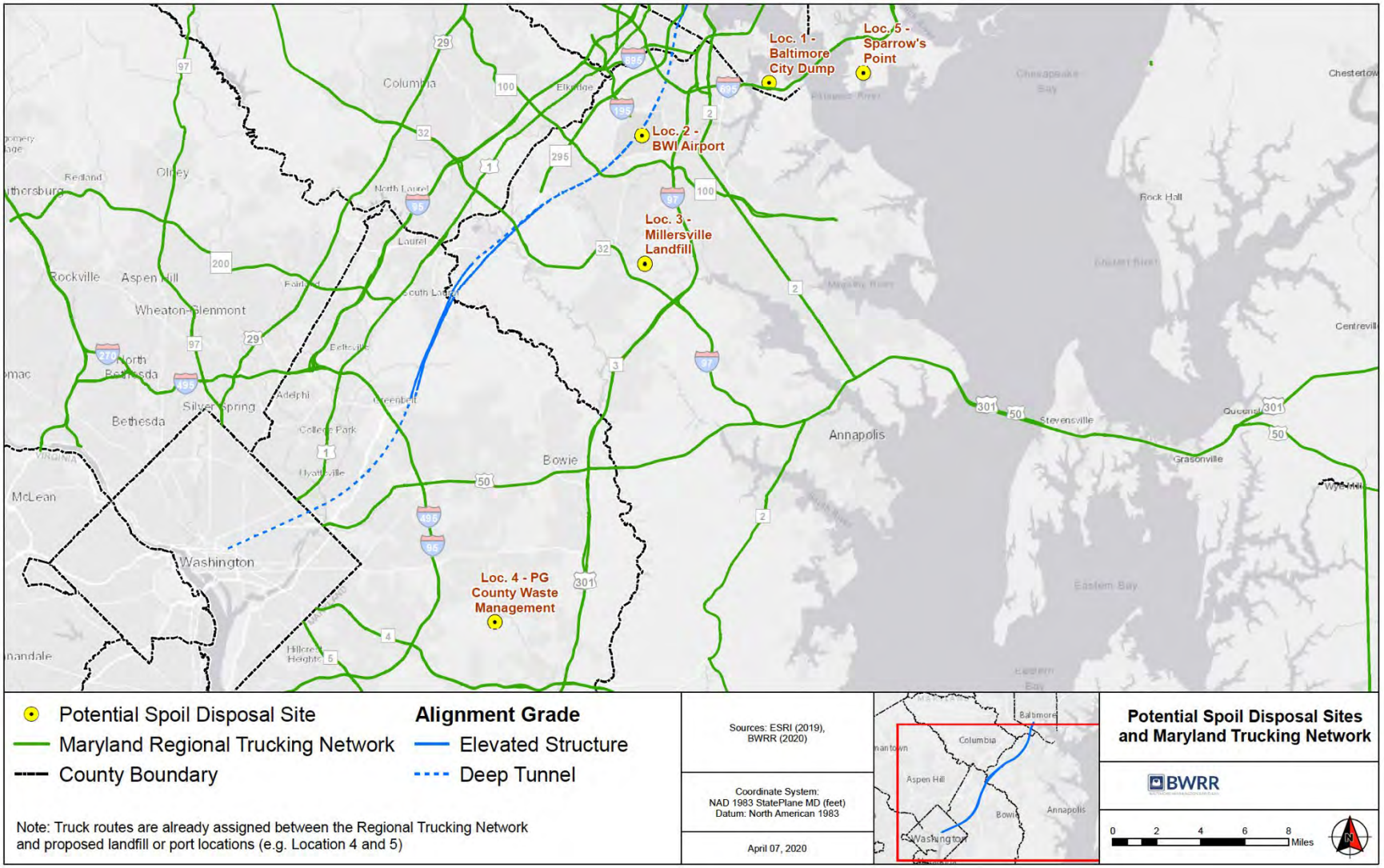
Table 31. Summary of Total Spoils for Alignment Alternatives J & J1

Alignment	Alternative	Est. Volume Spoils (cubic yards)
Alternative J	Cherry Hill Station Alternative	23,445,000
Alternative J	Camden Yards Station Alternative	26,735,000
Alternative J1	Cherry Hill Station Alternative	25,060,000
Alternative J1	Camden Yards Station Alternative	28,345,000

The volume of soils anticipated to be produced by the project will be disposed of pursuant to a coordinated plan developed during final design. Given the depth and nature of the soils, which are anticipated to be clean and undisturbed, the material can potentially be useful as daily cover for local landfills (e.g. Millersville Landfill, Baltimore City Dump, PG County Waste Management) and/or fill for local or future projects (e.g. Sparrow's Point redevelopment, BWI Airport).

Figure 24 shows the regional trucking network and how it can be used to connect the spoil site haul network to the disposal sites, minus the last 1-3 miles to the disposal sites, which should already have designated routes for trucks to follow. Additionally, Maryland Environmental Services has expressed interest in use of the excavated soils for local stabilization projects.

Figure 24. Potential Spoil Disposal Sites and Trucking Network to Deposit as Needed Throughout the Region

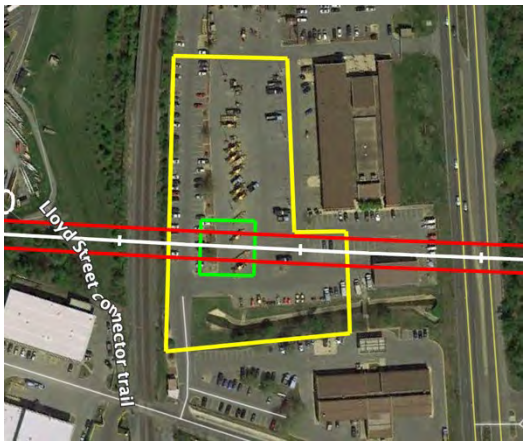


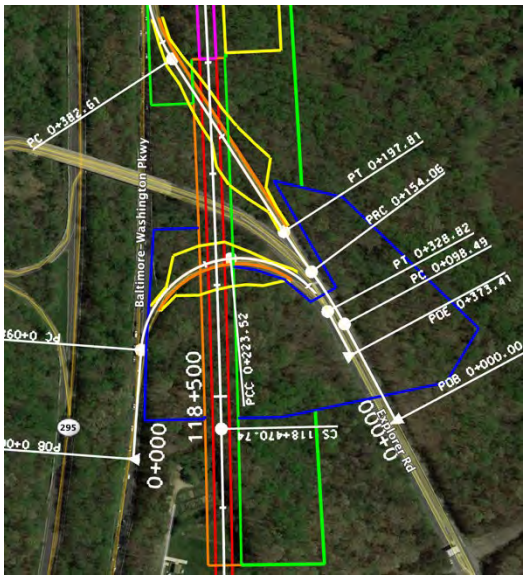
15. ACCESS ROADS

During construction, temporary access roads will be required along viaduct structures for the delivery of materials (Tables 32 and 33). Measures in particularly sensitive areas, such as wetlands, will be available to minimize surface disruption during viaduct construction.

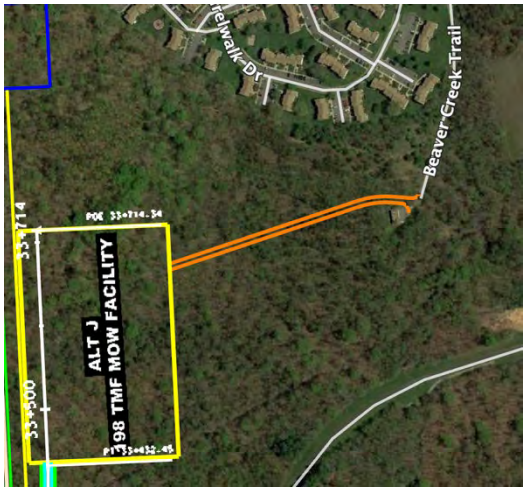
The spacing and locations of emergency access stairs from the viaduct section will be coordinated with the FRA Office of Safety and local emergency response providers. Stairs will be located adjacent to existing roadways or in otherwise accessible areas to avoid construction of new roadways.

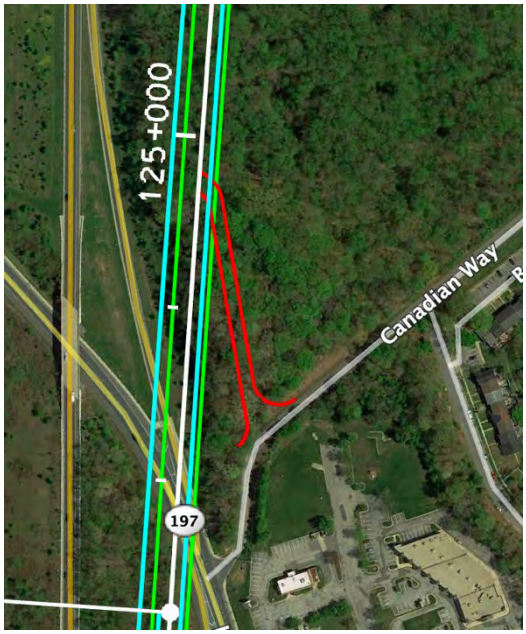
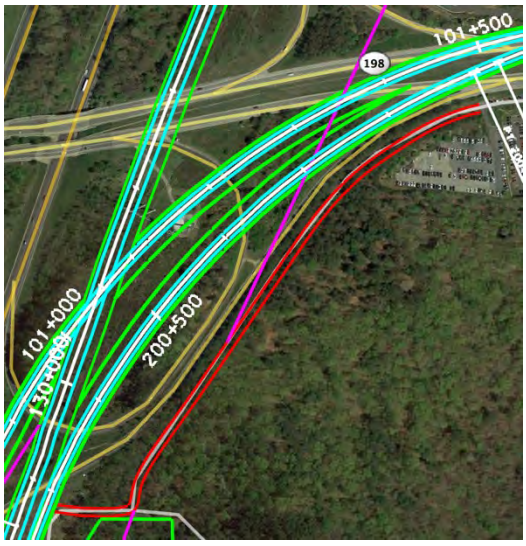
Table 32. Alignment Alternative J Access Roads Construction

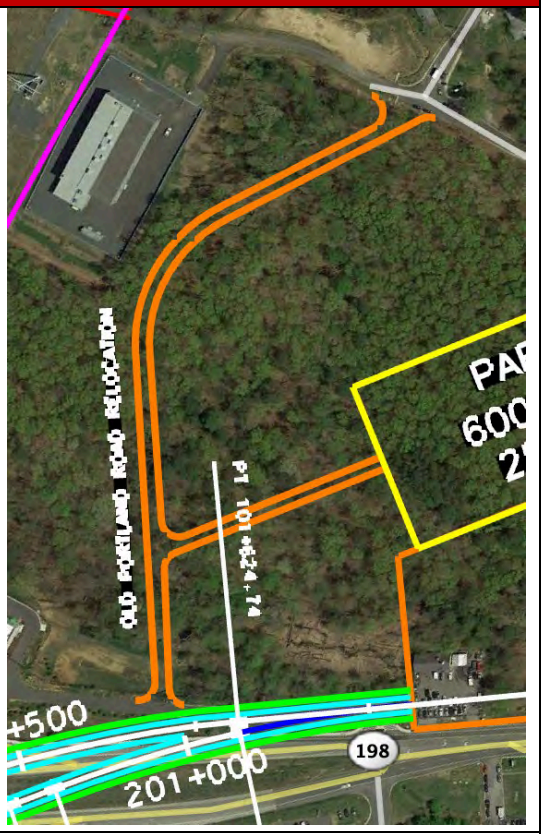
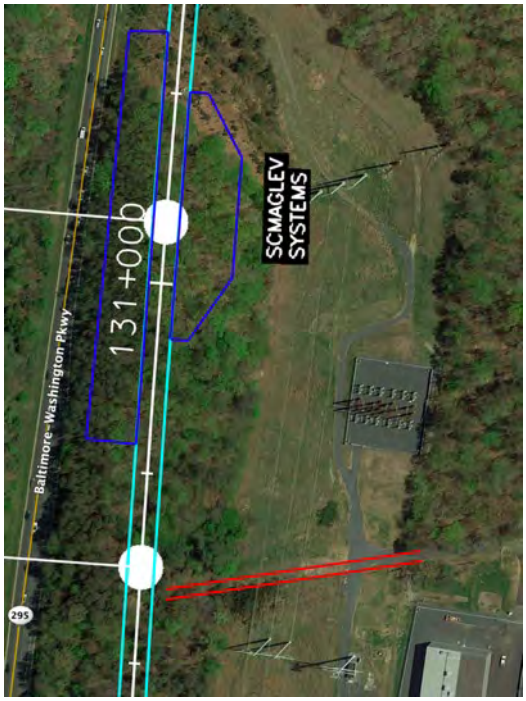
Facility	Approximate Station	Road Access	
MVE Station		Existing roads	
FA/EE	104+300	Existing roads (Adams Place NE)	
FA/EE	108+100	Existing roads (Kenilworth Avenue)	

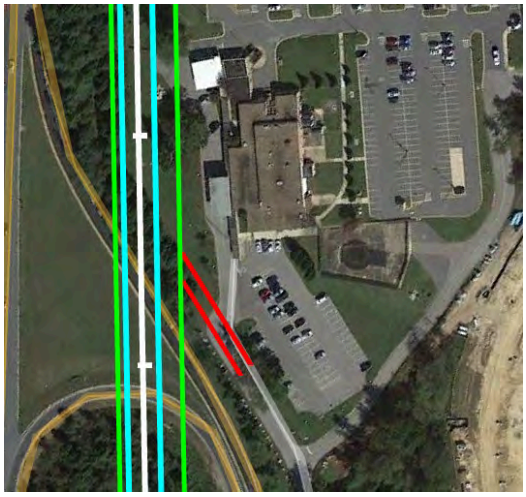
Facility	Approximate Station	Road Access	
FA/EE	113+100	New access road from Riverdale Rd.	
South Portal	118+500	New roadway along alignment corridor from Beaver Dam Road from Soil Conservation Road	
BARC West		New access roads from Odell Road and relocation of Odell Rd.	

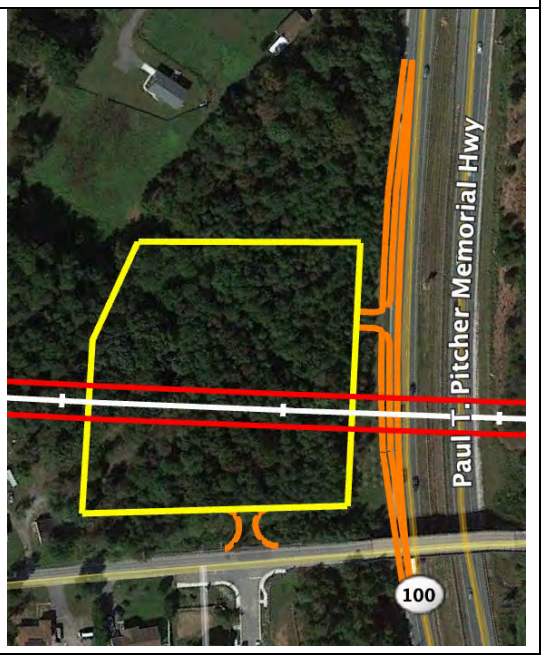
Facility	Approximate Station	Road Access	
BARC West		New access roads from Powder Mill Road	
BARC Airstrip		New access roads from Springfield Road	
Viaduct	121+900	New access roads from Powder Mill Road and Soil Conservation Rd.	

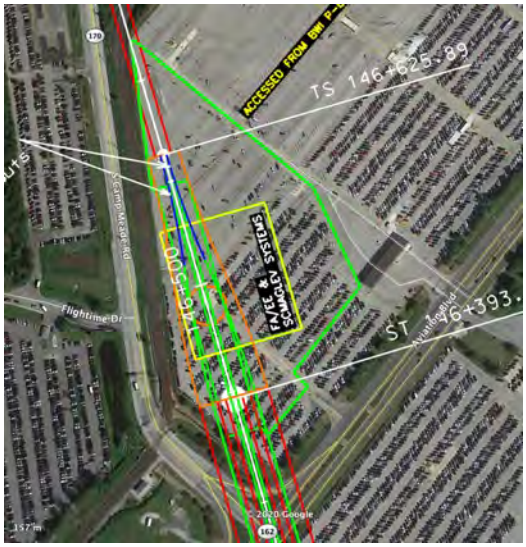
Facility	Approximate Station	Road Access	
MD-198 TMF MOW Facility	33+714	New access road from Beaver Creek Trail	
Substation	124+200	New access road from 295 off-ramp	

Facility	Approximate Station	Road Access	
Viaduct Access Road	125+000	New access road from Canadian Way	
Viaduct Access Road	130+000	New access road from commercial property adjacent to Laurel Fort Meade Rd.	

Facility	Approximate Station	Road Access	
MD-198 TMF	201+000	Old Portland Road Relocation	
Viaduct Access Road	130+800	Extension of Old Portland Rd from MD-198 TMF	

Facility	Approximate Station	Road Access	
Viaduct Access Road	131+900	Bridge on River Road	
Viaduct Access Road	132+500	New access road off River Road	
Viaduct Access Road	133+250	New access road off Colony Seven Rd.	

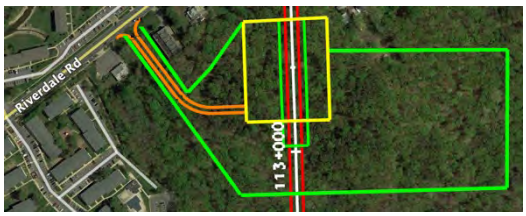
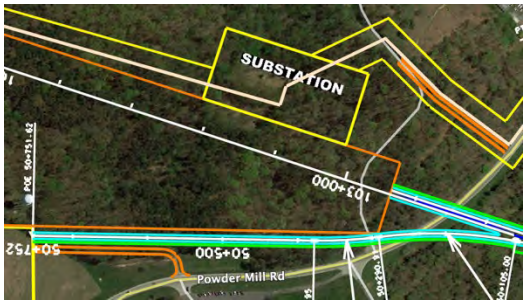
Facility	Approximate Station	Road Access	
North Portal	134+700	North access from Max Blobs Park Road	
FA/EE	140+300	New access road from MD 100 and Harman's Road.	
FA/EE	141+500	Existing access from Railroad Avenue & Old Dorsey Road.	

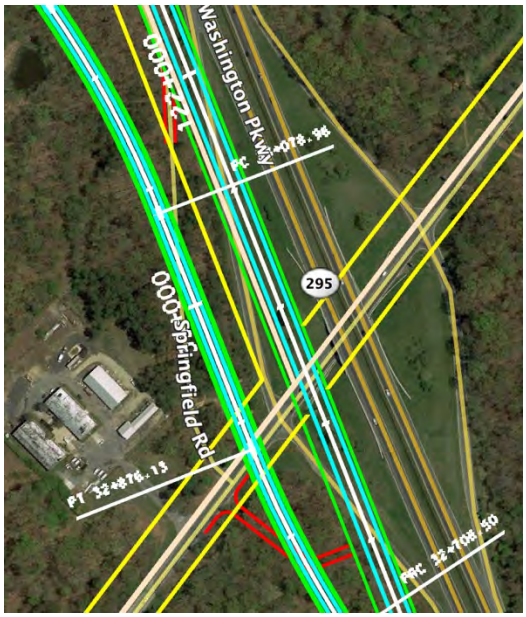
Facility	Approximate Station	Road Access	
S. BWI Switch Box	143+500	Use of existing airport roads – Mathison Way	
BWI Station		Use of existing airport roads	
N. BWI Switch Box	146+500	Use of existing airport roads – Aviation Blvd. and access from BWI P-Lot	

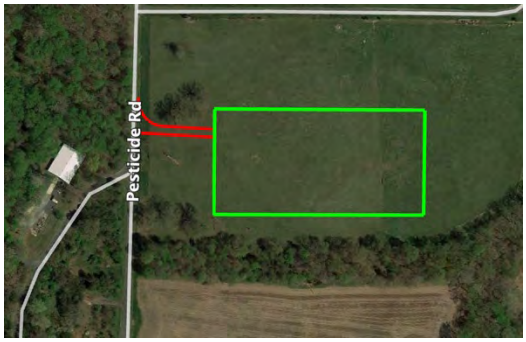
Facility	Approximate Station	Road Access	
FA/EE and Substation	151+100	Access from existing roads	
Cherry Hill Station		Use of existing roads (Annapolis Road, W. Patapsco Avenue, and Cherry Hill Road). Some roads reprofiled	
Camden Yards Station Alternative		Use of existing roads (Conway Street, Pratt Street)	

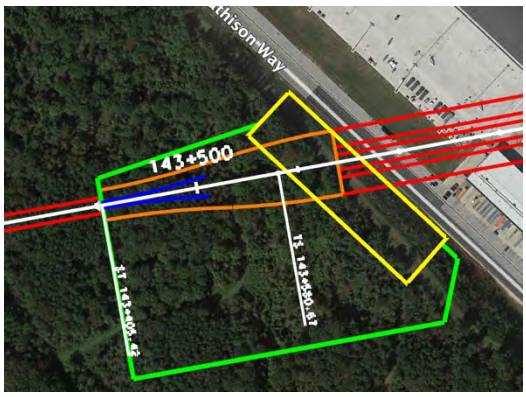
Table 33. Alignment Alternative J1 Access Roads Construction

Facility	Approximate Station	Road Access	
MVE Station	-	Existing roads	
FA/EE	104+300	Existing roads (Adams Place NE)	

Facility	Approximate Station	Road Access	
FA/EE	108+100	Existing roads (Kenilworth Avenue)	
FA/EE	113+100	New access road from Riverdale Road	
BARC West	-	New access roads from Odell Road and relocation of Odell Road	
BARC West		New access roads from Powder Mill Road	

Facility	Approximate Station	Road Access	
BARC Airstrip	-	New access roads from Springfield Road	
Viaduct	121+600 122+000	New access roads from Powder Mill Road and Springfield Road	
MD-198 TMF MOW Facility	122+200	Relocation of Springfield Road and access road from relocated road	

Facility	Approximate Station	Road Access	
Viaduct	121+500	Access road from Pesticide Road	
Substation	126+500	New access from Brock Bridge Road	
MD-198 TMF	105+400	Old Portland Road relocation	
FA/EE	134+500	North access from Max Blobs Park Road	

Facility	Approximate Station	Road Access	
FA/EE	140+300	Access roads from MD 100 and Harman's Road	
FA/EE	141+600	Access from Railroad Avenue and Old Dorsey Road	
S. BWI Switch Box	143+500	Use of existing airport roads – Mathison Way	

Facility	Approximate Station	Road Access	
BWI Station	-	Use of existing airport roads	
N. BWI Switch Box	146+500	Use of existing airport roads – Aviation Blvd – accessed from BWI P-Lot	
FA/EE and Substation	151+100	Access from existing roads	
Cherry Hill Station	-	Use of existing roads (Annapolis Road, W. Patapsco Avenue, and Cherry Hill Road). Some roads reprofiled	
Camden Yards Station Alternative	-	Use of existing roads (Conway Street, Pratt Street)	

16. HAUL ROUTES

Anticipated haul routes for construction traffic have been developed for the respective project elements for Alignment J and J1 (including FA/EE locations, substations, tunnel portals, and Stations) and are highlighted in Figures 25 to 35 below. These routes will serve as the primary means for construction traffic to access the major local traffic routes.

Figure 25. Proposed Haul Route for Cherry Hill Portal (Alignment Alternative J & J1)

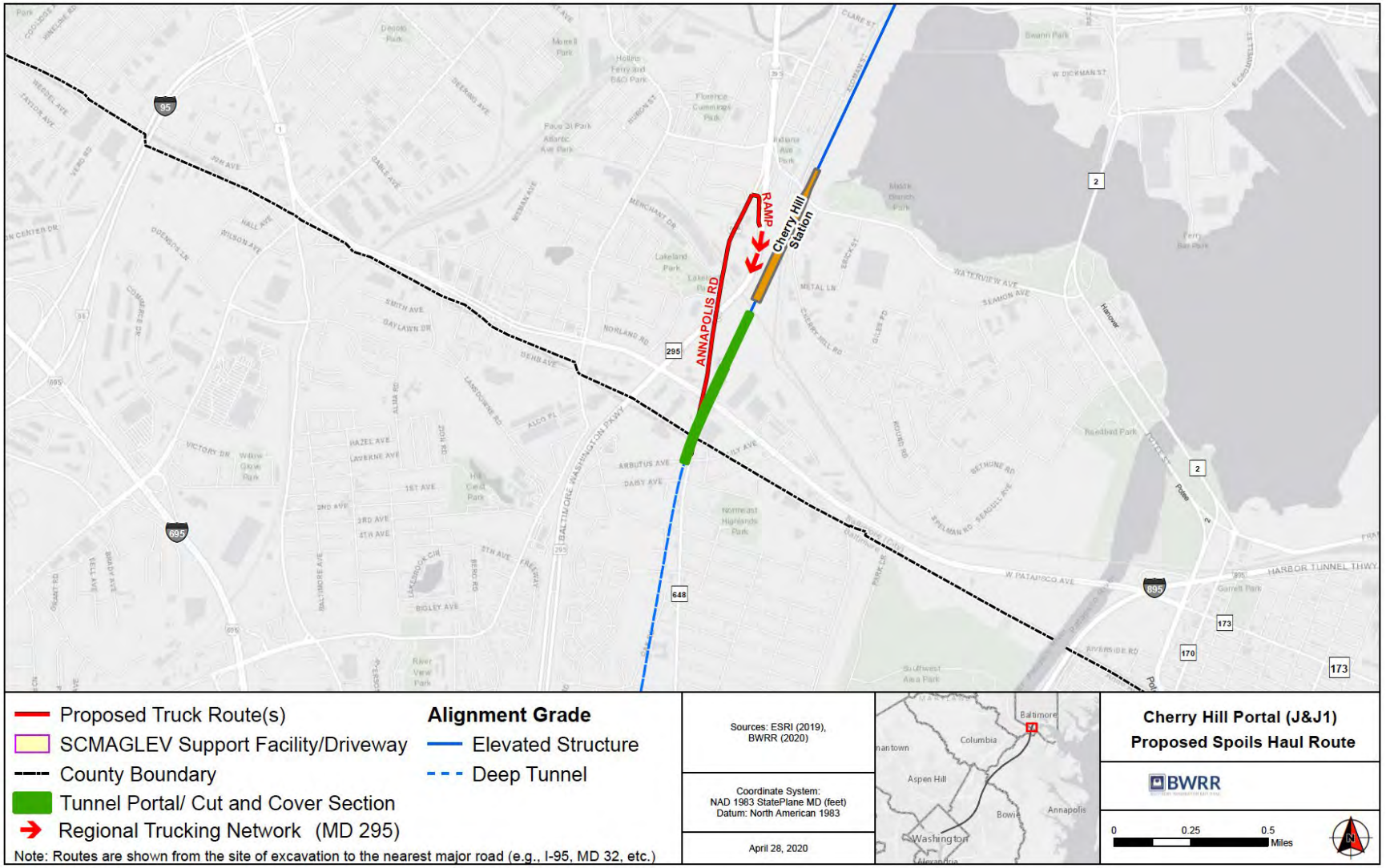


Figure 26. Proposed Haul Route for I-895 FA/EE (Alignment Alternative J & J1)

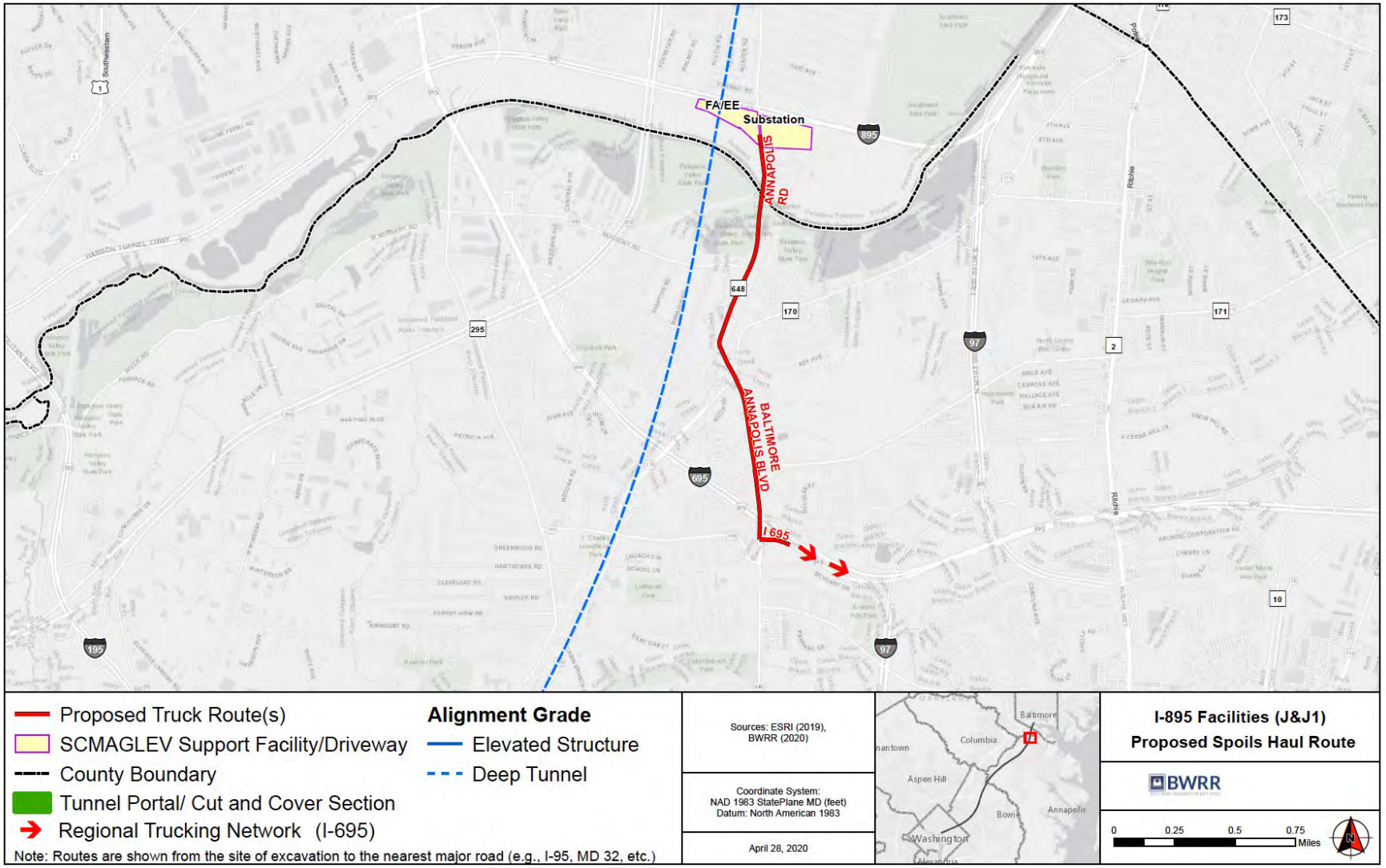


Figure 27. Proposed Haul Route for Harmans FA/EE (Alignment Alternative J & J1)

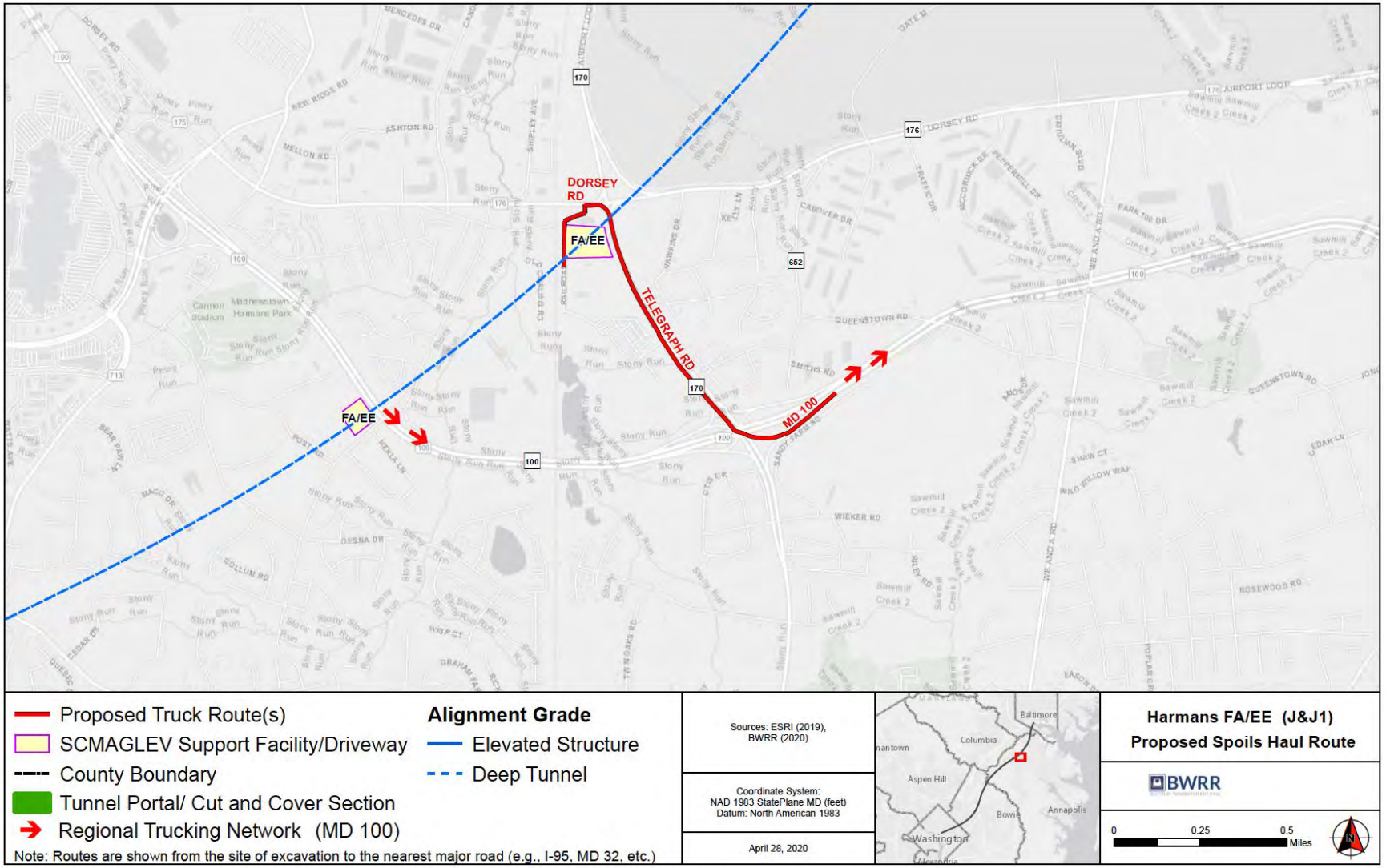


Figure 28. Proposed Haul Route for NSA Portal/ FA/EE (Alignment Alternative J & J1)

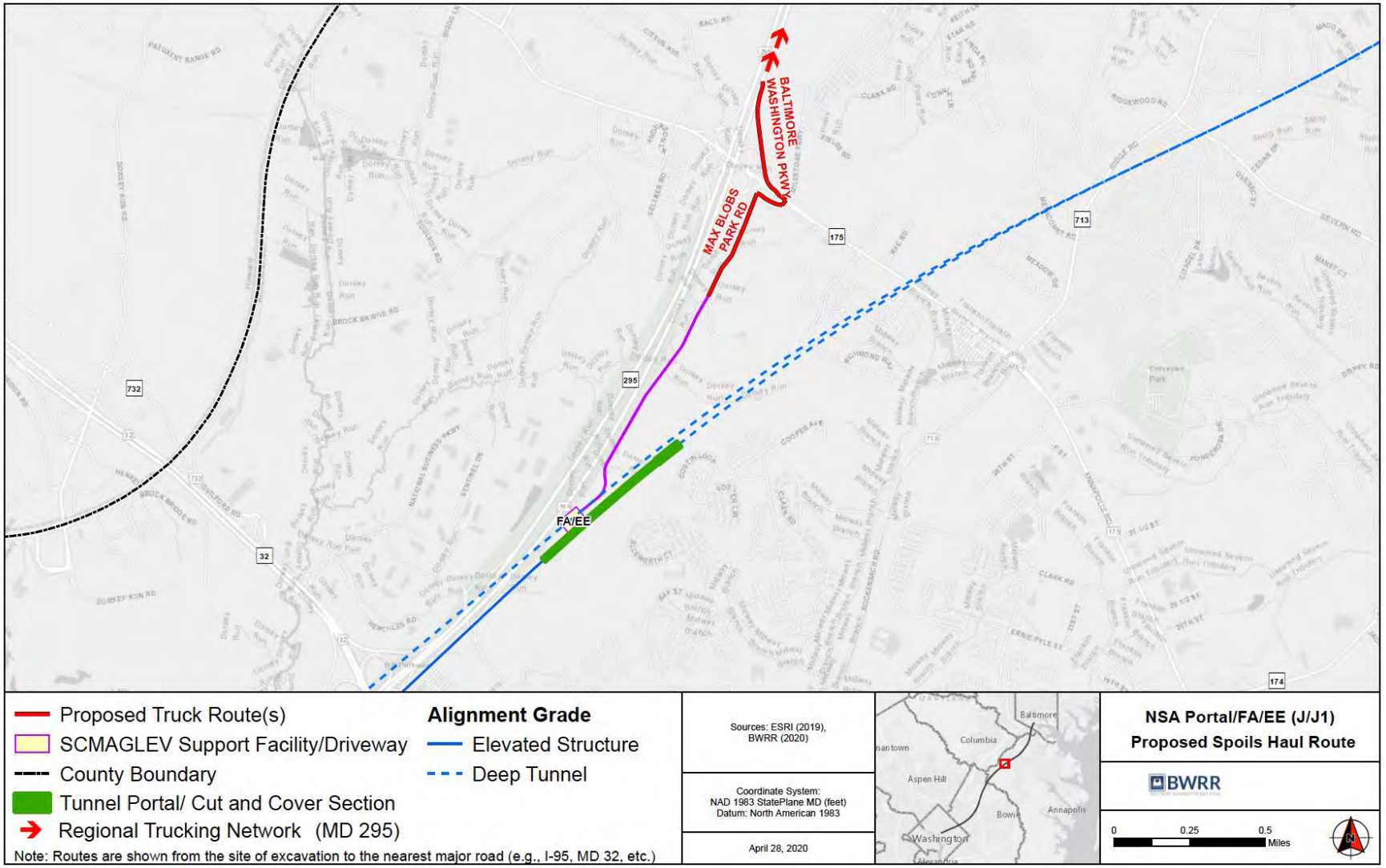


Figure 29. Proposed Haul Route for Maryland City Portal (Alignment Alternative J1)

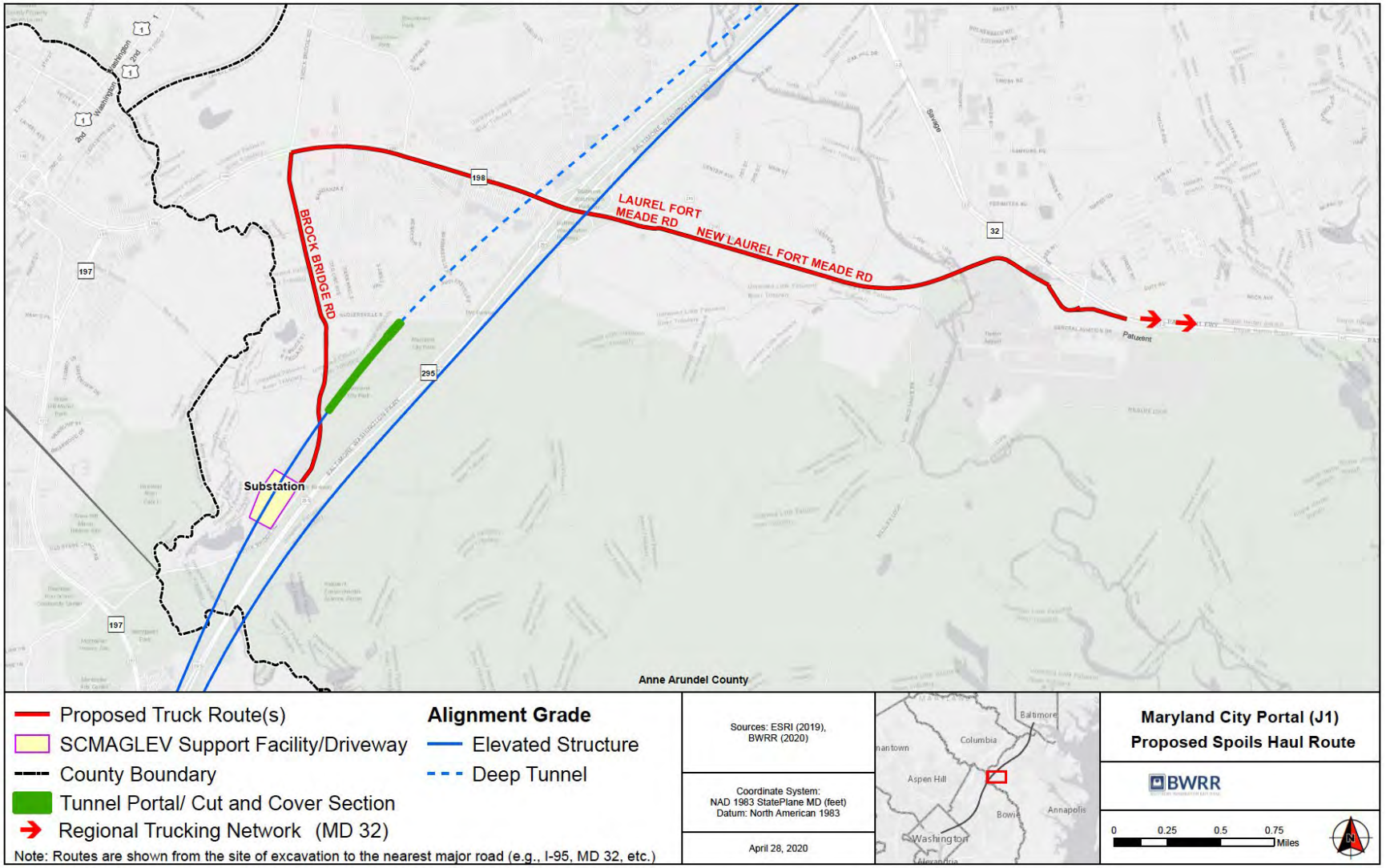


Figure 30. Proposed Haul Route for South Portal (Alignment Alternative J & J1)

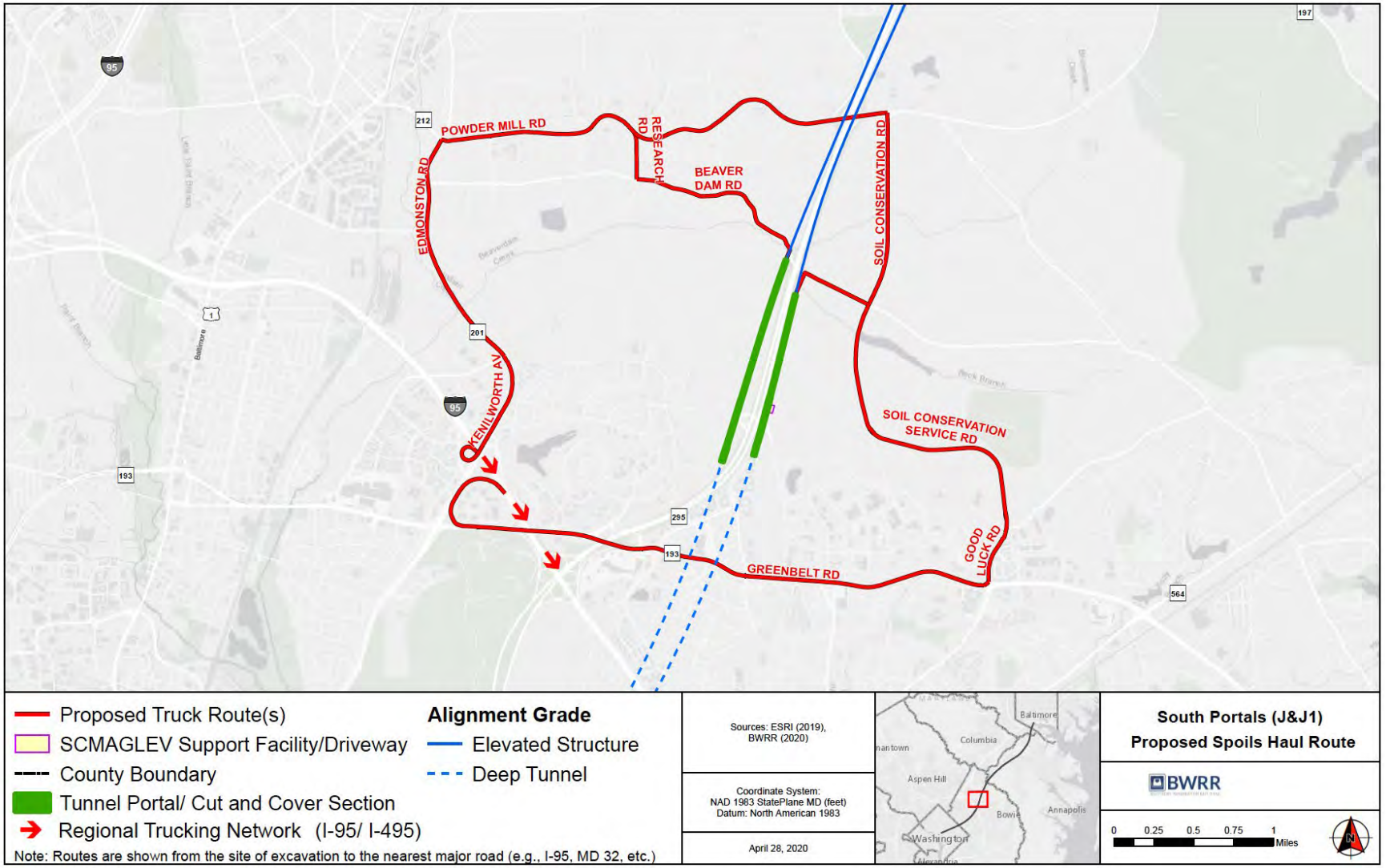


Figure 31. Proposed Haul Route for MD-410 FA/EE (Alignment Alternative J & J1)

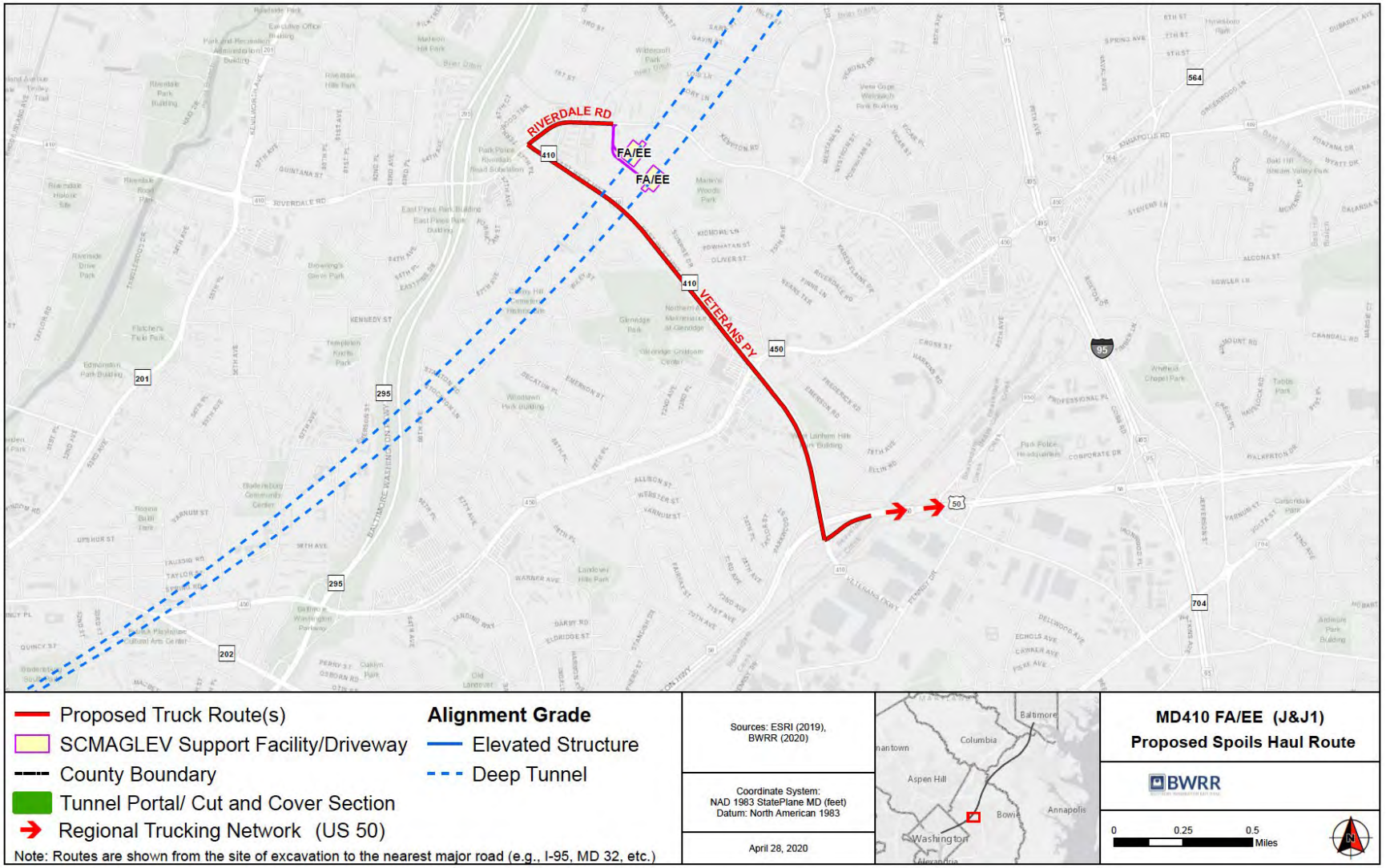


Figure 32. Proposed Haul Route for WSSC FA/EE (Alignment Alternative J & J1)

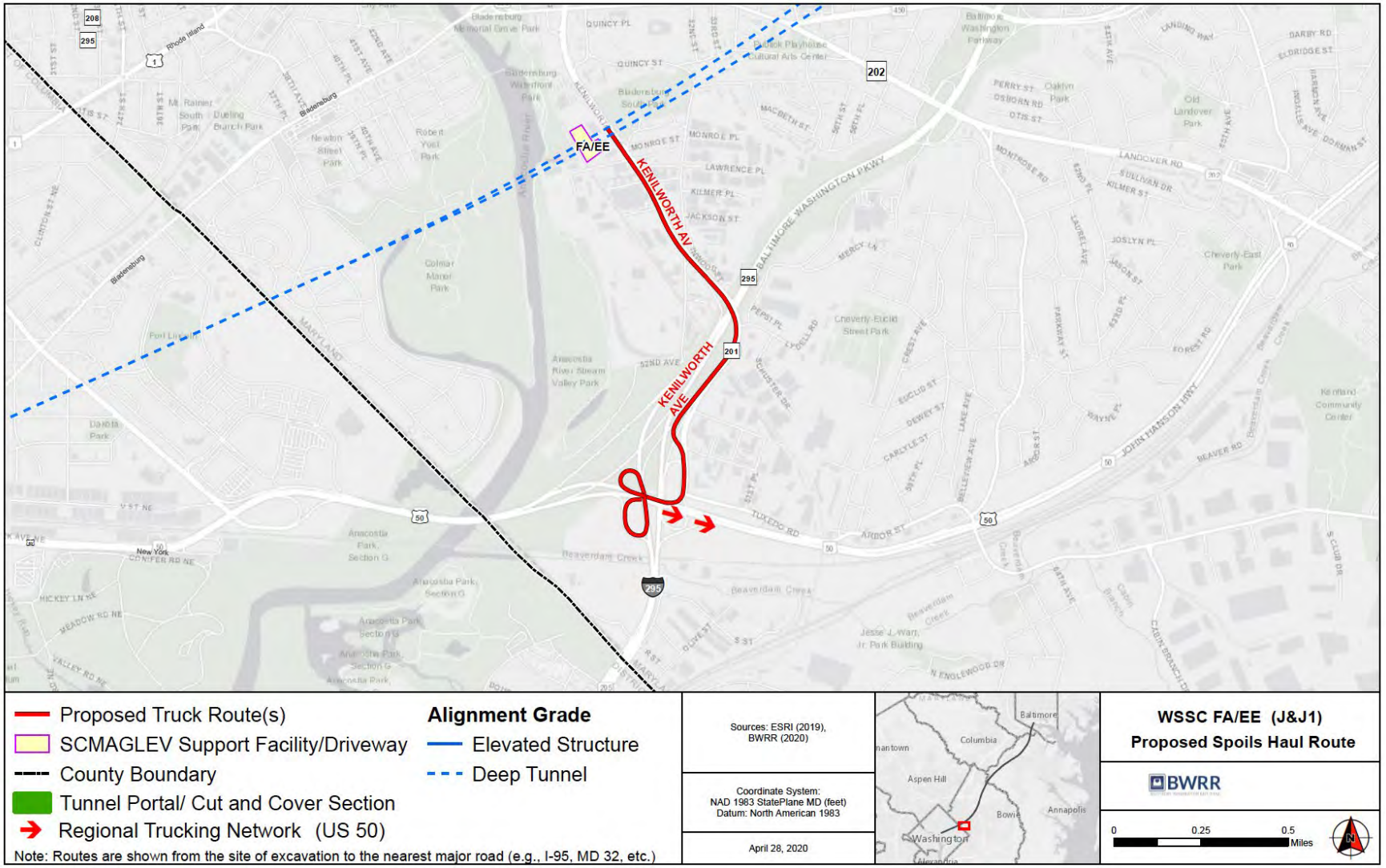


Figure 33. Proposed Haul Route for Langdon FA/EE (Alignment Alternative J & J1)

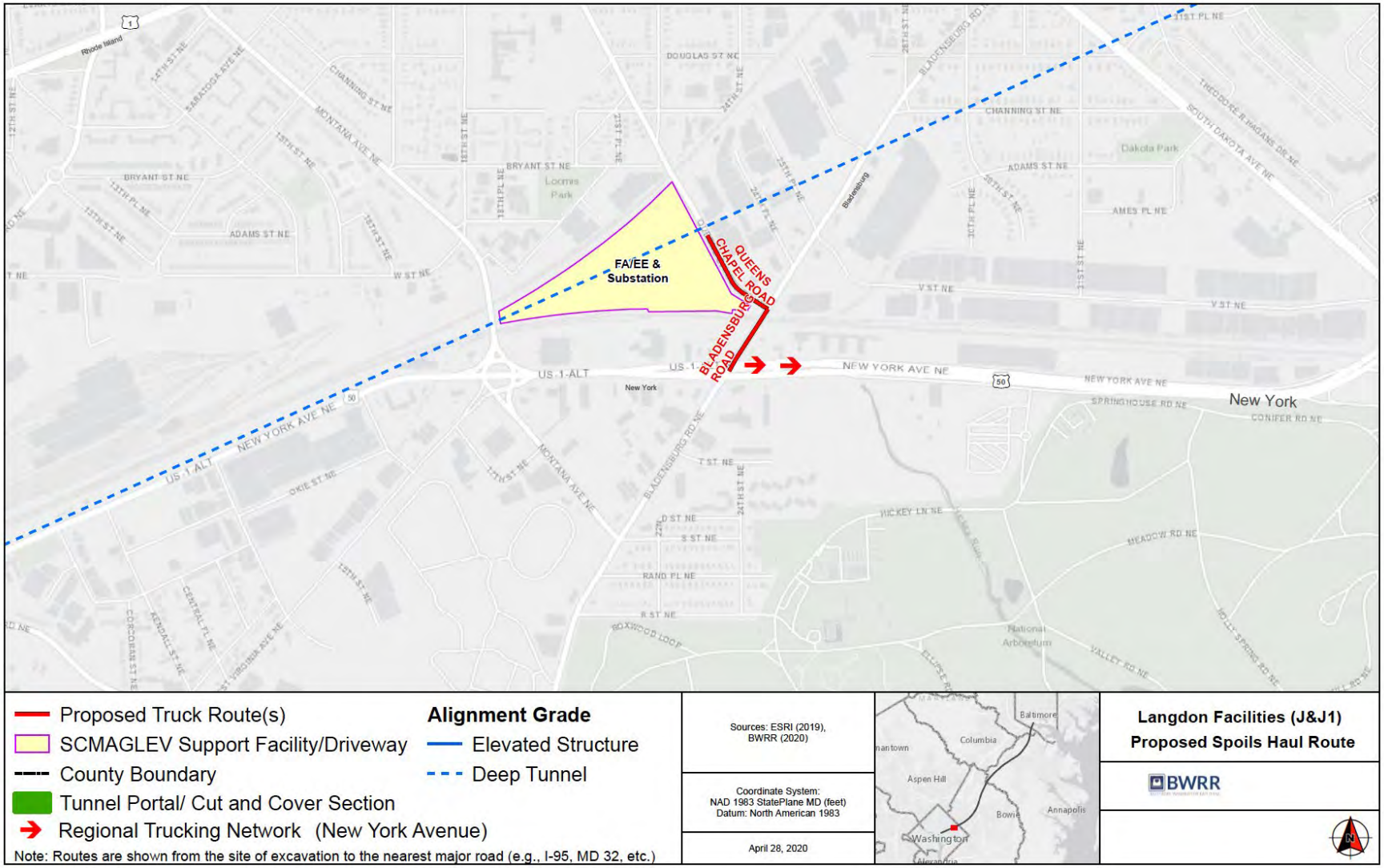


Figure 34. Proposed Haul Route for DC Station (Alignment Alternative J & J1)

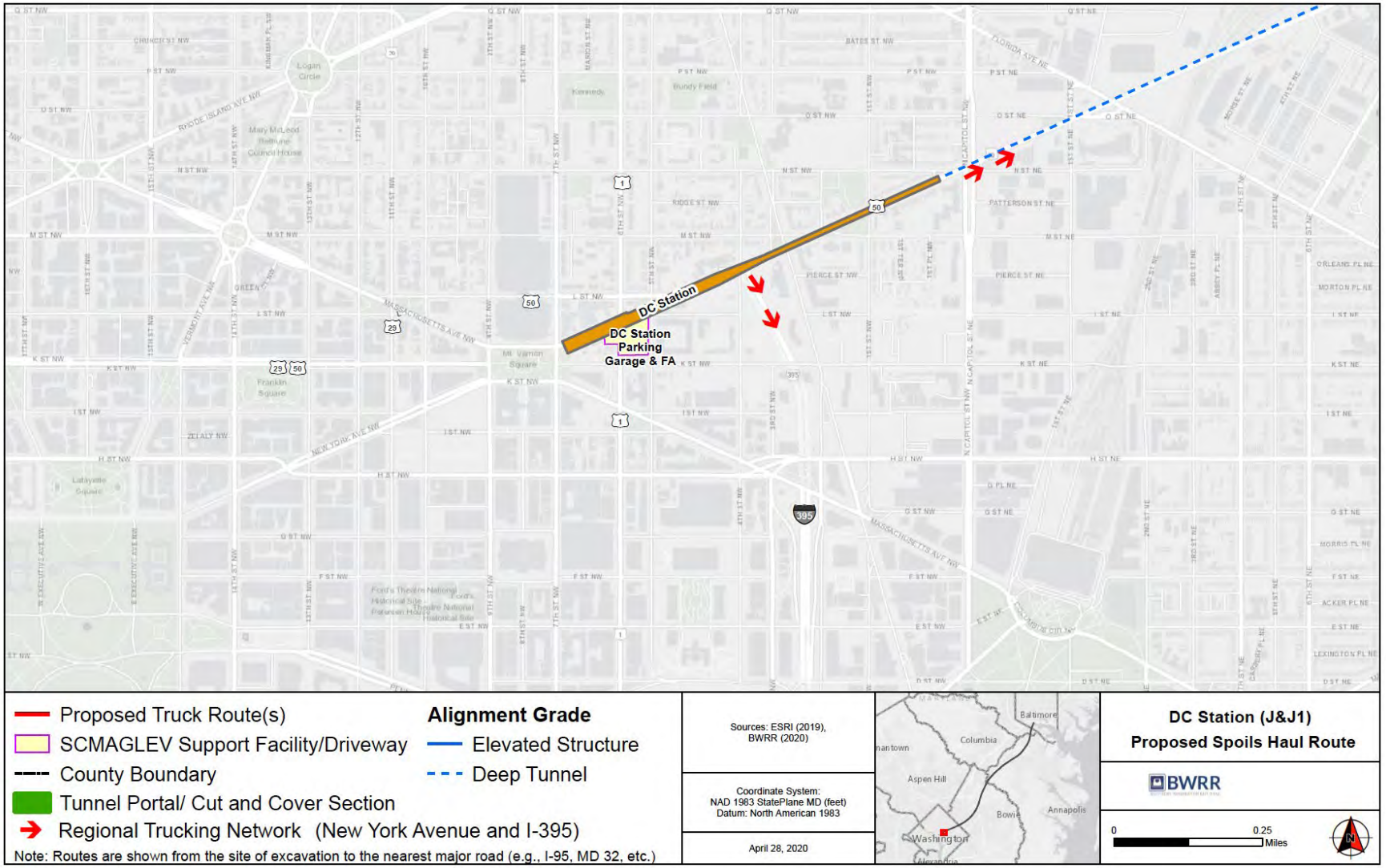
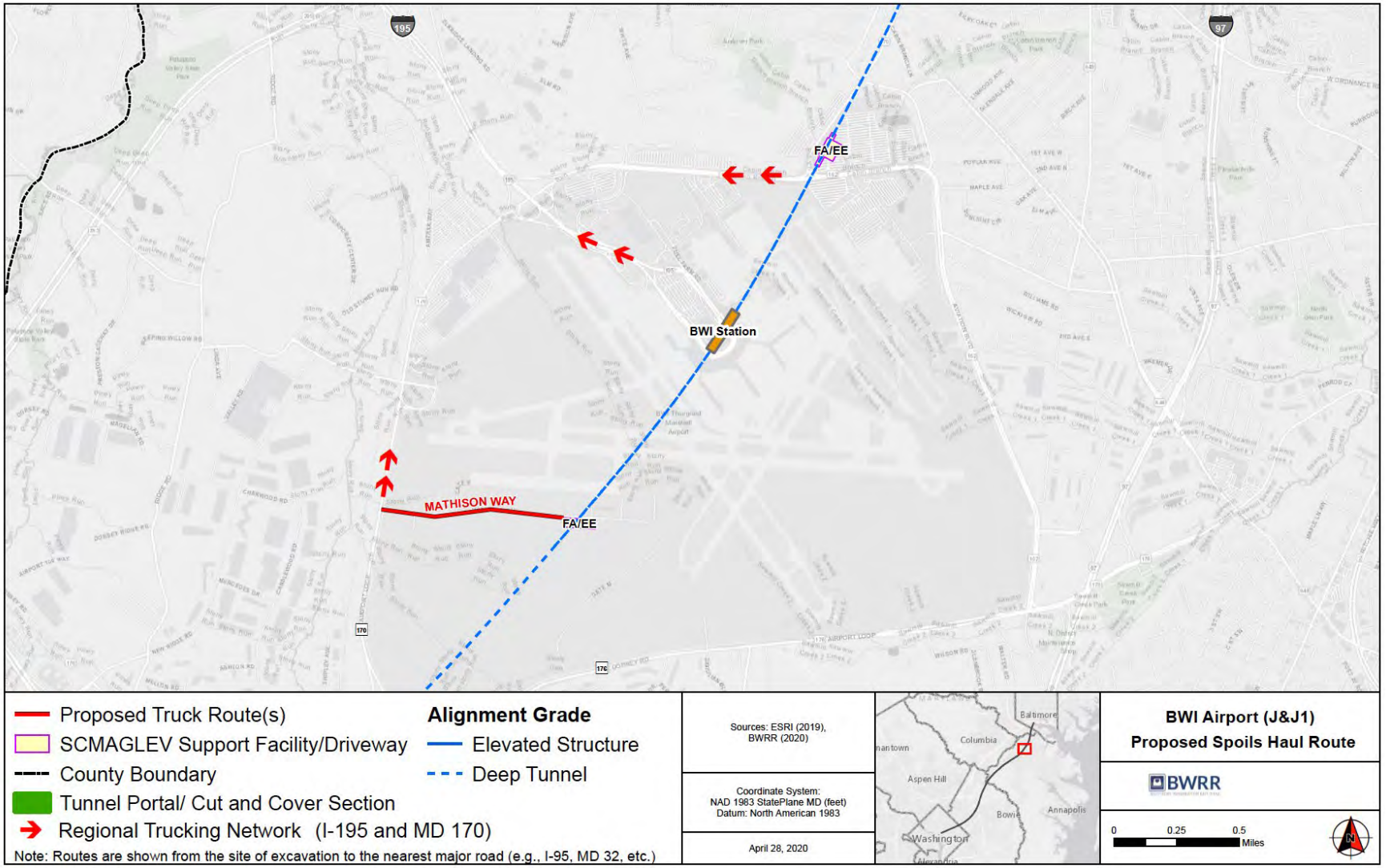


Figure 35 Proposed Haul Route for BWI Airport (Alignment Alternative J & J1)



17. UTILITY IMPACTS

Utility impacts will be addressed by one of several measures: removal, relocation, re-routing, vertical adjustments, or modification. Coordination meetings with utility providers are underway to address and mitigate impacts. Mitigation measures may impact existing travel ways during construction and will be coordinated with the affected government entities accordingly.

17.1 UTILITY IMPACTS EARLY WORKS

Utility Adjustments and Relocations:

- BGE/PEPCO: BWRR will coordinate with BGE/PEPCO for adjustments and utility relocations including design, permitting and Rights of Way acquisition, and construction of the required adjustments and relocations.
- DC Water: BWRR will be responsible for the design, permitting, and construction of relocations. DC Water will review and approve design and inspect the construction works.
- WSSC: BWRR will be responsible for the design, permitting, and construction of relocations. WSSC will review and approve design and inspect the construction works.
- Other Utilities: BWRR will coordinate with the respective utility owners for adjustments and relocations.

17.2 UTILITY IMPACTS FOR ELEVATED VIADUCT STRUCTURE

The elevated viaduct portions of alternatives J and J1 will impact aerial transmission lines, including high-tension transmission lines and distribution lines that are owned and operated by Baltimore Gas & Electric (BGE) and the Potomac Electric Power Company (Pepco), both public utilities owned by Exelon. Alternative J runs parallel to a BGE high-tension transmission line corridor for 1.8 kilometers (1.1 miles) in the vicinity of MD Route 198. The relocations will involve limited burial or raising of the existing lines in the existing alignments. Power corridors will require construction of trenches or above-ground high voltage posts. Construction may require travel lanes to be closed, but can be scheduled for off-peak hours, with lanes open during peak traffic hours.

The alignment alternatives do not cross any major substations. Other utility impacts will be identified and addressed during design development by modifying or relocating the utility as required. Bridge pier locations will be modified where practical during preliminary design to avoid impacting underground utilities. In some cases, utility relocation may be required.

17.3 UTILITY IMPACTS FOR TUNNELS

SCMAGLEV tunnel depths of 15 meters (49 feet) or greater are expected to avoid direct impacts to underground utilities. A major crossing is the DC Water CSO Northeast Boundary tunnel under New York Avenue south of Montana Avenue NE. The SCMAGLEV tunnel will be designed to avoid the CSO tunnel. Other major existing underground utilities will be avoided where possible.

Discussions have been initiated with the Washington Suburban Sanitary Commission (WSSC) about the potential use of a parking lot for one of its administrative facilities as a TBM retrieval shaft and future FA/EE location. No major WSSC infrastructure is expected to be impacted. Underground utility impacts

can be expected at transition portals or TBM launch sites, where top-down construction methods will be applied.

17.4 UTILITY IMPACTS FOR PASSENGER STATIONS

Station excavation will impact utilities that are buried in the streets, such as water, sewer, power, gas, and communications systems. As an initial phase of the construction work, utilities will be relocated, replaced, or, in some cases, supported in place, to allow station excavation to proceed. As the design advances, impacted utilities will be identified and designs will be undertaken to address temporary and permanent solutions, as required.

The above-ground station alternative at Cherry Hill will require utility relocation work, at locations of station foundations.

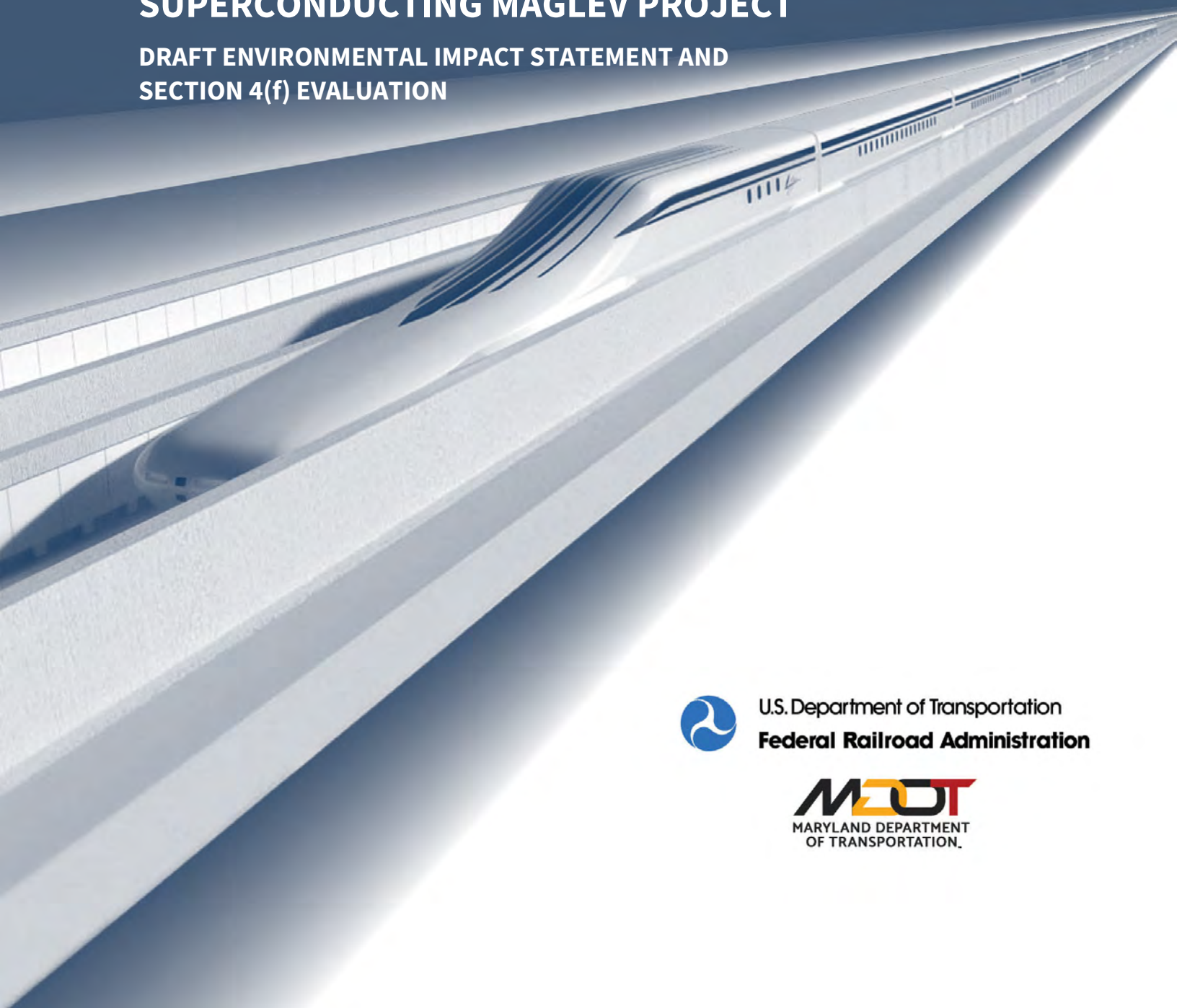
Appendix G8.

Traffic Control Plans Memorandum

Materials Provided by the Project Sponsor

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

BALTIMORE-WASHINGTON SCMAGLEV PROJECT

TRAFFIC CONTROL PLANS MEMORANDUM

STATIONS AND VIADUCT

REVISION: 2

DATE: October 09, 2020

(Response to data requests #12, #38 and #39)

BWRR
BALTIMORE-WASHINGTON RAPID RAIL

BALTIMORE-WASHINGTON SCMAGLEV PROJECT

TRAFFIC CONTROL PLANS MEMORANDUM STATIONS AND VIADUCT

4.3 PRELIMINARY ENGINEERING

REVISION: 2

DATE: OCTOBER 9, 2020

LOUIS BERGER

TABLE OF CONTENTS

TABLES

FIGURES

NOTES/REVISIONS FOR VERSION CONTROL

Revision 1: 2020-15-06

File Name: LB 4.3 Traffic Tech Memo Rev1 2020-06-15.docx

1. INTRODUCTION

This report contains the maintenance of traffic (MOT) plans, parking mitigations, transportation assumptions, and roadway improvements for the SCMAGLEV system. The MOT plans provide the proposed roadway closures and detours for each station. Separate Baltimore-Washington SCMAGLEV Traffic Control Plan (TCP) sheets should be referenced to aid in understanding the plans. Parking mitigations are focused on the Washington DC Station area because the MOT plans assume the use of all available pavement to maximize traffic capacity. Transportation assumptions provide the peak hour trip generation and modal split for each station. 2045 trip generation and modal split tables are provided in this document to assist with modeling future traffic. The transportation assumptions also include the proposed locations of the parking garages, pick-up/drop-off locations, and proposed roadway improvements (Cherry Hill only). The report is organized by station first, then covers the alignment segments and facilities.

2. WASHINGTON DC SCMAGLEV STATION

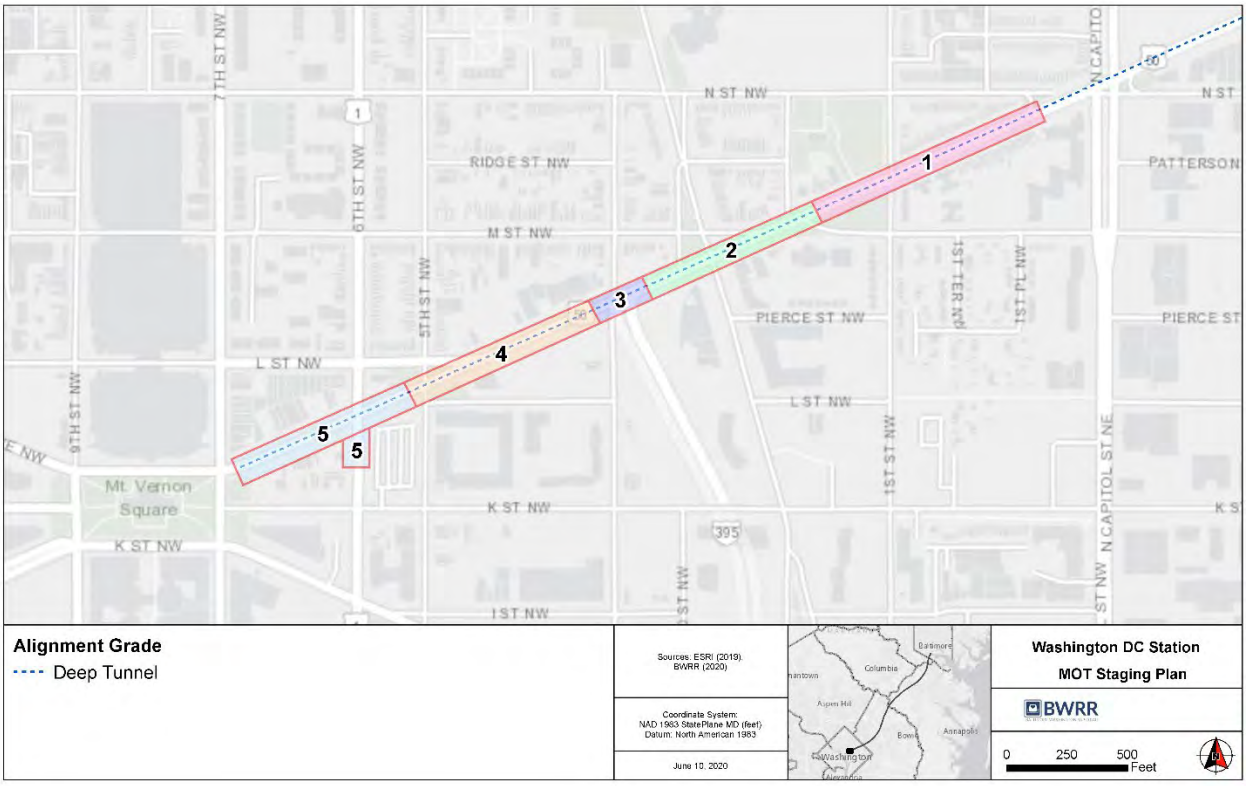
2.1 INTRODUCTION

This section describes the SCMAGLEV Washington DC traffic control plan, parking mitigation, and transportation assumptions.

2.2 TRAFFIC CONTROL PLAN

The Washington DC SCMAGLEV Station will be an underground station located under New York (NY) Avenue east of Carnegie Library. The station will include a pedestrian tunnel that connects to the DC Convention Center underneath 7th Avenue NW. Construction will temporarily close segments of NY Avenue from First Street to 7th Street NW. The Station will be constructed using top down construction and will take place over five segments and pedestrian underpass (Figure 1). The pedestrian underpass is planned for construction coinciding with Segment 5.

Figure 1: Washington DC Five Construction Staging Segments



Each of the segments is comprised of a minimum of two stages. To reduce the duration of construction and accelerate construction, concurrent work is proposed for:

- Segment 1 and Segment 5 (including the pedestrian underpass)
- Segment 1 and Segment 4
- Segment 2 and Segment 4
- Segment 3 will be stand alone

Table 1 contains a summary of the Washington DC station MOT Segment schedule. Traffic will re-open for each segment upon completion of these construction activities. NY Avenue is estimated to fully re-open to traffic after approximately 45 months.

Table 1: Washington DC Station MOT Segment Schedule Summary

Segment	Stage	Construction Duration in Months	Construction Hours	Notes:
1	1	11	7AM-4PM	Night work with approval from DDOT
1	2	9	7AM-4PM	Night work with approval from DDOT
2	1	8	7AM-4PM	Night work with approval from DDOT
2	2	8	7AM-4PM	Night work with approval from DDOT
3	1	<5	7AM-4PM	Night work with approval from DDOT
3	2	<3	7AM-4PM	Night work with approval from DDOT
4	1	15	7AM-4PM	Night work with approval from DDOT
4	2	8	7AM-4PM	Night work with approval from DDOT
5	1	11	7AM-4PM	Night work with approval from DDOT
5	2	7	7AM-4PM	Night work with approval from DDOT
Pedestrian Underpass (5)	1	11	7AM-4PM	Night work with approval from DDOT Work coincides with segment 5
Pedestrian Underpass (5)	2	7	7AM-4PM	Night work with approval from DDOT Work coincides with segment 5

DDOT: District Department of Transportation

2.2.1 SEGMENT ONE

Station construction during Segment 1-Stage 1 will be on the south side of NY Avenue for the construction of the south and central slurry walls and arch between the south and central slurry wall. Two westbound lanes will be maintained on the north side of NY Avenue. Southbound First Street NW will be detoured via westbound NY Avenue, 4th Street and K Street. Eastbound NY Avenue will be detoured via eastbound M Street NW, First Street NE, and N Street NW. Refer to sheet TCP-01. Parking along NY Avenue, 4th Street NW, N Street NW, M Street NW, K Street NW, and First Street NE will be prohibited at all times.

Station construction during Segment 1-Stage 2 will be on the north side of NY Avenue for the construction of the north slurry wall and arch between the north and central slurry wall. Two westbound lanes will be shifted and maintained on the south side of NY Avenue. Southbound First Street NW traffic will be detoured via eastbound O Street NW, North Capitol Street NW, and K Street NW. Eastbound NY Avenue traffic to be detoured via eastbound M Street NW, First Street NE, and N Street NW. Refer to sheet TCP-02. Parking along NY Avenue, O Street NW, N Street NW, M Street NW, K Street NW, and First Street NE will be prohibited at all times.

2.2.2 SEGMENT TWO

Station construction during Segment 2-Stage 2 requires the partial closure of the south side of NY Avenue from east of I-395/4th Street NW to M Street NW to construct the south slurry wall and arch between the south and central slurry walls. Two lanes will be maintained for both east and westbound NY Avenue. Westbound New Jersey Avenue will be detoured via eastbound K Street NW, North Capitol Street NW, and NY Avenue. Pierce Street NW and L Street NW will be detoured via northbound First Street NW and NY Avenue. Refer to sheet TCP-03. Parking along NY Avenue, K Street NW, First Street NW and North Capitol Street NE will be prohibited at all times.

Station construction during Segment2-Stage 2 requires the partial closure of the north side of NY Avenue from east of I-395/4th Street NW to M Street NW to construct the north slurry wall and arch between the north and central slurry walls. Two lanes will be maintained for both east and westbound NY Avenue. Westbound New Jersey Avenue will be detoured via eastbound K Street NW, North Capitol Street NE, and NY Avenue. Southbound 3rd Street NW will be detoured via M Street NW and 4th Street NW. Refer to sheet TCP-04. Parking along NY Avenue, K Street NW, M Street NW, 4th Street NW, and North Capitol Street NE will be prohibited at all times.

2.2.3 SEGMENT THREE

Prior to the start of Segment 3, the intersection of I-395 and NY Avenue will be shifted east to the existing Temple parking lot to ensure access to I-395 will remain open. A temporary signal will be used to control traffic. Station construction during Segment 3-Stage 1 requires the partial closure of the north side of NY Avenue for the construction of the north and two center slurry walls and arches between slurry walls. Two westbound lanes will be shifted and maintained on the south side of NY Avenue. Eastbound NY Avenue will be detoured via southbound 6th Street NW, K Street NW, and New Jersey Avenue. Southbound 4th Street NW will be detoured via westbound N Street NW, 6th Street NW, K Street NW, and New Jersey Avenue. Refer to sheet TCP-05. Parking along NY Avenue, 4th Street NW, 6th Street NW, and N Street NW will be prohibited at all times.

Station construction during Segment 3-Stage 2 requires the partial closure of the south side of NY Avenue for the construction of the south slurry wall and arches between the south and central slurry walls. Two westbound lanes will be maintained on the north side of NY Avenue. Eastbound NY Avenue traffic will be detoured via southbound 6th Street NW, K Street NW, and New Jersey Avenue. Eastbound NY Avenue to I-395 traffic will be detoured via southbound 6th Street NW and Massachusetts Avenue NW. Refer to sheet TCP-06. Parking on NY Avenue, 6th Street NW, K Street NW, New Jersey Avenue NW, and Massachusetts Avenue NW will be prohibited at all times.

2.2.4 SEGMENT FOUR

Station construction for Segment 4-Stage 1 requires the partial closure of the north side of NY Avenue for the construction of the north slurry wall and two central slurry walls. Arches will be constructed between the slurry walls. Two westbound lanes with be shifted and maintained on the south side of NY Avenue. Eastbound NY Avenue traffic will be detoured via 6th Street NW, K Street NW, and New Jersey Avenue. Eastbound NY Avenue to I-395 traffic will be detoured via 6th Street NW and Massachusetts Avenue NW. Southbound 5th Street NW traffic will be detoured via westbound M St NW, southbound 6th Street NW, and eastbound K Street NW. Northbound 5th Street NW traffic will be detoured via westbound NY Avenue, northbound 6th Street NW, and eastbound M Street NW. Refer to sheet TCP-07. Parking along NY Avenue, 6th Street NW, K Street NW, New Jersey Avenue, and Massachusetts Avenue NW prohibited at all times.

Station construction for Segment 4-Stage 2 requires partial closure of the south side of NY Avenue between 5th Street and I-395 for the construction of the south slurry wall and arches between the south and central slurry walls. Westbound NY Avenue lanes will be maintained. Eastbound NY Avenue traffic will be detoured via southbound 6th Street NW, K Street NW, and New Jersey Avenue. Eastbound NY Avenue to I-395 traffic to be detoured via 6th Street NW and Massachusetts Avenue NW. Northbound 5th Street NW and westbound L Street NW to be detoured via K Street NW and 6th Street NW. Refer to sheet TCP-08. Parking along NY Avenue, 6th Street NW, 5th Street NW, K Street NW, New Jersey Avenue, and Massachusetts Avenue NW will be prohibited at all times.

2.2.5 SEGMENT FIVE

Segment 5-Stage 1 requires the partial closure of the north side of NY Avenue for the construction of the north and two central slurry walls. Arches will be constructed between the slurry walls. While the 6th Street NW intersection is closed, construction will proceed in parallel on slurry walls and road support structure for 6th Street NW between NY Avenue and K Street NW to open 6th Street NW up to traffic for the remainder of construction. Two westbound NY Avenue lanes will be shifted and maintained on the south side of NY Avenue. Massachusetts Avenue to eastbound NY Avenue traffic will be detoured via southbound 9th Street NW, H Street NW, and 5th Street NW. 7th Street to eastbound NY Avenue traffic will be detoured via K Street NW and 5th Street NW. Northbound 6th Street NW will be detoured via westbound NY Avenue, 7th Street NW, and I Street NW. Southbound 6th Street NW traffic will be detoured via I Street NW, 7th Street NW, and H Street NW. Refer to sheet TCP-09. Parking along NY Avenue, 9th Street NW, 7th Street NW, 5th Street NW, L Street NW, K Street NW, and H Street NW will be prohibited at all times.

Segment 5-Stage 2 requires the partial closure of the south side of NY Avenue between 7th Street NW and 5th Street NW for the construction of the south slurry wall and arches between the south and central slurry walls. Two westbound NY Avenue lanes will be maintained. Massachusetts Avenue NW to eastbound NY Avenue traffic will be detoured via southbound 9th Street NW, H Street NW, and 5th Street NW. 7th Street NW to eastbound NY Avenue traffic will be detoured via K Street SW and 5th Street NW. Northbound 6th Street NW will be detoured via westbound K Street NW, 7th Street NW, and I Street NW. Southbound 6th Street NW traffic will be detoured via I Street NW, 7th Street NW, and H Street NW. Refer to sheet TCP-10. Parking along NY Avenue, 9th Street NW, 7th Street NW, 5th Street NW, L Street NW, K Street NW, and H Street NW will be prohibited at all times.

2.2.6 PEDESTRIAN UNDERPASS

The pedestrian underpass (tunnel) to the Convention Center will be constructed in two stages and coincide with the two Segment 5 stages.

The pedestrian tunnel Station construction during Stage 1 requires the partial closure of the north side of NY Avenue for the construction of the north and two center slurry walls and arches between slurry walls. Two slurry walls and one arch will be constructed for the pedestrian tunnel. Two westbound lanes will be shifted and maintained on the south side of NY Avenue. Massachusetts Avenue to Eastbound NY Avenue will be detoured via southbound 9th Street NW, H Street NW, and 6th St NW. Southbound 7th Street NW will be detoured via westbound L Street NW, 6th Street NW, and New York Avenue. Northbound 7th Street NW will be detour via westbound K St NW, 6th Street NW, and L Street NW. Refer to sheet TCP-11. Parking along NY Avenue, 9th Street NW, 7th Street NW, 6th Street NW, L St NW, K Street NW, and H Street NW will be prohibited at all times.

The pedestrian tunnel construction during Stage 2 requires the partial closure of the south side of NY Avenue for the construction of the south slurry wall and arches between the south and central slurry walls. Two westbound lanes will be maintained on the north side of NY Avenue. Massachusetts Avenue to Eastbound NY Avenue will be detoured via southbound 9th Street NW, H Street NW, and 6th St NW. Southbound 7th Street NW will be detoured via eastbound L Street NW, 9th Street NW, and K Street NW. Northbound 7th Street NW will be detour via westbound K St NW, 6th Street NW, and New York Avenue. Refer to sheet TCP-12. Parking along NY Avenue, 9th Street NW, 7th Street NW, 6th Street NW, L St NW, K Street NW, and H Street NW will be prohibited at all times.

2.3 PARKING MITIGATION

The SCMAGLEV construction and operation will reduce the number of on-street parking in Washington DC in the vicinity of the Washington DC Station. For the purposes of this assessment, the study team assumed that each proposed detour route will result in full displacement of on-street parking on both sides of the identified section. This will result in approximately 375 displaced on-street parking spaces over the course of the construction period. This section describes a worst-case scenario temporary on-street parking loss due to the proposed MOT plans and proposed mitigation approach to address the loss.

The MOT plan will require temporary removal of on-street parking on the following streets:

- NY Avenue between 7th Street NW and North Capitol Street while the Washington DC station box is under construction.
- K Street between 7th Street and New Jersey Avenue NW while the Washington DC station box is under construction and K Street NW is used as a detour route for eastbound NY Avenue traffic.
- L Street between 6th and 7th Streets NW while the Washington DC station box is under construction and L Street NW is used as a detour route for 6th Street NW traffic.
- M Street between NY Avenue NW and North Capitol Street while the Washington DC station box is under construction and M Street NW is used as a detour route for eastbound NY Avenue traffic.
- First Street NE between K Street and NY Avenue while the Washington DC station box is under construction and First Street NE is used as a detour route for eastbound NY Avenue traffic.
- 5th Street NW between NY Avenue and H Street while the Washington DC station box is under construction and 5th Street NW is used as a detour route for eastbound NY Avenue traffic.
- North Capitol Street between NY Avenue and K Street NW while the Washington DC station box is under construction and North Capitol Street is used as a detour route for eastbound NY Avenue traffic.
- First Street NE, Massachusetts Avenue, New Jersey Avenue, First, 4th, 9th, 7th, H, N, and O Streets NW may also be affected, but requires further analysis to determine if it is warranted.

The following outlines a range of possible options to address the parking mitigation needs associated with the NY Avenue construction activity. Some of these proposed options will be short term solutions and others could address a more long-term need within the area and help to mitigate multiple segments depending on the proximity of the closures.

2.3.1 SEGMENT 1 (NY AVENUE FROM EAST OF M STREET NW TO JUST WEST OF NORTH CAPITOL STREET)

This two-stage segment will reduce on-street parking in the Northwest DC area along NY Avenue, 4th Street, K Street, M Street, N Street, North Capitol Street, O Street, and First Street NE.

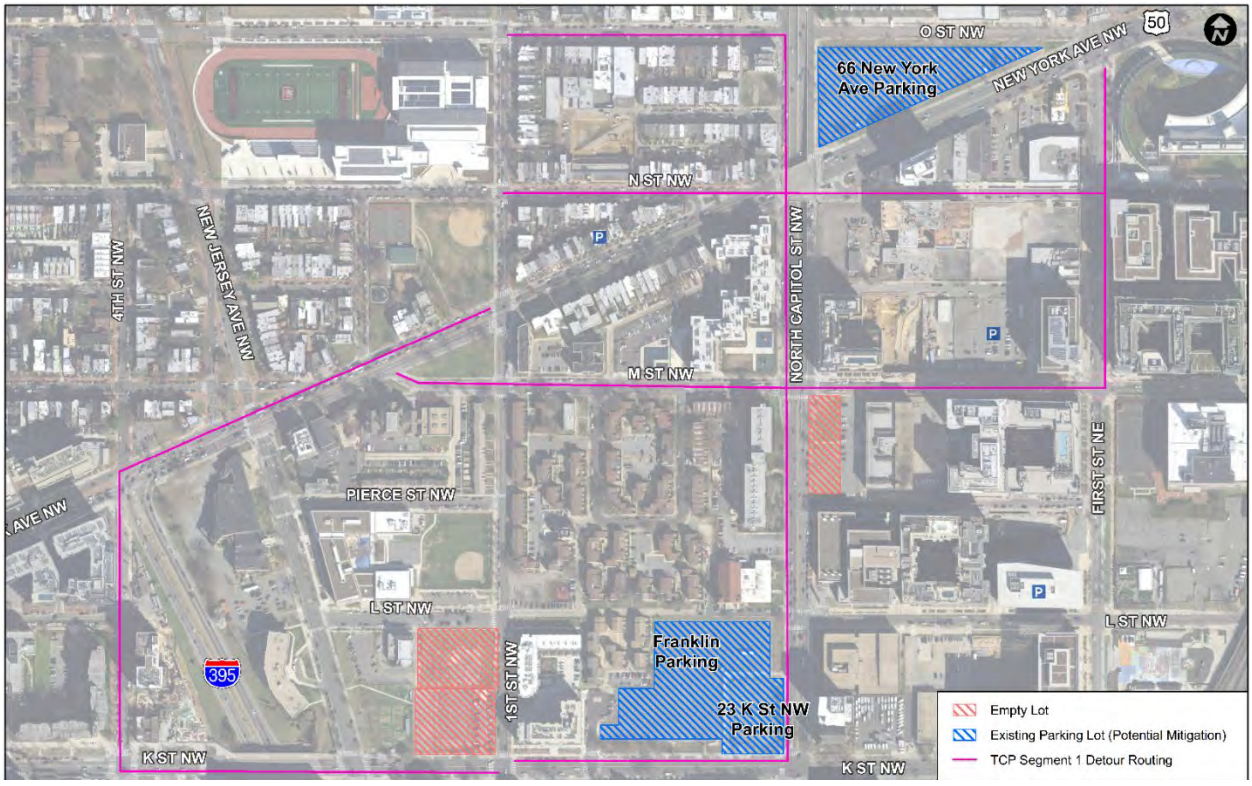
SEGMENT 1 CONCEPTUAL PARKING MITIGATION APPROACH

- Convert Franklin Parking Area at the corner of K Street and North Capitol Street to a structured 1 to 2 level parking garage.
  - Could be used to support parking mitigation associated with Segments 1 and 2.
- Convert empty lot at the corner of K and First Streets NW near the Southern Baptist Church to a surface level parking area.
  - Could be used to support parking mitigation associated with Segments 1, 2, and 3.

- The following locations are not recommended, but depending on need, a small patch of open area could be converted to a surface parking area adjacent to the DC Housing Authority Building and there are two parcels at the intersection of New Jersey Avenue and H Street NW that could be converted to surface level or structured parking.
  - The H Street NW parcels are south of the affected areas and therefore provide minimal benefit to relocated parking users. The DC Housing Authority property is closer to the affected parking areas, but the remaining area is a relatively small and the site has its own set of concerns due to its proximity to the Housing Authority.
- Convert surface parking area at the corner of North Capitol Street and O Street NE just north of NY Avenue to a structured 1 to 2 level parking garage.
- Segment 1 also has approximately 3 existing parking garages within walking distance of proposed prohibited parking areas that could be used as supplemental parking during the associated construction closures.

Figure 2 illustrates the proposed Segment 1 detour routes and parking replacement opportunities. The purple lines represent the proposed detour routes where on-street parking would be reduced.

Figure 2: Parking Replacement Opportunities for Segment 1



2.3.2 SEGMENT 2 (NY AVENUE FROM EAST OF I-395/4TH STREET NW TO M STREET NW)

This two-stage segment will reduce on-street parking in the Northwest DC area along NY Avenue, 4th Street, K Street, M Street, N Street, North Capitol, Pierce Street, L Street and First Street.

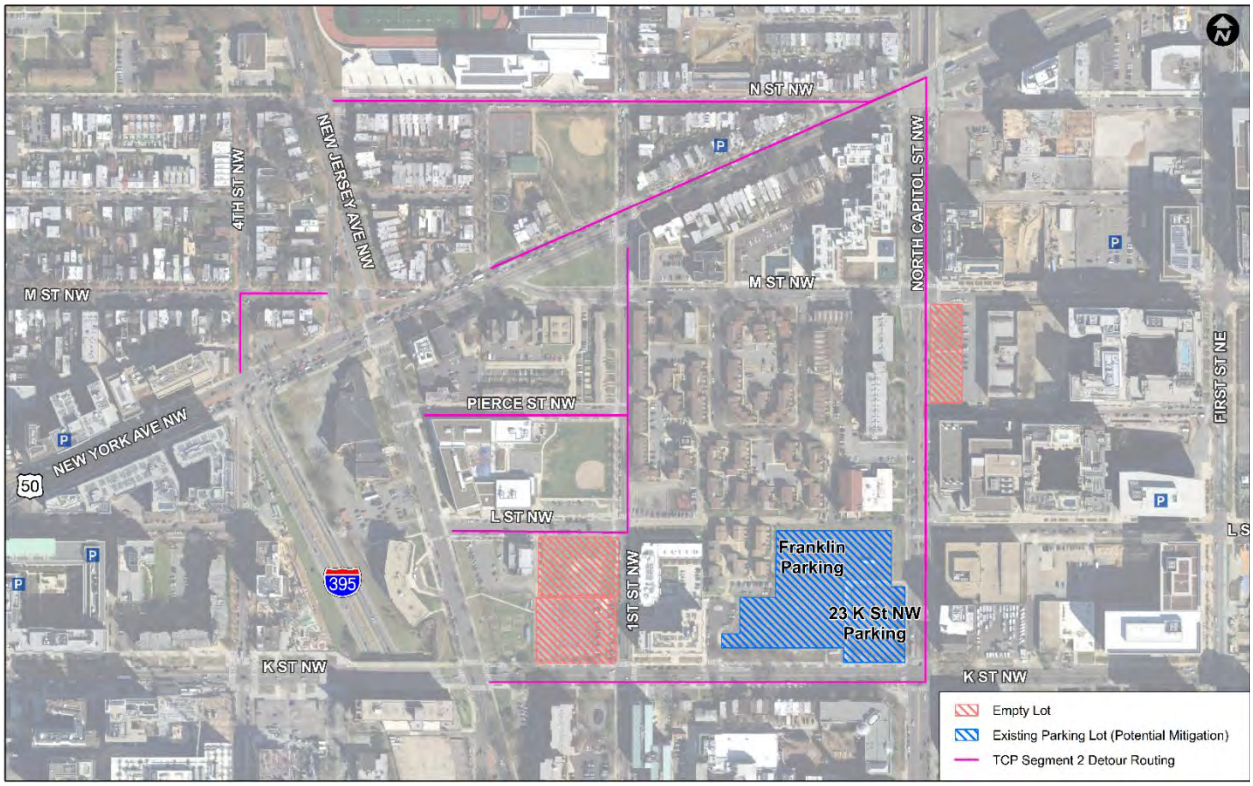
SEGMENT 2 CONCEPTUAL PARKING MITIGATION APPROACH

- Convert Franklin Parking Area at the corner of K Street NW and North Capitol to a structured 1 to 2 level parking garage.
  - Could be used to support parking mitigation associated with Segments 1 and 2.
- Convert empty lot at the corner of K and First Street NW near the Southern Baptist Church to a surface level parking area.
  - Could be used to support parking mitigation associated with Segments 1, 2 and 3.
- The following locations are not recommended, but depending on need, a small patch of open area could be converted to a surface parking area adjacent to the DC Housing Authority Building and there are two parcels at the intersection of New Jersey Avenue and H Street NW that could be converted to surface level or structured parking.
  - The H Street NW parcels are south of the affected areas and therefore provide minimal benefit to relocated parking users. The DC Housing Authority property is closer to the affected parking areas, but the remaining area is a relatively small and the site has its own set of concerns due to its proximity to the Housing Authority.

Segment 2 also has two existing parking garages within walking distance of proposed prohibited parking areas that could be used as supplemental parking during the associated construction closures.

Figure 3 illustrates the proposed Segment 2 detour routes and parking replacement opportunities. The purple lines represent the proposed detour routes where on-street parking would be reduced.

Figure 3: Parking Replacement Opportunities for Segment 2



2.3.3 SEGMENT 3 (NY AVENUE AT THE I-395 INTERSECTION)

This two-stage segment will reduce on-street parking in the Northwest DC area along NY Avenue, 4th Street, K Street, 6th Street, N Street, Massachusetts Avenue and New Jersey Avenue.

SEGMENT 3 CONCEPTUAL PARKING MITIGATION APPROACH

- Convert Franklin Parking Area at the corner of First and 5th Streets NW to a structured 1 to 2 level parking garage.
  - Could be used to support parking mitigation associated with Segments 3, 4 and 5.
- Additional on-street parking could be utilized just north of NY Avenue along both 6th Street and L Street NW.
  - Both on-street parking recommendations would require modifications to current parking restrictions.
- Segment 3 also has approximately 8 existing parking garages within walking distance of proposed prohibited parking areas that could be used as supplemental parking during the associated construction closures.

Figure 4 illustrates the proposed Segment 3 detour routes and parking replacement opportunities. The purple lines represent the proposed detour routes where on-street parking would be reduced.

Figure 4: Parking Replacement Opportunities for Segment 3

2.3.4 SEGMENT 4 (NY AVENUE FROM 5TH STREET NW TO WEST OF I-395/4TH STREET NW)

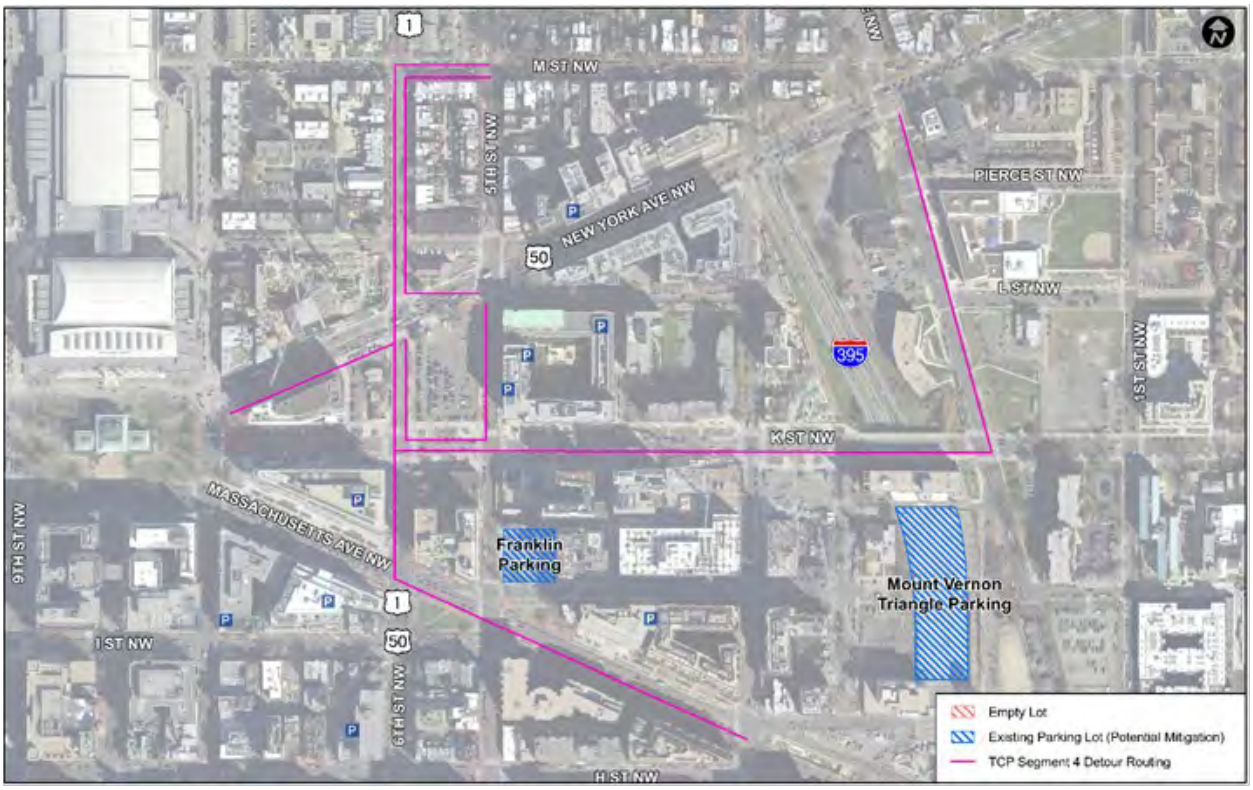
This two-stage segment will reduce on-street parking in the Northwest DC area along NY Avenue, 6th Street, K Street, 5th Street, Massachusetts Avenue and New Jersey Avenue.

SEGMENT 4 CONCEPTUAL PARKING MITIGATION APPROACH

- Convert Franklin Parking Area at the corner of First and 5th Streets NW to a structured 1 to 2 level parking garage.
  - Could be used to support parking mitigation associated with Segments 3, 4 and 5.
- Convert Mount Vernon Triangle Parking Area at the corner of K Street and New Jersey Avenue NW to a structured 1 to 2 level parking garage.
  - Could be used to support parking mitigation associated with Segments 3 and 4.
- Additional on-street parking could be utilized just north of NY Avenue along both 6th and L Streets NW.
  - Both on-street parking recommendations would require modifications to current parking restrictions.
- Segment 4 also has approximately 8 existing parking garages within walking distance of proposed prohibited parking areas that could be used as supplemental parking during the associated construction closures.

Figure 5 illustrates the proposed Segment 4 detour routes and parking replacement opportunities. The purple lines represent the proposed detour routes where on-street parking would be reduced.

Figure 5: Parking Replacement Opportunities for Segment 4



2.3.5 SEGMENT 5 (NY AVENUE BETWEEN 7TH STREET NW AND WEST OF 5TH STREET NW)

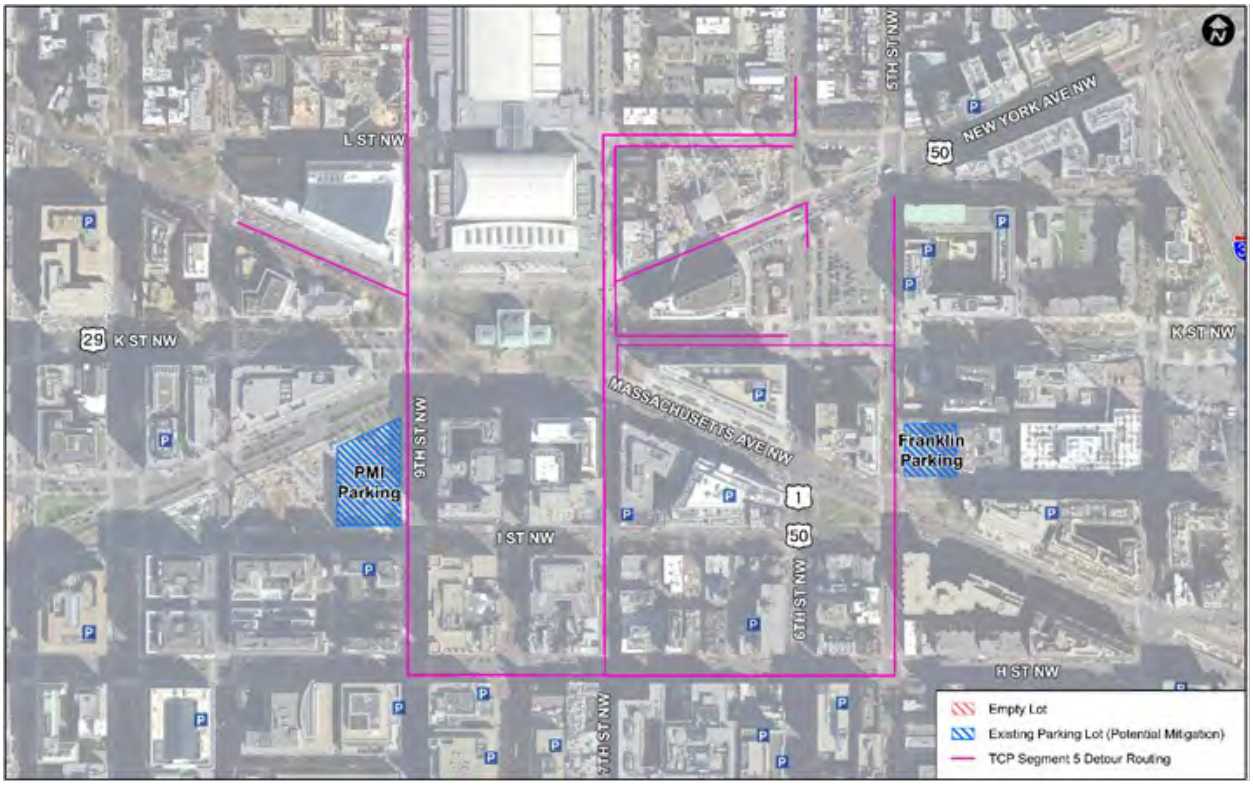
This two-stage segment will reduce on-street parking in the Northwest DC area along NY Avenue, 6th Street, K Street, 5th Street, Massachusetts Avenue, 9th Street, 7th Street, L Street and H Street.

SEGMENT 5 CONCEPTUAL PARKING MITIGATION APPROACH

- Convert Franklin Parking Area at the corner of First and 5th Streets NW to a structured 1 to 2 level parking garage.
  - Could be used to support parking mitigation associated with Segments 3, 4 and 5.
- Additional on-street parking could be utilized just north of NY Avenue along both 6thand L Streets NW.
  - Both on-street parking recommendations would require modifications to current parking restrictions.
- Convert PMI Parking Area located at 900 New York Avenue (corner of I and 9th Streets NW) to a structured 1 to 2 level parking garage.
- Segment 5 also has approximately 17 existing parking garages within walking distance of proposed prohibited parking areas that could be used as supplemental parking during the associated construction closures.

Figure 6 illustrates the proposed Segment 5 detour routes and parking replacement opportunities. The purple lines represent the proposed detour routes where on-street parking would be reduced.

Figure 6: Parking Replacement Opportunities for Segment 5



The proposed mitigations will be reevaluated once the Draft Environmental Impact Statement traffic analysis is available.

The SCMAGLEV operation will require removal of on-street parking on 6th Street between NY Avenue and K Street NW while the proposed SCMAGLEV station headhouse, parking garage, and proposed underground pick-up area are under construction and after the project is complete. 6th Street NW between NY Avenue and K Street NW will become a drop-off area for Transportation Network Companies (TNC) such as UBER and Lyft, taxis, and kiss & rides once the station opens and trains begin service. This section of roadway fronts on a surface parking lot, medical offices, and a new hotel under construction. Segment 5 mitigations could be used as a long-term solution; however, this street segment does not front direct on active commercial or residential use.

2.4 FUTURE 2045 TRANSPORTATION ASSUMPTIONS

This section describes the proposed SCMAGLEV Washington DC station access, trip generation, modal split, and distribution assumptions.

The Washington DC Station future transportation assumptions are based on the ridership forecasts and proposed station access portals. The station would contain three access portals with the main one located between 5th and 6th Streets NW on the south side of NY Avenue. Another portal would be situated on the northwest corner of 7th Street and Mt. Vernon Place NW tucked next to the convention center. A third portal would be situated on the north side of NY Avenue between 3rd and 4th Streets NW and would be designed as a low volume access point primarily serving the neighborhoods to the north and east of the station.

The main drop-off area for taxis, TNCs, and kiss & rides would be along both sides of 6th Street NW between NY Avenue and K Street NW. Kiss & ride, special vans, or other shuttle bus pick-ups would be available through an underground staging area accessible from 6th Street NW between NY Avenue and K Street NW. This staging area would be restricted to pick-ups only. TNCs and taxies would be forbidden to enter. TNCs would be directed to pick-up along 7th Street NW between Mount Vernon Place and L Street NW along the southbound side (Convention Center side). Taxis would continue to use the existing 9th Street taxi stand.

Parking would be available at the station accessible from K Street NW between 5th and 6th Streets NW. Up to 250 parking spaces will be housed underground with a direct underground walking connection to the SCMAGLEV station. Passengers who drive to the DC Station will also have the option to park in other private parking garages surrounding the Mt. Vernon Square area.

Two sets of ridership projections are presented, one for each Baltimore station option. Depending on the Baltimore station location, the ridership projections differ by 10 percent.

2.4.1 RIDERSHIP BASED ON CHERRY HILL STATION OPTION

Tables 2 and 3 provide the 2045 ridership forecasts by travel mode for both access to the station and egress from the station if a Cherry Hill Station in Baltimore is selected. Together these values represent the forecasted inbound (access) and outbound (egress) person trips traveling to and from the SCMAGLEV station. "Other" represents bicycling and walking trips. All daily person trips traveling to and from trains are balanced; therefore, the total daily inbound passengers who would park at the station equal the total daily outbound passengers who parked at the station. Some of the passengers might be returning home from the previous day or departing with plans to return a different day. Either way, the balanced forecasts

account for those scenarios because the forecasts represent daily one-way trips. The forecasts also reflect scenarios where a passenger uses one travel mode to access the station and another to leave the station, for example take a bus to the station, but walk home upon returning to the station.

The ridership forecasts were originally developed for 2025 and 2050. A revised set of forecasts were developed covering 2045 to match the NEPA traffic analysis future year. These forecasts were adjusted from the 2050 forecasts.

Table 2: Washington DC Inbound to Station 2045 Ridership Forecasts (For Cherry Hill Station Option)

Access							
Period	**Drive & Park**	**Kiss & Ride**	**Taxi/ Rideshare**	**Bus**	**Rail**	**Other**	**Total**
Person Trips							
AM	942	696	1,669	179	1,964	273	5,724
PM	547	2,114	3,111	985	2,342	987	10,085
Daily	3,360	5,715	10,040	2,249	8,822	3,129	33,315
Modal Split Percentages							
AM	16%	12%	29%	3%	34%	5%	100%
PM	5%	21%	31%	10%	23%	10%	100%
Daily	10%	17%	30%	7%	26%	9%	100%

Table 3: Washington DC Outbound to Station 2045 Ridership Forecasts (For Cherry Hill Station Option)

Egress							
Period	**Drive & Park**	**Kiss & Ride**	**Taxi/ Rideshare**	**Bus**	**Rail**	**Other**	**Total**
Person Trips							
AM	146	2,696	3,510	1,202	2,082	2,507	12,143
PM	1,264	787	1,547	289	1,331	477	5,694
Daily	3,360	6,213	9,457	2,650	6,893	4,743	33,315
Modal Split Percentages							
AM	1%	22%	29%	10%	17%	21%	100%
PM	22%	14%	27%	5%	23%	8%	100%
Daily	10%	19%	28%	8%	21%	14%	100%

The ridership volumes were projected by modal share for daily trips, morning trips (AM peak period), afternoon trips, evening trips (PM peak period), and overnight trips. The AM and PM peak period trips cover a 4-hr peak period. In order to determine the AM and PM peak hour ridership, MARC train boarding and alighting information at the MARC Halethorpe station near BWI airport in Maryland were utilized to

determine a percentage of the 4-hr peak period ridership that would occur during the peak hour. This percentage was determined to be 36.5% in the AM and 36.4% in the PM. The total Washington DC vehicle trip generation are presented in Table 4 based on Cherry Hill Station option.

Table 4: Washington DC Vehicular 2045 Trip Generation (For Cherry Hill Station Option)

Period	Boarding Peak Period Trips	Boarding Peak Hour Percentage	Boarding Peak Hour Trips	Alighting Peak Period Trips	Alighting Peak Hour Percentage	Alighting Peak Hour Trips
AM	3,307	36.5%	1,207	6,352	36.5%	2,318
PM	5,771	36.4%	2,101	3,598	36.4%	1,310

The vehicle trip generation must be split based on the travel mode and appropriate drop/off, pick-up, and garage options.

Trip distribution was developed through the ridership model based on inter-regional transportation zones used by the I-95 Corridor Coalition travel demand model called ICAT or integrated Corridor Analysis Tool zones. These inter-regional zones are larger than the Washington and Baltimore maintained regional travel demand model Transportation Analysis zones (TAZ); therefore, special ridership tables were developed to connect the ICAT zone data to the Washington and Baltimore travel demand model TAZs. Detailed tables will be provided that contain ridership forecasts by travel demand model zones to cover the origin/destination trip distribution for passengers using the Washington DC station.

2.4.2 RIDERSHIP BASED ON CAMDEN YARDS STATION OPTION

Tables 5 and 6 provide the 2045 ridership forecasts by travel mode for both access to the station and egress from the station if a Camden Yards Station in Baltimore were selected. Section 2.4.1 provides more detail regarding the ridership forecasts.

Table 5: Washington DC Inbound to Station 2045 Ridership Forecasts (For Camden Yards Station Option)

Access							
Period	**Drive & Park**	**Kiss & Ride**	**Taxi/ Rideshare**	**Bus**	**Rail**	**Other**	**Total**
Person Trips							
AM	1,077	783	1,886	201	2,228	310	6,484
PM	613	2,330	3,440	1,086	2,594	1,088	11,151
Daily	3,769	6,284	11,092	2,471	9,762	3,466	36,844
Modal Split Percentages							
AM	17%	12%	29%	3%	34%	5%	100%
PM	5%	21%	31%	10%	23%	10%	100%
Daily	10%	17%	30%	7%	26%	9%	100%

Table 6: Washington DC Outbound to Station 2045 Ridership Forecasts (For Camden Yards Station Option)

Egress							
Period	**Drive & Park**	**Kiss & Ride**	**Taxi/ Rideshare**	**Bus**	**Rail**	**Other**	**Total**
Person Trips							
AM	162	2,954	3,853	1,310	2,274	2,800	13,351
PM	1,433	882	1,738	323	1,490	539	6,406
Daily	3,768	6,842	10,443	2,905	7,583	5,303	36,844
Modal Split Percentages							
AM	1%	22%	29%	10%	17%	21%	100%
PM	22%	14%	27%	5%	23%	8%	100%
Daily	10%	19%	28%	8%	21%	14%	100%

Following the same procedures followed for the Washington DC SCMAGLEV station based on the Cherry Hill Station option (Section 2.4.1), the total Washington DC vehicle trip generation are presented in Table 7 based on Camden Yards Station option.

Table 7: Washington DC 2045 Vehicular Trip Generation (For Camden Yards Station Option)

Peak Period	Boarding Peak Period Trips	Boarding Peak Hour Percentage	Boarding Peak Hour Trips	Alighting Peak Period Trips	Alighting Peak Hour Percentage	Alighting Peak Hour Trips
AM	3,745	36.5%	1,367	6,968	36.5%	2,543
PM	6,383	36.4%	2,323	4,054	36.4%	1,476

The vehicle trip generation must be split based on the travel mode and appropriate drop/off, pick-up, and garage options. Detailed tables will be provided that contain ridership forecasts by travel demand model zones (see Section 2.4.1 for more details) to cover the origin/destination trip distribution for passengers using the Washington DC station.

Roadway and pedestrian improvements are proposed as part of the SCMAGLEV Washington DC station development. These include the following:

- Upgrading 6th Street NW to an active drop-off area between NY Avenue and K Street NW
- Creating a universal TNC pick-up area along the southbound side of 7th Street NW serving Mount Vernon Square area
- Constructing a pedestrian tunnel under 7th Street to connect the convention center, TNC pick-up area, and taxi pick-up area.

Refer to Washington DC Station Site Civil Drawings to view access locations.

3. BWI AIRPORT SCMAGLEV STATION

3.1 INTRODUCTION

This section describes the SCMAGLEV BWI Airport Station construction plan and transportation assumptions.

3.2 CONSTRUCTION PLAN (PARKING AND MOT)

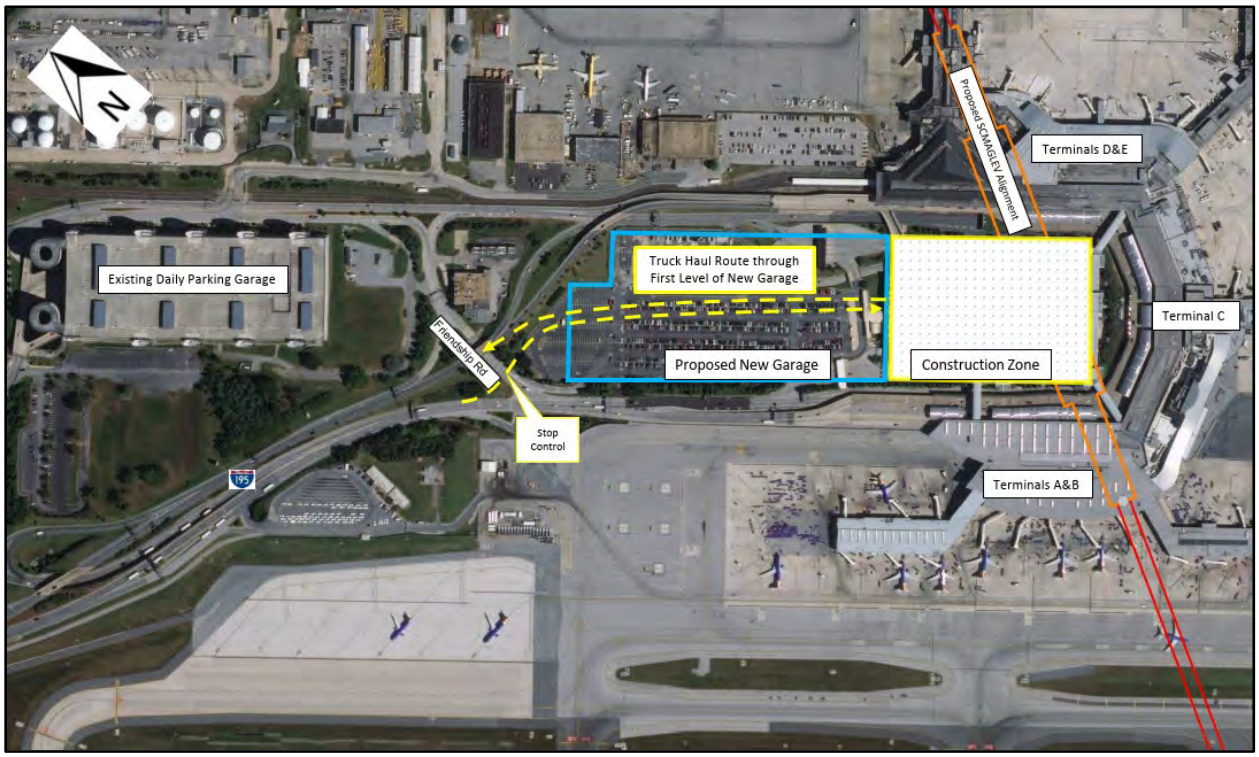
The SCMAGLEV station at BWI airport will be an underground station. The existing hourly parking garage in the center of the terminal will be demolished to accommodate slurry wall braced, top-down construction of the station. A new Ground Transportation Center (GTC) and hourly garage facility will be built above the station.

The work will be completed over eight stages of construction:

- Stage 1: Relocation of existing employee parking
- Stage 2: Construction of hourly garage in the location of former existing employee parking lot, northwest of the existing hourly parking garage
- Stage 3: Construction of permanent enclosed permanent pedestrian viaducts from the new garage to Terminals A/B and E
- Stage 4: Demolition of the existing hourly parking garage
- Stage 5: Construction of the SCMAGLEV station
- Stage 6: Construction of a pedestrian tunnel passage between the SCMAGLEV station and Terminals A/B and E
- Stage 7: Construction of a GTC on top of the SCMAGLEV station
- Stage 8: Construction of a new hourly garage on top of the newly constructed ground transportation center

The proposed construction plan for the SCMAGLEV station at BWI airport is shown in the figure below. It consists of building a new parking garage over the existing employee parking lot, which will be used while the location of the existing garage is demolished and becomes the construction zone. The truck access for the station construction zone will include a truck haul route accessed through the first level of the proposed garage, accessed from I-195. Prior to the opening of the truck haul route, two short temporary access roads (shown in yellow) will be constructed at the western side of the new garage to facilitate egress and ingress to/from the truck haul route and I-195. Station construction traffic will be controlled in such a way that construction traffic will not circulate past the terminal entrances. Figure 7 illustrates the proposed construction plan.

Figure 7: BWI Proposed Construction Plan

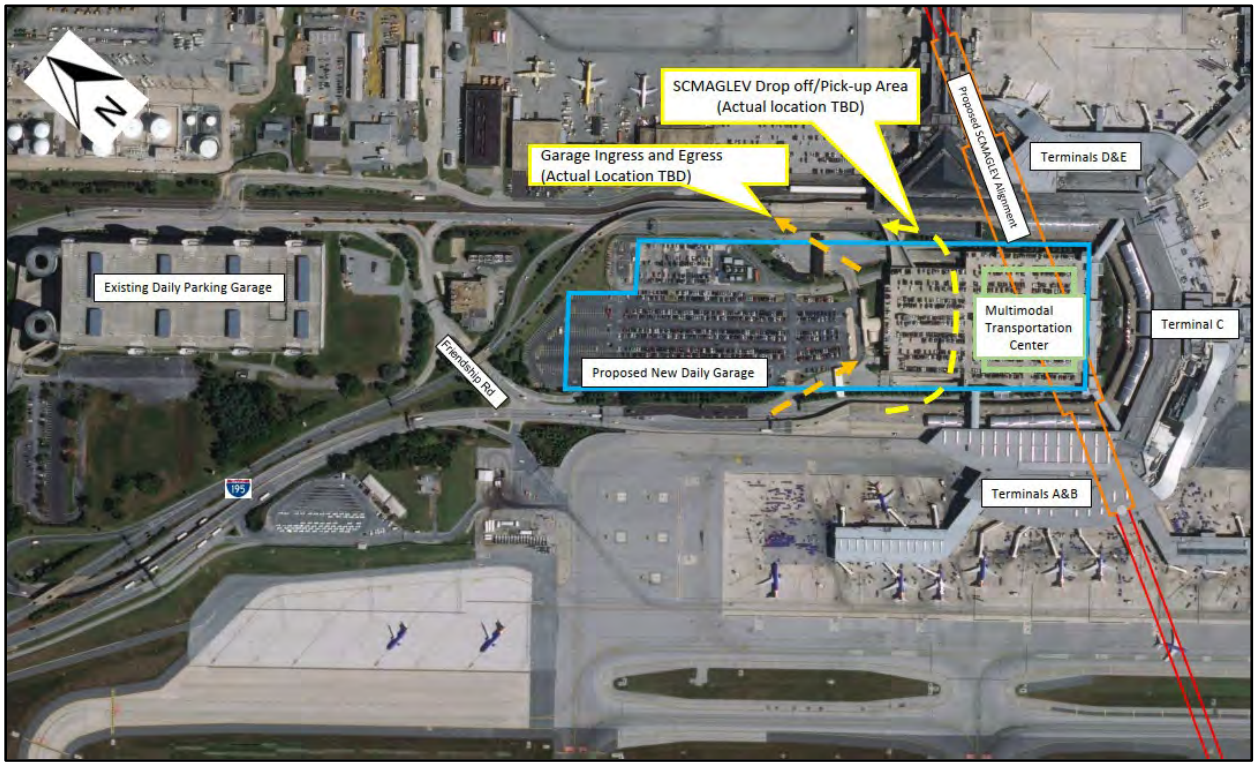


3.3 FUTURE 2045 TRANSPORTATION ASSUMPTIONS

This section describes the proposed SCMAGLEV BWI station access, trip generation, modal split, and distribution assumptions.

The BWI Station future transportation assumptions are based on the ridership forecasts and proposed station access points. The main access point for taxis, TNCs, and kiss & rides would be a new drop-off/pick-up area to the northwest of the proposed BWI Ground Transportation Center. The pick-up/drop-off area would be connected to the airport loop roadway serving the airport terminals. The design of those connections is not specified at this point because Maryland Aviation Administration (MAA) plans to incorporate them into their long-term plans to upgrade the airport roadway system and construct a new expanded hourly garage. Access points within the airport terminals would include pedestrian tunnels between Terminals A/B, C (already exists), and D/E. The proposed newly constructed hourly garage replacing the existing employee parking lot and proposed reconstructed existing hourly garage on top of the GTC will provide direct access to the SCMAGLEV station via pedestrian passages. Both hourly garages would house more than the 5,000 parking spaces and serve SCMAGLEV passenger and short-term airport parking needs. Passengers would also have the option to use the Daily Garage or other long-term parking facilities surrounding the airport. Figure 8 illustrates the proposed new SCMAGLEV Station plan.

Figure 8: BWI Station Plan



Two sets of ridership projections are presented, one for each Baltimore station option. Depending on the Baltimore station location, the ridership projections differ.

3.3.1 RIDERSHIP BASED ON CHERRY HILL STATION OPTION

Tables 8 an 9 provide the 2045 ridership forecasts by travel mode for both access to the station and egress from the station if a Cherry Hill Station in Baltimore were selected. Section 2.4.1 provides more detail regarding the ridership forecasts.

Table 8 BWI Airport Inbound to Station Ridership Forecasts (For Cherry Hill Station Option)

Access							
Period	**Drive & Park**	**Kiss & Ride**	**Taxi/ Rideshare**	**Bus**	**Rail**	**Other**	**Total**
Person Trips							
AM	2,834	674	893	121	529	635	5,686
PM	448	572	1,050	47	173	600	2,890
Daily	5,952	2,669	4,425	285	1,172	3,046	17,549
Modal Split Percentages							
AM	50%	12%	16%	2%	9%	11%	100%
PM	15%	20%	36%	2%	6%	21%	100%
Daily	34%	15%	25%	2%	7%	17%	100%

Table 9 BWI Airport Outbound to Station Ridership Forecasts (For Cherry Hill Station Option)

Egress							
Period	**Drive & Park**	**Kiss & Ride**	**Taxi/ Rideshare**	**Bus**	**Rail**	**Other**	**Total**
Person Trips							
AM	97	606	1,153	35	124	887	2,900
PM	2,593	439	731	45	184	493	4,485
Daily	5,951	2,595	4,700	189	729	3,384	17,549
Modal Split Percentages							
AM	3%	21%	40%	1%	4%	31%	100%
PM	58%	10%	16%	1%	4%	11%	100%
Daily	34%	15%	27%	1%	4%	19%	100%

Following the same procedures followed for Washington DC SCMAGLEV station (Section 2.4.1), the total BWI Airport trip generation are presented in Table 10 based on Cherry Hill Station option.

Table 10: BWI Airport Vehicular Trip Generation (For Cherry Hill Station Option)

Peak Hour	Boarding Peak Period Trips	Boarding Peak Hour Percentage	Boarding Peak Hour Trips	Alighting Peak Period Trips	Alighting Peak Hour Percentage	Alighting Peak Hour Trips
AM	4,401	36.5%	1,606	1,855	36.5%	677
PM	2,070	36.4%	754	3,763	36.4%	1,370

The vehicle trip generation must be split between the garage for passengers driving to the station to park and the drop-off/pick-up area for taxis, TNCs, and kiss & rides. Detailed tables will be provided that contain ridership forecasts by travel demand model zones (see Section 2.4.1 for more details) to cover the origin/destination trip distribution for passengers using the BWI Airport station.

3.3.2 RIDERSHIP BASED ON CAMDEN YARDS STATION OPTION

Tables 11 and 12 provide the 2045 ridership forecasts by travel mode for both access to the station and egress from the station if a Camden Yards Station in Baltimore were selected. Section 2.4.1 provides more detail regarding the ridership forecasts.

Table 11 BWI Airport Inbound to Station Ridership Forecasts (For Camden Yards Station Option)

Access							
Period	Drive & Park	Kiss & Ride	Taxi/ Rideshare	Bus	Rail	Other	Total
Person Trips							
AM	2,737	636	850	139	589	649	5,600
PM	446	553	1,025	57	201	645	2,926
Daily	5,868	2,593	4,324	332	1,322	3,210	17,649
Modal Split Percentages							
AM	49%	11%	15%	2%	11%	12%	100%
PM	15%	19%	35%	2%	7%	22%	100%
Daily	33%	15%	24%	2%	7%	18%	100%

Table 12 BWI Airport Outbound to Station Ridership Forecasts (For Camden Yards Station Option)

Egress							
Period	**Drive & Park**	**Kiss & Ride**	**Taxi/ Rideshare**	**Bus**	**Rail**	**Other**	**Total**
Person Trips							
AM	99	611	1,164	42	142	951	3,008
PM	2,506	413	695	51	200	508	4,373
Daily	5,868	2,538	4,622	218	806	3,596	17,649
Modal Split Percentages							
AM	3%	20%	39%	1%	5%	32%	100%
PM	57%	9%	16%	1%	5%	12%	100%
Daily	33%	14%	26%	1%	5%	20%	100%

Following the same procedures followed for Washington DC SCMAGLEV station (Section 2.4.1), the total BWI Airport trip generation are presented in Table 13 based on Camden Yards Station option.

Table 13: BWI Airport Vehicular Trip Generation (For Camden Yards Station Option)

Peak Hour	Boarding Peak Period Trips	Boarding Peak Hour Percentage	Boarding Peak Hour Trips	Alighting Peak Period Trips	Alighting Peak Hour Percentage	Alighting Peak Hour Trips
AM	4,224	36.5%	1,542	1,873	36.5%	684
PM	2,023	36.4%	737	3,614	36.4%	1,315

The trip generation must be split between the garage for passengers driving to the station to park and the drop-off/pick-up area for taxis, TNCs, and kiss & rides. Detailed tables will be provided that contain ridership forecasts by travel demand model zones (see Section 2.4.1 for more details) to cover the origin/destination trip distribution for passengers using the BWI Airport station.

Roadway and pedestrian improvements are proposed as part of the SCMAGLEV BWI Airport station development, but at a high level to avoid interfering with the MAA plans to upgrade the airport roadway systems as part of their master plan. These include the following:

- Creating looping ramps that connects the SCMAGLEV pick-up/drop-off area to the airport loop roadway
- Creating underground pedestrian tunnels between SCMAGLEV station and Terminals A/B and D/E
- Creating pedestrian connections between the future daily garage and SCMAGLEV station

Refer to BWI Airport Station Site Civil Drawings to view access locations.

4. BALTIMORE SCMAGLEV STATION - CAMDEN YARDS OPTION

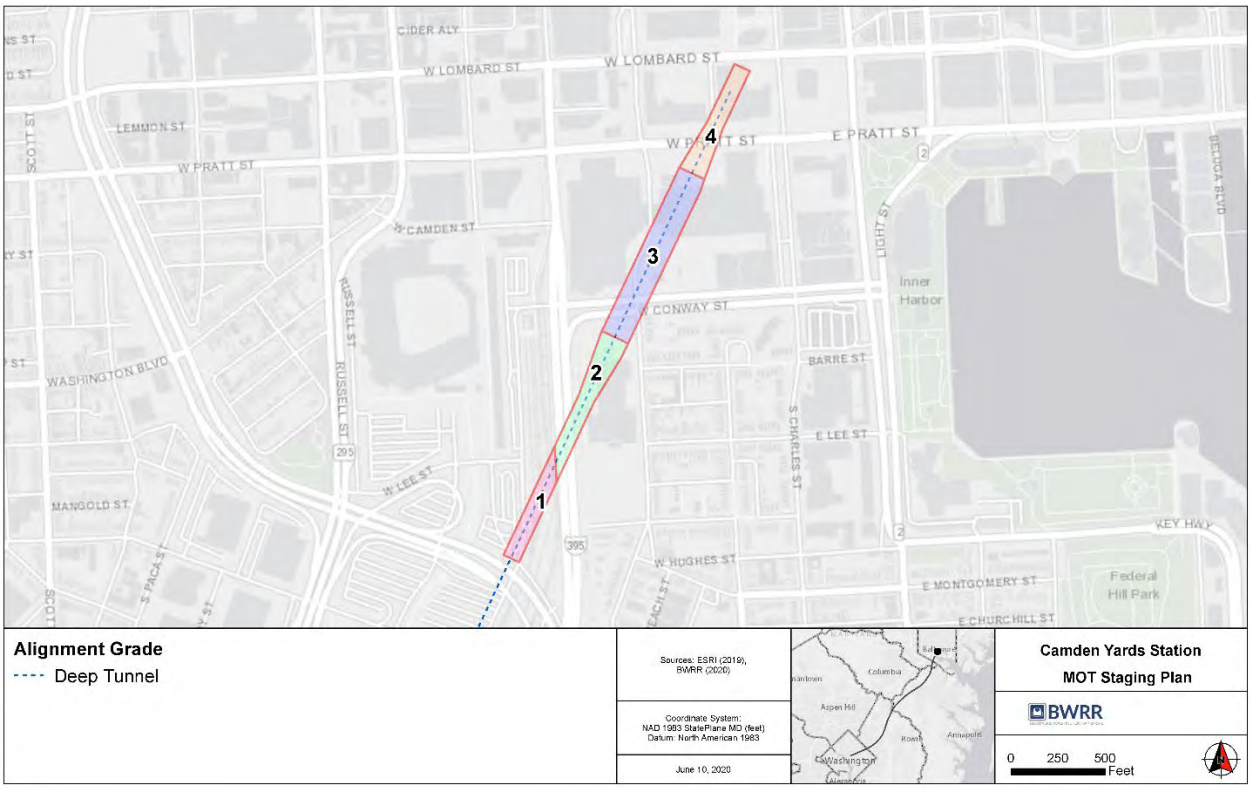
4.1 INTRODUCTION

This section describes the Camden Yards SCMAGLEV traffic control plan, construction issues, and transportation assumptions.

4.2 TRAFFIC CONTROL PLAN

The Camden Yards SCMAGLEV station alternative in Baltimore is an underground station located under Howard Street, Martin Luther King (MLK) Jr. Boulevard, Conway Street, and Pratt Street. The Station will be constructed using top down construction and will take place over four segments (Figure 9).

Figure 9: Baltimore Camden Yards Four Construction Staging Segments



Each of the segments is comprised of a minimum of two stages. To reduce the duration of construction and accelerate construction, concurrent work is proposed for:

- Segment 1 and Segment 4
- Segment 3 and Segment 4
- Segment 2 and Segment 3

Table 14 contains a summary of the Camden Yards station MOT Segment schedule. Traffic will re-open for each segment upon completion of these construction activities. Construction is estimated to conclude after approximately 50 months.

Table 14: Camden Yards Station MOT Segment Schedule Summary

Segment	Stage	Construction Duration in Months	Construction Hours	Notes:
1	1	18	7AM-4PM	Night work with approval from BCDOT
2	1	10	7AM-4PM	Night work with approval from BCDOT
2	2	10	7AM-4PM	Night work with approval from BCDOT
3	1	8	7AM-4PM	Night work with approval from BCDOT
3	2	8	7AM-4PM	Night work with approval from BCDOT
3	3	8	7AM-4PM	Night work with approval from BCDOT
4	1	8	7AM-4PM	Night work with approval from BCDOT
4	2	8	7AM-4PM	Night work with approval from BCDOT
4	3	8	7AM-4PM	Night work with approval from BCDOT

BCDOT: Baltimore City Department of Transportation

4.2.1 SEGMENT ONE

Station construction during Segment 1 will be on the CSX railway, MARC Commuter Rail, and MTA Light RailLink lines between MLK Jr. Boulevard and I-395 to install the slurry walls and excavate the southern portion of the Camden SCMAGLEV Station. Because of the cut and cover construction method required to construct the station box, these rail lines will be closed during Segment one construction. Shuttle bus service will be provided for the MARC Commuter Rail and MTA Light RailLink to transport passengers past the construction area. Discussions with CSX will be necessary to develop an alternative to trains traveling through the Howard Street Tunnel.

4.2.2 SEGMENT TWO

Station construction during Segment 2-Stage 1 will be on northbound I-395 between MLK Jr. Boulevard and Howard Street to install the slurry walls and excavate the portion of the Camden SCMAGLEV Station. Northbound I-395 traffic will be detoured via MLK Jr. Boulevard and W. Pratt Street. Southbound I-395 traffic will be maintained. Refer to sheet TCP-49.

Station construction during Segment 2-Stage 2 will be on southbound I-395 between MLK Jr. Boulevard and Howard Street to install the slurry walls and excavate a portion of the Camden Station. The Southbound I-395 traffic will need to crossover to the northbound I-395 lanes between MLK Jr. Boulevard and Conway Street. Prior to this lane shift, the existing I-395 raised median will need to be removed at the transitions in order to install median pavement that will allow the crossover. Northbound I-395 traffic will continue to be detoured via MLK Jr. Boulevard and W. Pratt Street. Refer to sheet TCP-50.

4.2.3 SEGMENT THREE

Station construction during Segment 3-Stage 1 will be on eastbound Conway Street between I-395/Howard Street and Charles Street to install the slurry walls and excavate a portion of the Camden Station. Eastbound Conway Street traffic will be detoured via northbound Howard Street and eastbound W. Pratt Street. Northbound S. Sharp Street will be closed between W. Pratt and Conway Streets; therefore, S. Sharp Street traffic will be detoured via eastbound W. Hill Street, southbound S. Hanover Street, eastbound W. Montgomery Street, and northbound Charles Street. Refer to sheet TCP-51.

Station construction during Segment 3-Stage 2 will be on westbound Conway Street between Charles Street and I-395/Howard Street to construct the slurry walls and excavate the Camden Station. Eastbound Conway Street traffic will continue to be detoured via northbound Howard Street and eastbound W. Pratt Street. Westbound Conway Street traffic will crossover to the eastbound Conway Street lanes at the Charles Street intersection. Traffic will crossover back to the westbound lanes prior to the Howard Street/I-395 intersection. Southbound S. Sharp Street traffic at the W. Pratt Street and S. Sharp Street intersection will be detoured via eastbound W. Pratt Street, southbound Light Street and westbound Conway Street. Northbound S. Sharp Street will be limited to left turn only movement at the Conway Street intersection. Prior to the lane shift onto the crossover, temporary median base-widening will be performed to accommodate the shift. Refer to sheet TCP-52.

Station construction during Segment 3-Stage 3 will be on Sharp Street between W. Pratt Street and Conway Street to construct the slurry walls and excavate the Camden Station. Southbound Sharp Street traffic will be detoured via eastbound W. Pratt Street, southbound Light Street, and westbound Conway Street. Refer to sheet TCP-53.

4.2.4 SEGMENT FOUR

Station construction during Segment 4-Stage 1 will be on the two south lanes of W. Pratt Street between Sharp and Light Street to partially construct the slurry walls and excavate the Camden Station. During Segment 4-Stage 2, the work zone shifts to the two north lanes of W. Pratte Street between Sharp and Light Streets to complete the slurry walls and exaction for the Camden Station. Local traffic will be allowed onto Hanover Street beyond Lombard Street. Southbound Hanover Street will be detoured via westbound Lombard Street, southbound Hopkins Place, and eastbound W. Pratt Street. Northbound Hanover Street traffic will be detoured via eastbound W. Pratt Street, northbound Charles Street, and westbound Lombard Street. Two lanes of traffic on W. Pratt Street will be maintained at all times during Segment 4, Stages 1 and 2. Refer to sheets TCP-54 to TCP-55.

Station construction during Segment 4-Stage 3 will be on Hanover Street between Lombard Street and W. Pratt Street to construct the slurry walls and excavate the Camden Station. Local traffic will be allowed onto Hanover Street beyond Lombard Street. Southbound Hanover Street will be detoured via westbound Lombard Street, southbound Hopkins Place, and eastbound W. Pratt Street. Northbound Hanover Street traffic will be detoured via eastbound W. Pratt Street, northbound Charles Street, and westbound Lombard Street. Refer to sheet TCP-56.

4.3 CONSTRUCTION ISSUES

The construction process presents serious concerns that are not readily quantifiable. This corridor contains major freight and passenger rail services, and is the primary gateway into Baltimore City's central business district. Major downtown buildings will be either partially or fully demolished during construction. The Baltimore Inner Harbor economy, other planned projects, and stadium traffic could be affected.

4.3.1 FREIGHT AND PASSENGER SERVICES

The construction would include an 18-month closure of the CSX rail freight line, and MTA Light Rail and MARC Camden passenger lines. The CSX rail Howard Street tunnel, a major freight line for CSX, will not be accessible from the southside, thus disrupting the CSX northeast regional freight movements. Passenger service including MTA's Light RailLink, MARC Camden rail service, commuter bus service, and other locally operated transit systems (LOTS) will also be disrupted. The construction could also reduce parking serving the existing Camden Station.

Between the freight and passenger service closures, a limited shutdown of this magnitude would compromise passenger and freight activity along the East Coast and influence a regional economy that annually generates nearly $3 trillion in gross domestic product. Over 350,000 carloads of goods annually travel through this corridor and will influence both regional and local economic drivers, including the Port of Baltimore and other key intermodal transport generators. The flow of passenger rail travel through this area means hobbling an intercity rail line serving over 750,000 daily passengers.

4.3.2 GATEWAY TO BALTIMORE CENTRAL BUSINESS DISTRICT

The closure of I-395, Conway Street, and Pratt Street, the gateway to Baltimore's City's central business district, will divert traffic onto MLK Jr. Boulevard. A long-term closure of eastbound Conway Street will divert all traffic onto alternate roadways and result in large traffic delays and queueing. The roads in this area, specifically I-395, MLK Jr. Boulevard, and Conway Street are all very heavily traveled roadways, especially in the AM and PM peak hours. Table 15 summarizes the gateway roadways and their traffic characteristics. As shown, both Northbound I-395 and Eastbound Conway Street have high Annual Average Daily Traffic (AADT) and high peak hour traffic. Historic traffic shows that there is existing queueing and congestion on these roadways during the peak hours according to the Baltimore Metropolitan Council Traffic Count Database. Full closure of Northbound I-395 or Eastbound Conway Street is expected to increase delay and queueing beyond the existing congested levels on the surrounding roadways.

Table 15: Traffic Volume by Roadway

Roadway	Functional Class	# Lanes (directional)	AADT (two way)	AM peak volume (directional)	PM peak volume (directional)
I-395 Northbound	Urban Interstate	2	60,022	2,427	1,669
Conway St (Eastbound)	Urban Principal Arterial Other	3	36,681	2,055	1,413
MLK Blvd (Northbound)	Urban Principal Arterial Other	3	12,381	2.193	1.527
W. Pratt St (Eastbound)	Urban Principal Arterial Other	4	9,650	1,482	1,371

Source: Baltimore Metropolitan Council Traffic Count Database

4.3.3 BUILDING DEMOLITIONS

Several buildings will require full or partial demolition. These buildings include the following:

- Partial Demolition
  - Federal Reserve Bank (~20,000 SF) including parking
  - Multi-level Baltimore Convention Center (~60,000 SF per level)
- Full Demolition
  - Historic Old Otterbein Church (~5,000 SF)
  - 17-story Bank of America building and its associated multi-level underground parking garage
  - 8-story U.S. Courthouse

— Underground parking garage and access to the Convention Center, which is accessible via a ramp in the median of Conway Street

4.3.4 BALTIMORE ECONOMY, PLANNED PROJECTS, AND STADIUMS

The severity of a downward change to economic activity in the Inner Harbor area (for example, lost wages, sports and entertainment revenue, tourism revenue) due to the combination of construction, traffic, and transit disruptions would require additional study. Planned traffic detours would also affect residential activity in the Otterbein, Federal Hill, and Sharp-Leadenhall neighborhoods. Any roadway and infrastructure improvements already planned by the City of Baltimore would be disrupted and would require additional coordination that can potentially delay the initiation of construction for this project. The construction will also cause disruption to both Oriole Park at Camden Yards and M&T Bank Stadium access and parking lots. Parking options during events at the stadiums are currently limited; additional disruptions to sizable lots will create severe logistical problems to access stadium events and cause additional traffic congestion and queueing on event days during much of the year.

4.4 FUTURE 2045 TRANSPORTATION ASSUMPTIONS

This section describes the proposed SCMAGLEV Camden Yards station access, trip generation, modal split, and distribution assumptions.

The Camden Yard Station future transportation assumptions are based on the ridership forecasts and two proposed station access portals. An access portal would be provided along the southbound side of E. Pratt Street between S. Hanover and S. Charles Streets. A second access portal would be situated along the northside of Conway Street hallway between S. Sharp and S. Charles Streets, in place of an existing surface parking lot. Two garages would be constructed housing up to 4,000 parking spaces on the northside of E. Pratt Street between Hopkins Place and S. Charles Street. Access to the garages would be along S. Hanover Street. Pick-up and drop-off areas for TNCs, taxi's, and kiss & rides would be available at both access portals (E. Pratt and Conway Streets). Additional parking is available surrounding the station on S. Charles, S. Light, and S. Calvert Streets.

Tables 16 and 17 provide the 2045 ridership forecasts by travel mode for both access to the station and egress from the station. Section 2.4.1 provides more detail regarding the ridership forecasts.

Table 16 Camden Yards Inbound to Station Ridership Forecasts

Access							
Period	**Drive & Park**	**Kiss & Ride**	**Taxi/ Rideshare**	**Bus**	**Rail**	**Other**	**Total**
Person Trips							
AM	3,125	595	665	674	3,052	451	8,562
PM	502	567	995	337	1,203	462	4,066
Daily	6,190	2,353	3,518	1,825	7,356	2,029	23,271
Modal Split Percentages							
AM	36%	7%	8%	8%	36%	5%	100%
PM	12%	14%	24%	8%	30%	11%	100%
Daily	27%	10%	15%	8%	32%	9%	100%

Table 17 Camden Yards Outbound to Station Ridership Forecasts

Egress							
Period	**Drive & Park**	**Kiss & Ride**	**Taxi/ Rideshare**	**Bus**	**Rail**	**Other**	**Total**
Person Trips							
AM	99	697	1,275	350	1,072	761	4,254
PM	3,189	587	856	421	1,698	512	7,262
Daily	6,190	2,715	4,477	1,604	5,712	2,573	23,271
Modal Split Percentages							
AM	2%	16%	30%	8%	25%	18%	100%
PM	44%	8%	12%	6%	23%	7%	100%
Daily	27%	12%	19%	7%	25%	11%	100%

Following the same procedures followed for Washington DC SCMAGLEV station (Section 2.4.1), the total Camden Yards trip generation are presented in Table 18.

Table 18: Camden Yards Trip Generation

Peak Hour	Boarding Peak Period Trips	Boarding Peak Hour Percentage	Boarding Peak Hour Trips	Alighting Peak Period Trips	Alighting Peak Hour Percentage	Alighting Peak Hour Trips
AM	4,385	36.5%	1,601	2,070	36.5%	756
PM	2,065	36.4%	751	4,631	36.4%	1,686

The trip generation must be split between the two station access portals. Detailed tables will be provided that contain ridership forecasts by travel demand model zones (see Section 2.4.1 for more details) to cover the origin/destination trip distribution for passengers using the Camden Yards station.

Roadway improvements are not proposed as part of the SCMAGLEV Camden Yards station development other than providing access to the new garages along S Hanover Street, access to the E Pratt Street station portal and access to the Conway Street station portal.

Refer to Camden Yards Station Option Site Civil Drawings to view access locations.

5. BALTIMORE SCMAGLEV STATION - CHERRY HILL OPTION

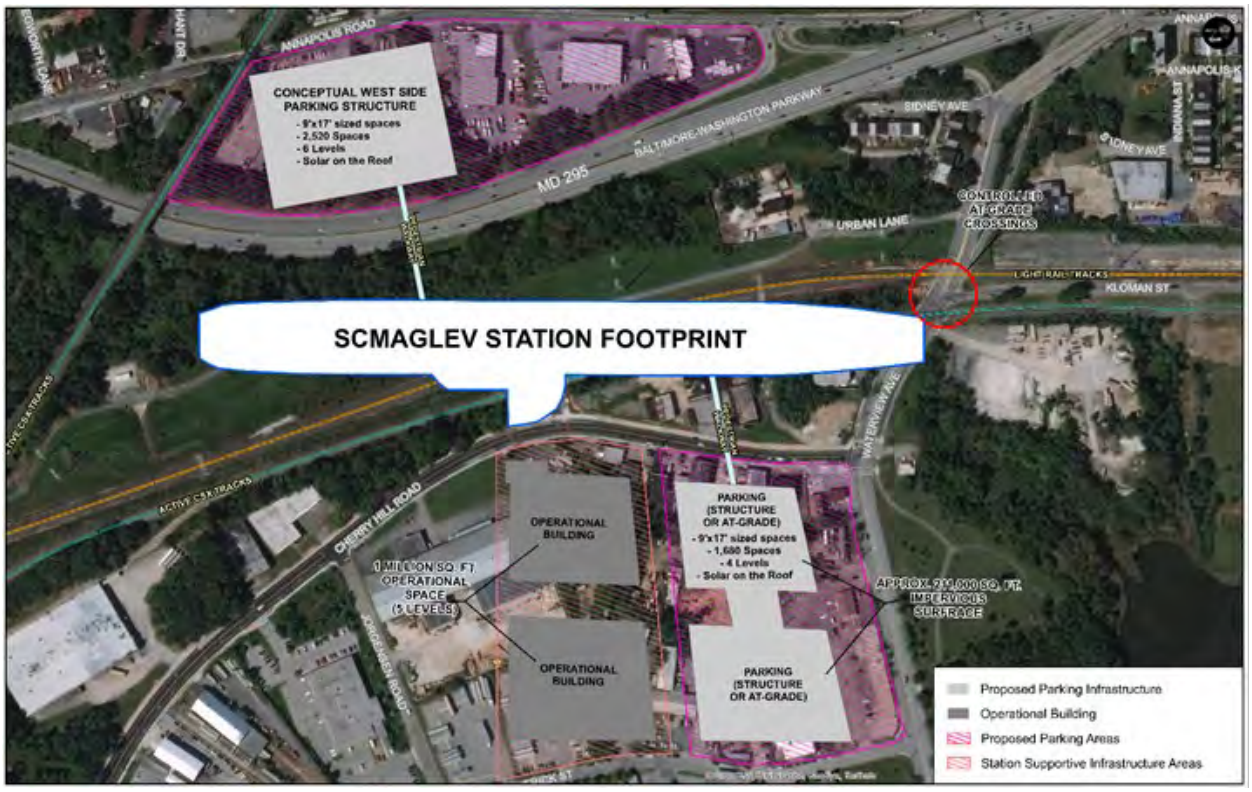
5.1 INTRODUCTION

This section describes the SCMAGLEV Cherry Hill Station traffic control plan, transportation assumptions, roadway improvements, and proposed garages.

5.2 TRAFFIC CONTROL PLAN

The Cherry Hill SCMAGLEV station alternative in Baltimore is elevated and crosses over an existing CSX railroad track and MTA light RailLink station with two tracks. The SCMAGLEV station will require modifications to local roadway and temporary traffic disruptions to W. Patapsco Avenue, Annapolis Road, Cherry Hill Road, and Waterview Avenue during construction. Two new multi-level parking garages will be constructed adjacent to the station, one to the east across from Cherry Hill Road, and one to the west across from MD 295. The east garage will connect to the station via an elevated pedestrian bridge over Cherry Hill Road. The west garage will connect to the station via an elevated pedestrian bridge over MD-295. Figure 10 illustrates the proposed Cherry Hill Station garages and station footprint.

Figure 10: West Side Parking Facility



Each of the segments is comprised of a minimum of two stages. To reduce the duration of construction, concurrent work is proposed for:

— Annapolis Road Stage 1, Waterview Avenue Stage 1, and Cherry Hill Road Stage 1
— Annapolis Road Stage 1, Waterview Avenue Stage 2, and Cherry Hill Road Stage 1

Table 19 contains a summary of the Cherry Hill station MOT Segment schedule.

Table 19: Washington DC Station MOT Segment Schedule Summary

Segment	Stage	Construction Duration in Months	Construction Hours	Notes:
Annapolis Road	1	30	Off-peak and Overnight	24-hour work with approval from BCDOT
Waterview Avenue	1	30	Off-peak and Overnight	24-hour work with approval from BCDOT
Waterview Avenue	2	30	Overnight	Overnight work with approval from BCDOT
Cherry Hill Road	1	30	Off-peak and Overnight	24-hour work with approval from BCDOT

5.2.1 ANNAPOLIS ROAD (EITHER ALIGNMENT ALTERNATIVE)

Annapolis Road will be closed south of W. Patapsco Avenue to Daisy Avenue and north of W. Patapsco Avenue to approximately 800-ft north to adjust the profile of Annapolis Road. Annapolis Road traffic south of the W. Patapsco Avenue intersection will be detoured via Daisy Avenue, Lansdowne Road, Washington Boulevard, and W. Patapsco Avenue. Annapolis Road traffic north of W. Patapsco Avenue will be temporarily re-routed around the work zone through the Patapsco Plaza Shopping Center. The re-route will require outside shoulder base-widening along the northbound shoulder of Annapolis Road prior to the road closure. Refer to sheet TCP-44.

5.2.2 CHERRY HILL ROAD – ERIK STREET – JORGENSEN ROAD (EITHER ALIGNMENT ALTERNATIVE)

Cherry Hill Road will be closed between Waterview Avenue and Jorgensen Road, and Erick Street and Jorgensen Road will be closed entirely. Traffic will be detoured via Waterview Avenue, Potee Street, and Cherry Hill Road. Only construction equipment will be permitted to use Erick Street, Jorgensen Road, and Cherry Hill Road. Refer to sheet TCP-48. Further analysis will need to be done with regards to pedestrian access to Waterview Avenue and accessing existing properties during construction.

5.2.3 WATERVIEW AVENUE (EITHER ALIGNMENT ALTERNATIVE)

Waterview Avenue will be closed in two stages.

For the first stage, Waterview Avenue will be closed between Cherry Hill Road and the MTA Light RailLink tracks. Prior to the Waterview Avenue road closure, a temporary a bypass road will be constructed to the north of Waterview Avenue. When the bypass road is no longer feasible due to station construction, a detour will be put in place. Waterview Avenue west of the road closure will be detoured via Annapolis Road, W. Patapsco Avenue, Potee Street and S. Hanover Street. Waterview Avenue east of the road closure will be detoured via Potee Street, W. Patapsco Avenue, and Annapolis Road. Refer to sheet TCP-46.

For the second stage, one lane will be closed in each direction along Waterview Avenue at the intersections of Sidney Avenue and Erick Street to install a new traffic signal at each location. Access to Sidney Avenue and the off-ramp from northbound MD 295 to Waterview Avenue will be maintained during construction. Refer to sheet TCP-47.

5.3 FUTURE 2045 TRANSPORTATION ASSUMPTIONS

This section describes the proposed SCMAGLEV proposed station access, trip generation, modal split, and distribution assumptions; and the proposed Cherry Hill roadway improvements to mitigate the additional traffic attracted to the area.

The Cherry Hill Station future transportation assumptions are based on the ridership forecasts in Table 22 and proposed roadway improvements connecting MD 295 to the east and west side of the Station. Together the east and west access would provide approximately 4,000 parking spaces.

The east side access consists of a four-panel grid-like street network with proposed buildings within each of the panels. Two of them would operate as garages that can store approximately 750 parking spaces and the other two buildings would house SCMAGLEV operation space. The east side site would also provide a pick-up and drop-off area for TNCs, taxi's, kiss & rides, and space for a shuttle or other local MTA bus. The west side access consists of a parking garage that can store approximately 2,500 passenger vehicles. A pick-up/drop-off area would be provided to serve TNCs, taxis, and kiss & rides.

Tables 20 and 21 provide the 2045 ridership forecasts by travel mode for both access to the station and egress from the station. Section 2.4.1 provides more detail regarding the ridership forecasts.

Table 20 Cherry Hill Inbound to Station Ridership Forecasts

Access							
Period	**Drive & Park**	**Kiss & Ride**	**Taxi/ Rideshare**	**Bus**	**Rail**	**Other**	**Total**
Person Trips							
AM	2,633	526	574	537	2,679	230	7,178
PM	363	475	823	280	1,110	244	3,296
Daily	4,919	1,968	2,879	1,546	6,908	985	19,205
Modal Split Percentages							
AM	37%	7%	8%	7%	37%	3%	100%
PM	11%	14%	25%	9%	34%	7%	100%
Daily	26%	10%	15%	8%	36%	5%	100%

Table 21 Cherry Hill Outbound to Station Ridership Forecasts

Egress							
Period	**Drive & Park**	**Kiss & Ride**	**Taxi/ Rideshare**	**Bus**	**Rail**	**Other**	**Total**
Person Trips							
AM	86	551	990	332	1,137	361	3,458
PM	2,511	481	711	379	1,764	244	6,089
Daily	4,919	2,177	3,579	1,468	5,845	1,218	19,205
Modal Split Percentages							
AM	3%	16%	29%	10%	33%	10%	100%
PM	41%	8%	12%	6%	29%	4%	100%
Daily	26%	11%	19%	8%	30%	6%	100%

Following the same procedures followed for the Washington DC SCMAGLEV station (Section 2,4.1), the total Cherry Hill vehicle trip generation are presented in Table 22.

Table 22: Vehicular Trip Generation

Peak Hour	Boarding Peak Period Trips	Boarding Peak Hour Percentage	Boarding Peak Hour Trips	Alighting Peak Period Trips	Alighting Peak Hour Percentage	Alighting Peak Hour Trips
AM	3,733	36.5%	1,362	1,627	36.5%	594
PM	1,661	36.4%	605	3,702	36.4%	1,348

The trip generation must be split between the east and west access points. To help direct passengers to open parking spots, signs will be posted along MD 295 with parking space availability. Passengers who choose to drive from MD 295 to the east access point will be directed as follows:

- From the North, Exit MD 295 at the Westport Exit onto Manokin Street, make a right onto Annapolis Road, follow straight onto Waterview Avenue to the east access site.
- From the south, Exit MD 295 at the Cherry Hill Exit, make a right onto Waterview Avenue to the east access site.

Passengers who choose to drive from MD 295 to the west access point will be directed as follows:

- From the North, Exit MD 295 at the Annapolis Road Exit, make a left onto Annapolis Road to the west access site.
- From the south, Exit MD 295 at the Waterview Avenue Exit, make a left onto Waterview Avenue, make the next left to remain on Waterview Avenue, make the next left onto Annapolis Road to the east access site.

The city of Baltimore is implementing roadway improvements as part of reconstructing the Annapolis Road and Waterview Avenue bridges. Improvements include the MD 295 southbound off-ramp to Annapolis Road and Annapolis Road between the off-ramp and Waterview Avenue. These can be found at https://transportation.baltimorecity.gov/replacement-three-bridges-over-maryland-295.

The SCMAGLEV proposed roadway improvements would address the potential traffic issues caused by the attraction of new vehicle trips to the Cherry Hill street network. Roadway improvements were developed assuming 50 percent of the total trips are generated to each access point (east and west). This will affect the driveways serving each access site, the MD 295 interchange ramp intersection with the local roadways, and the segments between the ramps and sites. This creates the largest amount of conflicting traffic moves and a conservative scenario where both access points would be used.

These improvements are as follows and are illustrated in drawing STA-301, STA-302, and STA-303:

1. Annapolis Road and Manokin Street: Upgrade the traffic signal to a fully actuated traffic signal (traffic signal timings adjusted dynamically depending on the vehicle demand using vehicle detectors); stripe a 100-foot left-turn lane along the Annapolis Road northbound approach.
2. Annapolis Road and Russell Street: Install a new fully actuated traffic signal; stripe a 175-foot right-turn lane along the Russell Street eastbound approach; stripe a 350-foot left turn lane along the Annapolis Road northbound approach.
3. Annapolis Road and Waterview Avenue EB side of MD 295: Stripe a 375-foot four-lane cross section (two lanes in each direction) along the Annapolis Road southbound approach (ending near Maisel Street); upgrade signal to a fully actuated signal (this may be covered by the current proposed improvements).

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

Refer to Cherry Hill Station Site Civil Drawings to view access locations.

5.4 PROPOSED PARKING

The Cherry Hill SCMAGLEV station will include parking both east and west of the station. The subject properties are zoned TOD-4 (on the east side of MD 295) and I-4 (on the west side of MD 295). Both respective zoning districts allow for either at-grade or structured parking, as well as a rail station. Today the area is primarily mixed-use with warehouses, industrial sites, and residential properties. There are no highway overlay zones, no buffering or screening requirements, and no parking requirements for a rail station.

Parking demand for this site is based on analysis developed in November of 2018 for the planning horizon year of 2045. The project demand for parking is 4,000 spaces. With an active light rail and freight rail line just to the north of the site at Waterview Avenue, the consideration of potential limitations to the station due to at grade crossings has led the analysis to consider a facility to the west of the Cherry Hill Maglev station across MD 295, with a pedestrian bridge crossing over MD 295.

The west side site would be a six-level facility and will hold over 2,500 parking spaces. There will be a pedestrian bridge connecting the parking structure to the station. The pedestrian bridge will exit the parking facility at the third level and cross over to the station where it would connect at Concourse 5 in Section B. Figure 10 illustrates the west side facility.

The structured parking facility on the east side site will be four levels and hold over 1,500 parking spaces. There would be a pedestrian bridge connecting the parking facility to Concourse 5. The east side parking facility would allow for a larger amount of open space at the station and two levels of covered parking.

5.4.1 OTHER PARKING CONSIDERATIONS

Several factors will need to be considered, including solar infrastructure on the roof of the garage and smart garage technologies. Solar panels on the roof would provide additional covered parking at the roof level and potentially would power the garage with enough energy to sell back to the grid. The solar panels would also benefit the project in terms of LEED certification status. Smart garage technologies such as ultrasonic sensors (which can be installed above each space and used to monitor the availability of parking throughout the garage), and smart parking signing (that can be installed at garage entrances and used to provide information on parking space availability by floor) are examples of customer-friendly parking solutions that have proven to be very popular.

Another factor to consider is the use of helical ramps outside of the footprint of the garage to provide one-way access between each of the flat levels. This configuration would remove internal ramps and allow for a greater range of repurposing options for the facility. Additionally, by constructing the tall ceilings (12'-14'), this allows the facility to be repurposed for other uses if the need for the some of the parking is no longer necessary.

Figure 11 illustrates the facility located at Baltimore/Washington International Thurgood Marshall Airport. It is an example of a parking garage that has the technology items noted in this section, as well as the helical ramps, high ceilings and level floors.

Figure 11: Parking Facility Example

BWI Parking Garage / Desman Associates / Parking Designer, Structural Engineer of Record, and Revenue Control System Design Specialist

6. ALIGNMENT TRAFFIC CONTROL PLANS

Table 23 contains a summary of the alignment MOT Segment schedule. Traffic will re-open for each segment upon completion of these construction activities.

Table 23: Alignment MOT Segment Schedule Summary

Segment	Alignment	Stage	Construction Duration	Construction Hours
MD 197	J or J1	1	4 weekend days	7AM-4PM
MD 198	J	1	6 weekend days	7AM-4PM
MD 32	J	1	7 weekend days	7AM-4PM
Powder Mill Road/ MD 295	J1	1	2 weekend days	Nighttime
Powder Mill Road/ MD 295	J	2	3 weekend days	Nighttime
Powder Mill Road/ Beaver Dam Road	J1	BARC TMF Option 1	3 weekend days	24 hours
Powder Mill Road/ Beaver Dam Road	J1	BARC TMF Option 2	2 weekend days	24 hours
Powder Mill Road/ Beaver Dam Road	J	BARC TMF Option 1	3 weekend days	24 hours
Powder Mill Road	J1	BARC TMF Option 1	4 weekend days	24 hours
Powder Mill Road	J1	BARC TMF Option 2	1 weekend day	24 hours
Powder Mill Road	J	BARC TMF Option 1	4 weekend days	24 hours
Powder Mill Road	J	BARC TMF Option 2	1 weekend day	24 hours
Soil Conservation Road	J1	BARC TMF Option 1	1 weekend day	Nighttime
Soil Conservation Road	J1	BARC TMF Option 2	2 weekend days	24 hours
Springfield Road	J1	1	28 days	24 hours
Brock Bridge Road	J1	1	2 weekend days	24 hours
Connector Road	J	1	2 weekend days	24 hours
W. Patapsco Avenue	J or J1	1	6.5 months	Nighttime
W. Patapsco Avenue	J or J1	2	6.5 months	Nighttime
Explorer Road	J	1	4 months	24 hours
MD 198 TMF/MD 295 NB Off-ramp from EB MD 198	J	1	2 weekend days	24 hours
MD 198 TMF/MD 295 NB On-ramp from EB MD 198	J	1	4 weekend days	24 hours
MD 198 TMF/MD 198 EB	J	1	2 weekend days	24 hours
MD 198 TMF/MD 295 NB On-ramp from MD 198 WB	J	1	2 weekend days	24 hours
MD 198 TMF/MD 295 SB	J1	1	2 weekend days	24 hours
MD 198 TMF/MD 295 NB	J1	1	2 weekend days	24 hours
MD 198 TMF/MD 198 EB	J1	1	1 weekend day	24 hours
MD 198 TMF/ MD 198 WB	J1	1	1 weekend day	24 hours
MD 198 TMF/MD 295 NB On-ramp from WB MD 198	J1	1	1 weekend day	24 hours
MD 198/MOW/Powder Mil Road Interchange	J	1	4 weekend days	24 hours
MD 198/MOW/Powder Mill Road	J1	1	1 weekend day	24 hours
MD 198/MOW/Beaver Dam Road	J1	1	1 weekend day	24 hours
MD 198/MOW/Springfield Road	J1	1	1 weekend day	24 hours

BARC: Beltsville Agricultural Research Center

TMF: Transit Maintenance Facility

MOW: Maintenance of Way

6.1 MD 197 CROSSING (ALTERNATIVE J AND J1)

Eastbound and westbound MD 197 and all on/off ramps at the MD 295/MD 197 interchange will be closed to install four concrete viaduct spans over MD 197 and the existing on/off ramps. Traffic to/from MD 295 is to be detoured via Powder Mill Road interchange ramps. MD 197 through traffic will be detoured via Contee Road, US 1 and Powder Mill Road, refer to sheet TCP-25. Due to the high traffic volume using the MD 197 interchange, the closures are to be performed over weekends.

6.2 MD 198 VIADUCT CROSSING (Alternative J)

At the interchange of MD 295 and MD 198 there are a total of 6 proposed concrete viaduct spans over existing ramps and MD 198 that require ramp and roadway closures. Each of these closures will require a detour plan to maintain traffic flow at the interchange. A total of 6 stages will be required to install 6 concrete viaduct spans.

During Stage 1, the MD 295 northbound off-ramp to eastbound MD 198 will be closed to install a single concrete viaduct span over the off-ramp. Northbound MD 295 to eastbound MD 198 traffic will be detoured via MD 32. Refer to sheet TCP-27.

During Stage 2, the MD 295 northbound on-ramp from eastbound MD 198 will be closed to install a single concrete viaduct span over the on-ramp. Eastbound MD 198 to northbound MD 295 traffic will be detoured via MD 32. Refer to sheet TCP-28.

During Stage 3, the MD 295 northbound off-ramp to westbound MD 198 will be closed to install a single concrete viaduct span over the off-ramp. Northbound MD 295 to westbound MD 198 traffic will be detoured via MD 32. Refer to sheet TCP-29.

During Stage 4, the MD 295 northbound on-ramp from westbound MD 198 will be closed to install a single concrete viaduct span over the on-ramp. Westbound MD 198 to northbound MD 295 traffic will be detoured via eastbound MD 198 and westbound MD 32. Refer to sheet TCP-30.

During Stage 5, eastbound MD 198 at MD 295 will be closed to install a single concrete viaduct span over the eastbound lanes. Eastbound MD 198 through traffic will be detoured via southbound MD 295, eastbound MD 197, and northbound MD 295. Eastbound MD 198 to northbound MD 295 will be detoured via southbound MD 295 and eastbound MD 197. Refer to sheet TCP-31.

Finally, during Stage 6, westbound MD 198 at MD 295 will be closed to install a single concrete viaduct span over the westbound lanes. Westbound MD 198 through traffic will be detoured via northbound MD 295, westbound MD 32, and southbound MD 295. Northbound MD 295 to westbound MD 198 will be detoured via northbound MD 295, westbound MD 32, and southbound MD 295. Refer to sheet TCP-32.

Due to the high traffic volume using the MD 198 and MD 32 interchanges, closure will be performed during the weekend.

6.3 MD 32 VIADUCT CROSSING (ALTERNATIVE J)

At the interchange of MD 295 and MD 32, there are a total of 7 proposed concrete viaduct spans over existing interchange ramps and MD 32 that require ramp and roadway closures. Each of these closures will required a detour plan to maintain traffic flow at the interchange. A total of 6 stages are required to install all 7 viaduct spans.

During Stage 1 the off-ramp from northbound MD 295 to eastbound MD 32 will be closed to install a single concrete viaduct span over the off-ramp. Traffic will be detoured via eastbound MD 198. Refer to sheet TCP-35.

During Stage 2, the on-ramp from eastbound MD 32 to northbound MD 295 will be closed to install a single concrete viaduct span over the on-ramp. Eastbound MD 32 to northbound MD 295 traffic will be detoured via eastbound MD 198. Refer to sheet TCP-36. A temporary signal will be installed where the southbound MD 295 off-ramp terminates at MD 198 to accommodate the additional traffic volumes introduced at the interchange. Coordination will take place with Maryland State Highway Administration's MD 198 widening project.

During Stage 3, the off-ramp from northbound MD 295 to westbound MD 32 will be closed to install a single concrete viaduct over the off-ramp. Northbound MD 295 to westbound MD 32 traffic will be detoured via eastbound MD 198. Refer to sheet TCP-37.

During Stage 4, the on-ramp from westbound MD 32 to northbound MD 295 be closed to install a single concrete viaduct span over the on-ramp. Westbound MD 32 to northbound MD 295 traffic will be detoured via westbound MD 198. Refer to sheet TCP-38.

During Stage 5, Westbound MD 32 and the MD 295 off-ramp toward westbound MD 32 will be closed to install two concrete viaduct spans over the MD 295 northbound off-ramp to MD 32. Westbound MD 32 will be detoured via westbound MD 198, Whiskey Bottom Road, Brock Bridge Road and Dorsey Run Road. Westbound MD 32 through traffic will be detoured via eastbound MD 32, westbound MD 198, Whiskey Bottom Road, Brock Bridge Road and Dorsey Run Road. Westbound MD 32 to MD 295 southbound will be detoured via westbound MD 198. Refer to sheet TCP-39.

In Stage 6, eastbound MD 32 and the off-ramp from southbound MD 295 to eastbound MD 32 will be closed to install a single concrete viaduct span over eastbound MD 32. Southbound MD 295 to eastbound MD 32 will be detoured via southbound MD 295 westbound, MD 198, and northbound MD 295. Eastbound MD 32 to northbound MD 295 will be detoured via southbound MD 295 and westbound MD 198. Eastbound MD 32 through traffic will be detoured via southbound MD 295, westbound MD 198, and northbound MD 295. Refer to sheet TCP-40.

Due to the high traffic volume using the MD 32 interchange, all closures are to be performed during the weekend.

6.4 POWDER MILL ROAD VIADUCT CROSSING (ALTERNATIVE J AND J1) AND PROPOSED TRANSIT MAINTENANCE FACILITY OPTION VIADUCT CROSSINGS

There are two options for the SCMAGLEV alignment near Beaver Dam Road, Powder Mill Road, and Soil Conservation Road: Alternative J1 is aligned to the west of MD 295 and Alternative J is aligned to the east of MD 295. *For each alignment there are three proposed options for the TMF facility, two situated within the Beltsville Agricultural Research Center (BARC) and the third situated north of MD-198.*. BARC TMF Option 1 is located west of MD 295 north of Powder Mill Road. BARC TMF Option 2 is located east of MD 295 south of Powder Mill Road. Each alignment and TMF option will be discussed in the following proposed traffic control plans regarding Beaver Dam Road, Powder Mill Road, and Soil Conservation Road.

6.4.1 MD 295 ALTERNATIVE J1

For BARC TMF Option 2, northbound MD 295 will be closed between MD 193 and Powder Mill Road to install one concrete viaduct span over northbound MD 295. Northbound MD 295 traffic will be detoured

via the Capital Beltway, MD 201, and Powder Mill Road. Traffic from MD 193 will be detoured via MD 201 and Powder Mill Road. Refer to sheet TCP-14.

Once the northbound MD 295 work is complete, southbound MD 295 will be closed between MD 193 and Powder Mill Road to install one concrete viaduct span over southbound MD 295. Southbound MD 295 traffic will be detoured via Powder Mill Road, MD 201, and the Capital Beltway. Refer to sheet TCP-16.

6.4.2 MD 295 ALTERNATIVE J

For BARC TMF Option 1, northbound MD 295 will be closed between MD 193 and Powder Mill Road to install two concrete viaduct spans over northbound MD 295. Northbound MD 295 traffic will be detoured via the Capital Beltway, MD 201, and Powder Mill Road. Traffic from MD 193 will be detoured via MD 201 and Powder Mill Road. Refer to sheet TCP-15.

Once the northbound MD 295 work is complete, southbound MD 295 will be closed between MD 193 and Powder Mill Road to install one concrete viaduct span over southbound MD 295. Southbound MD 295 traffic will be detoured via Powder Mill Road, MD 201, and the Capital Beltway. Refer to sheet TCP-17.

6.4.3 BEAVER DAM ROAD ALTERNATIVE J1

For BARC TMF Option 1, Beaver Dam Road will be closed between Research Road and Soil Conservation Road to install three concrete viaduct spans over Beaver Dam Road. Beaver Dam Road traffic will be detoured via Research Road, Powder Mill Road, and Soil Conservation Road. Local traffic will be permitted on Beaver Dam Road. Refer to sheet TCP-18.

For BARC TMF Option 2, Beaver Dam Road will be closed between Research Road and Soil Conservation Road to install two concrete viaduct spans over Beaver Dam Road. Beaver Dam Road traffic will be detoured via Research Road, Powder Mill Road, and Soil Conservation Road. Local traffic will be permitted on Beaver Dam Road. Refer to sheet TCP-18.

6.4.4 BEAVER DAM ROAD ALTERNATIVE J

For both TMF options, Beaver Dam Road will be closed between Research Road and Soil Conservation Road to install three concrete viaduct spans over Beaver Dam Road. Beaver Dam Road traffic will be detoured via Research Road, Powder Mill Road, and Soil Conservation Road. Local traffic will be permitted on Beaver Dam Road. Refer to sheet TCP-19.

6.4.5 POWDER MILL ROAD ALTERNATIVE J1

For BARC TMF Option 1, Powder Mill Road will be closed at the approaches to the existing interchange with MD 295 to install three concrete viaduct spans over Power Mill Road and two interchange ramps. Traffic to/from MD 295 is to be detoured via MD 197 interchange ramps and through traffic will be detoured via Edmonston Road, Muirkirk Road, and MD 197. Refer to sheet TCP-20. From south to north, the spans will be placed over the MD 295 off-ramp onto Powder Mill Road, Powder Mill Road and the MD 295 on ramp from Powder Mill Road, respectively.

For BARC TMF Option 2, Powder Mill Road will be closed at the approaches to the existing interchange with MD 295 to install one concrete viaduct span over Power Mill. Traffic to/from MD 295 is to be detoured via MD 197 interchange ramps and through traffic will be detoured via Edmonston Road, Muirkirk Road, and MD 197. Refer to sheet TCP-20.

6.4.6 POWDER MILL ROAD ALTERNATIVE J

For BARC TMF Option 1, Powder Mill Road will be closed at the approaches to the existing interchange with MD 295 to install three concrete viaduct spans over Power Mill Road and two interchange ramps. Traffic to/from MD 295 is to be detoured via MD 197 interchange ramps and through traffic will be detoured via Edmonston Road, Muirkirk Road, and MD 197. Refer to sheet TCP-21. From south to north, the spans will be placed over the MD 295 off-ramp onto Powder Mill Road, Powder Mill Road and the MD 295 on ramp from Powder Mill Road, respectively.

For BARC TMF Option 2, Powder Mill Road will be closed at the approaches to the existing interchange with MD 295 to install one concrete viaduct span over Power Mill. Traffic to/from MD 295 is to be detoured via MD 197 interchange ramps and through traffic will be detoured via Edmonston Road, Muirkirk Road, and MD 197. Refer to sheet TCP-21.

6.4.7 SOIL CONSERVATION ROAD ALTERNATIVE J1

For BARC TMF Option 1, Soil Conservation Road will be closed between Powder Mill Road and Beaver Dam Road. Only local traffic will be permitted on Soil Conservation Road at the intersections with Powder Mill Road and Beaver Dam Road to access residences. Soil Conservation Road will be detoured via Powder Mill Road, Research Road and Beaver Dam Road. Refer to sheet TCP-22.

For BARC TMF Option 2, Soil Conservation Road will be closed between Powder Mill Road and Beaver Dam Road. Only local traffic will be permitted on Soil Conservation Road at the intersections with Powder Mill Road and Beaver Dam Road to access residences. Soil Conservation Road will be detoured via Powder Mill Road, Research Road and Beaver Dam Road. Refer to sheet TCP-22.

6.5 SPRINGFIELD ROAD VIADUCT CROSSING (ALTERNATIVE J1)

Springfield Road will be closed between Powder Mill Road and Odell Road to install approximately 11 concrete viaduct spaces adjacent to Springfield Road. Only local traffic will be permitted on Springfield Road at the intersection with Odell Road, to access residences and schools. Springfield Road will also be closed beyond Sumner Grover Drive. Springfield Road traffic will be detoured via Powder Mill Road, Poultry Road and Odell Road. Refer to sheet TCP-23.

6.6 BROCK BRIDGE ROAD VIADUCT CROSSING (ALTERNATIVE J1)

Brock Bridge Road will be closed between MD 197 and New Sudlerville Road to install two concrete viaduct spans over Brock Bridge Road. Brock Bridge Road traffic will be detoured via MD 197 and MD 198. Local traffic will be allowed beyond New Sudlerville Road to access residences and schools. Refer to sheet TCP-26.

6.7 CONNECTOR ROAD VIADUCT CROSSING (ALTERNATIVE J)

Connector Road will be closed between National Business Parkway and Canine Road to install two viaduct spans over Connector Road and the on-ramp from eastbound Connector Road to northbound MD 295, respectively. Traffic from National Business Parkway heading to NSA will be detoured via Guilford Drive, Dorsey Run Road, eastbound MD 32 and Canine Road. A similar detour will be provided for the reverse route. Traffic exiting the NSA heading to northbound MD 295 will be detoured via Canine Road and the northbound MD 295 on-ramp from westbound MD 32. Traffic from southbound MD 295 heading to the NSA will be detoured via the southbound MD 295 off-ramp to eastbound MD 32 and Canine Road. A similar detour will be provided for the reverse route. Refer to sheet TCP-41.

6.8 W. PATAPSCO AVENUE TUNNEL PORTAL

The Patapsco Avenue profile will be raised for the construction of a SCMAGLEV transition portal. The proposed work will be constructed using cut-and-cover tunneling over a short section of track to create the transition between the viaduct and TBM tunnel sections. The construction of the transition portal will take place over two stages. The existing typical section of W. Patapsco Avenue provides 6-lanes (3 eastbound/3westbound) and 2 dedicated left-turns lanes on eastbound and westbound W. Patapsco Avenue at its intersection with Annapolis Road.

For the first stage of W. Patapsco Avenue construction, the eastbound W. Patapsco Avenue profile will be raised for the construction of the transition portal. Eastbound W. Patapsco Avenue will be closed from approximately 500-ft west of Annapolis Road to approximately 900-ft east of Annapolis Road. Annapolis Road traffic will be detoured via W. Patapsco Avenue, Washington Boulevard, Lansdowne Road, and Daisy Avenue. W. Patapsco Avenue in the eastbound and westbound directions will both be reduced from 3-lanes to 2-lanes. Temporary pavement widening will be performed in the median to facilitate a crossover of eastbound traffic to westbound travel lanes. Additional temporary pavement widening will be performed along the outside shoulder of westbound W. Patapsco Avenue to provide the additional width required to maintain a dedicated left-turn lane from eastbound W. Patapsco Avenue to northbound Annapolis Road. Refer to sheet TCP-42.

In the second stage of W. Patapsco Avenue construction, the westbound W. Patapsco Avenue profile will be raised for construction of the transition portal. Westbound W. Patapsco Avenue will be closed from approximately 500-ft west of Annapolis Road to approximately 900-ft east of Annapolis Road. Annapolis Road traffic will be detoured via W. Patapsco Avenue, Hollins Ferry Road, and Wegworth Lane. Two lanes will be maintained in both directions with an additional dedicated left-turn lane provided in the westbound direction. All lanes from Stage 1 will shift to the reconstructed eastbound W. Patapsco Avenue. Temporary pavement widening will be performed along the outside shoulder of eastbound W. Patapsco Avenue to provide the additional width required to maintain a dedicated left-turn lane from westbound W. Patapsco Avenue to southbound Annapolis Road. Refer to sheets TCP-43 and TCP-45.

6.9 EXPLORER ROAD (ALTERNATIVE J)

Northbound MD 295 on and off ramps will be closed at Explorer Road to raise the Explorer Road ramps over the Maglev cut and cover tunnel. Traffic to/from MD 295 northbound is to be detoured via MD 193, Goddard Road, and Explorer Road. Refer to sheet TCP-13.

6.10 PROPOSED MD 198 TRANSIT MAINTENANCE FACILITY OPTION 10A VIADUCT CROSSINGS (ALTERNATIVE J)

For MD 198 TMF Option – Alternative J, numerous viaduct crossings are required to construct the lead in track. The TMF Option is proposed in the northeast quadrant of the MD 295/MD 198 interchange. Due to the high traffic volume using the MD 198 interchange, closure will be performed during the weekend. The detours required to construct the lead in track to the TMF option from Alternative J will be discussed in the following traffic control plans regarding the interchange and its ramps.

6.10.1 MD 295 NORTHBOUND OFF-RAMP TO EASTBOUND MD 198

For the MD 198 TMF Option, the MD 295 northbound off-ramp to eastbound MD 198 will be closed to install two concrete viaduct spans over the off-ramp. Northbound MD 295 to eastbound MD 198 traffic will be detoured via MD 32. Refer to sheet TCP-27.

6.10.2 MD 295 NORTHBOUND ON-RAMP FROM EASTBOUND MD 198

For the MD 198 TMF Option, the MD 295 northbound on-ramp from eastbound MD 198 will be closed to install four concrete viaduct spans over the on-ramp. Eastbound MD 198 to northbound MD 295 traffic will be detoured via MD 32. Refer to sheet TCP-30.

6.10.3 EASTBOUND MD 198

For the MD 198 TMF Option, eastbound MD 198 at MD 295 will be closed to install two concrete viaduct spans over the eastbound lanes. Eastbound MD 198 through traffic will be detoured via southbound MD 295, eastbound MD 197, and northbound MD 295. Eastbound MD 198 to northbound MD 295 will be detoured via southbound MD 295 and eastbound MD 197. Refer to sheet TCP-29.

6.10.4 MD 295 NORTHBOUND ON-RAMP FROM WESTBOUND MD 198

For the MD 198 TMF Option, westbound MD 198 at MD 295 will be closed to install two concrete viaduct spans over the westbound lanes, one of which crosses over the on-ramp. Westbound MD 198 through traffic will be detoured via northbound MD 295, westbound MD 32, and southbound MD 295. Northbound MD 295 to westbound MD 198 will be detoured via northbound MD 295, westbound MD 32, and southbound MD 295. Refer to sheet TCP-28.

6.11 PROPOSED MD 198 TRANSIT MAINTENANCE FACILITY OPTION 10A VIADUCT CROSSINGS (ALTERNATIVE J1)

For MD 198 TMF Option – Alternative J1, numerous viaduct crossings are required to construct the lead in track. The TMF Option is proposed in the northeast quadrant of the MD 295/MD 198 interchange. Due to the high traffic volume using the MD 198 interchange, closure will be performed during the weekend. The detours required to construct the lead in track to the TMF option from Alternative J1 will be discussed in the following traffic control plans regarding the interchange and its ramps.

6.11.1 SOUTHBOUND MD 295

For the MD 198 TMF Option, southbound MD 295 and the eastbound MD 198 on-ramp to southbound MD 295 will be closed to install two concrete viaduct spans over southbound MD 295 and the on-ramp. Traffic will be detoured via westbound MD 198 and southbound MD 197. Refer to sheet TCP-33.

6.11.2 NORTHBOUND MD 295

For the MD 198 TMF Option, northbound MD 295 and the eastbound MD 198 on-ramp to northbound MD 295 will be closed to install two concrete viaduct spans over northbound MD 295 and the on-ramp. Traffic will be detoured via eastbound MD 198 and westbound MD 32. Refer to sheet TCP-34.

6.11.3 EASTBOUND MD 198

For the MD 198 TMF Option, eastbound MD 198 at MD 295 will be closed to install one concrete viaduct span over the eastbound lanes. Eastbound MD 198 through traffic will be detoured via southbound MD 295, eastbound MD 197, and northbound MD 295. Eastbound MD 198 to northbound MD 295 will be detoured via southbound MD 295 and eastbound MD 197. Refer to sheet TCP-31.

6.11.4 WESTBOUND MD 198

For the MD 198 TMF Option, westbound MD 198 at MD 295 will be closed to install a single concrete viaduct span over the westbound lanes. Westbound MD 198 through traffic will be detoured via northbound MD 295, westbound MD 32, and southbound MD 295. Northbound MD 295 to westbound MD 198 will be detoured via northbound MD 295, westbound MD 32, and southbound MD 295. Refer to sheet TCP-32.

6.11.5 MD 295 NORTHBOUND ON-RAMP FROM WESTBOUND MD 198

For the MD 198 TMF Option, the MD 295 northbound on-ramp from westbound MD 198 will be closed to install a single concrete viaduct span over the on-ramp. Westbound MD 198 to northbound MD 295 traffic will be detoured via eastbound MD 198 and westbound MD 32. Refer to sheet TCP-30.

6.12 PROPOSED MAINTENANCE OF WAY SITE FOR TRANSIT MAINTENANCE FACILITY OPTION 10A VIADUCT CROSSINGS (ALTERNATIVE J)

For the Maintenance of Way (MOW) site for MD 198 TMF Option – Alternative J, viaduct crossings will be required to construct the lead-in track. The MOW site is proposed east of MD 295 between the Powder Mill Road and MD 197 interchanges. The detour required to construct the lead in track to the MOW site will be discussed in the following traffic control plan regarding Powder Mill Road.

Powder Mill Road will be closed at the approaches to the existing interchange with MD 295 to install three concrete viaduct spans over Power Mill Road and two interchange ramps. Traffic to/from MD 295 is to be detoured via MD 197 interchange ramps and through traffic will be detoured via Edmonston Road, Muirkirk Road, and MD 197. Refer to sheet TCP-21. From south to north, the spans will be placed over the MD 295 off-ramp onto Powder Mill Road, Powder Mill Road and the MD 295 on ramp from Powder Mill Road, respectively.

6.13 PROPOSED MAINTENANCE OF WAY SITE FOR TRANSIT MAINTENANCE FACILITY OPTION 10A VIADUCT CROSSINGS (ALTERNATIVE J1)

For the MOW site for MD 198 TMF Option – Alternative J1 numerous viaduct crossings will be required to construct the lead-in track. The MOW site is proposed west of MD 295 between the Powder Mill Road and MD 197 interchanges. The detours required to construct the lead in track to the MOW site will be discussed in the following traffic control plans regarding Powder Mill Road, Beaver Dam Road, and Springfield Road.

6.13.1 POWDER MILL ROAD

Powder Mill Road will be closed at the approaches to the existing interchange with MD 295 to install one concrete viaduct spans over Power Mill Road. Traffic to/from MD 295 is to be detoured via MD 197 interchange ramps and through traffic will be detoured via Edmonston Road, Muirkirk Road, and MD 197. Refer to sheet TCP-20.

6.13.2 BEAVER DAM ROAD

Beaver Dam Road will be closed between Research Road and Soil Conservation Road to install one concrete viaduct span over Beaver Dam Road. Beaver Dam Road traffic will be detoured via Research Road, Powder Mill Road, and Soil Conservation Road. Local traffic will be permitted on Beaver Dam Road. Refer to sheet TCP-18.

6.13.3 SPRINGFIELD ROAD

Springfield Road will be closed between Powder Mill Road and Odell Road to install one concrete viaduct span over Springfield Road. Springfield Road traffic will be detoured via Powder Mill Road, Poultry Road, and Odell Road. Local traffic will be permitted on the north side of Springfield Road. Refer to sheet TCP-24.

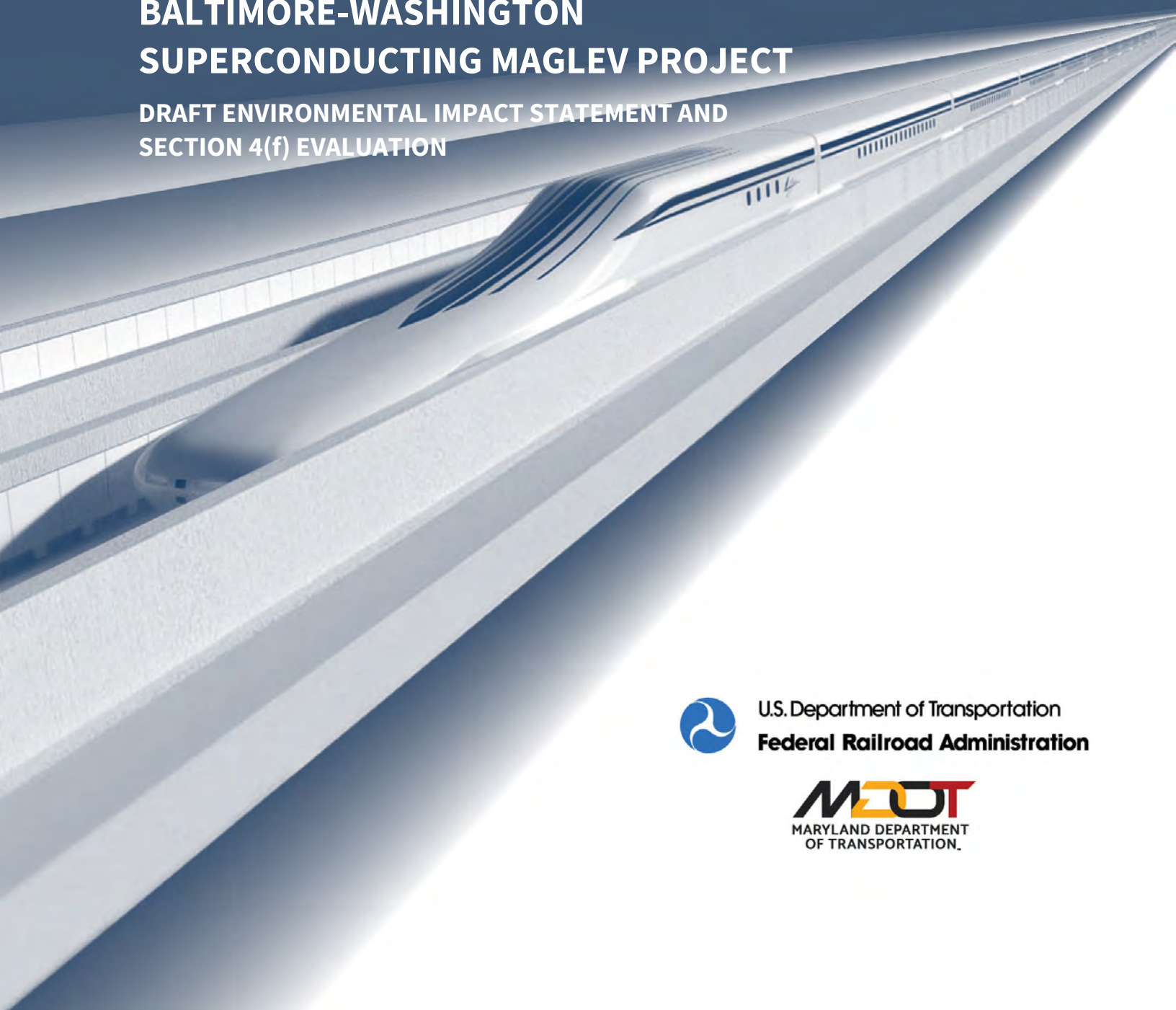
Appendix G9.

Capital and Construction Costs Memorandum

Materials Provided by the Project Sponsor

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

BALTIMORE-WASHINGTON SCMAGLEV PROJECT

CAPITAL AND CONSTRUCTION COST TABLES

REVISION: 0

DATE: March 31, 2020

BWRR

BALTIMORE-WASHINGTON RAPID RAIL

FRA MAIN WORKSHEET

Grantee Name: **Maryland DOT and Baltimore-Washington Rapid Rail (BWRR)**

Project Name and Location: **Baltimore-Washington SCMAGLEV** LB 4.3 SCC Alt J and J1 - MVS East - Camden Yard BARC.xls

Current Phase : **Administrative Draft Environmental Impact Statement**

Alignment: **J**

TMF **BARC**

Baltimore Station: **Camden Yards**

Note: Costs do not reflect Value Engineering opportunities

Issue Date	
Today's Date	**3/31/20**
Yr of Base Year $	**2018**
Yr of Revenue Ops	**2029**

Standard Cost Category		Unit	Quantity	Base Year Dollars: Without Contingency (X000)	Base Year Dollars: Allocated Contingency (X000)	Base Year Dollars: **TOTAL (X000)**	Unit Cost (X000)	Percent of Construction Cost	Percent of Total Project Cost	**YOE Dollars Total (X000)** (from Inflation Worksheet)
10	**Guideway & Track Elements**	**Lineal Miles of Guideway**	39.17	5,756,616	-	**5,756,616**	146,961	57%	57%	
10.010	Guideway: At-grade exclusive right-of-way	Lineal Miles of Guideway				-				
10.020	Guideway: At-grade semi-exclusive (allows cross-traffic)	Lineal Miles of Guideway				-				
10.030	Guideway: At-grade in mixed traffic	Lineal Miles of Guideway				-				
10.040	Guideway: Aerial structure	Lineal Miles of Guideway	9.76	689,893	-	689,893	70,711			
10.041	Bridges	Lineal Miles of Guideway				-				
10.042	Viaduct	Lineal Miles of Guideway	8.83	661,993	-	661,993	75,000			
10.043	Other Structure (MOW Ramp)	Lineal Miles of Guideway	0.93	27,900	-	27,900	30,000			
10.044	Portals	Lineal Miles of Guideway				-				
10.050	Guideway: Built-up fill	Lineal Miles of Guideway	0.31	23,068	-	23,068	75,000			
10.060	Guideway: Underground cut & cover	Lineal Miles of Guideway	1.63	277,287	-	277,287	170,000			
10.061	Cut & Cover Guideway Soft Soils	Lineal Miles of Guideway				-				
10.062	Cut & Cover Guideway Hard Soils	Lineal Miles of Guideway				-				
10.063	Cut & Cover Guideway Vent Soft Soils	Lineal Miles of Guideway				-				
10.064	Cut & Cover Guideway Vent Hard Soils	Lineal Miles of Guideway				-				
10.065	Unspecified	Lineal Miles of Guideway				-				
10.070	Guideway: Underground tunnel	Lineal Miles of Guideway	27.48	4,533,512	-	4,533,512	165,000			
10.071	Bored Earth Open	Lineal Miles of Guideway				-				
10.072	Bored Earth Close	Lineal Miles of Guideway				-				
10.073	Bored Earth Mixed Shield	Lineal Miles of Guideway	27.48	4,533,512	-	4,533,512	165,000			
10.074	Bored Earth Mixes Shield SEM	Lineal Miles of Guideway				-				
10.075	Rock Drill & Blast	Lineal Miles of Guideway				-				
10.076	Rock Boring Machine	Lineal Miles of Guideway				-				
10.077	Sunken Tunnel	Lineal Miles of Guideway				-				
10.078	Unspecified	Lineal Miles of Guideway				-				
10.080	Guideway: Retained cut or fill	Lineal Miles of Guideway				-				
10.090	Track: Direct fixation	Track Miles				-				
10.100	Track: Embedded	Track Miles				-				
10.110	Track: Ballasted	Track Miles				-				
10.120	Track: Special (switches, turnouts)	Track Miles				-				
10.130	Track: Vibration & Noise Dampening	Track Miles				-				
10.140	Special Structures	Lineal Miles of Guideway	29.11	232,855	-	232,855	8,000			
10.141	Escape Gallery	Lineal Miles of Guideway	29.11	232,855	-	232,855	8,000			
20	**Stations, Stops, Terminals, Intermodels**	**Stations**	3	3,612,903	-	**3,612,903**	1,204,301	36%	36%	
20.010	At-Grade Station, Stop, Shelter, Mall, Terminal, Platform	Stations				-				
20.020	Aerial station, stop, shelter, mall, terminal, platform	Stations				-				
20.030	Underground station, stop, shelter, mall, terminal, platform	Stations	3.00	3,612,903	-	3,612,903	1,204,301			
20.031	WASHINGTON DC STATION	Stations	1.00	1,222,581	-	1,222,581	1,222,581			
	WASHINGTON DC STATION - CIVIL/STRUCTURAL	Stations	1.00	1,000,000	-	1,000,000	1,000,000			
	WASHINGTON DC STATION - ARCHITECTURAL	Stations	1.00	222,581	-	222,581	222,581			
20.032	BWI AIRPORT STATION	Stations	1.00	945,161	-	945,161	945,161			
	BWI AIRPORT STATION - CIVIL/STRUCTURAL	Stations	1.00	800,000	-	800,000	800,000			
	BWI AIRPORT STATION - ARCHITECTURAL	Stations	1.00	145,161	-	145,161	145,161			
20.033	BALTIMORE STATION	Stations	1.00	1,445,161	-	1,445,161	1,445,161			
	BALTIMORE STATION - CIVIL/STRUCTURAL	Stations	1.00	1,300,000	-	1,300,000	1,300,000			
	BALTIMORE STATION - ARCHITECTURAL	Stations	1.00	145,161	-	145,161	145,161			
20.040	Major stations, landings, terminals: Intermodal, ferry, trolley, etc.	Stations				-				
20.050	Joint development	Stations				-				
20.060	Automobile parking multi-story structure	Spaces				-				
20.070	Elevators, escalators	Number				-				
20.071	Elevators	Number				-				
20.072	Escalators	Number				-				
20.073	Unspecified	Number				-				
20.080	Passenger Overpass	Number				-				
20.090	Underground Interconnecting Tunnel	Number				-				
20.091	Cut and Cover	Number				-				
20.092	Bored Earth Soft Soils	Number				-				
20.093	Bored Rock Hard Soils	Number				-				
20.094	Unspecified	Number				-				
20.100	Signage and Graphics	Number				-				
30	**Support Facilities: Yards, Shops, Admin. Bldgs**	**Number**	16.00	602,400	-	**602,400**	37,650	6%	6%	
30.010	Administration Building: Office, sales, storage, revenue counting	Number				-				
30.011	Administrative Building	Number				-				
30.012	Central Control Facility	Number				-				
30.013	Central Revenue Counting Facility	Number				-				
30.014	Unspecified	Number				-				
30.020	Light Maintenance Facility	Number				-				
30.030	Heavy Maintenance Facility (TMF, Shop Equipment included in Code 50, Systems)	Number	1.00	80,000	-	80,000	80,000			
30.040	Storage or Maintenance of Way Building (MOW Facilities at TMF and Westport)	Number	2.00	60,000	-	60,000	30,000			
30.050	Yard and Yard Track	Number	1.00	120,000	-	120,000	120,000			
30.060	Electrical Substations (Equipment is included in Code 50, Systems)	Number	4.00	22,400	-	22,400	5,600			
30.061	Electrical Substation (at 104+250- DC)	Number	1.00	5,600	-	5,600	5,600			
30.062	Electrical Substation (at 124+100-LAUREL, MD)	Number	1.00	5,600	-	5,600	5,600			
30.063	Electrical Substation (at 151+100-SOUTH OF I-895)	Number	1.00	5,600	-	5,600	5,600			
30.064	Electrical Substation (at 155+500-BALTIMORE)	Number	1.00	5,600	-	5,600	5,600			
30.070	Ventilation Plant/Emergency Exits	Number	8.00	320,000	-	320,000	40,000			
30.071	Ventilation Plant (FA/EE) No.1 (at 104+400)	Number	1.00	40,000	-	40,000	40,000			
30.072	Ventilation Plant (FA/EE) No.2 (at 108+150)	Number	1.00	40,000	-	40,000	40,000			
30.073	Ventilation Plant (FA/EE) No.3 (at 113+100)	Number	1.00	40,000	-	40,000	40,000			
30.074	Ventilation Plant (FA/EE) No.4 (at 140+300)	Number	1.00	40,000	-	40,000	40,000			
30.075	Ventilation Plant (FA/EE) No.5 (at 141+600)	Number	1.00	40,000	-	40,000	40,000			
30.076	Ventilation Plant (FA/EE) No.6(at 143+600)	Number	1.00	40,000	-	40,000	40,000			
30.077	Ventilation Plant (FA/EE) No.7 (at 146+500)	Number	1.00	40,000	-	40,000	40,000			
30.078	Ventilation Plant (FA/EE) No.8 (at 151+100)	Number	1.00	40,000	-	40,000	40,000			
40	**Sitework & Special Conditions**	**Lineal Miles of Guideway**	39.17	79,073	-	**79,073**	2,019	1%	1%	
40.010	Demolition, Clearing, Earthwork	Lineal Miles of Guideway	10.77	1,895	-	1,895	176			
40.020	Site Utilities, Utility Relocation	Lineal Miles of Guideway	10.77	1,271	-	1,271	118			
40.021	Urban Replacement In-Kind Public Utilities	Lineal Miles of Guideway				-				
40.022	Urban Replacement In-Kind Private Utilities	Lineal Miles of Guideway				-				
40.023	Urban Replacement Betterment Public Utilities	Lineal Miles of Guideway				-				
40.024	Urban Replacement Betterment Private Utilities	Lineal Miles of Guideway				-				
40.025	Suburban Replacement In-Kind Public Utilities	Lineal Miles of Guideway				-				
40.026	Suburban Replacement In-Kind Private Utilities	Lineal Miles of Guideway				-				
40.027	Suburban Replacement Betterment Public Utilities	Lineal Miles of Guideway				-				
40.028	Suburban Replacement Betterment Private Utilities	Lineal Miles of Guideway				-				
40.029	Unspecified	Lineal Miles of Guideway				-				
40.030	Haz. mat'l, contam'd soil removal/mitigation, ground water treatments	Lineal Miles of Guideway	10.77	162	-	162	15			
40.031	HazMat Abatement	Lineal Miles of Guideway				-				
40.032	Contaminated Soil Removal	Lineal Miles of Guideway				-				
40.033	Ground Water Treatment	Lineal Miles of Guideway				-				
40.034	Unspecified	Lineal Miles of Guideway				-				
40.040	Environmental mitigation, e.g. wetlands, historic/archeologic, parks	Lineal Miles of Guideway				-				
40.050	Site structures including retaining walls, sound walls	Lineal Miles of Guideway	10.77	41,839	-	41,839	3,886			
40.051	Mechanically Stabilized Earth Walls	Lineal Miles of Guideway				-				
40.052	Concrete Walls	Lineal Miles of Guideway				-				
40.053	Other Walls	Lineal Miles of Guideway				-				
40.054	Unspecified	Lineal Miles of Guideway				-				
40.060	Pedestrian / bike access and accommodation, landscaping	Lineal Miles of Guideway				-				
40.070	Automobile, bus, van accessways including roads, parking lots	Lump Sum	1.00	31,818	-	31,818	31,818			
40.071	Surface Parking Lot	Spaces				-				
40.072	Auto Access	Stations				-				
40.073	Bus Access	Spaces				-				
40.074	Bus Parking and Berthing	Spaces				-				
40.075	Unspecified	Spaces				-				
40.080	Temporary Facilities and other indirect costs during construction	Lump Sum	1.00	2,089	-	2,089	2,089			
40.081	Roadway Changes	Lineal Miles of Guideway				-				
40.082	Third-Party Work	Lineal Miles of Guideway				-				
40.083	Mobilization	Lineal Miles of Guideway				-				
40.084	Maintenance of Traffic (Railroad reroute, shutdown, reschedule, stage, phase, worker-protect, work-around)	Lineal Miles of Guideway				-				

40.085	Unallocated Indirect Costs	Lump Sum				-				
40.086	Unspecified	Lineal Miles of Guideway				-				
50	**Systems**	**LUMP SUM**	0.00	-	-	**-**		0%	0%	
50.010	Train control and signals	Track Miles				-				
50.011	Train Control - Wayside	Track Miles				-				
50.012	Train Control - On Board Systems	Track Miles				-				
50.013	Train Control - Centralized Systems	Track Miles				-				
50.014	Unspecified	Track Miles				-				
50.020	Traffic signals and crossing protection	Track Miles				-				
50.030	Traction power supply: substations	Track Miles				-				
50.040	Traction power distribution: catenary and third rail	Track Miles				-				
50.041	Catenary	Track Miles				-				
50.042	Third Rail	Track Miles				-				
50.043	Power Distribution and Connections	Track Miles				-				
50.044	Unspecified	Track Miles				-				
50.050	Communications	Lineal Miles of Guideway				-				
50.051	Wired	Lineal Miles of Guideway				-				
50.052	Radio Based	Lineal Miles of Guideway				-				
50.053	Unspecified	Lineal Miles of Guideway				-				
50.060	Fare collection system and equipment	Stations				-				
50.061	Central Revenue Counting Systems	Stations				-				
50.062	Revenue Collection - In Station	Stations				-				
50.063	Revenue Collection - On Vehicle	Vehicles				-				
50.064	Unspecified	Stations				-				
50.070	Central Control System	Lineal Miles of Guideway				-				
51	**Construction Subtotal (10-50)**	**Lineal Miles of Guideway**	39.17	10,050,992	-	**10,050,992**	256,592	100%	100%	
60	**Row, Land, Existing Improvements**	**Lineal Miles of Guideway**				**-**			0%	
60.010	Purchase or lease of real estate	Lineal Miles of Guideway				-				
60.011	Full Takes	Lineal Miles of Guideway				-				
60.012	Part Takes	Lineal Miles of Guideway				-				
60.013	Easement Acquisitions	Lineal Miles of Guideway				-				
60.014	Other Rights	Lineal Miles of Guideway				-				
60.015	Donated Value	Lineal Miles of Guideway				-				
60.016	Unspecified	Lineal Miles of Guideway				-				
60.020	Relocation of existing households and businesses	Lineal Miles of Guideway				-				
60.021	Residential (Owners)	Lineal Miles of Guideway				-				
60.022	Residential (Tenants)	Lineal Miles of Guideway				-				
60.023	Business (Owners and Tenants)	Lineal Miles of Guideway				-				
60.024	Others (Personal Property Moves)	Lineal Miles of Guideway				-				
60.025	Unspecified	Lineal Miles of Guideway				-				
60.030	Services	Lineal Miles of Guideway				-				
60.031	Property Management	Lineal Miles of Guideway				-				
60.032	Agency	Lineal Miles of Guideway				-				
60.033	Contractor R/W Services (Title/Appraisal, etc)	Lineal Miles of Guideway				-				
60.034	Legal Services	Lineal Miles of Guideway				-				
60.035	Unspecified	Lineal Miles of Guideway				-				
60.040	Other Real Estate Costs	Lineal Miles of Guideway				-				
70	**Vehicles**	**Vehicles**	0.00	-	-	**-**			0%	
70.010	Light Rail	Vehicles				-				
70.011	Static	Vehicles				-				
70.012	Articulated	Vehicles				-				
70.013	Unspecified	Vehicles				-				
70.020	Heavy Rail	Vehicles				-				
70.021	Small Scale	Vehicles				-				
70.022	Large Scale	Vehicles				-				
70.023	Unspecified	Vehicles				-				
70.030	Commuter Rail	Vehicles				-				
70.031	Locomotive	Vehicles				-				
70.032	Passenger Car	Vehicles				-				
70.033	Bi-Level Passenger Car	Vehicles				-				
70.034	Self-Propelled Passenger Car	Vehicles				-				
70.035	Unspecified	Vehicles				-				
70.040	Bus	Vehicles				-				
70.041	Small Bus	Vehicles				-				
70.042	Standard 40 Foot Bus	Vehicles				-				
70.043	Articulated Bus	Vehicles				-				
70.044	Unspecified	Vehicles				-				
70.050	Other Vehicles	Vehicles				-				
70.060	Non-revenue vehicles	Vehicles				-				
70.061	Maintenance of Way Vehicles	Vehicles				-				
70.062	Automobiles	Vehicles				-				
70.063	Trucks	Vehicles				-				
70.064	Unspecified	Vehicles				-				
70.070	Spare parts/ Rotable Components	Vehicles				-				
70.080	Intercity Passenger Rail	Vehicles				-				
70.081	Diesel Locomotive	Vehicles				-				
70.082	Cab Car	Vehicles				-				
70.083	Bi-Level Coach	Vehicles				-				
70.084	Single Level Coach	Vehicles				-				
70.085	DMU	Vehicles				-				
70.086	EMU	Vehicles				-				
70.087	Unspecified					-				
80	**Professional Services**			-	-	**-**			0%	
80.000	Planning and Concept Design					-				
80.010	Preliminary Engineering					-				
80.020	Final Design					-				
80.030	Project Management for Design and Construction					-				
80.031	Agency Project Management					-				
80.032	Project Management Oversight Support					-				
80.033	Agency Force Account					-				
80.034	Unspecified					-				
80.040	Construction Administration & Management					-				
80.050	Professional Liability and other Non-Construction Insurance					-				
80.060	Legal; Permits; Review Fees by other agencies, cities, etc.					-				
80.070	Surveys, Testing, Investigation, Inspection					-				
80.080	Start up					-				
80.081	Training/Start-up					-				
80.082	Safety Certification					-				
80.083	Off-Site Vehicle Testing, Test Runs					-				
80.084	Commissioning					-				
80.085	Unspecified					-				
80.090	Other					-				
81	**Subtotal (10-80)**	Lineal Miles of Guideway	39.17	10,050,992	-	10,050,992	256,592		100%	
90	**Unallocated Contingency**	Total Amount				**-**			0%	
91	**Subtotal (10-90)**	Lineal Miles of Guideway	39.17	10,050,992	-	**10,050,992**	256,592		100%	
100	**Finance Charges**	Total Amount		-	-	**-**			0%	
101	**Total Project Costs (10-100)**	Lineal Miles of Guideway	39.17	10,050,992	-	**10,050,992**	256,592		100%	

Allocated Contingency as % of Base Yr Dollars w/o Contingency	0.00%
Unallocated Contingency as % of Base Yr Dollars w/o Contingency	0.00%
Total Contingency as % of Base Yr Dollars w/o Contingency	0.00%

FRA MAIN WORKSHEET

Grantee Name: **Maryland DOT and Baltimore-Washington Rapid Rail (BWRR)**

Project Name and Location: **Baltimore-Washington SCMAGLEV** LB 4.3 SCC Alt J and J1 - MVS East - Camden Yard MD-198.xls

Current Phase : **Administrative Draft Environmental Impact Statement**

Alignment: **J**

TMF **MD-198**

Baltimore Station: **Camden Yards**

Note: Costs do not reflect Value Engineering opportunities

Issue Date	
Today's Date	**3/31/20**
Yr of Base Year $	**2018**
Yr of Revenue Ops	**2029**

Standard Cost Category		Unit	Quantity	Base Year Dollars: Without Contingency (X000)	Allocated Contingency (X000)	**TOTAL (X000)**	Unit Cost (X000)	Percent of Construction Cost	Percent of Total Project Cost	YOE Dollars Total (X000) (from Inflation Worksheet)
10	**Guideway & Track Elements**	**Lineal Miles of Guideway**	40.97	5,810,616	-	**5,810,616**	141,822	56%	56%	
10.010	Guideway: At-grade exclusive right-of-way	Lineal Miles of Guideway				-				
10.020	Guideway: At-grade semi-exclusive (allows cross-traffic)	Lineal Miles of Guideway				-				
10.030	Guideway: At-grade in mixed traffic	Lineal Miles of Guideway				-				
10.040	Guideway: Aerial structure	Lineal Miles of Guideway	11.56	743,893	-	743,893	64,370			
10.041	Bridges	Lineal Miles of Guideway				-				
10.042	Viaduct	Lineal Miles of Guideway	8.83	661,993	-	661,993	75,000			
10.043	Other Structure (MOW Ramp)	Lineal Miles of Guideway	2.73	81,900		81,900	30,000			
10.044	Portals	Lineal Miles of Guideway				-				
10.050	Guideway: Built-up fill	Lineal Miles of Guideway	0.31	23,068	-	23,068	75,000			
10.060	Guideway: Underground cut & cover	Lineal Miles of Guideway	1.63	277,287	-	277,287	170,000			
10.061	Cut & Cover Guideway Soft Soils	Lineal Miles of Guideway				-				
10.062	Cut & Cover Guideway Hard Soils	Lineal Miles of Guideway				-				
10.063	Cut & Cover Guideway Vent Soft Soils	Lineal Miles of Guideway				-				
10.064	Cut & Cover Guideway Vent Hard Soils	Lineal Miles of Guideway				-				
10.065	Unspecified	Lineal Miles of Guideway				-				
10.070	Guideway: Underground tunnel	Lineal Miles of Guideway	27.48	4,533,512	-	4,533,512	165,000			
10.071	Bored Earth Open	Lineal Miles of Guideway				-				
10.072	Bored Earth Close	Lineal Miles of Guideway				-				
10.073	Bored Earth Mixed Shield	Lineal Miles of Guideway	27.48	4,533,512	-	4,533,512	165,000			
10.074	Bored Earth Mixes Shield SEM	Lineal Miles of Guideway				-				
10.075	Rock Drill & Blast	Lineal Miles of Guideway				-				
10.076	Rock Boring Machine	Lineal Miles of Guideway				-				
10.077	Sunken Tunnel	Lineal Miles of Guideway				-				
10.078	Unspecified	Lineal Miles of Guideway				-				
10.080	Guideway: Retained cut or fill	Lineal Miles of Guideway				-				
10.090	Track: Direct fixation	Track Miles				-				
10.100	Track: Embedded	Track Miles				-				
10.110	Track: Ballasted	Track Miles				-				
10.120	Track: Special (switches, turnouts)	Track Miles				-				
10.130	Track: Vibration & Noise Dampening	Track Miles				-				
10.140	Special Structures	Lineal Miles of Guideway	29.11	232,855	-	232,855	8,000			
10.141	Escape Gallery	Lineal Miles of Guideway	29.11	232,855	-	232,855	8,000			
20	**Stations, Stops, Terminals, Intermodels**	**Stations**	3	3,612,903	-	**3,612,903**	1,204,301	35%	35%	
20.010	At-Grade Station, Stop, Shelter, Mall, Terminal, Platform	Stations				-				
20.020	Aerial station, stop, shelter, mall, terminal, platform	Stations				-				
20.030	Underground station, stop, shelter, mall, terminal, platform	Stations	3.00	3,612,903	-	3,612,903	1,204,301			
20.031	WASHINGTON DC STATION	Stations	1.00	1,222,581	-	1,222,581	1,222,581			
	WASHINGTON DC STATION - CIVIL/STRUCTURAL	Stations	1.00	1,000,000	-	1,000,000	1,000,000			
	WASHINGTON DC STATION - ARCHITECTURAL	Stations	1.00	222,581	-	222,581	222,581			
20.032	BWI AIRPORT STATION	Stations	1.00	945,161	-	945,161	945,161			
	BWI AIRPORT STATION - CIVIL/STRUCTURAL	Stations	1.00	800,000	-	800,000	800,000			
	BWI AIRPORT STATION - ARCHITECTURAL	Stations	1.00	145,161	-	145,161	145,161			
20.033	BALTIMORE STATION	Stations	1.00	1,445,161	-	1,445,161	1,445,161			
	BALTIMORE STATION - CIVIL/STRUCTURAL	Stations	1.00	1,300,000	-	1,300,000	1,300,000			
	BALTIMORE STATION - ARCHITECTURAL	Stations	1.00	145,161	-	145,161	145,161			
20.040	Major stations, landings, terminals: Intermodal, ferry, trolley, etc.	Stations				-				
20.050	Joint development	Stations				-				
20.060	Automobile parking multi-story structure	Spaces				-				
20.070	Elevators, escalators	Number				-				
20.071	Elevators	Number				-				
20.072	Escalators	Number				-				
20.073	Unspecified	Number				-				
20.080	Passenger Overpass	Number				-				
20.090	Underground Interconnecting Tunnel	Number				-				
20.091	Cut and Cover	Number				-				
20.092	Bored Earth Soft Soils	Number				-				
20.093	Bored Rock Hard Soils	Number				-				
20.094	Unspecified	Number				-				
20.100	Signage and Graphics	Number				-				
30	**Support Facilities: Yards, Shops, Admin. Bldgs**	**Number**	16.00	802,400	-	**802,400**	50,150	8%	8%	
30.010	Administration Building: Office, sales, storage, revenue counting	Number				-				
30.011	Administrative Building	Number				-				
30.012	Central Control Facility	Number				-				
30.013	Central Revenue Counting Facility	Number				-				
30.014	Unspecified	Number				-				
30.020	Light Maintenance Facility	Number				-				
30.030	Heavy Maintenance Facility (TMF, Shop Equipment included in Code 50, Systems)	Number	1.00	280,000	-	280,000	280,000			
30.040	Storage or Maintenance of Way Building (MOW Facilities at TMF and Westport)	Number	2.00	60,000	-	60,000	30,000			
30.050	Yard and Yard Track	Number	1.00	120,000	-	120,000	120,000			
30.060	Electrical Substations (Equipment is included in Code 50, Systems)	Number	4.00	22,400	-	22,400	5,600			
30.061	Electrical Substation (at 104+250- DC)	Number	1.00	5,600	-	5,600	5,600			
30.062	Electrical Substation (at 124+100-LAUREL, MD)	Number	1.00	5,600	-	5,600	5,600			
30.063	Electrical Substation (at 151+100-SOUTH OF I-895)	Number	1.00	5,600	-	5,600	5,600			
30.064	Electrical Substation (at 155+500-BALTIMORE)	Number	1.00	5,600	-	5,600	5,600			
30.070	Ventilation Plant/Emergency Exits	Number	8.00	320,000	-	320,000	40,000			
30.071	Ventilation Plant (FA/EE) No.1 (at 104+400)	Number	1.00	40,000	-	40,000	40,000			
30.072	Ventilation Plant (FA/EE) No.2 (at 108+150)	Number	1.00	40,000	-	40,000	40,000			
30.073	Ventilation Plant (FA/EE) No.3 (at 113+100)	Number	1.00	40,000	-	40,000	40,000			
30.074	Ventilation Plant (FA/EE) No.4 (at 140+300)	Number	1.00	40,000	-	40,000	40,000			
30.075	Ventilation Plant (FA/EE) No.5 (at 141+600)	Number	1.00	40,000	-	40,000	40,000			
30.076	Ventilation Plant (FA/EE) No.6(at 143+600)	Number	1.00	40,000	-	40,000	40,000			
30.077	Ventilation Plant (FA/EE) No.7 (at 146+500)	Number	1.00	40,000	-	40,000	40,000			
30.078	Ventilation Plant (FA/EE) No.8 (at 151+100)	Number	1.00	40,000	-	40,000	40,000			
40	**Sitework & Special Conditions**	**Lineal Miles of Guideway**	40.97	79,073	-	**79,073**	1,930	1%	1%	
40.010	Demolition, Clearing, Earthwork	Lineal Miles of Guideway	10.77	1,895	-	1,895	176			
40.020	Site Utilities, Utility Relocation	Lineal Miles of Guideway	10.77	1,271	-	1,271	118			
40.021	Urban Replacement In-Kind Public Utilities	Lineal Miles of Guideway				-				
40.022	Urban Replacement In-Kind Private Utilities	Lineal Miles of Guideway				-				
40.023	Urban Replacement Betterment Public Utilities	Lineal Miles of Guideway				-				
40.024	Urban Replacement Betterment Private Utilities	Lineal Miles of Guideway				-				
40.025	Suburban Replacement In-Kind Public Utilities	Lineal Miles of Guideway				-				
40.026	Suburban Replacement In-Kind Private Utilities	Lineal Miles of Guideway				-				
40.027	Suburban Replacement Betterment Public Utilities	Lineal Miles of Guideway				-				
40.028	Suburban Replacement Betterment Private Utilities	Lineal Miles of Guideway				-				
40.029	Unspecified	Lineal Miles of Guideway				-				
40.030	Haz. mat'l, contam'd soil removal/mitigation, ground water treatments	Lineal Miles of Guideway	10.77	162	-	162	15			
40.031	HazMat Abatement	Lineal Miles of Guideway				-				
40.032	Contaminated Soil Removal	Lineal Miles of Guideway				-				
40.033	Ground Water Treatment	Lineal Miles of Guideway				-				
40.034	Unspecified	Lineal Miles of Guideway				-				
40.040	Environmental mitigation, e.g. wetlands, historic/archeologic, parks	Lineal Miles of Guideway				-				
40.050	Site structures including retaining walls, sound walls	Lineal Miles of Guideway	10.77	41,839	-	41,839	3,886			
40.051	Mechanically Stabilized Earth Walls	Lineal Miles of Guideway				-				
40.052	Concrete Walls	Lineal Miles of Guideway				-				
40.053	Other Walls	Lineal Miles of Guideway				-				
40.054	Unspecified	Lineal Miles of Guideway				-				
40.060	Pedestrian / bike access and accommodation, landscaping	Lineal Miles of Guideway				-				
40.070	Automobile, bus, van accessways including roads, parking lots	Lump Sum	1.00	31,818	-	31,818	31,818			
40.071	Surface Parking Lot	Spaces				-				
40.072	Auto Access	Stations				-				
40.073	Bus Access	Spaces				-				
40.074	Bus Parking and Berthing	Spaces				-				
40.075	Unspecified	Spaces				-				
40.080	Temporary Facilities and other indirect costs during construction	Lump Sum	1.00	2,089	-	2,089	2,089			
40.081	Roadway Changes	Lineal Miles of Guideway				-				
40.082	Third-Party Work	Lineal Miles of Guideway				-				
40.083	Mobilization	Lineal Miles of Guideway				-				
40.084	Maintenance of Traffic (Railroad reroute, shutdown, reschedule, stage, phase, worker-protect, work-around)	Lineal Miles of Guideway				-				

40.085	Unallocated Indirect Costs	Lump Sum				-				
40.086	Unspecified	Lineal Miles of Guideway				-				
50	**Systems**	**LUMP SUM**	0.00	-	-	**-**		0%	0%	
50.010	Train control and signals	Track Miles				-				
50.011	Train Control - Wayside	Track Miles				-				
50.012	Train Control - On Board Systems	Track Miles				-				
50.013	Train Control - Centralized Systems	Track Miles				-				
50.014	Unspecified	Track Miles				-				
50.020	Traffic signals and crossing protection	Track Miles				-				
50.030	Traction power supply: substations	Track Miles				-				
50.040	Traction power distribution: catenary and third rail	Track Miles				-				
50.041	Catenary	Track Miles				-				
50.042	Third Rail	Track Miles				-				
50.043	Power Distribution and Connections	Track Miles				-				
50.044	Unspecified	Track Miles				-				
50.050	Communications	Lineal Miles of Guideway				-				
50.051	Wired	Lineal Miles of Guideway				-				
50.052	Radio Based	Lineal Miles of Guideway				-				
50.053	Unspecified	Lineal Miles of Guideway				-				
50.060	Fare collection system and equipment	Stations				-				
50.061	Central Revenue Counting Systems	Stations				-				
50.062	Revenue Collection - In Station	Stations				-				
50.063	Revenue Collection - On Vehicle	Vehicles				-				
50.064	Unspecified	Stations				-				
50.070	Central Control System	Lineal Miles of Guideway				-				
51	**Construction Subtotal (10-50)**	**Lineal Miles of Guideway**	40.97	10,304,992	-	**10,304,992**	251,519	100%	100%	
60	**Row, Land, Existing Improvements**	**Lineal Miles of Guideway**				**-**			0%	
60.010	Purchase or lease of real estate	Lineal Miles of Guideway				-				
60.011	Full Takes	Lineal Miles of Guideway				-				
60.012	Part Takes	Lineal Miles of Guideway				-				
60.013	Easement Acquisitions	Lineal Miles of Guideway				-				
60.014	Other Rights	Lineal Miles of Guideway				-				
60.015	Donated Value	Lineal Miles of Guideway				-				
60.016	Unspecified	Lineal Miles of Guideway				-				
60.020	Relocation of existing households and businesses	Lineal Miles of Guideway				-				
60.021	Residential (Owners)	Lineal Miles of Guideway				-				
60.022	Residential (Tenants)	Lineal Miles of Guideway				-				
60.023	Business (Owners and Tenants)	Lineal Miles of Guideway				-				
60.024	Others (Personal Property Moves)	Lineal Miles of Guideway				-				
60.025	Unspecified	Lineal Miles of Guideway				-				
60.030	Services	Lineal Miles of Guideway				-				
60.031	Property Management	Lineal Miles of Guideway				-				
60.032	Agency	Lineal Miles of Guideway				-				
60.033	Contractor R/W Services (Title/Appraisal, etc)	Lineal Miles of Guideway				-				
60.034	Legal Services	Lineal Miles of Guideway				-				
60.035	Unspecified	Lineal Miles of Guideway				-				
60.040	Other Real Estate Costs	Lineal Miles of Guideway				-				
70	**Vehicles**	**Vehicles**	0.00	-	-	**-**			0%	
70.010	Light Rail	Vehicles				-				
70.011	Static	Vehicles				-				
70.012	Articulated	Vehicles				-				
70.013	Unspecified	Vehicles				-				
70.020	Heavy Rail	Vehicles				-				
70.021	Small Scale	Vehicles				-				
70.022	Large Scale	Vehicles				-				
70.023	Unspecified	Vehicles				-				
70.030	Commuter Rail	Vehicles				-				
70.031	Locomotive	Vehicles				-				
70.032	Passenger Car	Vehicles				-				
70.033	Bi-Level Passenger Car	Vehicles				-				
70.034	Self-Propelled Passenger Car	Vehicles				-				
70.035	Unspecified	Vehicles				-				
70.040	Bus	Vehicles				-				
70.041	Small Bus	Vehicles				-				
70.042	Standard 40 Foot Bus	Vehicles				-				
70.043	Articulated Bus	Vehicles				-				
70.044	Unspecified	Vehicles				-				
70.050	Other Vehicles	Vehicles				-				
70.060	Non-revenue vehicles	Vehicles				-				
70.061	Maintenance of Way Vehicles	Vehicles				-				
70.062	Automobiles	Vehicles				-				
70.063	Trucks	Vehicles				-				
70.064	Unspecified	Vehicles				-				
70.070	Spare parts/ Rotable Components	Vehicles				-				
70.080	Intercity Passenger Rail	Vehicles				-				
70.081	Diesel Locomotive	Vehicles				-				
70.082	Cab Car	Vehicles				-				
70.083	Bi-Level Coach	Vehicles				-				
70.084	Single Level Coach	Vehicles				-				
70.085	DMU	Vehicles				-				
70.086	EMU	Vehicles				-				
70.087	Unspecified					-				
80	**Professional Services**			-	-	**-**			0%	
80.000	Planning and Concept Design					-				
80.010	Preliminary Engineering					-				
80.020	Final Design					-				
80.030	Project Management for Design and Construction					-				
80.031	Agency Project Management					-				
80.032	Project Management Oversight Support					-				
80.033	Agency Force Account					-				
80.034	Unspecified					-				
80.040	Construction Administration & Management					-				
80.050	Professional Liability and other Non-Construction Insurance					-				
80.060	Legal; Permits; Review Fees by other agencies, cities, etc.					-				
80.070	Surveys, Testing, Investigation, Inspection					-				
80.080	Start up					-				
80.081	Training/Start-up					-				
80.082	Safety Certification					-				
80.083	Off-Site Vehicle Testing, Test Runs					-				
80.084	Commissioning					-				
80.085	Unspecified					-				
80.090	Other					-				
81	**Subtotal (10-80)**	Lineal Miles of Guideway	40.97	10,304,992	-	10,304,992	251,519		100%	
90	**Unallocated Contingency**	Total Amount				**-**			0%	
91	**Subtotal (10-90)**	Lineal Miles of Guideway	40.97	10,304,992	-	**10,304,992**	251,519		100%	
100	**Finance Charges**	Total Amount		-	-	**-**			0%	
101	**Total Project Costs (10-100)**	Lineal Miles of Guideway	40.97	10,304,992	-	**10,304,992**	251,519		100%	

Allocated Contingency as % of Base Yr Dollars w/o Contingency	0.00%
Unallocated Contingency as % of Base Yr Dollars w/o Contingency	0.00%
Total Contingency as % of Base Yr Dollars w/o Contingency	0.00%

FRA MAIN WORKSHEET

Grantee Name: **Maryland DOT and Baltimore-Washington Rapid Rail (BWRR)**

Project Name and Location: **Baltimore-Washington SCMAGLEV** LB 4.3 SCC Alt J and J1 - MVS East - Cherry Hill BARC.xls

Current Phase : **Administrative Draft Environmental Impact Statement**

Alignment: **J**
TMF **BARC**
Baltimore Station: **Cherry Hill**
Note: Costs do not reflect Value Engineering opportunities

Issue Date	
Today's Date	**3/31/20**
Yr of Base Year $	**2018**
Yr of Revenue Ops	**2029**

Standard Cost Category		Unit	Quantity	Base Year Dollars: Without Contingency (X000)	Base Year Dollars: Allocated Contingency (X000)	Base Year Dollars: **TOTAL (X000)**	Unit Cost (X000)	Percent of Construction Cost	Percent of Total Project Cost	**YOE Dollars Total (X000)** (from Inflation Worksheet)
10	**Guideway & Track Elements**	**Lineal Miles of Guideway**	37.56	5,396,906	-	**5,396,906**	143,705	61%	61%	
10.010	Guideway: At-grade exclusive right-of-way	Lineal Miles of Guideway				-				
10.020	Guideway: At-grade semi-exclusive (allows cross-traffic)	Lineal Miles of Guideway				-				
10.030	Guideway: At-grade in mixed traffic	Lineal Miles of Guideway				-				
10.040	Guideway: Aerial structure	Lineal Miles of Guideway	10.24	706,589	-	706,589	68,981			
10.041	Bridges	Lineal Miles of Guideway				-				
10.042	Viaduct	Lineal Miles of Guideway	8.87	665,489	-	665,489	75,000			
10.043	Other Structure (MOW Ramp)	Lineal Miles of Guideway	1.37	41,100		41,100	30,000			
10.044	Portals	Lineal Miles of Guideway				-				
10.050	Guideway: Built-up fill	Lineal Miles of Guideway	0.46	34,253	-	34,253	75,000			
10.060	Guideway: Underground cut & cover	Lineal Miles of Guideway	2.01	341,195	-	341,195	170,000			
10.061	Cut & Cover Guideway Soft Soils	Lineal Miles of Guideway				-				
10.062	Cut & Cover Guideway Hard Soils	Lineal Miles of Guideway				-				
10.063	Cut & Cover Guideway Vent Soft Soils	Lineal Miles of Guideway				-				
10.064	Cut & Cover Guideway Vent Hard Soils	Lineal Miles of Guideway				-				
10.065	Unspecified	Lineal Miles of Guideway				-				
10.070	Guideway: Underground tunnel	Lineal Miles of Guideway	24.85	4,100,025	-	4,100,025	165,000			
10.071	Bored Earth Open	Lineal Miles of Guideway				-				
10.072	Bored Earth Close	Lineal Miles of Guideway				-				
10.073	Bored Earth Mixed Shield	Lineal Miles of Guideway	24.85	4,100,025	-	4,100,025	165,000			
10.074	Bored Earth Mixes Shield SEM	Lineal Miles of Guideway				-				
10.075	Rock Drill & Blast	Lineal Miles of Guideway				-				
10.076	Rock Boring Machine	Lineal Miles of Guideway				-				
10.077	Sunken Tunnel	Lineal Miles of Guideway				-				
10.078	Unspecified	Lineal Miles of Guideway				-				
10.080	Guideway: Retained cut or fill	Lineal Miles of Guideway				-				
10.090	Track: Direct fixation	Track Miles				-				
10.100	Track: Embedded	Track Miles				-				
10.110	Track: Ballasted	Track Miles				-				
10.120	Track: Special (switches, turnouts)	Track Miles				-				
10.130	Track: Vibration & Noise Dampening	Track Miles				-				
10.140	Special Structures	Lineal Miles of Guideway	26.86	214,845	-	214,845	8,000			
10.141	Escape Gallery	Lineal Miles of Guideway	26.86	214,845	-	214,845	8,000			
20	**Stations, Stops, Terminals, Intermodels**	**Stations**	3	2,788,710	-	**2,788,710**	929,570	31%	31%	
20.010	At-Grade Station, Stop, Shelter, Mall, Terminal, Platform	Stations				-				
20.020	Aerial station, stop, shelter, mall, terminal, platform	Stations	1.00	620,968	-	620,968	620,968			
20.021	BALTIMORE STATION	Stations	1.00	620,968	-	620,968	620,968			
	BALTIMORE STATION - CIVIL/STRUCTURAL	Stations	1.00	475,807	-	475,807	475,807			
	BALTIMORE STATION - ARCHITECTURAL	Stations	1.00	145,161	-	145,161	145,161			
20.030	Underground station, stop, shelter, mall, terminal, platform	Stations	2.00	2,167,742	-	2,167,742	1,083,871			
20.031	WASHINGTON DC STATION	Stations	1.00	1,222,581	-	1,222,581	1,222,581			
	WASHINGTON DC STATION - CIVIL/STRUCTURAL	Stations	1.00	1,000,000	-	1,000,000	1,000,000			
	WASHINGTON DC STATION - ARCHITECTURAL	Stations	1.00	222,581	-	222,581	222,581			
20.032	BWI AIRPORT STATION	Stations	1.00	945,161	-	945,161	945,161			
	BWI AIRPORT STATION - CIVIL/STRUCTURAL	Stations	1.00	800,000	-	800,000	800,000			
	BWI AIRPORT STATION - ARCHITECTURAL	Stations	1.00	145,161	-	145,161	145,161			
20.040	Major stations, landings, terminals: Intermodal, ferry, trolley, etc.	Stations				-				
20.050	Joint development	Stations				-				
20.060	Automobile parking multi-story structure	Spaces				-				
20.070	Elevators, escalators	Number				-				
20.071	Elevators	Number				-				
20.072	Escalators	Number				-				
20.073	Unspecified	Number				-				
20.080	Passenger Overpass	Number				-				
20.090	Underground Interconnecting Tunnel	Number				-				
20.091	Cut and Cover	Number				-				
20.092	Bored Earth Soft Soils	Number				-				
20.093	Bored Rock Hard Soils	Number				-				
20.094	Unspecified	Number				-				
20.100	Signage and Graphics	Number				-				
30	**Support Facilities: Yards, Shops, Admin. Bldgs**	**Number**	16.00	602,400	-	**602,400**	37,650	7%	7%	
30.010	Administration Building: Office, sales, storage, revenue counting	Number				-				
30.011	Administrative Building	Number				-				
30.012	Central Control Facility	Number				-				
30.013	Central Revenue Counting Facility	Number				-				
30.014	Unspecified	Number				-				
30.020	Light Maintenance Facility	Number				-				
30.030	Heavy Maintenance Facility (TMF, Shop Equipment included in Code 50, Systems)	Number	1.00	80,000	-	80,000	80,000			
30.040	Storage or Maintenance of Way Building (MOW Facilities at TMF and Cherry Hill)	Number	2.00	60,000	-	60,000	30,000			
30.050	Yard and Yard Track	Number	1.00	120,000	-	120,000	120,000			
30.060	Electrical Substations (Equipment is included in Code 50, Systems)	Number	4.00	22,400	-	22,400	5,600			
30.061	Electrical Substation (at 104+250- DC)	Number	1.00	5,600	-	5,600	5,600			
30.062	Electrical Substation (at 124+100-LAUREL, MD)	Number	1.00	5,600	-	5,600	5,600			
30.063	Electrical Substation (at 151+100-SOUTH OF I-895)	Number	1.00	5,600	-	5,600	5,600			
30.064	Electrical Substation (at 155+500-BALTIMORE)	Number	1.00	5,600	-	5,600	5,600			
30.070	Ventilation Plant/Emergency Exits	Number	8.00	320,000	-	320,000	40,000			
30.071	Ventilation Plant (FA/EE) No.1 (at 104+400)	Number	1.00	40,000	-	40,000	40,000			
30.072	Ventilation Plant (FA/EE) No.2 (at 108+150)	Number	1.00	40,000	-	40,000	40,000			
30.073	Ventilation Plant (FA/EE) No.3 (at 113+100)	Number	1.00	40,000	-	40,000	40,000			
30.074	Ventilation Plant (FA/EE) No.4 (at 140+300)	Number	1.00	40,000	-	40,000	40,000			
30.075	Ventilation Plant (FA/EE) No.5 (at 141+600)	Number	1.00	40,000	-	40,000	40,000			
30.076	Ventilation Plant (FA/EE) No.6(at 143+600)	Number	1.00	40,000	-	40,000	40,000			
30.077	Ventilation Plant (FA/EE) No.7 (at 146+500)	Number	1.00	40,000	-	40,000	40,000			
30.078	Ventilation Plant (FA/EE) No.8 (at 151+100)	Number	1.00	40,000	-	40,000	40,000			
40	**Sitework & Special Conditions**	**Lineal Miles of Guideway**	37.56	79,073	-	**79,073**	2,105	1%	1%	
40.010	Demolition, Clearing, Earthwork	Lineal Miles of Guideway	11.34	1,895	-	1,895	167			
40.020	Site Utilities, Utility Relocation	Lineal Miles of Guideway	11.34	1,271	-	1,271	112			
40.021	Urban Replacement In-Kind Public Utilities	Lineal Miles of Guideway				-				
40.022	Urban Replacement In-Kind Private Utilities	Lineal Miles of Guideway				-				
40.023	Urban Replacement Betterment Public Utilities	Lineal Miles of Guideway				-				
40.024	Urban Replacement Betterment Private Utilities	Lineal Miles of Guideway				-				
40.025	Suburban Replacement In-Kind Public Utilities	Lineal Miles of Guideway				-				
40.026	Suburban Replacement In-Kind Private Utilities	Lineal Miles of Guideway				-				
40.027	Suburban Replacement Betterment Public Utilities	Lineal Miles of Guideway				-				
40.028	Suburban Replacement Betterment Private Utilities	Lineal Miles of Guideway				-				
40.029	Unspecified	Lineal Miles of Guideway				-				
40.030	Haz. mat'l, contam'd soil removal/mitigation, ground water treatments	Lineal Miles of Guideway	11.34	162	-	162	14			
40.031	HazMat Abatement	Lineal Miles of Guideway				-				
40.032	Contaminated Soil Removal	Lineal Miles of Guideway				-				
40.033	Ground Water Treatment	Lineal Miles of Guideway				-				
40.034	Unspecified	Lineal Miles of Guideway				-				
40.040	Environmental mitigation, e.g. wetlands, historic/archeologic, parks	Lineal Miles of Guideway				-				
40.050	Site structures including retaining walls, sound walls	Lineal Miles of Guideway	11.34	41,839	-	41,839	3,690			
40.051	Mechanically Stabilized Earth Walls	Lineal Miles of Guideway				-				
40.052	Concrete Walls	Lineal Miles of Guideway				-				
40.053	Other Walls	Lineal Miles of Guideway				-				
40.054	Unspecified	Lineal Miles of Guideway				-				
40.060	Pedestrian / bike access and accommodation, landscaping	Lineal Miles of Guideway				-				
40.070	Automobile, bus, van accessways including roads, parking lots	Lump Sum	1.00	31,818	-	31,818	31,818			
40.071	Surface Parking Lot	Spaces				-				
40.072	Auto Access	Stations				-				
40.073	Bus Access	Spaces				-				
40.074	Bus Parking and Berthing	Spaces				-				
40.075	Unspecified	Spaces				-				
40.080	Temporary Facilities and other indirect costs during construction	Lump Sum	1.00	2,089	-	2,089	2,089			
40.081	Roadway Changes	Lineal Miles of Guideway				-				
40.082	Third-Party Work	Lineal Miles of Guideway				-				
40.083	Mobilization	Lineal Miles of Guideway				-				
40.084	Maintenance of Traffic (Railroad reroute, shutdown, reschedule, stage, phase, worker-protect, work-around)	Lineal Miles of Guideway				-				

40.085	Unallocated Indirect Costs	Lump Sum				-				
40.086	Unspecified	Lineal Miles of Guideway				-				
50	**Systems**	**LUMP SUM**	0.00	-	-	**-**		0%	0%	
50.010	Train control and signals	Track Miles				-				
50.011	Train Control - Wayside	Track Miles				-				
50.012	Train Control - On Board Systems	Track Miles				-				
50.013	Train Control - Centralized Systems	Track Miles				-				
50.014	Unspecified	Track Miles				-				
50.020	Traffic signals and crossing protection	Track Miles				-				
50.030	Traction power supply: substations	Track Miles				-				
50.040	Traction power distribution: catenary and third rail	Track Miles				-				
50.041	Catenary	Track Miles				-				
50.042	Third Rail	Track Miles				-				
50.043	Power Distribution and Connections	Track Miles				-				
50.044	Unspecified	Track Miles				-				
50.050	Communications	Lineal Miles of Guideway				-				
50.051	Wired	Lineal Miles of Guideway				-				
50.052	Radio Based	Lineal Miles of Guideway				-				
50.053	Unspecified	Lineal Miles of Guideway				-				
50.060	Fare collection system and equipment	Stations				-				
50.061	Central Revenue Counting Systems	Stations				-				
50.062	Revenue Collection - In Station	Stations				-				
50.063	Revenue Collection - On Vehicle	Vehicles				-				
50.064	Unspecified	Stations				-				
50.070	Central Control System	Lineal Miles of Guideway				-				
51	**Construction Subtotal (10-50)**	**Lineal Miles of Guideway**	37.56	8,867,089	-	**8,867,089**	236,106	100%	100%	
60	**Row, Land, Existing Improvements**	**Lineal Miles of Guideway**				**-**			0%	
60.010	Purchase or lease of real estate	Lineal Miles of Guideway				-				
60.011	Full Takes	Lineal Miles of Guideway				-				
60.012	Part Takes	Lineal Miles of Guideway				-				
60.013	Easement Acquisitions	Lineal Miles of Guideway				-				
60.014	Other Rights	Lineal Miles of Guideway				-				
60.015	Donated Value	Lineal Miles of Guideway				-				
60.016	Unspecified	Lineal Miles of Guideway				-				
60.020	Relocation of existing households and businesses	Lineal Miles of Guideway				-				
60.021	Residential (Owners)	Lineal Miles of Guideway				-				
60.022	Residential (Tenants)	Lineal Miles of Guideway				-				
60.023	Business (Owners and Tenants)	Lineal Miles of Guideway				-				
60.024	Others (Personal Property Moves)	Lineal Miles of Guideway				-				
60.025	Unspecified	Lineal Miles of Guideway				-				
60.030	Services	Lineal Miles of Guideway				-				
60.031	Property Management	Lineal Miles of Guideway				-				
60.032	Agency	Lineal Miles of Guideway				-				
60.033	Contractor R/W Services (Title/Appraisal, etc)	Lineal Miles of Guideway				-				
60.034	Legal Services	Lineal Miles of Guideway				-				
60.035	Unspecified	Lineal Miles of Guideway				-				
60.040	Other Real Estate Costs	Lineal Miles of Guideway				-				
70	**Vehicles**	**Vehicles**	0.00	-	-	**-**			0%	
70.010	Light Rail	Vehicles				-				
70.011	Static	Vehicles				-				
70.012	Articulated	Vehicles				-				
70.013	Unspecified	Vehicles				-				
70.020	Heavy Rail	Vehicles				-				
70.021	Small Scale	Vehicles				-				
70.022	Large Scale	Vehicles				-				
70.023	Unspecified	Vehicles				-				
70.030	Commuter Rail	Vehicles				-				
70.031	Locomotive	Vehicles				-				
70.032	Passenger Car	Vehicles				-				
70.033	Bi-Level Passenger Car	Vehicles				-				
70.034	Self-Propelled Passenger Car	Vehicles				-				
70.035	Unspecified	Vehicles				-				
70.040	Bus	Vehicles				-				
70.041	Small Bus	Vehicles				-				
70.042	Standard 40 Foot Bus	Vehicles				-				
70.043	Articulated Bus	Vehicles				-				
70.044	Unspecified	Vehicles				-				
70.050	Other Vehicles	Vehicles				-				
70.060	Non-revenue vehicles	Vehicles				-				
70.061	Maintenance of Way Vehicles	Vehicles				-				
70.062	Automobiles	Vehicles				-				
70.063	Trucks	Vehicles				-				
70.064	Unspecified	Vehicles				-				
70.070	Spare parts/ Rotable Components	Vehicles				-				
70.080	Intercity Passenger Rail	Vehicles				-				
70.081	Diesel Locomotive	Vehicles				-				
70.082	Cab Car	Vehicles				-				
70.083	Bi-Level Coach	Vehicles				-				
70.084	Single Level Coach	Vehicles				-				
70.085	DMU	Vehicles				-				
70.086	EMU	Vehicles				-				
70.087	Unspecified					-				
80	**Professional Services**			-	-	**-**			0%	
80.000	Planning and Concept Design					-				
80.010	Preliminary Engineering					-				
80.020	Final Design					-				
80.030	Project Management for Design and Construction					-				
80.031	Agency Project Management					-				
80.032	Project Management Oversight Support					-				
80.033	Agency Force Account					-				
80.034	Unspecified					-				
80.040	Construction Administration & Management					-				
80.050	Professional Liability and other Non-Construction Insurance					-				
80.060	Legal; Permits; Review Fees by other agencies, cities, etc.					-				
80.070	Surveys, Testing, Investigation, Inspection					-				
80.080	Start up					-				
80.081	Training/Start-up					-				
80.082	Safety Certification					-				
80.083	Off-Site Vehicle Testing, Test Runs					-				
80.084	Commissioning					-				
80.085	Unspecified					-				
80.090	Other					-				
81	**Subtotal (10-80)**	Lineal Miles of Guideway	37.56	8,867,089	-	8,867,089	236,106		100%	
90	**Unallocated Contingency**	Total Amount				**-**			0%	
91	**Subtotal (10-90)**	Lineal Miles of Guideway	37.56	8,867,089	-	**8,867,089**	236,106		100%	
100	**Finance Charges**	Total Amount		-	-	**-**			0%	
101	**Total Project Costs (10-100)**	Lineal Miles of Guideway	37.56	8,867,089	-	**8,867,089**	236,106		100%	

Allocated Contingency as % of Base Yr Dollars w/o Contingency	0.00%
Unallocated Contingency as % of Base Yr Dollars w/o Contingency	0.00%
Total Contingency as % of Base Yr Dollars w/o Contingency	0.00%

FRA MAIN WORKSHEET

Grantee Name: **Maryland DOT and Baltimore-Washington Rapid Rail (BWRR)**

Project Name and Location: **Baltimore-Washington SCMAGLEV** LB 4.3 SCC Alt J and J1 - MVS East - Cherry Hill MD-198.xls

Current Phase : **Administrative Draft Environmental Impact Statement**

Alignment: **J**
TMF **MD-198**
Baltimore Station: **Cherry Hill**
Note: Costs do not reflect Value Engineering opportunities

Issue Date
Today's Date **3/31/20**
Yr of Base Year $ **2018**
Yr of Revenue Ops **2029**

Standard Cost Category		Unit	Quantity	Base Year Dollars: Without Contingency (X000)	Allocated Contingency (X000)	TOTAL (X000)	Unit Cost (X000)	Percent of Construction Cost	Percent of Total Project Cost	YOE Dollars Total (X000) (from Inflation Worksheet)
10	**Guideway & Track Elements**	**Lineal Miles of Guideway**	39.36	5,450,906	-	**5,450,906**	138,504	60%	60%	
10.010	Guideway: At-grade exclusive right-of-way	Lineal Miles of Guideway				-				
10.020	Guideway: At-grade semi-exclusive (allows cross-traffic)	Lineal Miles of Guideway				-				
10.030	Guideway: At-grade in mixed traffic	Lineal Miles of Guideway				-				
10.040	Guideway: Aerial structure	Lineal Miles of Guideway	12.04	760,589	-	760,589	63,155			
10.041	Bridges	Lineal Miles of Guideway				-				
10.042	Viaduct	Lineal Miles of Guideway	8.87	665,489	-	665,489	75,000			
10.043	Other Structure (MOW Ramp)	Lineal Miles of Guideway	3.17	95,100		95,100	30,000			
10.044	Portals	Lineal Miles of Guideway				-				
10.050	Guideway: Built-up fill	Lineal Miles of Guideway	0.46	34,253	-	34,253	75,000			
10.060	Guideway: Underground cut & cover	Lineal Miles of Guideway	2.01	341,195	-	341,195	170,000			
10.061	Cut & Cover Guideway Soft Soils	Lineal Miles of Guideway				-				
10.062	Cut & Cover Guideway Hard Soils	Lineal Miles of Guideway				-				
10.063	Cut & Cover Guideway Vent Soft Soils	Lineal Miles of Guideway				-				
10.064	Cut & Cover Guideway Vent Hard Soils	Lineal Miles of Guideway				-				
10.065	Unspecified	Lineal Miles of Guideway				-				
10.070	Guideway: Underground tunnel	Lineal Miles of Guideway	24.85	4,100,025	-	4,100,025	165,000			
10.071	Bored Earth Open	Lineal Miles of Guideway				-				
10.072	Bored Earth Close	Lineal Miles of Guideway				-				
10.073	Bored Earth Mixed Shield	Lineal Miles of Guideway	24.85	4,100,025	-	4,100,025	165,000			
10.074	Bored Earth Mixes Shield SEM	Lineal Miles of Guideway				-				
10.075	Rock Drill & Blast	Lineal Miles of Guideway				-				
10.076	Rock Boring Machine	Lineal Miles of Guideway				-				
10.077	Sunken Tunnel	Lineal Miles of Guideway				-				
10.078	Unspecified	Lineal Miles of Guideway				-				
10.080	Guideway: Retained cut or fill	Lineal Miles of Guideway				-				
10.090	Track: Direct fixation	Track Miles				-				
10.100	Track: Embedded	Track Miles				-				
10.110	Track: Ballasted	Track Miles				-				
10.120	Track: Special (switches, turnouts)	Track Miles				-				
10.130	Track: Vibration & Noise Dampening	Track Miles				-				
10.140	Special Structures	Lineal Miles of Guideway	26.86	214,845	-	214,845	8,000			
10.141	Escape Gallery	Lineal Miles of Guideway	26.86	214,845	-	214,845	8,000			
20	**Stations, Stops, Terminals, Intermodels**	**Stations**	3	2,788,710	-	**2,788,710**	929,570	31%	31%	
20.010	At-Grade Station, Stop, Shelter, Mall, Terminal, Platform	Stations				-				
20.020	Aerial station, stop, shelter, mall, terminal, platform	Stations	1.00	620,968	-	620,968	620,968			
20.021	BALTIMORE STATION	Stations	1.00	620,968	-	620,968	620,968			
	BALTIMORE STATION - CIVIL/STRUCTURAL	Stations	1.00	475,807	-	475,807	475,807			
	BALTIMORE STATION - ARCHITECTURAL	Stations	1.00	145,161	-	145,161	145,161			
20.030	Underground station, stop, shelter, mall, terminal, platform	Stations	2.00	2,167,742	-	2,167,742	1,083,871			
20.031	WASHINGTON DC STATION	Stations	1.00	1,222,581	-	1,222,581	1,222,581			
	WASHINGTON DC STATION - CIVIL/STRUCTURAL	Stations	1.00	1,000,000	-	1,000,000	1,000,000			
	WASHINGTON DC STATION - ARCHITECTURAL	Stations	1.00	222,581	-	222,581	222,581			
20.032	BWI AIRPORT STATION	Stations	1.00	945,161	-	945,161	945,161			
	BWI AIRPORT STATION - CIVIL/STRUCTURAL	Stations	1.00	800,000	-	800,000	800,000			
	BWI AIRPORT STATION - ARCHITECTURAL	Stations	1.00	145,161	-	145,161	145,161			
20.040	Major stations, landings, terminals: Intermodal, ferry, trolley, etc.	Stations				-				
20.050	Joint development	Stations				-				
20.060	Automobile parking multi-story structure	Spaces				-				
20.070	Elevators, escalators	Number				-				
20.071	Elevators	Number				-				
20.072	Escalators	Number				-				
20.073	Unspecified	Number				-				
20.080	Passenger Overpass	Number				-				
20.090	Underground Interconnecting Tunnel	Number				-				
20.091	Cut and Cover	Number				-				
20.092	Bored Earth Soft Soils	Number				-				
20.093	Bored Rock Hard Soils	Number				-				
20.094	Unspecified	Number				-				
20.100	Signage and Graphics	Number				-				
30	**Support Facilities: Yards, Shops, Admin. Bldgs**	**Number**	16.00	802,400	-	**802,400**	50,150	9%	9%	
30.010	Administration Building: Office, sales, storage, revenue counting	Number				-				
30.011	Administrative Building	Number				-				
30.012	Central Control Facility	Number				-				
30.013	Central Revenue Counting Facility	Number				-				
30.014	Unspecified	Number				-				
30.020	Light Maintenance Facility	Number				-				
30.030	Heavy Maintenance Facility (TMF, Shop Equipment included in Code 50, Systems)	Number	1.00	280,000	-	280,000	280,000			
30.040	Storage or Maintenance of Way Building (MOW Facilities at TMF and Cherry Hill)	Number	2.00	60,000	-	60,000	30,000			
30.050	Yard and Yard Track	Number	1.00	120,000	-	120,000	120,000			
30.060	Electrical Substations (Equipment is included in Code 50, Systems)	Number	4.00	22,400	-	22,400	5,600			
30.061	Electrical Substation (at 104+250- DC)	Number	1.00	5,600	-	5,600	5,600			
30.062	Electrical Substation (at 124+100-LAUREL, MD)	Number	1.00	5,600	-	5,600	5,600			
30.063	Electrical Substation (at 151+100-SOUTH OF I-895)	Number	1.00	5,600	-	5,600	5,600			
30.064	Electrical Substation (at 155+500-BALTIMORE)	Number	1.00	5,600	-	5,600	5,600			
30.070	Ventilation Plant/Emergency Exits	Number	8.00	320,000	-	320,000	40,000			
30.071	Ventilation Plant (FA/EE) No.1 (at 104+400)	Number	1.00	40,000	-	40,000	40,000			
30.072	Ventilation Plant (FA/EE) No.2 (at 108+150)	Number	1.00	40,000	-	40,000	40,000			
30.073	Ventilation Plant (FA/EE) No.3 (at 113+100)	Number	1.00	40,000	-	40,000	40,000			
30.074	Ventilation Plant (FA/EE) No.4 (at 140+300)	Number	1.00	40,000	-	40,000	40,000			
30.075	Ventilation Plant (FA/EE) No.5 (at 141+600)	Number	1.00	40,000	-	40,000	40,000			
30.076	Ventilation Plant (FA/EE) No.6(at 143+600)	Number	1.00	40,000	-	40,000	40,000			
30.077	Ventilation Plant (FA/EE) No.7 (at 146+500)	Number	1.00	40,000	-	40,000	40,000			
30.078	Ventilation Plant (FA/EE) No.8 (at 151+100)	Number	1.00	40,000	-	40,000	40,000			
40	**Sitework & Special Conditions**	**Lineal Miles of Guideway**	39.36	79,073	-	**79,073**	2,009	1%	1%	
40.010	Demolition, Clearing, Earthwork	Lineal Miles of Guideway	11.34	1,895	-	1,895	167			
40.020	Site Utilities, Utility Relocation	Lineal Miles of Guideway	11.34	1,271	-	1,271	112			
40.021	Urban Replacement In-Kind Public Utilities	Lineal Miles of Guideway				-				
40.022	Urban Replacement In-Kind Private Utilities	Lineal Miles of Guideway				-				
40.023	Urban Replacement Betterment Public Utilities	Lineal Miles of Guideway				-				
40.024	Urban Replacement Betterment Private Utilities	Lineal Miles of Guideway				-				
40.025	Suburban Replacement In-Kind Public Utilities	Lineal Miles of Guideway				-				
40.026	Suburban Replacement In-Kind Private Utilities	Lineal Miles of Guideway				-				
40.027	Suburban Replacement Betterment Public Utilities	Lineal Miles of Guideway				-				
40.028	Suburban Replacement Betterment Private Utilities	Lineal Miles of Guideway				-				
40.029	Unspecified	Lineal Miles of Guideway				-				
40.030	Haz. mat'l, contam'd soil removal/mitigation, ground water treatments	Lineal Miles of Guideway	11.34	162	-	162	14			
40.031	HazMat Abatement	Lineal Miles of Guideway				-				
40.032	Contaminated Soil Removal	Lineal Miles of Guideway				-				
40.033	Ground Water Treatment	Lineal Miles of Guideway				-				
40.034	Unspecified	Lineal Miles of Guideway				-				
40.040	Environmental mitigation, e.g. wetlands, historic/archeologic, parks	Lineal Miles of Guideway				-				
40.050	Site structures including retaining walls, sound walls	Lineal Miles of Guideway	11.34	41,839	-	41,839	3,690			
40.051	Mechanically Stabilized Earth Walls	Lineal Miles of Guideway				-				
40.052	Concrete Walls	Lineal Miles of Guideway				-				
40.053	Other Walls	Lineal Miles of Guideway				-				
40.054	Unspecified	Lineal Miles of Guideway				-				
40.060	Pedestrian / bike access and accommodation, landscaping	Lineal Miles of Guideway				-				
40.070	Automobile, bus, van accessways including roads, parking lots	Lump Sum	1.00	31,818	-	31,818	31,818			
40.071	Surface Parking Lot	Spaces				-				
40.072	Auto Access	Stations				-				
40.073	Bus Access	Spaces				-				
40.074	Bus Parking and Berthing	Spaces				-				
40.075	Unspecified	Spaces				-				
40.080	Temporary Facilities and other indirect costs during construction	Lump Sum	1.00	2,089	-	2,089	2,089			
40.081	Roadway Changes	Lineal Miles of Guideway				-				
40.082	Third-Party Work	Lineal Miles of Guideway				-				
40.083	Mobilization	Lineal Miles of Guideway				-				
40.084	Maintenance of Traffic (Railroad reroute, shutdown, reschedule, stage, phase, worker-protect, work-around)	Lineal Miles of Guideway				-				

40.085	Unallocated Indirect Costs	Lump Sum				-				
40.086	Unspecified	Lineal Miles of Guideway				-				
50	**Systems**	**LUMP SUM**	0.00	-	-	**-**		0%	0%	
50.010	Train control and signals	Track Miles				-				
50.011	Train Control - Wayside	Track Miles				-				
50.012	Train Control - On Board Systems	Track Miles				-				
50.013	Train Control - Centralized Systems	Track Miles				-				
50.014	Unspecified	Track Miles				-				
50.020	Traffic signals and crossing protection	Track Miles				-				
50.030	Traction power supply: substations	Track Miles				-				
50.040	Traction power distribution: catenary and third rail	Track Miles				-				
50.041	Catenary	Track Miles				-				
50.042	Third Rail	Track Miles				-				
50.043	Power Distribution and Connections	Track Miles				-				
50.044	Unspecified	Track Miles				-				
50.050	Communications	Lineal Miles of Guideway				-				
50.051	Wired	Lineal Miles of Guideway				-				
50.052	Radio Based	Lineal Miles of Guideway				-				
50.053	Unspecified	Lineal Miles of Guideway				-				
50.060	Fare collection system and equipment	Stations				-				
50.061	Central Revenue Counting Systems	Stations				-				
50.062	Revenue Collection - In Station	Stations				-				
50.063	Revenue Collection - On Vehicle	Vehicles				-				
50.064	Unspecified	Stations				-				
50.070	Central Control System	Lineal Miles of Guideway				-				
51	**Construction Subtotal (10-50)**	**Lineal Miles of Guideway**	39.36	9,121,089	-	**9,121,089**	231,761	100%	100%	
60	**Row, Land, Existing Improvements**	**Lineal Miles of Guideway**				**-**			0%	
60.010	Purchase or lease of real estate	Lineal Miles of Guideway				-				
60.011	Full Takes	Lineal Miles of Guideway				-				
60.012	Part Takes	Lineal Miles of Guideway				-				
60.013	Easement Acquisitions	Lineal Miles of Guideway				-				
60.014	Other Rights	Lineal Miles of Guideway				-				
60.015	Donated Value	Lineal Miles of Guideway				-				
60.016	Unspecified	Lineal Miles of Guideway				-				
60.020	Relocation of existing households and businesses	Lineal Miles of Guideway				-				
60.021	Residential (Owners)	Lineal Miles of Guideway				-				
60.022	Residential (Tenants)	Lineal Miles of Guideway				-				
60.023	Business (Owners and Tenants)	Lineal Miles of Guideway				-				
60.024	Others (Personal Property Moves)	Lineal Miles of Guideway				-				
60.025	Unspecified	Lineal Miles of Guideway				-				
60.030	Services	Lineal Miles of Guideway				-				
60.031	Property Management	Lineal Miles of Guideway				-				
60.032	Agency	Lineal Miles of Guideway				-				
60.033	Contractor R/W Services (Title/Appraisal, etc)	Lineal Miles of Guideway				-				
60.034	Legal Services	Lineal Miles of Guideway				-				
60.035	Unspecified	Lineal Miles of Guideway				-				
60.040	Other Real Estate Costs	Lineal Miles of Guideway				-				
70	**Vehicles**	**Vehicles**	0.00	-	-	**-**			0%	
70.010	Light Rail	Vehicles				-				
70.011	Static	Vehicles				-				
70.012	Articulated	Vehicles				-				
70.013	Unspecified	Vehicles				-				
70.020	Heavy Rail	Vehicles				-				
70.021	Small Scale	Vehicles				-				
70.022	Large Scale	Vehicles				-				
70.023	Unspecified	Vehicles				-				
70.030	Commuter Rail	Vehicles				-				
70.031	Locomotive	Vehicles				-				
70.032	Passenger Car	Vehicles				-				
70.033	Bi-Level Passenger Car	Vehicles				-				
70.034	Self-Propelled Passenger Car	Vehicles				-				
70.035	Unspecified	Vehicles				-				
70.040	Bus	Vehicles				-				
70.041	Small Bus	Vehicles				-				
70.042	Standard 40 Foot Bus	Vehicles				-				
70.043	Articulated Bus	Vehicles				-				
70.044	Unspecified	Vehicles				-				
70.050	Other Vehicles	Vehicles				-				
70.060	Non-revenue vehicles	Vehicles				-				
70.061	Maintenance of Way Vehicles	Vehicles				-				
70.062	Automobiles	Vehicles				-				
70.063	Trucks	Vehicles				-				
70.064	Unspecified	Vehicles				-				
70.070	Spare parts/ Rotable Components	Vehicles				-				
70.080	Intercity Passenger Rail	Vehicles				-				
70.081	Diesel Locomotive	Vehicles				-				
70.082	Cab Car	Vehicles				-				
70.083	Bi-Level Coach	Vehicles				-				
70.084	Single Level Coach	Vehicles				-				
70.085	DMU	Vehicles				-				
70.086	EMU	Vehicles				-				
70.087	Unspecified					-				
80	**Professional Services**			-	-	**-**			0%	
80.000	Planning and Concept Design					-				
80.010	Preliminary Engineering					-				
80.020	Final Design					-				
80.030	Project Management for Design and Construction					-				
80.031	Agency Project Management					-				
80.032	Project Management Oversight Support					-				
80.033	Agency Force Account					-				
80.034	Unspecified					-				
80.040	Construction Administration & Management					-				
80.050	Professional Liability and other Non-Construction Insurance					-				
80.060	Legal; Permits; Review Fees by other agencies, cities, etc.					-				
80.070	Surveys, Testing, Investigation, Inspection					-				
80.080	Start up					-				
80.081	Training/Start-up					-				
80.082	Safety Certification					-				
80.083	Off-Site Vehicle Testing, Test Runs					-				
80.084	Commissioning					-				
80.085	Unspecified					-				
80.090	Other					-				
81	**Subtotal (10-80)**	Lineal Miles of Guideway	39.36	9,121,089	-	9,121,089	231,761		100%	
90	**Unallocated Contingency**	Total Amount				**-**			0%	
91	**Subtotal (10-90)**	Lineal Miles of Guideway	39.36	9,121,089	-	**9,121,089**	231,761		100%	
100	**Finance Charges**	Total Amount		-	-	**-**			0%	
101	**Total Project Costs (10-100)**	Lineal Miles of Guideway	39.36	9,121,089	-	**9,121,089**	231,761		100%	

Allocated Contingency as % of Base Yr Dollars w/o Contingency	0.00%
Unallocated Contingency as % of Base Yr Dollars w/o Contingency	0.00%
Total Contingency as % of Base Yr Dollars w/o Contingency	0.00%

FRA MAIN WORKSHEET

Grantee Name: **Maryland DOT and Baltimore-Washington Rapid Rail (BWRR)**

Project Name and Location: **Baltimore-Washington SCMAGLEV** LB 4.3 SCC Alt J and J1 - MVS East - Camden Yard BARC.xls

Current Phase : **Administrative Draft Environmental Impact Statement**

Alignment: **J1**
TMF **BARC**
Baltimore Station: **Camden Yards**
Note: Costs do not reflect Value Engineering opportunities

Issue Date	
Today's Date	3/31/20
Yr of Base Year $	2018
Yr of Revenue Ops	2029

Standard Cost Category		Unit	Quantity	Base Year Dollars: Without Contingency (X000)	Allocated Contingency (X000)	TOTAL (X000)	Unit Cost (X000)	Percent of Construction Cost	Percent of Total Project Cost	YOE Dollars Total (X000) (from Inflation Worksheet)
10	**Guideway & Track Elements**	**Lineal Miles of Guideway**	39.20	6,154,671	-	**6,154,671**	157,020	59%	59%	
10.010	Guideway: At-grade exclusive right-of-way	Lineal Miles of Guideway				-				
10.020	Guideway: At-grade semi-exclusive (allows cross-traffic)	Lineal Miles of Guideway				-				
10.030	Guideway: At-grade in mixed traffic	Lineal Miles of Guideway				-				
10.040	Guideway: Aerial structure	Lineal Miles of Guideway	5.68	384,412	-	384,412	67,637			
10.041	Bridges	Lineal Miles of Guideway				-				
10.042	Viaduct	Lineal Miles of Guideway	4.75	356,512	-	356,512	75,000			
10.043	Other Structure (MOW Ramp)	Lineal Miles of Guideway	0.93	27,900		27,900	30,000			
10.044	Portals	Lineal Miles of Guideway				-				
10.050	Guideway: Built-up fill	Lineal Miles of Guideway	0.36	26,797	-	26,797	75,000			
10.060	Guideway: Underground cut & cover	Lineal Miles of Guideway	1.50	255,104	-	255,104	170,000			
10.061	Cut & Cover Guideway Soft Soils	Lineal Miles of Guideway				-				
10.062	Cut & Cover Guideway Hard Soils	Lineal Miles of Guideway				-				
10.063	Cut & Cover Guideway Vent Soft Soils	Lineal Miles of Guideway				-				
10.064	Cut & Cover Guideway Vent Hard Soils	Lineal Miles of Guideway				-				
10.065	Unspecified	Lineal Miles of Guideway				-				
10.070	Guideway: Underground tunnel	Lineal Miles of Guideway	31.66	5,223,112	-	5,223,112	165,000			
10.071	Bored Earth Open	Lineal Miles of Guideway				-				
10.072	Bored Earth Close	Lineal Miles of Guideway				-				
10.073	Bored Earth Mixed Shield	Lineal Miles of Guideway	31.66	5,223,112	-	5,223,112	165,000			
10.074	Bored Earth Mixes Shield SEM	Lineal Miles of Guideway				-				
10.075	Rock Drill & Blast	Lineal Miles of Guideway				-				
10.076	Rock Boring Machine	Lineal Miles of Guideway				-				
10.077	Sunken Tunnel	Lineal Miles of Guideway				-				
10.078	Unspecified	Lineal Miles of Guideway				-				
10.080	Guideway: Retained cut or fill	Lineal Miles of Guideway				-				
10.090	Track: Direct fixation	Track Miles				-				
10.100	Track: Embedded	Track Miles				-				
10.110	Track: Ballasted	Track Miles				-				
10.120	Track: Special (switches, turnouts)	Track Miles				-				
10.130	Track: Vibration & Noise Dampening	Track Miles				-				
10.140	Special Structures	Lineal Miles of Guideway	33.16	265,247	-	265,247	8,000			
10.141	Escape Gallery	Lineal Miles of Guideway	33.16	265,247	-	265,247	8,000			
20	**Stations, Stops, Terminals, Intermodels**	**Stations**	3	3,612,903	-	**3,612,903**	1,204,301	34%	34%	
20.010	At-Grade Station, Stop, Shelter, Mall, Terminal, Platform	Stations				-				
20.020	Aerial station, stop, shelter, mall, terminal, platform	Stations				-				
20.030	Underground station, stop, shelter, mall, terminal, platform	Stations	3.00	3,612,903	-	3,612,903	1,204,301			
20.031	WASHINGTON DC STATION	Stations	1.00	1,222,581	-	1,222,581	1,222,581			
	WASHINGTON DC STATION - CIVIL/STRUCTURAL	Stations	1.00	1,000,000	-	1,000,000	1,000,000			
	WASHINGTON DC STATION - ARCHITECTURAL	Stations	1.00	222,581	-	222,581	222,581			
20.032	BWI AIRPORT STATION	Stations	1.00	945,161	-	945,161	945,161			
	BWI AIRPORT STATION - CIVIL/STRUCTURAL	Stations	1.00	800,000	-	800,000	800,000			
	BWI AIRPORT STATION - ARCHITECTURAL	Stations	1.00	145,161	-	145,161	145,161			
20.033	BALTIMORE STATION	Stations	1.00	1,445,161	-	1,445,161	1,445,161			
	BALTIMORE STATION - CIVIL/STRUCTURAL	Stations	1.00	1,300,000	-	1,300,000	1,300,000			
	BALTIMORE STATION - ARCHITECTURAL	Stations	1.00	145,161	-	145,161	145,161			
20.040	Major stations, landings, terminals: Intermodal, ferry, trolley, etc.	Stations				-				
20.050	Joint development	Stations				-				
20.060	Automobile parking multi-story structure	Spaces				-				
20.070	Elevators, escalators	Number				-				
20.071	Elevators	Number				-				
20.072	Escalators	Number				-				
20.073	Unspecified	Number				-				
20.080	Passenger Overpass	Number				-				
20.090	Underground Interconnecting Tunnel	Number				-				
20.091	Cut and Cover	Number				-				
20.092	Bored Earth Soft Soils	Number				-				
20.093	Bored Rock Hard Soils	Number				-				
20.094	Unspecified	Number				-				
20.100	Signage and Graphics	Number				-				
30	**Support Facilities: Yards, Shops, Admin. Bldgs**	**Number**	17.00	642,400	-	**642,400**	37,788	6%	6%	
30.010	Administration Building: Office, sales, storage, revenue counting	Number				-				
30.011	Administrative Building	Number				-				
30.012	Central Control Facility	Number				-				
30.013	Central Revenue Counting Facility	Number				-				
30.014	Unspecified	Number				-				
30.020	Light Maintenance Facility	Number				-				
30.030	Heavy Maintenance Facility (TMF, Shop Equipment included in Code 50, Systems)	Number	1.00	80,000	-	80,000	80,000			
30.040	Storage or Maintenance of Way Building (MOW Facilities at TMF and Westport)	Number	2.00	60,000	-	60,000	30,000			
30.050	Yard and Yard Track	Number	1.00	120,000	-	120,000	120,000			
30.060	Electrical Substations (Equipment is included in Code 50, Systems)	Number	4.00	22,400	-	22,400	5,600			
30.061	Electrical Substation (at 104+500, Ivy City, DC)	Number	1.00	5,600	-	5,600	5,600			
30.062	Electrical Substation (at 127+000, Suburban Airport, Laurel, MD)	Number	1.00	5,600	-	5,600	5,600			
30.063	Electrical Substation (at 151+100-SOUTH OF I-895)	Number	1.00	5,600	-	5,600	5,600			
30.064	Electrical Substation (at 155+400- Westport, MD)	Number	1.00	5,600	-	5,600	5,600			
30.070	Ventilation Plant/Emergency Exits	Number	9.00	360,000	-	360,000	40,000			
30.071	Ventilation Plant (FA/EE) No.1 (at 104+400)	Number	1.00	40,000	-	40,000	40,000			
30.072	Ventilation Plant (FA/EE) No.2 (at 108+150)	Number	1.00	40,000	-	40,000	40,000			
30.073	Ventilation Plant (FA/EE) No.3 (at 113+100)	Number	1.00	40,000	-	40,000	40,000			
30.074	Ventilation Plant (FA/EE) No 4 (at 137+475)	Number	1.00	40,000	-	40,000	40,000			
30.075	Ventilation Plant (FA/EE) No.5 (at 140+300)	Number	1.00	40,000	-	40,000	40,000			
30.076	Ventilation Plant (FA/EE) No.6 (at 141+600)	Number	1.00	40,000	-	40,000	40,000			
30.077	Ventilation Plant (FA/EE) No.7 (at 143+600)	Number	1.00	40,000	-	40,000	40,000			
30.078	Ventilation Plant (FA/EE) No.8 (at 146+500)	Number	1.00	40,000	-	40,000	40,000			
30.079	Ventilation Plant (FA/EE) No.9 (at 151+100)	Number	1.00	40,000	-	40,000	40,000			
40	**Sitework & Special Conditions**	**Lineal Miles of Guideway**	39.20	83,409	-	**83,409**	2,128	1%	1%	
40.010	Demolition, Clearing, Earthwork	Lineal Miles of Guideway	6.61	1,894	-	1,894	286			
40.020	Site Utilities, Utility Relocation	Lineal Miles of Guideway	6.61	1,336	-	1,336	202			
40.021	Urban Replacement In-Kind Public Utilities	Lineal Miles of Guideway				-				
40.022	Urban Replacement In-Kind Private Utilities	Lineal Miles of Guideway				-				
40.023	Urban Replacement Betterment Public Utilities	Lineal Miles of Guideway				-				
40.024	Urban Replacement Betterment Private Utilities	Lineal Miles of Guideway				-				
40.025	Suburban Replacement In-Kind Public Utilities	Lineal Miles of Guideway				-				
40.026	Suburban Replacement In-Kind Private Utilities	Lineal Miles of Guideway				-				
40.027	Suburban Replacement Betterment Public Utilities	Lineal Miles of Guideway				-				
40.028	Suburban Replacement Betterment Private Utilities	Lineal Miles of Guideway				-				
40.029	Unspecified	Lineal Miles of Guideway				-				
40.030	Haz. mat'l, contam'd soil removal/mitigation, ground water treatments	Lineal Miles of Guideway	6.61	128	-	128	19			
40.031	HazMat Abatement	Lineal Miles of Guideway				-				
40.032	Contaminated Soil Removal	Lineal Miles of Guideway				-				
40.033	Ground Water Treatment	Lineal Miles of Guideway				-				
40.034	Unspecified	Lineal Miles of Guideway				-				
40.040	Environmental mitigation, e.g. wetlands, historic/archeologic, parks	Lineal Miles of Guideway	6.61	46,059	-	46,059	6,967			
40.050	Site structures including retaining walls, sound walls	Lineal Miles of Guideway				-				
40.051	Mechanically Stabilized Earth Walls	Lineal Miles of Guideway				-				
40.052	Concrete Walls	Lineal Miles of Guideway				-				
40.053	Other Walls	Lineal Miles of Guideway				-				
40.054	Unspecified	Lineal Miles of Guideway				-				
40.060	Pedestrian / bike access and accommodation, landscaping	Lineal Miles of Guideway				-				
40.070	Automobile, bus, van accessways including roads, parking lots	Lump Sum	1.00	31,737	-	31,737	31,737			
40.071	Surface Parking Lot	Spaces				-				
40.072	Auto Access	Stations				-				
40.073	Bus Access	Spaces				-				
40.074	Bus Parking and Berthing	Spaces				-				
40.075	Unspecified	Spaces				-				
40.080	Temporary Facilities and other indirect costs during construction	Lump Sum	1.00	2,255	-	2,255	2,255			
40.081	Roadway Changes	Lineal Miles of Guideway				-				
40.082	Third-Party Work	Lineal Miles of Guideway				-				
40.083	Mobilization	Lineal Miles of Guideway				-				

40.084	Maintenance of Traffic (Railroad reroute, shutdown, reschedule, stage, phase, worker-protect, work-around)	Lineal Miles of Guideway				-				
40.085	Unallocated Indirect Costs	Lump Sum				-				
40.086	Unspecified	Lineal Miles of Guideway				-				
50	**Systems**	**LUMP SUM**	0.00	-	-	**-**		0%	0%	
50.010	Train control and signals	Track Miles				-				
50.011	Train Control - Wayside	Track Miles				-				
50.012	Train Control - On Board Systems	Track Miles				-				
50.013	Train Control - Centralized Systems	Track Miles				-				
50.014	Unspecified	Track Miles				-				
50.020	Traffic signals and crossing protection	Track Miles				-				
50.030	Traction power supply: substations	Track Miles				-				
50.040	Traction power distribution: catenary and third rail	Track Miles				-				
50.041	Catenary	Track Miles				-				
50.042	Third Rail	Track Miles				-				
50.043	Power Distribution and Connections	Track Miles				-				
50.044	Unspecified	Track Miles				-				
50.050	Communications	Lineal Miles of Guideway				-				
50.051	Wired	Lineal Miles of Guideway				-				
50.052	Radio Based	Lineal Miles of Guideway				-				
50.053	Unspecified	Lineal Miles of Guideway				-				
50.060	Fare collection system and equipment	Stations				-				
50.061	Central Revenue Counting Systems	Stations				-				
50.062	Revenue Collection - In Station	Stations				-				
50.063	Revenue Collection - On Vehicle	Vehicles				-				
50.064	Unspecified	Stations				-				
50.070	Central Control System	Lineal Miles of Guideway				-				
51	**Construction Subtotal (10-50)**	**Lineal Miles of Guideway**	39.20	10,493,383	-	**10,493,383**	267,711	100%	100%	
60	**Row, Land, Existing Improvements**	**Lineal Miles of Guideway**	0.00			**-**			0%	
60.010	Purchase or lease of real estate	Lineal Miles of Guideway				-				
60.011	Full Takes	Lineal Miles of Guideway				-				
60.012	Part Takes	Lineal Miles of Guideway				-				
60.013	Easement Acquisitions	Lineal Miles of Guideway				-				
60.014	Other Rights	Lineal Miles of Guideway				-				
60.015	Donated Value	Lineal Miles of Guideway				-				
60.016	Unspecified	Lineal Miles of Guideway				-				
60.020	Relocation of existing households and businesses	Lineal Miles of Guideway				-				
60.021	Residential (Owners)	Lineal Miles of Guideway				-				
60.022	Residential (Tenants)	Lineal Miles of Guideway				-				
60.023	Business (Owners and Tenants)	Lineal Miles of Guideway				-				
60.024	Others (Personal Property Moves)	Lineal Miles of Guideway				-				
60.025	Unspecified	Lineal Miles of Guideway				-				
60.030	Services	Lineal Miles of Guideway				-				
60.031	Property Management	Lineal Miles of Guideway				-				
60.032	Agency	Lineal Miles of Guideway				-				
60.033	Contractor R/W Services (Title/Appraisal, etc)	Lineal Miles of Guideway				-				
60.034	Legal Services	Lineal Miles of Guideway				-				
60.035	Unspecified	Lineal Miles of Guideway				-				
60.040	Other Real Estate Costs	Lineal Miles of Guideway				-				
70	**Vehicles**	**Vehicles**	0.00	-	-	**-**			0%	
70.060	Non-revenue vehicles	Vehicles				-				
70.061	Maintenance of Way Vehicles	Vehicles				-				
70.062	Automobiles	Vehicles				-				
70.063	Trucks	Vehicles				-				
70.064	Unspecified	Vehicles				-				
70.070	Spare parts/ Rotable Components	Vehicles				-				
70.080	Intercity Passenger Rail	Vehicles				-				
70.081	Diesel Locomotive	Vehicles				-				
70.082	Cab Car	Vehicles				-				
70.083	Bi-Level Coach	Vehicles				-				
70.084	Single Level Coach	Vehicles				-				
70.085	DMU	Vehicles				-				
70.086	EMU	Vehicles				-				
70.087	Unspecified					-				
80	**Professional Services**			-	-	**-**			0%	
80.000	Planning and Concept Design					-				
80.010	Preliminary Engineering					-				
80.020	Final Design					-				
80.030	Project Management for Design and Construction					-				
80.031	Agency Project Management					-				
80.032	Project Management Oversight Support					-				
80.033	Agency Force Account					-				
80.034	Unspecified					-				
80.040	Construction Administration & Management					-				
80.050	Professional Liability and other Non-Construction Insurance					-				
80.060	Legal; Permits; Review Fees by other agencies, cities, etc.					-				
80.070	Surveys, Testing, Investigation, Inspection					-				
80.080	Start up					-				
80.081	Training/Start-up					-				
80.082	Safety Certification					-				
80.083	Off-Site Vehicle Testing, Test Runs					-				
80.084	Commissioning					-				
80.085	Unspecified					-				
80.090	Other					-				
81	**Subtotal (10-80)**	Lineal Miles of Guideway	39.20	10,493,383	-	10,493,383	267,711		100%	
90	**Unallocated Contingency**	Total Amount				**-**			0%	
91	**Subtotal (10-90)**	Lineal Miles of Guideway	39.20	10,493,383	-	**10,493,383**	267,711		100%	
100	**Finance Charges**	Total Amount		-	-	**-**			0%	
101	**Total Project Costs (10-100)**	Lineal Miles of Guideway	39.20	10,493,383	-	**10,493,383**	267,711		100%	

Allocated Contingency as % of Base Yr Dollars w/o Contingency	0.00%
Unallocated Contingency as % of Base Yr Dollars w/o Contingency	0.00%
Total Contingency as % of Base Yr Dollars w/o Contingency	0.00%

FRA MAIN WORKSHEET

Grantee Name: **Maryland DOT and Baltimore-Washington Rapid Rail (BWRR)**

Project Name and Location: **Baltimore-Washington SCMAGLEV** LB 4.3 SCC Alt J and J1 - MVS East - Camden Yard MD-198.xls

Current Phase : **Administrative Draft Environmental Impact Statement**

Alignment: **J1**
TMF **MD-198**
Baltimore Station: **Camden Yards**
Note: Costs do not reflect Value Engineering opportunities

Issue Date	
Today's Date	3/31/20
Yr of Base Year $	2018
Yr of Revenue Ops	2029

Standard Cost Category		Unit	Quantity	Base Year Dollars: Without Contingency (X000)	Allocated Contingency (X000)	TOTAL (X000)	Unit Cost (X000)	Percent of Construction Cost	Percent of Total Project Cost	YOE Dollars Total (X000) (from Inflation Worksheet)
10	**Guideway & Track Elements**	**Lineal Miles of Guideway**	41.13	6,212,571	-	**6,212,571**	151,060	58%	58%	
10.010	Guideway: At-grade exclusive right-of-way	Lineal Miles of Guideway				-				
10.020	Guideway: At-grade semi-exclusive (allows cross-traffic)	Lineal Miles of Guideway				-				
10.030	Guideway: At-grade in mixed traffic	Lineal Miles of Guideway				-				
10.040	Guideway: Aerial structure	Lineal Miles of Guideway	7.61	442,312	-	442,312	58,096			
10.041	Bridges	Lineal Miles of Guideway				-				
10.042	Viaduct	Lineal Miles of Guideway	4.75	356,512	-	356,512	75,000			
10.043	Other Structure (MOW Ramp)	Lineal Miles of Guideway	2.86	85,800		85,800	30,000			
10.044	Portals	Lineal Miles of Guideway				-				
10.050	Guideway: Built-up fill	Lineal Miles of Guideway	0.36	26,797	-	26,797	75,000			
10.060	Guideway: Underground cut & cover	Lineal Miles of Guideway	1.50	255,104	-	255,104	170,000			
10.061	Cut & Cover Guideway Soft Soils	Lineal Miles of Guideway				-				
10.062	Cut & Cover Guideway Hard Soils	Lineal Miles of Guideway				-				
10.063	Cut & Cover Guideway Vent Soft Soils	Lineal Miles of Guideway				-				
10.064	Cut & Cover Guideway Vent Hard Soils	Lineal Miles of Guideway				-				
10.065	Unspecified	Lineal Miles of Guideway				-				
10.070	Guideway: Underground tunnel	Lineal Miles of Guideway	31.66	5,223,112	-	5,223,112	165,000			
10.071	Bored Earth Open	Lineal Miles of Guideway				-				
10.072	Bored Earth Close	Lineal Miles of Guideway				-				
10.073	Bored Earth Mixed Shield	Lineal Miles of Guideway	31.66	5,223,112	-	5,223,112	165,000			
10.074	Bored Earth Mixes Shield SEM	Lineal Miles of Guideway				-				
10.075	Rock Drill & Blast	Lineal Miles of Guideway				-				
10.076	Rock Boring Machine	Lineal Miles of Guideway				-				
10.077	Sunken Tunnel	Lineal Miles of Guideway				-				
10.078	Unspecified	Lineal Miles of Guideway				-				
10.080	Guideway: Retained cut or fill	Lineal Miles of Guideway				-				
10.090	Track: Direct fixation	Track Miles				-				
10.100	Track: Embedded	Track Miles				-				
10.110	Track: Ballasted	Track Miles				-				
10.120	Track: Special (switches, turnouts)	Track Miles				-				
10.130	Track: Vibration & Noise Dampening	Track Miles				-				
10.140	Special Structures	Lineal Miles of Guideway	33.16	265,247	-	265,247	8,000			
10.141	Escape Gallery	Lineal Miles of Guideway	33.16	265,247	-	265,247	8,000			
20	**Stations, Stops, Terminals, Intermodels**	**Stations**	3	3,612,903	-	**3,612,903**	1,204,301	34%	34%	
20.010	At-Grade Station, Stop, Shelter, Mall, Terminal, Platform	Stations				-				
20.020	Aerial station, stop, shelter, mall, terminal, platform	Stations				-				
20.030	Underground station, stop, shelter, mall, terminal, platform	Stations	3.00	3,612,903	-	3,612,903	1,204,301			
20.031	WASHINGTON DC STATION	Stations	1.00	1,222,581	-	1,222,581	1,222,581			
	WASHINGTON DC STATION - CIVIL/STRUCTURAL	Stations	1.00	1,000,000	-	1,000,000	1,000,000			
	WASHINGTON DC STATION - ARCHITECTURAL	Stations	1.00	222,581	-	222,581	222,581			
20.032	BWI AIRPORT STATION	Stations	1.00	945,161	-	945,161	945,161			
	BWI AIRPORT STATION - CIVIL/STRUCTURAL	Stations	1.00	800,000	-	800,000	800,000			
	BWI AIRPORT STATION - ARCHITECTURAL	Stations	1.00	145,161	-	145,161	145,161			
20.033	BALTIMORE STATION	Stations	1.00	1,445,161	-	1,445,161	1,445,161			
	BALTIMORE STATION - CIVIL/STRUCTURAL	Stations	1.00	1,300,000	-	1,300,000	1,300,000			
	BALTIMORE STATION - ARCHITECTURAL	Stations	1.00	145,161	-	145,161	145,161			
20.040	Major stations, landings, terminals: Intermodal, ferry, trolley, etc.	Stations				-				
20.050	Joint development	Stations				-				
20.060	Automobile parking multi-story structure	Spaces				-				
20.070	Elevators, escalators	Number				-				
20.071	Elevators	Number				-				
20.072	Escalators	Number				-				
20.073	Unspecified	Number				-				
20.080	Passenger Overpass	Number				-				
20.090	Underground Interconnecting Tunnel	Number				-				
20.091	Cut and Cover	Number				-				
20.092	Bored Earth Soft Soils	Number				-				
20.093	Bored Rock Hard Soils	Number				-				
20.094	Unspecified	Number				-				
20.100	Signage and Graphics	Number				-				
30	**Support Facilities: Yards, Shops, Admin. Bldgs**	**Number**	17.00	842,400	-	**842,400**	49,553	8%	8%	
30.010	Administration Building: Office, sales, storage, revenue counting	Number				-				
30.011	Administrative Building	Number				-				
30.012	Central Control Facility	Number				-				
30.013	Central Revenue Counting Facility	Number				-				
30.014	Unspecified	Number				-				
30.020	Light Maintenance Facility	Number				-				
30.030	Heavy Maintenance Facility (TMF, Shop Equipment included in Code 50, Systems)	Number	1.00	280,000	-	280,000	280,000			
30.040	Storage or Maintenance of Way Building (MOW Facilities at TMF and Westport)	Number	2.00	60,000	-	60,000	30,000			
30.050	Yard and Yard Track	Number	1.00	120,000	-	120,000	120,000			
30.060	Electrical Substations (Equipment is included in Code 50, Systems)	Number	4.00	22,400	-	22,400	5,600			
30.061	Electrical Substation (at 104+500, Ivy City, DC)	Number	1.00	5,600	-	5,600	5,600			
30.062	Electrical Substation (at 127+000, Suburban Airport, Laurel, MD)	Number	1.00	5,600	-	5,600	5,600			
30.063	Electrical Substation (at 151+100-SOUTH OF I-895)	Number	1.00	5,600	-	5,600	5,600			
30.064	Electrical Substation (at 155+400- Westport, MD)	Number	1.00	5,600	-	5,600	5,600			
30.070	Ventilation Plant/Emergency Exits	Number	9.00	360,000	-	360,000	40,000			
30.071	Ventilation Plant (FA/EE) No.1 (at 104+400)	Number	1.00	40,000	-	40,000	40,000			
30.072	Ventilation Plant (FA/EE) No.2 (at 108+150)	Number	1.00	40,000	-	40,000	40,000			
30.073	Ventilation Plant (FA/EE) No.3 (at 113+100)	Number	1.00	40,000	-	40,000	40,000			
30.074	Ventilation Plant (FA/EE) No 4 (at 137+475)	Number	1.00	40,000	-	40,000	40,000			
30.075	Ventilation Plant (FA/EE) No.5 (at 140+300)	Number	1.00	40,000	-	40,000	40,000			
30.076	Ventilation Plant (FA/EE) No.6 (at 141+600)	Number	1.00	40,000	-	40,000	40,000			
30.077	Ventilation Plant (FA/EE) No.7 (at 143+600)	Number	1.00	40,000	-	40,000	40,000			
30.078	Ventilation Plant (FA/EE) No.8 (at 146+500)	Number	1.00	40,000	-	40,000	40,000			
30.079	Ventilation Plant (FA/EE) No.9 (at 151+100)	Number	1.00	40,000	-	40,000	40,000			
40	**Sitework & Special Conditions**	**Lineal Miles of Guideway**	41.13	83,409	-	**83,409**	2,028	1%	1%	
40.010	Demolition, Clearing, Earthwork	Lineal Miles of Guideway	6.61	1,894	-	1,894	286			
40.020	Site Utilities, Utility Relocation	Lineal Miles of Guideway	6.61	1,336	-	1,336	202			
40.021	Urban Replacement In-Kind Public Utilities	Lineal Miles of Guideway				-				
40.022	Urban Replacement In-Kind Private Utilities	Lineal Miles of Guideway				-				
40.023	Urban Replacement Betterment Public Utilities	Lineal Miles of Guideway				-				
40.024	Urban Replacement Betterment Private Utilities	Lineal Miles of Guideway				-				
40.025	Suburban Replacement In-Kind Public Utilities	Lineal Miles of Guideway				-				
40.026	Suburban Replacement In-Kind Private Utilities	Lineal Miles of Guideway				-				
40.027	Suburban Replacement Betterment Public Utilities	Lineal Miles of Guideway				-				
40.028	Suburban Replacement Betterment Private Utilities	Lineal Miles of Guideway				-				
40.029	Unspecified	Lineal Miles of Guideway				-				
40.030	Haz. mat'l, contam'd soil removal/mitigation, ground water treatments	Lineal Miles of Guideway	6.61	128	-	128	19			
40.031	HazMat Abatement	Lineal Miles of Guideway				-				
40.032	Contaminated Soil Removal	Lineal Miles of Guideway				-				
40.033	Ground Water Treatment	Lineal Miles of Guideway				-				
40.034	Unspecified	Lineal Miles of Guideway				-				
40.040	Environmental mitigation, e.g. wetlands, historic/archeologic, parks	Lineal Miles of Guideway	6.61	46,059	-	46,059	6,967			
40.050	Site structures including retaining walls, sound walls	Lineal Miles of Guideway				-				
40.051	Mechanically Stabilized Earth Walls	Lineal Miles of Guideway				-				
40.052	Concrete Walls	Lineal Miles of Guideway				-				
40.053	Other Walls	Lineal Miles of Guideway				-				
40.054	Unspecified	Lineal Miles of Guideway				-				
40.060	Pedestrian / bike access and accommodation, landscaping	Lineal Miles of Guideway				-				
40.070	Automobile, bus, van accessways including roads, parking lots	Lump Sum	1.00	31,737	-	31,737	31,737			
40.071	Surface Parking Lot	Spaces				-				
40.072	Auto Access	Stations				-				
40.073	Bus Access	Spaces				-				
40.074	Bus Parking and Berthing	Spaces				-				
40.075	Unspecified	Spaces				-				
40.080	Temporary Facilities and other indirect costs during construction	Lump Sum	1.00	2,255	-	2,255	2,255			
40.081	Roadway Changes	Lineal Miles of Guideway				-				
40.082	Third-Party Work	Lineal Miles of Guideway				-				
40.083	Mobilization	Lineal Miles of Guideway				-				

40.084	Maintenance of Traffic (Railroad reroute, shutdown, reschedule, stage, phase, worker-protect, work-around)	Lineal Miles of Guideway				-				
40.085	Unallocated Indirect Costs	Lump Sum				-				
40.086	Unspecified	Lineal Miles of Guideway				-				
50	**Systems**	**LUMP SUM**	0.00	-	-	**-**		0%	0%	
50.010	Train control and signals	Track Miles				-				
50.011	Train Control - Wayside	Track Miles				-				
50.012	Train Control - On Board Systems	Track Miles				-				
50.013	Train Control - Centralized Systems	Track Miles				-				
50.014	Unspecified	Track Miles				-				
50.020	Traffic signals and crossing protection	Track Miles				-				
50.030	Traction power supply: substations	Track Miles				-				
50.040	Traction power distribution: catenary and third rail	Track Miles				-				
50.041	Catenary	Track Miles				-				
50.042	Third Rail	Track Miles				-				
50.043	Power Distribution and Connections	Track Miles				-				
50.044	Unspecified	Track Miles				-				
50.050	Communications	Lineal Miles of Guideway				-				
50.051	Wired	Lineal Miles of Guideway				-				
50.052	Radio Based	Lineal Miles of Guideway				-				
50.053	Unspecified	Lineal Miles of Guideway				-				
50.060	Fare collection system and equipment	Stations				-				
50.061	Central Revenue Counting Systems	Stations				-				
50.062	Revenue Collection - In Station	Stations				-				
50.063	Revenue Collection - On Vehicle	Vehicles				-				
50.064	Unspecified	Stations				-				
50.070	Central Control System	Lineal Miles of Guideway				-				
51	**Construction Subtotal (10-50)**	**Lineal Miles of Guideway**	41.13	10,751,283	-	**10,751,283**	261,419	100%	100%	
60	**Row, Land, Existing Improvements**	**Lineal Miles of Guideway**	0.00			**-**			0%	
60.010	Purchase or lease of real estate	Lineal Miles of Guideway				-				
60.011	Full Takes	Lineal Miles of Guideway				-				
60.012	Part Takes	Lineal Miles of Guideway				-				
60.013	Easement Acquisitions	Lineal Miles of Guideway				-				
60.014	Other Rights	Lineal Miles of Guideway				-				
60.015	Donated Value	Lineal Miles of Guideway				-				
60.016	Unspecified	Lineal Miles of Guideway				-				
60.020	Relocation of existing households and businesses	Lineal Miles of Guideway				-				
60.021	Residential (Owners)	Lineal Miles of Guideway				-				
60.022	Residential (Tenants)	Lineal Miles of Guideway				-				
60.023	Business (Owners and Tenants)	Lineal Miles of Guideway				-				
60.024	Others (Personal Property Moves)	Lineal Miles of Guideway				-				
60.025	Unspecified	Lineal Miles of Guideway				-				
60.030	Services	Lineal Miles of Guideway				-				
60.031	Property Management	Lineal Miles of Guideway				-				
60.032	Agency	Lineal Miles of Guideway				-				
60.033	Contractor R/W Services (Title/Appraisal, etc)	Lineal Miles of Guideway				-				
60.034	Legal Services	Lineal Miles of Guideway				-				
60.035	Unspecified	Lineal Miles of Guideway				-				
60.040	Other Real Estate Costs	Lineal Miles of Guideway				-				
70	**Vehicles**	**Vehicles**	0.00	-	-	**-**			0%	
70.060	Non-revenue vehicles	Vehicles				-				
70.061	Maintenance of Way Vehicles	Vehicles				-				
70.062	Automobiles	Vehicles				-				
70.063	Trucks	Vehicles				-				
70.064	Unspecified	Vehicles				-				
70.070	Spare parts/ Rotable Components	Vehicles				-				
70.080	Intercity Passenger Rail	Vehicles				-				
70.081	Diesel Locomotive	Vehicles				-				
70.082	Cab Car	Vehicles				-				
70.083	Bi-Level Coach	Vehicles				-				
70.084	Single Level Coach	Vehicles				-				
70.085	DMU	Vehicles				-				
70.086	EMU	Vehicles				-				
70.087	Unspecified					-				
80	**Professional Services**			-	-	**-**			0%	
80.000	Planning and Concept Design					-				
80.010	Preliminary Engineering					-				
80.020	Final Design					-				
80.030	Project Management for Design and Construction					-				
80.031	Agency Project Management					-				
80.032	Project Management Oversight Support					-				
80.033	Agency Force Account					-				
80.034	Unspecified					-				
80.040	Construction Administration & Management					-				
80.050	Professional Liability and other Non-Construction Insurance					-				
80.060	Legal; Permits; Review Fees by other agencies, cities, etc.					-				
80.070	Surveys, Testing, Investigation, Inspection					-				
80.080	Start up					-				
80.081	Training/Start-up					-				
80.082	Safety Certification					-				
80.083	Off-Site Vehicle Testing, Test Runs					-				
80.084	Commissioning					-				
80.085	Unspecified					-				
80.090	Other					-				
81	**Subtotal (10-80)**	Lineal Miles of Guideway	41.13	10,751,283	-	10,751,283	261,419		100%	
90	**Unallocated Contingency**	Total Amount				**-**			0%	
91	**Subtotal (10-90)**	Lineal Miles of Guideway	41.13	10,751,283	-	**10,751,283**	261,419		100%	
100	**Finance Charges**	Total Amount		-	-	**-**			0%	
101	**Total Project Costs (10-100)**	Lineal Miles of Guideway	41.13	10,751,283	-	**10,751,283**	261,419		100%	

Allocated Contingency as % of Base Yr Dollars w/o Contingency	0.00%
Unallocated Contingency as % of Base Yr Dollars w/o Contingency	0.00%
Total Contingency as % of Base Yr Dollars w/o Contingency	0.00%

FRA MAIN WORKSHEET

Grantee Name: **Maryland DOT and Baltimore-Washington Rapid Rail (BWRR)**

Project Name and Location: **Baltimore-Washington SCMAGLEV** LB 4.3 SCC Alt J and J1 - MVS East - Cherry Hill BARC.xls

Current Phase : **Administrative Draft Environmental Impact Statement**

Alignment: **J1**
TMF **BARC**
Baltimore Station: **Cherry Hill**
Note: Costs do not reflect Value Engineering opportunities

Issue Date	
Today's Date	3/31/20
Yr of Base Year $	2018
Yr of Revenue Ops	2029

Standard Cost Category		Unit	Quantity	Base Year Dollars: Without Contingency (X000)	Allocated Contingency (X000)	TOTAL (X000)	Unit Cost (X000)	Percent of Construction Cost	Percent of Total Project Cost	YOE Dollars Total (X000) (from Inflation Worksheet)
10	**Guideway & Track Elements**	**Lineal Miles of Guideway**	37.58	5,794,845	-	**5,794,845**	154,199	62%	62%	
10.010	Guideway: At-grade exclusive right-of-way	Lineal Miles of Guideway				-				
10.020	Guideway: At-grade semi-exclusive (allows cross-traffic)	Lineal Miles of Guideway				-				
10.030	Guideway: At-grade in mixed traffic	Lineal Miles of Guideway				-				
10.040	Guideway: Aerial structure	Lineal Miles of Guideway	6.17	401,107	-	401,107	65,008			
10.041	Bridges	Lineal Miles of Guideway				-				
10.042	Viaduct	Lineal Miles of Guideway	4.80	360,007	-	360,007	75,000			
10.043	Other Structure (MOW Ramp)	Lineal Miles of Guideway	1.37	41,100		41,100	30,000			
10.044	Portals	Lineal Miles of Guideway				-				
10.050	Guideway: Built-up fill	Lineal Miles of Guideway	0.51	37,981	-	37,981	75,000			
10.060	Guideway: Underground cut & cover	Lineal Miles of Guideway	1.88	319,012	-	319,012	170,000			
10.061	Cut & Cover Guideway Soft Soils	Lineal Miles of Guideway				-				
10.062	Cut & Cover Guideway Hard Soils	Lineal Miles of Guideway				-				
10.063	Cut & Cover Guideway Vent Soft Soils	Lineal Miles of Guideway				-				
10.064	Cut & Cover Guideway Vent Hard Soils	Lineal Miles of Guideway				-				
10.065	Unspecified	Lineal Miles of Guideway				-				
10.070	Guideway: Underground tunnel	Lineal Miles of Guideway	29.03	4,789,514	-	4,789,514	165,000			
10.071	Bored Earth Open	Lineal Miles of Guideway				-				
10.072	Bored Earth Close	Lineal Miles of Guideway				-				
10.073	Bored Earth Mixed Shield	Lineal Miles of Guideway	29.03	4,789,514	-	4,789,514	165,000			
10.074	Bored Earth Mixes Shield SEM	Lineal Miles of Guideway				-				
10.075	Rock Drill & Blast	Lineal Miles of Guideway				-				
10.076	Rock Boring Machine	Lineal Miles of Guideway				-				
10.077	Sunken Tunnel	Lineal Miles of Guideway				-				
10.078	Unspecified	Lineal Miles of Guideway				-				
10.080	Guideway: Retained cut or fill	Lineal Miles of Guideway				-				
10.090	Track: Direct fixation	Track Miles				-				
10.100	Track: Embedded	Track Miles				-				
10.110	Track: Ballasted	Track Miles				-				
10.120	Track: Special (switches, turnouts)	Track Miles				-				
10.130	Track: Vibration & Noise Dampening	Track Miles				-				
10.140	Special Structures	Lineal Miles of Guideway	30.90	247,231	-	247,231	8,000			
10.141	Escape Gallery	Lineal Miles of Guideway	30.90	247,231	-	247,231	8,000			
20	**Stations, Stops, Terminals, Intermodels**	**Stations**	3	2,788,710	-	**2,788,710**	929,570	30%	30%	
20.010	At-Grade Station, Stop, Shelter, Mall, Terminal, Platform	Stations				-				
20.020	Aerial station, stop, shelter, mall, terminal, platform	Stations	1.00	620,968	-	620,968	620,968			
20.021	BALTIMORE STATION	Stations	1.00	620,968	-	620,968	620,968			
	BALTIMORE STATION - CIVIL/STRUCTURAL	Stations	1.00	475,807	-	475,807	475,807			
	BALTIMORE STATION - ARCHITECTURAL	Stations	1.00	145,161	-	145,161	145,161			
20.030	Underground station, stop, shelter, mall, terminal, platform	Stations	2.00	2,167,742	-	2,167,742	1,083,871			
20.031	WASHINGTON DC STATION	Stations	1.00	1,222,581	-	1,222,581	1,222,581			
	WASHINGTON DC STATION - CIVIL/STRUCTURAL	Stations	1.00	1,000,000	-	1,000,000	1,000,000			
	WASHINGTON DC STATION - ARCHITECTURAL	Stations	1.00	222,581	-	222,581	222,581			
20.032	BWI AIRPORT STATION	Stations	1.00	945,161	-	945,161	945,161			
	BWI AIRPORT STATION - CIVIL/STRUCTURAL	Stations	1.00	800,000	-	800,000	800,000			
	BWI AIRPORT STATION - ARCHITECTURAL	Stations	1.00	145,161	-	145,161	145,161			
20.040	Major stations, landings, terminals: Intermodal, ferry, trolley, etc.	Stations				-				
20.050	Joint development	Stations				-				
20.060	Automobile parking multi-story structure	Spaces				-				
20.070	Elevators, escalators	Number				-				
20.071	Elevators	Number				-				
20.072	Escalators	Number				-				
20.073	Unspecified	Number				-				
20.080	Passenger Overpass	Number				-				
20.090	Underground Interconnecting Tunnel	Number				-				
20.091	Cut and Cover	Number				-				
20.092	Bored Earth Soft Soils	Number				-				
20.093	Bored Rock Hard Soils	Number				-				
20.094	Unspecified	Number				-				
20.100	Signage and Graphics	Number				-				
30	**Support Facilities: Yards, Shops, Admin. Bldgs**	**Number**	17.00	642,400	-	**642,400**	37,788	7%	7%	
30.010	Administration Building: Office, sales, storage, revenue counting	Number				-				
30.011	Administrative Building	Number				-				
30.012	Central Control Facility	Number				-				
30.013	Central Revenue Counting Facility	Number				-				
30.014	Unspecified	Number				-				
30.020	Light Maintenance Facility	Number				-				
30.030	Heavy Maintenance Facility (TMF, Shop Equipment included in Code 50, Systems)	Number	1.00	80,000	-	80,000	80,000			
30.040	Storage or Maintenance of Way Building (MOW Facilities at TMF and Cherry Hill)	Number	2.00	60,000	-	60,000	30,000			
30.050	Yard and Yard Track	Number	1.00	120,000	-	120,000	120,000			
30.060	Electrical Substations (Equipment is included in Code 50, Systems)	Number	4.00	22,400	-	22,400	5,600			
30.061	Electrical Substation (at 104+500, Ivy City, DC)	Number	1.00	5,600	-	5,600	5,600			
30.062	Electrical Substation (at 127+000, Suburban Airport, Laurel, MD)	Number	1.00	5,600	-	5,600	5,600			
30.063	Electrical Substation (at 151+100-SOUTH OF I-895)	Number	1.00	5,600	-	5,600	5,600			
30.064	Electrical Substation (at 155+400- Westport, MD)	Number	1.00	5,600	-	5,600	5,600			
30.070	Ventilation Plant/Emergency Exits	Number	9.00	360,000	-	360,000	40,000			
30.071	Ventilation Plant (FA/EE) No.1 (at 104+400)	Number	1.00	40,000	-	40,000	40,000			
30.072	Ventilation Plant (FA/EE) No.2 (at 108+150)	Number	1.00	40,000	-	40,000	40,000			
30.073	Ventilation Plant (FA/EE) No.3 (at 113+100)	Number	1.00	40,000	-	40,000	40,000			
30.074	Ventilation Plant (FA/EE) No 4 (at 137+475)	Number	1.00	40,000	-	40,000	40,000			
30.075	Ventilation Plant (FA/EE) No.5 (at 140+300)	Number	1.00	40,000	-	40,000	40,000			
30.076	Ventilation Plant (FA/EE) No.6 (at 141+600)	Number	1.00	40,000	-	40,000	40,000			
30.077	Ventilation Plant (FA/EE) No.7 (at 143+600)	Number	1.00	40,000	-	40,000	40,000			
30.078	Ventilation Plant (FA/EE) No.8 (at 146+500)	Number	1.00	40,000	-	40,000	40,000			
30.079	Ventilation Plant (FA/EE) No.9 (at 151+100)	Number	1.00	40,000	-	40,000	40,000			
40	**Sitework & Special Conditions**	**Lineal Miles of Guideway**	37.58	83,409	-	**83,409**	2,219	1%	1%	
40.010	Demolition, Clearing, Earthwork	Lineal Miles of Guideway	7.18	1,894	-	1,894	264			
40.020	Site Utilities, Utility Relocation	Lineal Miles of Guideway	7.18	1,336	-	1,336	186			
40.021	Urban Replacement In-Kind Public Utilities	Lineal Miles of Guideway				-				
40.022	Urban Replacement In-Kind Private Utilities	Lineal Miles of Guideway				-				
40.023	Urban Replacement Betterment Public Utilities	Lineal Miles of Guideway				-				
40.024	Urban Replacement Betterment Private Utilities	Lineal Miles of Guideway				-				
40.025	Suburban Replacement In-Kind Public Utilities	Lineal Miles of Guideway				-				
40.026	Suburban Replacement In-Kind Private Utilities	Lineal Miles of Guideway				-				
40.027	Suburban Replacement Betterment Public Utilities	Lineal Miles of Guideway				-				
40.028	Suburban Replacement Betterment Private Utilities	Lineal Miles of Guideway				-				
40.029	Unspecified	Lineal Miles of Guideway				-				
40.030	Haz. mat'l, contam'd soil removal/mitigation, ground water treatments	Lineal Miles of Guideway	7.18	128	-	128	18			
40.031	HazMat Abatement	Lineal Miles of Guideway				-				
40.032	Contaminated Soil Removal	Lineal Miles of Guideway				-				
40.033	Ground Water Treatment	Lineal Miles of Guideway				-				
40.034	Unspecified	Lineal Miles of Guideway				-				
40.040	Environmental mitigation, e.g. wetlands, historic/archeologic, parks	Lineal Miles of Guideway	7.18	46,059	-	46,059	6,412			
40.050	Site structures including retaining walls, sound walls	Lineal Miles of Guideway				-				
40.051	Mechanically Stabilized Earth Walls	Lineal Miles of Guideway				-				
40.052	Concrete Walls	Lineal Miles of Guideway				-				
40.053	Other Walls	Lineal Miles of Guideway				-				
40.054	Unspecified	Lineal Miles of Guideway				-				
40.060	Pedestrian / bike access and accommodation, landscaping	Lineal Miles of Guideway				-				
40.070	Automobile, bus, van accessways including roads, parking lots	Lump Sum	1.00	31,737	-	31,737	31,737			
40.071	Surface Parking Lot	Spaces				-				
40.072	Auto Access	Stations				-				
40.073	Bus Access	Spaces				-				
40.074	Bus Parking and Berthing	Spaces				-				
40.075	Unspecified	Spaces				-				
40.080	Temporary Facilities and other indirect costs during construction	Lump Sum	1.00	2,255	-	2,255	2,255			
40.081	Roadway Changes	Lineal Miles of Guideway				-				
40.082	Third-Party Work	Lineal Miles of Guideway				-				
40.083	Mobilization	Lineal Miles of Guideway				-				

40.084	Maintenance of Traffic (Railroad reroute, shutdown, reschedule, stage, phase, worker-protect, work-around)	Lineal Miles of Guideway				-				
40.085	Unallocated Indirect Costs	Lump Sum				-				
40.086	Unspecified	Lineal Miles of Guideway				-				
50	**Systems**	**LUMP SUM**	0.00	-	-	**-**		0%	0%	
50.010	Train control and signals	Track Miles				-				
50.011	Train Control - Wayside	Track Miles				-				
50.012	Train Control - On Board Systems	Track Miles				-				
50.013	Train Control - Centralized Systems	Track Miles				-				
50.014	Unspecified	Track Miles				-				
50.020	Traffic signals and crossing protection	Track Miles				-				
50.030	Traction power supply: substations	Track Miles				-				
50.040	Traction power distribution: catenary and third rail	Track Miles				-				
50.041	Catenary	Track Miles				-				
50.042	Third Rail	Track Miles				-				
50.043	Power Distribution and Connections	Track Miles				-				
50.044	Unspecified	Track Miles				-				
50.050	Communications	Lineal Miles of Guideway				-				
50.051	Wired	Lineal Miles of Guideway				-				
50.052	Radio Based	Lineal Miles of Guideway				-				
50.053	Unspecified	Lineal Miles of Guideway				-				
50.060	Fare collection system and equipment	Stations				-				
50.061	Central Revenue Counting Systems	Stations				-				
50.062	Revenue Collection - In Station	Stations				-				
50.063	Revenue Collection - On Vehicle	Vehicles				-				
50.064	Unspecified	Stations				-				
50.070	Central Control System	Lineal Miles of Guideway				-				
51	**Construction Subtotal (10-50)**	**Lineal Miles of Guideway**	37.58	9,309,364	-	**9,309,364**	247,719	100%	100%	
60	**Row, Land, Existing Improvements**	**Lineal Miles of Guideway**	0.00			**-**			0%	
60.010	Purchase or lease of real estate	Lineal Miles of Guideway				-				
60.011	Full Takes	Lineal Miles of Guideway				-				
60.012	Part Takes	Lineal Miles of Guideway				-				
60.013	Easement Acquisitions	Lineal Miles of Guideway				-				
60.014	Other Rights	Lineal Miles of Guideway				-				
60.015	Donated Value	Lineal Miles of Guideway				-				
60.016	Unspecified	Lineal Miles of Guideway				-				
60.020	Relocation of existing households and businesses	Lineal Miles of Guideway				-				
60.021	Residential (Owners)	Lineal Miles of Guideway				-				
60.022	Residential (Tenants)	Lineal Miles of Guideway				-				
60.023	Business (Owners and Tenants)	Lineal Miles of Guideway				-				
60.024	Others (Personal Property Moves)	Lineal Miles of Guideway				-				
60.025	Unspecified	Lineal Miles of Guideway				-				
60.030	Services	Lineal Miles of Guideway				-				
60.031	Property Management	Lineal Miles of Guideway				-				
60.032	Agency	Lineal Miles of Guideway				-				
60.033	Contractor R/W Services (Title/Appraisal, etc)	Lineal Miles of Guideway				-				
60.034	Legal Services	Lineal Miles of Guideway				-				
60.035	Unspecified	Lineal Miles of Guideway				-				
60.040	Other Real Estate Costs	Lineal Miles of Guideway				-				
70	**Vehicles**	**Vehicles**	0.00	-	-	**-**			0%	
70.060	Non-revenue vehicles	Vehicles				-				
70.061	Maintenance of Way Vehicles	Vehicles				-				
70.062	Automobiles	Vehicles				-				
70.063	Trucks	Vehicles				-				
70.064	Unspecified	Vehicles				-				
70.070	Spare parts/ Rotable Components	Vehicles				-				
70.080	Intercity Passenger Rail	Vehicles				-				
70.081	Diesel Locomotive	Vehicles				-				
70.082	Cab Car	Vehicles				-				
70.083	Bi-Level Coach	Vehicles				-				
70.084	Single Level Coach	Vehicles				-				
70.085	DMU	Vehicles				-				
70.086	EMU	Vehicles				-				
70.087	Unspecified					-				
80	**Professional Services**			-	-	**-**			0%	
80.000	Planning and Concept Design					-				
80.010	Preliminary Engineering					-				
80.020	Final Design					-				
80.030	Project Management for Design and Construction					-				
80.031	Agency Project Management					-				
80.032	Project Management Oversight Support					-				
80.033	Agency Force Account					-				
80.034	Unspecified					-				
80.040	Construction Administration & Management					-				
80.050	Professional Liability and other Non-Construction Insurance					-				
80.060	Legal; Permits; Review Fees by other agencies, cities, etc.					-				
80.070	Surveys, Testing, Investigation, Inspection					-				
80.080	Start up					-				
80.081	Training/Start-up					-				
80.082	Safety Certification					-				
80.083	Off-Site Vehicle Testing, Test Runs					-				
80.084	Commissioning					-				
80.085	Unspecified					-				
80.090	Other					-				
81	**Subtotal (10-80)**	Lineal Miles of Guideway	37.58	9,309,364	-	9,309,364	247,719		100%	
90	**Unallocated Contingency**	Total Amount				**-**			0%	
91	**Subtotal (10-90)**	Lineal Miles of Guideway	37.58	9,309,364	-	**9,309,364**	247,719		100%	
100	**Finance Charges**	Total Amount		-	-	**-**			0%	
101	**Total Project Costs (10-100)**	Lineal Miles of Guideway	37.58	9,309,364	-	**9,309,364**	247,719		100%	

Allocated Contingency as % of Base Yr Dollars w/o Contingency	0.00%
Unallocated Contingency as % of Base Yr Dollars w/o Contingency	0.00%
Total Contingency as % of Base Yr Dollars w/o Contingency	0.00%

FRA MAIN WORKSHEET

Grantee Name: **Maryland DOT and Baltimore-Washington Rapid Rail (BWRR)**

Project Name and Location: **Baltimore-Washington SCMAGLEV** LB 4.3 SCC Alt J and J1 - MVS East - Cherry Hill MD-198.xls

Current Phase : **Administrative Draft Environmental Impact Statement**

Alignment: **J1**
Washington Station: **MD-198**
Baltimore Station: **Cherry Hill**
Note: Costs do not reflect Value Engineering opportunities

Issue Date	
Today's Date	3/31/20
Yr of Base Year $	2018
Yr of Revenue Ops	2029

Standard Cost Category		Unit	Quantity	Base Year Dollars: Without Contingency (X000)	Allocated Contingency (X000)	TOTAL (X000)	Unit Cost (X000)	Percent of Construction Cost	Percent of Total Project Cost	YOE Dollars Total (X000) (from Inflation Worksheet)
10	**Guideway & Track Elements**	**Lineal Miles of Guideway**	39.50	5,852,445	-	**5,852,445**	148,162	61%	61%	
10.010	Guideway: At-grade exclusive right-of-way	Lineal Miles of Guideway				-				
10.020	Guideway: At-grade semi-exclusive (allows cross-traffic)	Lineal Miles of Guideway				-				
10.030	Guideway: At-grade in mixed traffic	Lineal Miles of Guideway				-				
10.040	Guideway: Aerial structure	Lineal Miles of Guideway	8.09	458,707	-	458,707	56,700			
10.041	Bridges	Lineal Miles of Guideway				-				
10.042	Viaduct	Lineal Miles of Guideway	4.80	360,007	-	360,007	75,000			
10.043	Other Structure (MOW Ramp)	Lineal Miles of Guideway	3.29	98,700		98,700	30,000			
10.044	Portals	Lineal Miles of Guideway				-				
10.050	Guideway: Built-up fill	Lineal Miles of Guideway	0.51	37,981	-	37,981	75,000			
10.060	Guideway: Underground cut & cover	Lineal Miles of Guideway	1.88	319,012	-	319,012	170,000			
10.061	Cut & Cover Guideway Soft Soils	Lineal Miles of Guideway				-				
10.062	Cut & Cover Guideway Hard Soils	Lineal Miles of Guideway				-				
10.063	Cut & Cover Guideway Vent Soft Soils	Lineal Miles of Guideway				-				
10.064	Cut & Cover Guideway Vent Hard Soils	Lineal Miles of Guideway				-				
10.065	Unspecified	Lineal Miles of Guideway				-				
10.070	Guideway: Underground tunnel	Lineal Miles of Guideway	29.03	4,789,514	-	4,789,514	165,000			
10.071	Bored Earth Open	Lineal Miles of Guideway				-				
10.072	Bored Earth Close	Lineal Miles of Guideway				-				
10.073	Bored Earth Mixed Shield	Lineal Miles of Guideway	29.03	4,789,514	-	4,789,514	165,000			
10.074	Bored Earth Mixes Shield SEM	Lineal Miles of Guideway				-				
10.075	Rock Drill & Blast	Lineal Miles of Guideway				-				
10.076	Rock Boring Machine	Lineal Miles of Guideway				-				
10.077	Sunken Tunnel	Lineal Miles of Guideway				-				
10.078	Unspecified	Lineal Miles of Guideway				-				
10.080	Guideway: Retained cut or fill	Lineal Miles of Guideway				-				
10.090	Track: Direct fixation	Track Miles				-				
10.100	Track: Embedded	Track Miles				-				
10.110	Track: Ballasted	Track Miles				-				
10.120	Track: Special (switches, turnouts)	Track Miles				-				
10.130	Track: Vibration & Noise Dampening	Track Miles				-				
10.140	Special Structures	Lineal Miles of Guideway	30.90	247,231	-	247,231	8,000			
10.141	Escape Gallery	Lineal Miles of Guideway	30.90	247,231	-	247,231	8,000			
20	**Stations, Stops, Terminals, Intermodels**	**Stations**	3	2,788,710	-	**2,788,710**	929,570	29%	29%	
20.010	At-Grade Station, Stop, Shelter, Mall, Terminal, Platform	Stations				-				
20.020	Aerial station, stop, shelter, mall, terminal, platform	Stations	1.00	620,968	-	620,968	620,968			
20.021	BALTIMORE STATION	Stations	1.00	620,968	-	620,968	620,968			
	BALTIMORE STATION - CIVIL/STRUCTURAL	Stations	1.00	475,807	-	475,807	475,807			
	BALTIMORE STATION - ARCHITECTURAL	Stations	1.00	145,161	-	145,161	145,161			
20.030	Underground station, stop, shelter, mall, terminal, platform	Stations	2.00	2,167,742	-	2,167,742	1,083,871			
20.031	WASHINGTON DC STATION	Stations	1.00	1,222,581	-	1,222,581	1,222,581			
	WASHINGTON DC STATION - CIVIL/STRUCTURAL	Stations	1.00	1,000,000	-	1,000,000	1,000,000			
	WASHINGTON DC STATION - ARCHITECTURAL	Stations	1.00	222,581	-	222,581	222,581			
20.032	BWI AIRPORT STATION	Stations	1.00	945,161	-	945,161	945,161			
	BWI AIRPORT STATION - CIVIL/STRUCTURAL	Stations	1.00	800,000	-	800,000	800,000			
	BWI AIRPORT STATION - ARCHITECTURAL	Stations	1.00	145,161	-	145,161	145,161			
20.040	Major stations, landings, terminals: Intermodal, ferry, trolley, etc.	Stations				-				
20.050	Joint development	Stations				-				
20.060	Automobile parking multi-story structure	Spaces				-				
20.070	Elevators, escalators	Number				-				
20.071	Elevators	Number				-				
20.072	Escalators	Number				-				
20.073	Unspecified	Number				-				
20.080	Passenger Overpass	Number				-				
20.090	Underground Interconnecting Tunnel	Number				-				
20.091	Cut and Cover	Number				-				
20.092	Bored Earth Soft Soils	Number				-				
20.093	Bored Rock Hard Soils	Number				-				
20.094	Unspecified	Number				-				
20.100	Signage and Graphics	Number				-				
30	**Support Facilities: Yards, Shops, Admin. Bldgs**	**Number**	17.00	842,400	-	**842,400**	49,553	9%	9%	
30.010	Administration Building: Office, sales, storage, revenue counting	Number				-				
30.011	Administrative Building	Number				-				
30.012	Central Control Facility	Number				-				
30.013	Central Revenue Counting Facility	Number				-				
30.014	Unspecified	Number				-				
30.020	Light Maintenance Facility	Number				-				
30.030	Heavy Maintenance Facility (TMF, Shop Equipment included in Code 50, Systems)	Number	1.00	280,000	-	280,000	280,000			
30.040	Storage or Maintenance of Way Building (MOW Facilities at TMF and Cherry Hill)	Number	2.00	60,000	-	60,000	30,000			
30.050	Yard and Yard Track	Number	1.00	120,000	-	120,000	120,000			
30.060	Electrical Substations (Equipment is included in Code 50, Systems)	Number	4.00	22,400	-	22,400	5,600			
30.061	Electrical Substation (at 104+500, Ivy City, DC)	Number	1.00	5,600	-	5,600	5,600			
30.062	Electrical Substation (at 127+000, Suburban Airport, Laurel, MD)	Number	1.00	5,600	-	5,600	5,600			
30.063	Electrical Substation (at 151+100-SOUTH OF I-895)	Number	1.00	5,600	-	5,600	5,600			
30.064	Electrical Substation (at 155+400- Westport, MD)	Number	1.00	5,600	-	5,600	5,600			
30.070	Ventilation Plant/Emergency Exits	Number	9.00	360,000	-	360,000	40,000			
30.071	Ventilation Plant (FA/EE) No.1 (at 104+400)	Number	1.00	40,000	-	40,000	40,000			
30.072	Ventilation Plant (FA/EE) No.2 (at 108+150)	Number	1.00	40,000	-	40,000	40,000			
30.073	Ventilation Plant (FA/EE) No.3 (at 113+100)	Number	1.00	40,000	-	40,000	40,000			
30.074	Ventilation Plant (FA/EE) No 4 (at 137+475)	Number	1.00	40,000	-	40,000	40,000			
30.075	Ventilation Plant (FA/EE) No.5 (at 140+300)	Number	1.00	40,000	-	40,000	40,000			
30.076	Ventilation Plant (FA/EE) No.6 (at 141+600)	Number	1.00	40,000	-	40,000	40,000			
30.077	Ventilation Plant (FA/EE) No.7 (at 143+600)	Number	1.00	40,000	-	40,000	40,000			
30.078	Ventilation Plant (FA/EE) No.8 (at 146+500)	Number	1.00	40,000	-	40,000	40,000			
30.079	Ventilation Plant (FA/EE) No.9 (at 151+100)	Number	1.00	40,000	-	40,000	40,000			
40	**Sitework & Special Conditions**	**Lineal Miles of Guideway**	39.50	83,409	-	**83,409**	2,112	1%	1%	
40.010	Demolition, Clearing, Earthwork	Lineal Miles of Guideway	7.18	1,894	-	1,894	264			
40.020	Site Utilities, Utility Relocation	Lineal Miles of Guideway	7.18	1,336	-	1,336	186			
40.021	Urban Replacement In-Kind Public Utilities	Lineal Miles of Guideway				-				
40.022	Urban Replacement In-Kind Private Utilities	Lineal Miles of Guideway				-				
40.023	Urban Replacement Betterment Public Utilities	Lineal Miles of Guideway				-				
40.024	Urban Replacement Betterment Private Utilities	Lineal Miles of Guideway				-				
40.025	Suburban Replacement In-Kind Public Utilities	Lineal Miles of Guideway				-				
40.026	Suburban Replacement In-Kind Private Utilities	Lineal Miles of Guideway				-				
40.027	Suburban Replacement Betterment Public Utilities	Lineal Miles of Guideway				-				
40.028	Suburban Replacement Betterment Private Utilities	Lineal Miles of Guideway				-				
40.029	Unspecified	Lineal Miles of Guideway				-				
40.030	Haz. mat'l, contam'd soil removal/mitigation, ground water treatments	Lineal Miles of Guideway	7.18	128	-	128	18			
40.031	HazMat Abatement	Lineal Miles of Guideway				-				
40.032	Contaminated Soil Removal	Lineal Miles of Guideway				-				
40.033	Ground Water Treatment	Lineal Miles of Guideway				-				
40.034	Unspecified	Lineal Miles of Guideway				-				
40.040	Environmental mitigation, e.g. wetlands, historic/archeologic, parks	Lineal Miles of Guideway	7.18	46,059	-	46,059	6,412			
40.050	Site structures including retaining walls, sound walls	Lineal Miles of Guideway				-				
40.051	Mechanically Stabilized Earth Walls	Lineal Miles of Guideway				-				
40.052	Concrete Walls	Lineal Miles of Guideway				-				
40.053	Other Walls	Lineal Miles of Guideway				-				
40.054	Unspecified	Lineal Miles of Guideway				-				
40.060	Pedestrian / bike access and accommodation, landscaping	Lineal Miles of Guideway				-				
40.070	Automobile, bus, van accessways including roads, parking lots	Lump Sum	1.00	31,737	-	31,737	31,737			
40.071	Surface Parking Lot	Spaces				-				
40.072	Auto Access	Stations				-				
40.073	Bus Access	Spaces				-				
40.074	Bus Parking and Berthing	Spaces				-				
40.075	Unspecified	Spaces				-				
40.080	Temporary Facilities and other indirect costs during construction	Lump Sum	1.00	2,255	-	2,255	2,255			
40.081	Roadway Changes	Lineal Miles of Guideway				-				
40.082	Third-Party Work	Lineal Miles of Guideway				-				
40.083	Mobilization	Lineal Miles of Guideway				-				

40.084	Maintenance of Traffic (Railroad reroute, shutdown, reschedule, stage, phase, worker-protect, work-around)	Lineal Miles of Guideway				-				
40.085	Unallocated Indirect Costs	Lump Sum				-				
40.086	Unspecified	Lineal Miles of Guideway				-				
50	**Systems**	**LUMP SUM**	0.00	-	-	**-**		0%	0%	
50.010	Train control and signals	Track Miles				-				
50.011	Train Control - Wayside	Track Miles				-				
50.012	Train Control - On Board Systems	Track Miles				-				
50.013	Train Control - Centralized Systems	Track Miles				-				
50.014	Unspecified	Track Miles				-				
50.020	Traffic signals and crossing protection	Track Miles				-				
50.030	Traction power supply: substations	Track Miles				-				
50.040	Traction power distribution: catenary and third rail	Track Miles				-				
50.041	Catenary	Track Miles				-				
50.042	Third Rail	Track Miles				-				
50.043	Power Distribution and Connections	Track Miles				-				
50.044	Unspecified	Track Miles				-				
50.050	Communications	Lineal Miles of Guideway				-				
50.051	Wired	Lineal Miles of Guideway				-				
50.052	Radio Based	Lineal Miles of Guideway				-				
50.053	Unspecified	Lineal Miles of Guideway				-				
50.060	Fare collection system and equipment	Stations				-				
50.061	Central Revenue Counting Systems	Stations				-				
50.062	Revenue Collection - In Station	Stations				-				
50.063	Revenue Collection - On Vehicle	Vehicles				-				
50.064	Unspecified	Stations				-				
50.070	Central Control System	Lineal Miles of Guideway				-				
51	**Construction Subtotal (10-50)**	**Lineal Miles of Guideway**	39.50	9,566,964	-	**9,566,964**	242,199	100%	100%	
60	**Row, Land, Existing Improvements**	**Lineal Miles of Guideway**	0.00			**-**			0%	
60.010	Purchase or lease of real estate	Lineal Miles of Guideway				-				
60.011	Full Takes	Lineal Miles of Guideway				-				
60.012	Part Takes	Lineal Miles of Guideway				-				
60.013	Easement Acquisitions	Lineal Miles of Guideway				-				
60.014	Other Rights	Lineal Miles of Guideway				-				
60.015	Donated Value	Lineal Miles of Guideway				-				
60.016	Unspecified	Lineal Miles of Guideway				-				
60.020	Relocation of existing households and businesses	Lineal Miles of Guideway				-				
60.021	Residential (Owners)	Lineal Miles of Guideway				-				
60.022	Residential (Tenants)	Lineal Miles of Guideway				-				
60.023	Business (Owners and Tenants)	Lineal Miles of Guideway				-				
60.024	Others (Personal Property Moves)	Lineal Miles of Guideway				-				
60.025	Unspecified	Lineal Miles of Guideway				-				
60.030	Services	Lineal Miles of Guideway				-				
60.031	Property Management	Lineal Miles of Guideway				-				
60.032	Agency	Lineal Miles of Guideway				-				
60.033	Contractor R/W Services (Title/Appraisal, etc)	Lineal Miles of Guideway				-				
60.034	Legal Services	Lineal Miles of Guideway				-				
60.035	Unspecified	Lineal Miles of Guideway				-				
60.040	Other Real Estate Costs	Lineal Miles of Guideway				-				
70	**Vehicles**	**Vehicles**	0.00	-	-	**-**			0%	
70.060	Non-revenue vehicles	Vehicles				-				
70.061	Maintenance of Way Vehicles	Vehicles				-				
70.062	Automobiles	Vehicles				-				
70.063	Trucks	Vehicles				-				
70.064	Unspecified	Vehicles				-				
70.070	Spare parts/ Rotable Components	Vehicles				-				
70.080	Intercity Passenger Rail	Vehicles				-				
70.081	Diesel Locomotive	Vehicles				-				
70.082	Cab Car	Vehicles				-				
70.083	Bi-Level Coach	Vehicles				-				
70.084	Single Level Coach	Vehicles				-				
70.085	DMU	Vehicles				-				
70.086	EMU	Vehicles				-				
70.087	Unspecified					-				
80	**Professional Services**			-	-	**-**			0%	
80.000	Planning and Concept Design					-				
80.010	Preliminary Engineering					-				
80.020	Final Design					-				
80.030	Project Management for Design and Construction					-				
80.031	Agency Project Management					-				
80.032	Project Management Oversight Support					-				
80.033	Agency Force Account					-				
80.034	Unspecified					-				
80.040	Construction Administration & Management					-				
80.050	Professional Liability and other Non-Construction Insurance					-				
80.060	Legal; Permits; Review Fees by other agencies, cities, etc.					-				
80.070	Surveys, Testing, Investigation, Inspection					-				
80.080	Start up					-				
80.081	Training/Start-up					-				
80.082	Safety Certification					-				
80.083	Off-Site Vehicle Testing, Test Runs					-				
80.084	Commissioning					-				
80.085	Unspecified					-				
80.090	Other					-				
81	**Subtotal (10-80)**	Lineal Miles of Guideway	39.50	9,566,964	-	9,566,964	242,199		100%	
90	**Unallocated Contingency**	Total Amount				**-**			0%	
91	**Subtotal (10-90)**	Lineal Miles of Guideway	39.50	9,566,964	-	**9,566,964**	242,199		100%	
100	**Finance Charges**	Total Amount		-	-	**-**			0%	
101	**Total Project Costs (10-100)**	Lineal Miles of Guideway	39.50	9,566,964	-	**9,566,964**	242,199		100%	

Allocated Contingency as % of Base Yr Dollars w/o Contingency	0.00%
Unallocated Contingency as % of Base Yr Dollars w/o Contingency	0.00%
Total Contingency as % of Base Yr Dollars w/o Contingency	0.00%

FRA INFLATION WORKSHEET

Issue Date of this worksheet: 3/31/20

Maryland DOT and BWRR

Today's Date: **3/31/20**

Project Name and Location: **Baltimore-Washington SCMAGLEV**
Alt J, MVS East, Camden Yard, BARC

Yr of Base Year $: 2018

Administrative Draft EIS

Yr of Revenue Ops: 2029

Orange cells - Costs prior to the Base Year (2015 in this example). PRODUCTS of the white cells at bottom (inputs) and purple cells (Category-specific compounded inflation factors)

Green cells - Category-specific annual INFLATION RATES. These are INPUTS. Note that the values shown for these inputs are arbitrary for the purpose of this example.

Purple cells - Category-specific compounded INFLATION FACTORS. Results of equations using purple and green cells.

Blue cells - Applies category-specific compounded inflation factors in the purple rows … this is for costs beginning in the Base Year (2015)

White cells - Base Year costs. These are INPUTS. Values prior to the Base Year are actuals. Values beginning in the Base Year are distributed over time according to the Project Schedule.

Insert comments, notes, etc.

BASE YEAR DOLLARS (X$000)	Base Yr Dollars	Double-Check Total	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
10 GUIDEWAY & TRACK ELEMENTS (route miles)	100,000	5,757	0	0	0	0	0	0	0	0	0	0					0	0	0	1,240	1,373	1,194	1,194	560	146	49		0	0	0	0	0	0
20 STATIONS, STOPS, TERMINALS, INTERMODAL (number)	30,000	3,613	0	0	0	0	0	0	0	0	0	0					0	0	0		406	542	542	542	602	723	256	0	0	0	0	0	0
30 SUPPORT FACILITIES: YARDS, SHOPS, ADMIN. BLDGS	10,000	602	0	0	0	0	0	0	0	0	0	0					0	0	0	27	39	42	42	126	192	116	19	0	0	0	0	0	0
40 SITEWORK & SPECIAL CONDITIONS	53,350	79	0	0	0	0	0	0	0	0	0	0					0	0	0	7	12	14	14	14	9	4	3	0	0	0	0	0	0
50 SYSTEMS	30,000	0	0	0	0	0	0	0	0	0	0	0					0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
60 ROW, LAND, EXISTING IMPROVEMENTS	35,175	0	0	0	0	0	0	0	0	0	0	0					0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
70 VEHICLES (number)	30,000	0	0	0	0	0	0	0	0	0	0	0					0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
80 PROFESSIONAL SERVICES (applies to Cats. 10-50)	77,168	0	0	0	0	0	0	0	0	0	0	0					0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
90 UNALLOCATED CONTINGENCY	20,000	0	0	0	0	0	0	0	0	0	0	0					0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
100 FINANCE CHARGES	14,582	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Project Cost (10 - 100)	400,275	10,051	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1,275**	**1,831**	**1,792**	**1,792**	**1,242**	**950**	**892**	**278**	**0**	**0**	**0**	**0**	**0**	**0**

Inflation Rate	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	1.035	2.035	3.035	4.035
10 GUIDEWAY & TRACK ELEMENTS (route miles)	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010
20 STATIONS, STOPS, TERMINALS, INTERMODAL (number)	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015
30 SUPPORT FACILITIES: YARDS, SHOPS, ADMIN. BLDGS	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020
40 SITEWORK & SPECIAL CONDITIONS	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025
50 SYSTEMS	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030
60 ROW, LAND, EXISTING IMPROVEMENTS	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035
70 VEHICLES (number)	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040
80 PROFESSIONAL SERVICES (applies to Cats. 10-50)	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045
90 UNALLOCATED CONTINGENCY	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050
100 FINANCE CHARGES	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055
Compounded Inflation Factor	1.411	1.363	1.317	1.272	1.229	1.188	1.148	1.109	1.071	1.035	1.000	1.035	1.071	1.109	1.148	1.188	1.229	1.272	1.317	1.363	1.411	1.460	1.511	1.564	1.619	1.675	1.734	3.529	10.709	43.213	217.576
10 GUIDEWAY & TRACK ELEMENTS (route miles)	1.105	1.094	1.083	1.072	1.062	1.051	1.041	1.030	1.020	1.010	1.000	1.010	1.020	1.030	1.041	1.051	1.062	1.072	1.083	1.094	1.105	1.116	1.127	1.138	1.149	1.161	1.173	1.184	1.196	1.208	1.220
20 STATIONS, STOPS, TERMINALS, INTERMODAL (number)	1.161	1.143	1.126	1.110	1.093	1.077	1.061	1.046	1.030	1.015	1.000	1.015	1.030	1.046	1.061	1.077	1.093	1.110	1.126	1.143	1.161	1.178	1.196	1.214	1.232	1.250	1.269	1.288	1.307	1.327	1.347
30 SUPPORT FACILITIES: YARDS, SHOPS, ADMIN. BLDGS	1.219	1.195	1.172	1.149	1.126	1.104	1.082	1.061	1.040	1.020	1.000	1.020	1.040	1.061	1.082	1.104	1.126	1.149	1.172	1.195	1.219	1.243	1.268	1.294	1.319	1.346	1.373	1.400	1.428	1.457	1.486
40 SITEWORK & SPECIAL CONDITIONS	1.280	1.249	1.218	1.189	1.160	1.131	1.104	1.077	1.051	1.025	1.000	1.025	1.051	1.077	1.104	1.131	1.160	1.189	1.218	1.249	1.280	1.312	1.345	1.379	1.413	1.448	1.485	1.522	1.560	1.599	1.639
50 SYSTEMS	1.344	1.305	1.267	1.230	1.194	1.159	1.126	1.093	1.061	1.030	1.000	1.030	1.061	1.093	1.126	1.159	1.194	1.230	1.267	1.305	1.344	1.384	1.426	1.469	1.513	1.558	1.605	1.653	1.702	1.754	1.806
60 ROW, LAND, EXISTING IMPROVEMENTS	1.411	1.363	1.317	1.272	1.229	1.188	1.148	1.109	1.071	1.035	1.000	1.035	1.071	1.109	1.148	1.188	1.229	1.272	1.317	1.363	1.411	1.460	1.511	1.564	1.619	1.675	1.734	1.795	1.857	1.923	1.990
70 VEHICLES (number)	1.480	1.423	1.369	1.316	1.265	1.217	1.170	1.125	1.082	1.040	1.000	1.040	1.082	1.125	1.170	1.217	1.265	1.316	1.369	1.423	1.480	1.539	1.601	1.665	1.732	1.801	1.873	1.948	2.026	2.107	2.191
80 PROFESSIONAL SERVICES (applies to Cats. 10-50)	1.553	1.486	1.422	1.361	1.302	1.246	1.193	1.141	1.092	1.045	1.000	1.045	1.092	1.141	1.193	1.246	1.302	1.361	1.422	1.486	1.553	1.623	1.696	1.772	1.852	1.935	2.022	2.113	2.208	2.308	2.412
90 UNALLOCATED CONTINGENCY	1.629	1.551	1.477	1.407	1.340	1.276	1.216	1.158	1.103	1.050	1.000	1.050	1.103	1.158	1.216	1.276	1.340	1.407	1.477	1.551	1.629	1.710	1.796	1.886	1.980	2.079	2.183	2.292	2.407	2.527	2.653
100 FINANCE CHARGES	1.708	1.619	1.535	1.455	1.379	1.307	1.239	1.174	1.113	1.055	1.000	1.055	1.113	1.174	1.239	1.307	1.379	1.455	1.535	1.619	1.708	1.802	1.901	2.006	2.116	2.232	2.355	2.485	2.621	2.766	2.918

YEAR OF EXPENDITURE DOLLARS (X$000)	YOE Dollars	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
10 GUIDEWAY & TRACK ELEMENTS (route miles)	6,287											0	0	0	0	0	0	0	1,330	1,487	1,306	1,319	625	165	55	0	0	0	0	0	0	0
20 STATIONS, STOPS, TERMINALS, INTERMODAL (number)	4,257											0	0	0	0	0	0	0	0	458	620	629	638	720	877	315	0	0	0	0	0	0
30 SUPPORT FACILITIES: YARDS, SHOPS, ADMIN. BLDGS	753											0	0	0	0	0	0	0	31	45	50	51	156	244	150	26	0	0	0	0	0	0
40 SITEWORK & SPECIAL CONDITIONS	101											0	0	0	0	0	0	0	9	15	18	19	19	12	6	4	0	0	0	0	0	0
50 SYSTEMS	0											0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
60 ROW, LAND, EXISTING IMPROVEMENTS	0											0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
70 VEHICLES (number)	0											0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
80 PROFESSIONAL SERVICES (applies to Cats. 10-50)	0											0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
90 UNALLOCATED CONTINGENCY	0											0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
100 FINANCE CHARGES	0																															0
Total Project Cost (10 - 100)	11,397	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1,370**	**2,005**	**1,993**	**2,017**	**1,438**	**1,141**	**1,088**	**345**	**0**	**0**	**0**	**0**	**0**	**0**

FRA INFLATION WORKSHEET

Maryland DOT and BWRR

Project Name and Location: **Baltimore-Washington SCMAGLEV**
Alt J, MVS East, Camden Yard, MD-198

Administrative Draft EIS

Issue Date of this worksheet	3/31/20
Today's Date	**3/31/20**
Yr of Base Year $	2018
Yr of Revenue Ops	2029

Orange cells - Costs prior to the Base Year (2015 in this example). PRODUCTS of the white cells at bottom (inputs) and purple cells (Category-specific compounded inflation factors)

Green cells - Category-specific annual INFLATION RATES. These are INPUTS. Note that the values shown for these inputs are arbitrary for the purpose of this example.

Purple cells - Category-specific compounded INFLATION FACTORS. Results of equations using purple and green cells.

Blue cells - Applies category-specific compounded inflation factors in the purple rows … this is for costs beginning in the Base Year (2015)

White cells - Base Year costs. These are INPUTS. Values prior to the Base Year are actuals. Values beginning in the Base Year are distributed over time according to the Project Schedule.

Insert comments, notes, etc.

BASE YEAR DOLLARS (X$000)	Base Yr Dollars	Double-Check Total	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
10 GUIDEWAY & TRACK ELEMENTS (route miles)	100,000	5,811	0	0	0	0	0	0	0	0	0	0					0	0	0	1,248	1,388	1,209	1,209	563	146	49		0	0	0	0	0	0
20 STATIONS, STOPS, TERMINALS, INTERMODAL (number)	30,000	3,613	0	0	0	0	0	0	0	0	0	0					0	0	0		406	542	542	542	602	723	256	0	0	0	0	0	0
30 SUPPORT FACILITIES: YARDS, SHOPS, ADMIN. BLDGS	10,000	802	0	0	0	0	0	0	0	0	0	0					0	0	0	48	66	69	69	153	223	147	26	0	0	0	0	0	0
40 SITEWORK & SPECIAL CONDITIONS	53,350	79	0	0	0	0	0	0	0	0	0	0					0	0	0	7	12	14	14	14	9	4	3	0	0	0	0	0	0
50 SYSTEMS	30,000	0	0	0	0	0	0	0	0	0	0	0					0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
60 ROW, LAND, EXISTING IMPROVEMENTS	35,175	0	0	0	0	0	0	0	0	0	0	0					0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
70 VEHICLES (number)	30,000	0	0	0	0	0	0	0	0	0	0	0					0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
80 PROFESSIONAL SERVICES (applies to Cats. 10-50)	77,168	0	0	0	0	0	0	0	0	0	0	0					0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
90 UNALLOCATED CONTINGENCY	20,000	0	0	0	0	0	0	0	0	0	0	0					0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
100 FINANCE CHARGES	14,582	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Project Cost (10 - 100)	400,275	10,305	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1,303**	**1,873**	**1,834**	**1,834**	**1,272**	**981**	**922**	**285**	**0**	**0**	**0**	**0**	**0**	**0**

Inflation Rate	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
10 GUIDEWAY & TRACK ELEMENTS (route miles)	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	1.035	2.035	3.035	4.035
20 STATIONS, STOPS, TERMINALS, INTERMODAL (number)	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010
30 SUPPORT FACILITIES: YARDS, SHOPS, ADMIN. BLDGS	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015
40 SITEWORK & SPECIAL CONDITIONS	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020
50 SYSTEMS	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025
60 ROW, LAND, EXISTING IMPROVEMENTS	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030
70 VEHICLES (number)	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035
80 PROFESSIONAL SERVICES (applies to Cats. 10-50)	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040
90 UNALLOCATED CONTINGENCY	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045
100 FINANCE CHARGES	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050
Compounded Inflation Factor	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055
10 GUIDEWAY & TRACK ELEMENTS (route miles)	1.411	1.363	1.317	1.272	1.229	1.188	1.148	1.109	1.071	1.035	1.000	1.035	1.071	1.109	1.148	1.188	1.229	1.272	1.317	1.363	1.411	1.460	1.511	1.564	1.619	1.675	1.734	3.529	10.709	43.213	217.576
20 STATIONS, STOPS, TERMINALS, INTERMODAL (number)	1.105	1.094	1.083	1.072	1.062	1.051	1.041	1.030	1.020	1.010	1.000	1.010	1.020	1.030	1.041	1.051	1.062	1.072	1.083	1.094	1.105	1.116	1.127	1.138	1.149	1.161	1.173	1.184	1.196	1.208	1.220
30 SUPPORT FACILITIES: YARDS, SHOPS, ADMIN. BLDGS	1.161	1.143	1.126	1.110	1.093	1.077	1.061	1.046	1.030	1.015	1.000	1.015	1.030	1.046	1.061	1.077	1.093	1.110	1.126	1.143	1.161	1.178	1.196	1.214	1.232	1.250	1.269	1.288	1.307	1.327	1.347
40 SITEWORK & SPECIAL CONDITIONS	1.219	1.195	1.172	1.149	1.126	1.104	1.082	1.061	1.040	1.020	1.000	1.020	1.040	1.061	1.082	1.104	1.126	1.149	1.172	1.195	1.219	1.243	1.268	1.294	1.319	1.346	1.373	1.400	1.428	1.457	1.486
50 SYSTEMS	1.280	1.249	1.218	1.189	1.160	1.131	1.104	1.077	1.051	1.025	1.000	1.025	1.051	1.077	1.104	1.131	1.160	1.189	1.218	1.249	1.280	1.312	1.345	1.379	1.413	1.448	1.485	1.522	1.560	1.599	1.639
60 ROW, LAND, EXISTING IMPROVEMENTS	1.344	1.305	1.267	1.230	1.194	1.159	1.126	1.093	1.061	1.030	1.000	1.030	1.061	1.093	1.126	1.159	1.194	1.230	1.267	1.305	1.344	1.384	1.426	1.469	1.513	1.558	1.605	1.653	1.702	1.754	1.806
70 VEHICLES (number)	1.411	1.363	1.317	1.272	1.229	1.188	1.148	1.109	1.071	1.035	1.000	1.035	1.071	1.109	1.148	1.188	1.229	1.272	1.317	1.363	1.411	1.460	1.511	1.564	1.619	1.675	1.734	1.795	1.857	1.923	1.990
80 PROFESSIONAL SERVICES (applies to Cats. 10-50)	1.480	1.423	1.369	1.316	1.265	1.217	1.170	1.125	1.082	1.040	1.000	1.040	1.082	1.125	1.170	1.217	1.265	1.316	1.369	1.423	1.480	1.539	1.601	1.665	1.732	1.801	1.873	1.948	2.026	2.107	2.191
90 UNALLOCATED CONTINGENCY	1.553	1.486	1.422	1.361	1.302	1.246	1.193	1.141	1.092	1.045	1.000	1.045	1.092	1.141	1.193	1.246	1.302	1.361	1.422	1.486	1.553	1.623	1.696	1.772	1.852	1.935	2.022	2.113	2.208	2.308	2.412
100 FINANCE CHARGES	1.629	1.551	1.477	1.407	1.340	1.276	1.216	1.158	1.103	1.050	1.000	1.050	1.103	1.158	1.216	1.276	1.340	1.407	1.477	1.551	1.629	1.710	1.796	1.886	1.980	2.079	2.183	2.292	2.407	2.527	2.653
	1.708	1.619	1.535	1.455	1.379	1.307	1.239	1.174	1.113	1.055	1.000	1.055	1.113	1.174	1.239	1.307	1.379	1.455	1.535	1.619	1.708	1.802	1.901	2.006	2.116	2.232	2.355	2.485	2.621	2.766	2.918

YEAR OF EXPENDITURE DOLLARS (X$000)	YOE Dollars	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
10 GUIDEWAY & TRACK ELEMENTS (route miles)	6,346											0	0	0	0	0	0	0	1,338	1,503	1,322	1,335	628	165	55	0	0	0	0	0	0	0
20 STATIONS, STOPS, TERMINALS, INTERMODAL (number)	4,257											0	0	0	0	0	0	0	0	458	620	629	638	720	877	315	0	0	0	0	0	0
30 SUPPORT FACILITIES: YARDS, SHOPS, ADMIN. BLDGS	998											0	0	0	0	0	0	0	55	78	83	84	191	283	190	34	0	0	0	0	0	0
40 SITEWORK & SPECIAL CONDITIONS	101											0	0	0	0	0	0	0	9	15	18	19	19	12	6	4	0	0	0	0	0	0
50 SYSTEMS	0											0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
60 ROW, LAND, EXISTING IMPROVEMENTS	0											0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
70 VEHICLES (number)	0											0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
80 PROFESSIONAL SERVICES (applies to Cats. 10-50)	0											0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
90 UNALLOCATED CONTINGENCY	0											0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
100 FINANCE CHARGES	0																															0
Total Project Cost (10 - 100)	11,702	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1,401**	**2,054**	**2,043**	**2,067**	**1,476**	**1,180**	**1,128**	**354**	**0**	**0**	**0**	**0**	**0**	**0**

FRA INFLATION WORKSHEET

	Issue Date of this worksheet	12/21/18
Maryland DOT and BWRR	Today's Date	**3/31/20**
Project Name and Location: **Baltimore-Washington SCMAGLEV Alt J, MVS East, Cherry Hill, BARC**	Yr of Base Year $	2018
Administrative Draft EIS	Yr of Revenue Ops	2029

Orange cells - Costs prior to the Base Year (2015 in this example). PRODUCTS of the white cells at bottom (inputs) and purple cells (Category-specific compounded inflation factors)

Green cells - Category-specific annual INFLATION RATES. These are INPUTS. Note that the values shown for these inputs are arbitrary for the purpose of this example.

Purple cells - Category-specific compounded INFLATION FACTORS. Results of equations using purple and green cells.

Blue cells - Applies category-specific compounded inflation factors in the purple rows … this is for costs beginning in the Base Year (2015)

White cells - Base Year costs. These are INPUTS. Values prior to the Base Year are actuals. Values beginning in the Base Year are distributed over time according to the Project Schedule.

Insert comments, notes, etc.

BASE YEAR DOLLARS (X$000)	Base Yr Dollars	Double-Check Total	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
10 GUIDEWAY & TRACK ELEMENTS (route miles)	100,000	5,397	0	0	0	0	0	0	0	0	0	0					0	0	0	1,162	1,288	1,120	1,120	524	137	45	0	0	0	0	0	0	0
20 STATIONS, STOPS, TERMINALS, INTERMODAL (number)	30,000	2,789	0	0	0	0	0	0	0	0	0	0					0	0	0	0	314	418	418	418	465	558	198	0	0	0	0	0	0
30 SUPPORT FACILITIES: YARDS, SHOPS, ADMIN. BLDGS	10,000	602	0	0	0	0	0	0	0	0	0	0					0	0	0	27	39	42	42	126	192	116	19	0	0	0	0	0	0
40 SITEWORK & SPECIAL CONDITIONS	53,350	79	0	0	0	0	0	0	0	0	0	0					0	0	0	7	12	14	14	14	9	4	3	0	0	0	0	0	0
50 SYSTEMS	30,000	0	0	0	0	0	0	0	0	0	0	0					0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
60 ROW, LAND, EXISTING IMPROVEMENTS	35,175	0	0	0	0	0	0	0	0	0	0	0					0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
70 VEHICLES (number)	30,000	0	0	0	0	0	0	0	0	0	0	0					0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
80 PROFESSIONAL SERVICES (applies to Cats. 10-50)	77,168	0	0	0	0	0	0	0	0	0	0	0					0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
90 UNALLOCATED CONTINGENCY	20,000	0	0	0	0	0	0	0	0	0	0	0					0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
100 FINANCE CHARGES	14,582	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Project Cost (10 - 100)	400,275	8,867	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1,196**	**1,653**	**1,595**	**1,595**	**1,083**	**803**	**724**	**220**	**0**	**0**	**0**	**0**	**0**	**0**

Inflation Rate	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	1.035	2.035	3.035	4.035
10 GUIDEWAY & TRACK ELEMENTS (route miles)	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010
20 STATIONS, STOPS, TERMINALS, INTERMODAL (number)	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015
30 SUPPORT FACILITIES: YARDS, SHOPS, ADMIN. BLDGS	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020
40 SITEWORK & SPECIAL CONDITIONS	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025
50 SYSTEMS	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030
60 ROW, LAND, EXISTING IMPROVEMENTS	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035
70 VEHICLES (number)	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040
80 PROFESSIONAL SERVICES (applies to Cats. 10-50)	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045
90 UNALLOCATED CONTINGENCY	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050
100 FINANCE CHARGES	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055
Compounded Inflation Factor	1.411	1.363	1.317	1.272	1.229	1.188	1.148	1.109	1.071	1.035	1.000	1.035	1.071	1.109	1.148	1.188	1.229	1.272	1.317	1.363	1.411	1.460	1.511	1.564	1.619	1.675	1.734	3.529	10.709	43.213	217.576
10 GUIDEWAY & TRACK ELEMENTS (route miles)	1.105	1.094	1.083	1.072	1.062	1.051	1.041	1.030	1.020	1.010	1.000	1.010	1.020	1.030	1.041	1.051	1.062	1.072	1.083	1.094	1.105	1.116	1.127	1.138	1.149	1.161	1.173	1.184	1.196	1.208	1.220
20 STATIONS, STOPS, TERMINALS, INTERMODAL (number)	1.161	1.143	1.126	1.110	1.093	1.077	1.061	1.046	1.030	1.015	1.000	1.015	1.030	1.046	1.061	1.077	1.093	1.110	1.126	1.143	1.161	1.178	1.196	1.214	1.232	1.250	1.269	1.288	1.307	1.327	1.347
30 SUPPORT FACILITIES: YARDS, SHOPS, ADMIN. BLDGS	1.219	1.195	1.172	1.149	1.126	1.104	1.082	1.061	1.040	1.020	1.000	1.020	1.040	1.061	1.082	1.104	1.126	1.149	1.172	1.195	1.219	1.243	1.268	1.294	1.319	1.346	1.373	1.400	1.428	1.457	1.486
40 SITEWORK & SPECIAL CONDITIONS	1.280	1.249	1.218	1.189	1.160	1.131	1.104	1.077	1.051	1.025	1.000	1.025	1.051	1.077	1.104	1.131	1.160	1.189	1.218	1.249	1.280	1.312	1.345	1.379	1.413	1.448	1.485	1.522	1.560	1.599	1.639
50 SYSTEMS	1.344	1.305	1.267	1.230	1.194	1.159	1.126	1.093	1.061	1.030	1.000	1.030	1.061	1.093	1.126	1.159	1.194	1.230	1.267	1.305	1.344	1.384	1.426	1.469	1.513	1.558	1.605	1.653	1.702	1.754	1.806
60 ROW, LAND, EXISTING IMPROVEMENTS	1.411	1.363	1.317	1.272	1.229	1.188	1.148	1.109	1.071	1.035	1.000	1.035	1.071	1.109	1.148	1.188	1.229	1.272	1.317	1.363	1.411	1.460	1.511	1.564	1.619	1.675	1.734	1.795	1.857	1.923	1.990
70 VEHICLES (number)	1.480	1.423	1.369	1.316	1.265	1.217	1.170	1.125	1.082	1.040	1.000	1.040	1.082	1.125	1.170	1.217	1.265	1.316	1.369	1.423	1.480	1.539	1.601	1.665	1.732	1.801	1.873	1.948	2.026	2.107	2.191
80 PROFESSIONAL SERVICES (applies to Cats. 10-50)	1.553	1.486	1.422	1.361	1.302	1.246	1.193	1.141	1.092	1.045	1.000	1.045	1.092	1.141	1.193	1.246	1.302	1.361	1.422	1.486	1.553	1.623	1.696	1.772	1.852	1.935	2.022	2.113	2.208	2.308	2.412
90 UNALLOCATED CONTINGENCY	1.629	1.551	1.477	1.407	1.340	1.276	1.216	1.158	1.103	1.050	1.000	1.050	1.103	1.158	1.216	1.276	1.340	1.407	1.477	1.551	1.629	1.710	1.796	1.886	1.980	2.079	2.183	2.292	2.407	2.527	2.653
100 FINANCE CHARGES	1.708	1.619	1.535	1.455	1.379	1.307	1.239	1.174	1.113	1.055	1.000	1.055	1.113	1.174	1.239	1.307	1.379	1.455	1.535	1.619	1.708	1.802	1.901	2.006	2.116	2.232	2.355	2.485	2.621	2.766	2.918

YEAR OF EXPENDITURE DOLLARS (X$000)	YOE Dollars	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
10 GUIDEWAY & TRACK ELEMENTS (route miles)	5,894											0	0	0	0	0	0	0	1,246	1,395	1,225	1,238	585	154	52	0	0	0	0	0	0	0
20 STATIONS, STOPS, TERMINALS, INTERMODAL (number)	3,286											0	0	0	0	0	0	0	0	353	478	485	493	556	677	243	0	0	0	0	0	0
30 SUPPORT FACILITIES: YARDS, SHOPS, ADMIN. BLDGS	753											0	0	0	0	0	0	0	31	45	50	51	156	244	150	26	0	0	0	0	0	0
40 SITEWORK & SPECIAL CONDITIONS	101											0	0	0	0	0	0	0	9	15	18	19	19	12	6	4	0	0	0	0	0	0
50 SYSTEMS	0											0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
60 ROW, LAND, EXISTING IMPROVEMENTS	0											0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
70 VEHICLES (number)	0											0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
80 PROFESSIONAL SERVICES (applies to Cats. 10-50)	0											0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
90 UNALLOCATED CONTINGENCY	0											0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
100 FINANCE CHARGES	0																															0
Total Project Cost (10 - 100)	10,034	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1,285**	**1,808**	**1,771**	**1,792**	**1,253**	**966**	**885**	**273**	**0**	**0**	**0**	**0**	**0**	**0**

FRA INFLATION WORKSHEET

Maryland DOT and BWRR

Project Name and Location: **Baltimore-Washington SCMAGLEV**
Alt J, MVS East, Cherry Hill, MD-198

Administrative Draft EIS

Issue Date of this worksheet	12/21/18
Today's Date	**3/31/20**
Yr of Base Year $	2018
Yr of Revenue Ops	2029

Orange cells - Costs prior to the Base Year (2015 in this example). PRODUCTS of the white cells at bottom (inputs) and purple cells (Category-specific compounded inflation factors)

Green cells - Category-specific annual INFLATION RATES. These are INPUTS. Note that the values shown for these inputs are arbitrary for the purpose of this example.

Purple cells - Category-specific compounded INFLATION FACTORS. Results of equations using purple and green cells.

Blue cells - Applies category-specific compounded inflation factors in the purple rows … this is for costs beginning in the Base Year (2015)

White cells - Base Year costs. These are INPUTS. Values prior to the Base Year are actuals. Values beginning in the Base Year are distributed over time according to the Project Schedule.

Insert comments, notes, etc.

BASE YEAR DOLLARS (X$000)	Base Yr Dollars	Double-Check Total	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
10 GUIDEWAY & TRACK ELEMENTS (route miles)	100,000	5,451	0	0	0	0	0	0	0	0	0	0					0	0	0	1,169	1,303	1,135	1,135	527	137	45	0	0	0	0	0	0	0
20 STATIONS, STOPS, TERMINALS, INTERMODAL (number)	30,000	2,789	0	0	0	0	0	0	0	0	0	0					0	0	0	0	314	418	418	418	465	558	198	0	0	0	0	0	0
30 SUPPORT FACILITIES: YARDS, SHOPS, ADMIN. BLDGS	10,000	802	0	0	0	0	0	0	0	0	0	0					0	0	0	48	66	69	69	153	223	147	26	0	0	0	0	0	0
40 SITEWORK & SPECIAL CONDITIONS	53,350	79	0	0	0	0	0	0	0	0	0	0					0	0	0	7	12	14	14	14	9	4	3	0	0	0	0	0	0
50 SYSTEMS	30,000	0	0	0	0	0	0	0	0	0	0	0					0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
60 ROW, LAND, EXISTING IMPROVEMENTS	35,175	0	0	0	0	0	0	0	0	0	0	0					0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
70 VEHICLES (number)	30,000	0	0	0	0	0	0	0	0	0	0	0					0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
80 PROFESSIONAL SERVICES (applies to Cats. 10-50)	77,168	0	0	0	0	0	0	0	0	0	0	0					0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
90 UNALLOCATED CONTINGENCY	20,000	0	0	0	0	0	0	0	0	0	0	0					0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
100 FINANCE CHARGES	14,582	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Project Cost (10 - 100)	400,275	9,121	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1,224**	**1,695**	**1,637**	**1,637**	**1,113**	**834**	**754**	**226**	**0**	**0**	**0**	**0**	**0**	**0**

Inflation Rate	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	1.035	2.035	3.035	4.035
10 GUIDEWAY & TRACK ELEMENTS (route miles)	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010
20 STATIONS, STOPS, TERMINALS, INTERMODAL (number)	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015
30 SUPPORT FACILITIES: YARDS, SHOPS, ADMIN. BLDGS	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020
40 SITEWORK & SPECIAL CONDITIONS	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025
50 SYSTEMS	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030
60 ROW, LAND, EXISTING IMPROVEMENTS	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035
70 VEHICLES (number)	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040
80 PROFESSIONAL SERVICES (applies to Cats. 10-50)	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045
90 UNALLOCATED CONTINGENCY	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050
100 FINANCE CHARGES	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055
Compounded Inflation Factor	1.411	1.363	1.317	1.272	1.229	1.188	1.148	1.109	1.071	1.035	1.000	1.035	1.071	1.109	1.148	1.188	1.229	1.272	1.317	1.363	1.411	1.460	1.511	1.564	1.619	1.675	1.734	3.529	10.709	43.213	217.576
10 GUIDEWAY & TRACK ELEMENTS (route miles)	1.105	1.094	1.083	1.072	1.062	1.051	1.041	1.030	1.020	1.010	1.000	1.010	1.020	1.030	1.041	1.051	1.062	1.072	1.083	1.094	1.105	1.116	1.127	1.138	1.149	1.161	1.173	1.184	1.196	1.208	1.220
20 STATIONS, STOPS, TERMINALS, INTERMODAL (number)	1.161	1.143	1.126	1.110	1.093	1.077	1.061	1.046	1.030	1.015	1.000	1.015	1.030	1.046	1.061	1.077	1.093	1.110	1.126	1.143	1.161	1.178	1.196	1.214	1.232	1.250	1.269	1.288	1.307	1.327	1.347
30 SUPPORT FACILITIES: YARDS, SHOPS, ADMIN. BLDGS	1.219	1.195	1.172	1.149	1.126	1.104	1.082	1.061	1.040	1.020	1.000	1.020	1.040	1.061	1.082	1.104	1.126	1.149	1.172	1.195	1.219	1.243	1.268	1.294	1.319	1.346	1.373	1.400	1.428	1.457	1.486
40 SITEWORK & SPECIAL CONDITIONS	1.280	1.249	1.218	1.189	1.160	1.131	1.104	1.077	1.051	1.025	1.000	1.025	1.051	1.077	1.104	1.131	1.160	1.189	1.218	1.249	1.280	1.312	1.345	1.379	1.413	1.448	1.485	1.522	1.560	1.599	1.639
50 SYSTEMS	1.344	1.305	1.267	1.230	1.194	1.159	1.126	1.093	1.061	1.030	1.000	1.030	1.061	1.093	1.126	1.159	1.194	1.230	1.267	1.305	1.344	1.384	1.426	1.469	1.513	1.558	1.605	1.653	1.702	1.754	1.806
60 ROW, LAND, EXISTING IMPROVEMENTS	1.411	1.363	1.317	1.272	1.229	1.188	1.148	1.109	1.071	1.035	1.000	1.035	1.071	1.109	1.148	1.188	1.229	1.272	1.317	1.363	1.411	1.460	1.511	1.564	1.619	1.675	1.734	1.795	1.857	1.923	1.990
70 VEHICLES (number)	1.480	1.423	1.369	1.316	1.265	1.217	1.170	1.125	1.082	1.040	1.000	1.040	1.082	1.125	1.170	1.217	1.265	1.316	1.369	1.423	1.480	1.539	1.601	1.665	1.732	1.801	1.873	1.948	2.026	2.107	2.191
80 PROFESSIONAL SERVICES (applies to Cats. 10-50)	1.553	1.486	1.422	1.361	1.302	1.246	1.193	1.141	1.092	1.045	1.000	1.045	1.092	1.141	1.193	1.246	1.302	1.361	1.422	1.486	1.553	1.623	1.696	1.772	1.852	1.935	2.022	2.113	2.208	2.308	2.412
90 UNALLOCATED CONTINGENCY	1.629	1.551	1.477	1.407	1.340	1.276	1.216	1.158	1.103	1.050	1.000	1.050	1.103	1.158	1.216	1.276	1.340	1.407	1.477	1.551	1.629	1.710	1.796	1.886	1.980	2.079	2.183	2.292	2.407	2.527	2.653
100 FINANCE CHARGES	1.708	1.619	1.535	1.455	1.379	1.307	1.239	1.174	1.113	1.055	1.000	1.055	1.113	1.174	1.239	1.307	1.379	1.455	1.535	1.619	1.708	1.802	1.901	2.006	2.116	2.232	2.355	2.485	2.621	2.766	2.918

YEAR OF EXPENDITURE DOLLARS (X$000)	YOE Dollars	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
10 GUIDEWAY & TRACK ELEMENTS (route miles)	5,953											0	0	0	0	0	0	0	1,253	1,411	1,241	1,254	588	154	52	0	0	0	0	0	0	0
20 STATIONS, STOPS, TERMINALS, INTERMODAL (number)	3,286											0	0	0	0	0	0	0	0	353	478	485	493	556	677	243	0	0	0	0	0	0
30 SUPPORT FACILITIES: YARDS, SHOPS, ADMIN. BLDGS	998											0	0	0	0	0	0	0	55	78	83	84	191	283	190	34	0	0	0	0	0	0
40 SITEWORK & SPECIAL CONDITIONS	101											0	0	0	0	0	0	0	9	15	18	19	19	12	6	4	0	0	0	0	0	0
50 SYSTEMS	0											0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
60 ROW, LAND, EXISTING IMPROVEMENTS	0											0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
70 VEHICLES (number)	0											0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
80 PROFESSIONAL SERVICES (applies to Cats. 10-50)	0											0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
90 UNALLOCATED CONTINGENCY	0											0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
100 FINANCE CHARGES	0																															0
Total Project Cost (10 - 100)	10,338	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1,317**	**1,857**	**1,821**	**1,842**	**1,290**	**1,005**	**924**	**282**	**0**	**0**	**0**	**0**	**0**	**0**

FRA INFLATION WORKSHEET

Issue Date of this worksheet: 3/31/20

Maryland DOT and BWRR

Today's Date: **3/31/20**

Project Name and Location: **Baltimore-Washington SCMAGLEV J1, MVS East, Camden Yard, BARC**

Yr of Base Year $: 2018

Administrative Draft EIS

Yr of Revenue Ops: 2029

Orange cells - Costs prior to the Base Year (2015 in this example). PRODUCTS of the white cells at bottom (inputs) and purple cells (Category-specific compounded inflation factors)

Green cells - Category-specific annual INFLATION RATES. These are INPUTS. Note that the values shown for these inputs are arbitrary for the purpose of this example.

Purple cells - Category-specific compounded INFLATION FACTORS. Results of equations using purple and green cells.

Blue cells - Applies category-specific compounded inflation factors in the purple rows … this is for costs beginning in the Base Year (2015)

White cells - Base Year costs. These are INPUTS. Values prior to the Base Year are actuals. Values beginning in the Base Year are distributed over time according to the Project Schedule.

Insert comments, notes, etc.

BASE YEAR DOLLARS (X$000)	Base Yr Dollars	Double-Check Total	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
10 GUIDEWAY & TRACK ELEMENTS (route miles)	100,000	6,155	0	0	0	0	0	0	0	0	0	0					0	0	0	1,326	1,468	1,276	1,276	599	157	52	0	0	0	0	0	0	0
20 STATIONS, STOPS, TERMINALS, INTERMODAL (number)	30,000	3,613	0	0	0	0	0	0	0	0	0	0					0	0	0	0	406	542	542	542	602	723	256	0	0	0	0	0	0
30 SUPPORT FACILITIES: YARDS, SHOPS, ADMIN. BLDGS	10,000	642	0	0	0	0	0	0	0	0	0	0					0	0	0	29	41	44	44	134	205	124	21	0	0	0	0	0	0
40 SITEWORK & SPECIAL CONDITIONS	53,350	83	0	0	0	0	0	0	0	0	0	0					0	0	0	8	13	15	15	15	9	5	3	0	0	0	0	0	0
50 SYSTEMS	30,000	0	0	0	0	0	0	0	0	0	0	0					0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
60 ROW, LAND, EXISTING IMPROVEMENTS	35,175	0	0	0	0	0	0	0	0	0	0	0					0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
70 VEHICLES (number)	30,000	0	0	0	0	0	0	0	0	0	0	0					0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
80 PROFESSIONAL SERVICES (applies to Cats. 10-50)	77,168	0	0	0	0	0	0	0	0	0	0	0					0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
90 UNALLOCATED CONTINGENCY	20,000	0	0	0	0	0	0	0	0	0	0	0					0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
100 FINANCE CHARGES	14,582	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Project Cost (10 - 100)	400,275	10,493	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1,363**	**1,929**	**1,878**	**1,878**	**1,290**	**973**	**903**	**280**	**0**	**0**	**0**	**0**	**0**	**0**

Inflation Rate	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	1.035	2.035	3.035	4.035
10 GUIDEWAY & TRACK ELEMENTS (route miles)	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010
20 STATIONS, STOPS, TERMINALS, INTERMODAL (number)	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015
30 SUPPORT FACILITIES: YARDS, SHOPS, ADMIN. BLDGS	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020
40 SITEWORK & SPECIAL CONDITIONS	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025
50 SYSTEMS	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030
60 ROW, LAND, EXISTING IMPROVEMENTS	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035
70 VEHICLES (number)	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040
80 PROFESSIONAL SERVICES (applies to Cats. 10-50)	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045
90 UNALLOCATED CONTINGENCY	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050
100 FINANCE CHARGES	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055
Compounded Inflation Factor	1.411	1.363	1.317	1.272	1.229	1.188	1.148	1.109	1.071	1.035	1.000	1.035	1.071	1.109	1.148	1.188	1.229	1.272	1.317	1.363	1.411	1.460	1.511	1.564	1.619	1.675	1.734	3.529	10.709	43.213	217.576
10 GUIDEWAY & TRACK ELEMENTS (route miles)	1.105	1.094	1.083	1.072	1.062	1.051	1.041	1.030	1.020	1.010	1.000	1.010	1.020	1.030	1.041	1.051	1.062	1.072	1.083	1.094	1.105	1.116	1.127	1.138	1.149	1.161	1.173	1.184	1.196	1.208	1.220
20 STATIONS, STOPS, TERMINALS, INTERMODAL (number)	1.161	1.143	1.126	1.110	1.093	1.077	1.061	1.046	1.030	1.015	1.000	1.015	1.030	1.046	1.061	1.077	1.093	1.110	1.126	1.143	1.161	1.178	1.196	1.214	1.232	1.250	1.269	1.288	1.307	1.327	1.347
30 SUPPORT FACILITIES: YARDS, SHOPS, ADMIN. BLDGS	1.219	1.195	1.172	1.149	1.126	1.104	1.082	1.061	1.040	1.020	1.000	1.020	1.040	1.061	1.082	1.104	1.126	1.149	1.172	1.195	1.219	1.243	1.268	1.294	1.319	1.346	1.373	1.400	1.428	1.457	1.486
40 SITEWORK & SPECIAL CONDITIONS	1.280	1.249	1.218	1.189	1.160	1.131	1.104	1.077	1.051	1.025	1.000	1.025	1.051	1.077	1.104	1.131	1.160	1.189	1.218	1.249	1.280	1.312	1.345	1.379	1.413	1.448	1.485	1.522	1.560	1.599	1.639
50 SYSTEMS	1.344	1.305	1.267	1.230	1.194	1.159	1.126	1.093	1.061	1.030	1.000	1.030	1.061	1.093	1.126	1.159	1.194	1.230	1.267	1.305	1.344	1.384	1.426	1.469	1.513	1.558	1.605	1.653	1.702	1.754	1.806
60 ROW, LAND, EXISTING IMPROVEMENTS	1.411	1.363	1.317	1.272	1.229	1.188	1.148	1.109	1.071	1.035	1.000	1.035	1.071	1.109	1.148	1.188	1.229	1.272	1.317	1.363	1.411	1.460	1.511	1.564	1.619	1.675	1.734	1.795	1.857	1.923	1.990
70 VEHICLES (number)	1.480	1.423	1.369	1.316	1.265	1.217	1.170	1.125	1.082	1.040	1.000	1.040	1.082	1.125	1.170	1.217	1.265	1.316	1.369	1.423	1.480	1.539	1.601	1.665	1.732	1.801	1.873	1.948	2.026	2.107	2.191
80 PROFESSIONAL SERVICES (applies to Cats. 10-50)	1.553	1.486	1.422	1.361	1.302	1.246	1.193	1.141	1.092	1.045	1.000	1.045	1.092	1.141	1.193	1.246	1.302	1.361	1.422	1.486	1.553	1.623	1.696	1.772	1.852	1.935	2.022	2.113	2.208	2.308	2.412
90 UNALLOCATED CONTINGENCY	1.629	1.551	1.477	1.407	1.340	1.276	1.216	1.158	1.103	1.050	1.000	1.050	1.103	1.158	1.216	1.276	1.340	1.407	1.477	1.551	1.629	1.710	1.796	1.886	1.980	2.079	2.183	2.292	2.407	2.527	2.653
100 FINANCE CHARGES	1.708	1.619	1.535	1.455	1.379	1.307	1.239	1.174	1.113	1.055	1.000	1.055	1.113	1.174	1.239	1.307	1.379	1.455	1.535	1.619	1.708	1.802	1.901	2.006	2.116	2.232	2.355	2.485	2.621	2.766	2.918

YEAR OF EXPENDITURE DOLLARS (X$000)	YOE Dollars	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
10 GUIDEWAY & TRACK ELEMENTS (route miles)	6,721											0	0	0	0	0	0	0	1,422	1,590	1,396	1,410	668	177	59	0	0	0	0	0	0	0
20 STATIONS, STOPS, TERMINALS, INTERMODAL (number)	4,257											0	0	0	0	0	0	0	0	458	620	629	638	720	877	315	0	0	0	0	0	0
30 SUPPORT FACILITIES: YARDS, SHOPS, ADMIN. BLDGS	803											0	0	0	0	0	0	0	33	48	53	54	167	260	160	27	0	0	0	0	0	0
40 SITEWORK & SPECIAL CONDITIONS	107											0	0	0	0	0	0	0	9	16	19	20	20	12	6	4	0	0	0	0	0	0
50 SYSTEMS	0											0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
60 ROW, LAND, EXISTING IMPROVEMENTS	0											0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
70 VEHICLES (number)	0											0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
80 PROFESSIONAL SERVICES (applies to Cats. 10-50)	0											0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
90 UNALLOCATED CONTINGENCY	0											0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
100 FINANCE CHARGES	0																															0
Total Project Cost (10 - 100)	11,888	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1,464**	**2,112**	**2,088**	**2,112**	**1,493**	**1,169**	**1,102**	**347**	**0**	**0**	**0**	**0**	**0**	**0**

FRA INFLATION WORKSHEET

Issue Date of this worksheet: 3/31/20

Maryland DOT and BWRR

Today's Date: **3/31/20**

Project Name and Location: **Baltimore-Washington SCMAGLEV J1, MVS East, Camden Yard, MD-198**

Yr of Base Year $: 2018

Administrative Draft EIS

Yr of Revenue Ops: 2029

Orange cells - Costs prior to the Base Year (2015 in this example). PRODUCTS of the white cells at bottom (inputs) and purple cells (Category-specific compounded inflation factors)

Green cells - Category-specific annual INFLATION RATES. These are INPUTS. Note that the values shown for these inputs are arbitrary for the purpose of this example.

Purple cells - Category-specific compounded INFLATION FACTORS. Results of equations using purple and green cells.

Blue cells - Applies category-specific compounded inflation factors in the purple rows … this is for costs beginning in the Base Year (2015)

White cells - Base Year costs. These are INPUTS. Values prior to the Base Year are actuals. Values beginning in the Base Year are distributed over time according to the Project Schedule.

Insert comments, notes, etc.

BASE YEAR DOLLARS (X$000)	Base Yr Dollars	Double-Check Total	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
10 GUIDEWAY & TRACK ELEMENTS (route miles)	100,000	6,213	0	0	0	0	0	0	0	0	0	0					0	0	0	1,334	1,484	1,292	1,292	602	157	52	0	0	0	0	0	0	0
20 STATIONS, STOPS, TERMINALS, INTERMODAL (number)	30,000	3,613	0	0	0	0	0	0	0	0	0	0					0	0	0	0	406	542	542	542	602	723	256	0	0	0	0	0	0
30 SUPPORT FACILITIES: YARDS, SHOPS, ADMIN. BLDGS	10,000	842	0	0	0	0	0	0	0	0	0	0					0	0	0	50	69	72	72	162	236	154	27	0	0	0	0	0	0
40 SITEWORK & SPECIAL CONDITIONS	53,350	83	0	0	0	0	0	0	0	0	0	0					0	0	0	8	13	15	15	15	9	5	3	0	0	0	0	0	0
50 SYSTEMS	30,000	0	0	0	0	0	0	0	0	0	0	0					0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
60 ROW, LAND, EXISTING IMPROVEMENTS	35,175	0	0	0	0	0	0	0	0	0	0	0					0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
70 VEHICLES (number)	30,000	0	0	0	0	0	0	0	0	0	0	0					0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
80 PROFESSIONAL SERVICES (applies to Cats. 10-50)	77,168	0	0	0	0	0	0	0	0	0	0	0					0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
90 UNALLOCATED CONTINGENCY	20,000	0	0	0	0	0	0	0	0	0	0	0					0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
100 FINANCE CHARGES	14,582	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Project Cost (10 - 100)	400,275	10,751	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1,391**	**1,972**	**1,922**	**1,922**	**1,320**	**1,004**	**934**	**286**	**0**	**0**	**0**	**0**	**0**	**0**

Inflation Rate	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	1.035	2.035	3.035	4.035
10 GUIDEWAY & TRACK ELEMENTS (route miles)	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010
20 STATIONS, STOPS, TERMINALS, INTERMODAL (number)	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015
30 SUPPORT FACILITIES: YARDS, SHOPS, ADMIN. BLDGS	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020
40 SITEWORK & SPECIAL CONDITIONS	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025
50 SYSTEMS	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030
60 ROW, LAND, EXISTING IMPROVEMENTS	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035
70 VEHICLES (number)	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040
80 PROFESSIONAL SERVICES (applies to Cats. 10-50)	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045
90 UNALLOCATED CONTINGENCY	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050
100 FINANCE CHARGES	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055
Compounded Inflation Factor	1.411	1.363	1.317	1.272	1.229	1.188	1.148	1.109	1.071	1.035	1.000	1.035	1.071	1.109	1.148	1.188	1.229	1.272	1.317	1.363	1.411	1.460	1.511	1.564	1.619	1.675	1.734	3.529	10.709	43.213	217.576
10 GUIDEWAY & TRACK ELEMENTS (route miles)	1.105	1.094	1.083	1.072	1.062	1.051	1.041	1.030	1.020	1.010	1.000	1.010	1.020	1.030	1.041	1.051	1.062	1.072	1.083	1.094	1.105	1.116	1.127	1.138	1.149	1.161	1.173	1.184	1.196	1.208	1.220
20 STATIONS, STOPS, TERMINALS, INTERMODAL (number)	1.161	1.143	1.126	1.110	1.093	1.077	1.061	1.046	1.030	1.015	1.000	1.015	1.030	1.046	1.061	1.077	1.093	1.110	1.126	1.143	1.161	1.178	1.196	1.214	1.232	1.250	1.269	1.288	1.307	1.327	1.347
30 SUPPORT FACILITIES: YARDS, SHOPS, ADMIN. BLDGS	1.219	1.195	1.172	1.149	1.126	1.104	1.082	1.061	1.040	1.020	1.000	1.020	1.040	1.061	1.082	1.104	1.126	1.149	1.172	1.195	1.219	1.243	1.268	1.294	1.319	1.346	1.373	1.400	1.428	1.457	1.486
40 SITEWORK & SPECIAL CONDITIONS	1.280	1.249	1.218	1.189	1.160	1.131	1.104	1.077	1.051	1.025	1.000	1.025	1.051	1.077	1.104	1.131	1.160	1.189	1.218	1.249	1.280	1.312	1.345	1.379	1.413	1.448	1.485	1.522	1.560	1.599	1.639
50 SYSTEMS	1.344	1.305	1.267	1.230	1.194	1.159	1.126	1.093	1.061	1.030	1.000	1.030	1.061	1.093	1.126	1.159	1.194	1.230	1.267	1.305	1.344	1.384	1.426	1.469	1.513	1.558	1.605	1.653	1.702	1.754	1.806
60 ROW, LAND, EXISTING IMPROVEMENTS	1.411	1.363	1.317	1.272	1.229	1.188	1.148	1.109	1.071	1.035	1.000	1.035	1.071	1.109	1.148	1.188	1.229	1.272	1.317	1.363	1.411	1.460	1.511	1.564	1.619	1.675	1.734	1.795	1.857	1.923	1.990
70 VEHICLES (number)	1.480	1.423	1.369	1.316	1.265	1.217	1.170	1.125	1.082	1.040	1.000	1.040	1.082	1.125	1.170	1.217	1.265	1.316	1.369	1.423	1.480	1.539	1.601	1.665	1.732	1.801	1.873	1.948	2.026	2.107	2.191
80 PROFESSIONAL SERVICES (applies to Cats. 10-50)	1.553	1.486	1.422	1.361	1.302	1.246	1.193	1.141	1.092	1.045	1.000	1.045	1.092	1.141	1.193	1.246	1.302	1.361	1.422	1.486	1.553	1.623	1.696	1.772	1.852	1.935	2.022	2.113	2.208	2.308	2.412
90 UNALLOCATED CONTINGENCY	1.629	1.551	1.477	1.407	1.340	1.276	1.216	1.158	1.103	1.050	1.000	1.050	1.103	1.158	1.216	1.276	1.340	1.407	1.477	1.551	1.629	1.710	1.796	1.886	1.980	2.079	2.183	2.292	2.407	2.527	2.653
100 FINANCE CHARGES	1.708	1.619	1.535	1.455	1.379	1.307	1.239	1.174	1.113	1.055	1.000	1.055	1.113	1.174	1.239	1.307	1.379	1.455	1.535	1.619	1.708	1.802	1.901	2.006	2.116	2.232	2.355	2.485	2.621	2.766	2.918

YEAR OF EXPENDITURE DOLLARS (X$000)	YOE Dollars	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
10 GUIDEWAY & TRACK ELEMENTS (route miles)	6,785											0	0	0	0	0	0	0	1,430	1,607	1,413	1,427	671	177	59	0	0	0	0	0	0	0
20 STATIONS, STOPS, TERMINALS, INTERMODAL (number)	4,257											0	0	0	0	0	0	0	0	458	620	629	638	720	877	315	0	0	0	0	0	0
30 SUPPORT FACILITIES: YARDS, SHOPS, ADMIN. BLDGS	1,048											0	0	0	0	0	0	0	57	81	86	88	201	300	200	36	0	0	0	0	0	0
40 SITEWORK & SPECIAL CONDITIONS	107											0	0	0	0	0	0	0	9	16	19	20	20	12	6	4	0	0	0	0	0	0
50 SYSTEMS	0											0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
60 ROW, LAND, EXISTING IMPROVEMENTS	0											0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
70 VEHICLES (number)	0											0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
80 PROFESSIONAL SERVICES (applies to Cats. 10-50)	0											0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
90 UNALLOCATED CONTINGENCY	0											0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
100 FINANCE CHARGES	0																															0
Total Project Cost (10 - 100)	12,196	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1,496**	**2,161**	**2,138**	**2,164**	**1,531**	**1,208**	**1,142**	**356**	**0**	**0**	**0**	**0**	**0**	**0**

FRA INFLATION WORKSHEET

Maryland DOT and BWRR

Project Name and Location: **Baltimore-Washington SCMAGLEV Alt J1, MVS East, Cherry Hill, BARC**

Administrative Draft EIS

Issue Date of this worksheet	12/21/18
Today's Date	**3/31/20**
Yr of Base Year $	2018
Yr of Revenue Ops	2029

Orange cells - Costs prior to the Base Year (2015 in this example). PRODUCTS of the white cells at bottom (inputs) and purple cells (Category-specific compounded inflation factors)

Green cells - Category-specific annual INFLATION RATES. These are INPUTS. Note that the values shown for these inputs are arbitrary for the purpose of this example.

Purple cells - Category-specific compounded INFLATION FACTORS. Results of equations using purple and green cells.

Blue cells - Applies category-specific compounded inflation factors in the purple rows … this is for costs beginning in the Base Year (2015)

White cells - Base Year costs. These are INPUTS. Values prior to the Base Year are actuals. Values beginning in the Base Year are distributed over time according to the Project Schedule.

Insert comments, notes, etc.

BASE YEAR DOLLARS (X$000)	Base Yr Dollars	Double-Check Total	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
10 GUIDEWAY & TRACK ELEMENTS (route miles)	100,000	5,795	0	0	0	0	0	0	0	0	0	0					0	0	0	1,248	1,383	1,203	1,203	563	147	49	0	0	0	0	0	0	0
20 STATIONS, STOPS, TERMINALS, INTERMODAL (number)	30,000	2,789	0	0	0	0	0	0	0	0	0	0					0	0	0	0	314	418	418	418	465	558	198	0	0	0	0	0	0
30 SUPPORT FACILITIES: YARDS, SHOPS, ADMIN. BLDGS	10,000	642	0	0	0	0	0	0	0	0	0	0					0	0	0	29	41	44	44	134	205	124	21	0	0	0	0	0	0
40 SITEWORK & SPECIAL CONDITIONS	53,350	83	0	0	0	0	0	0	0	0	0	0					0	0	0	8	13	15	15	15	9	5	3	0	0	0	0	0	0
50 SYSTEMS	30,000	0	0	0	0	0	0	0	0	0	0	0					0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
60 ROW, LAND, EXISTING IMPROVEMENTS	35,175	0	0	0	0	0	0	0	0	0	0	0					0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
70 VEHICLES (number)	30,000	0	0	0	0	0	0	0	0	0	0	0					0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
80 PROFESSIONAL SERVICES (applies to Cats. 10-50)	77,168	0	0	0	0	0	0	0	0	0	0	0					0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
90 UNALLOCATED CONTINGENCY	20,000	0	0	0	0	0	0	0	0	0	0	0					0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
100 FINANCE CHARGES	14,582	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Project Cost (10 - 100)	400,275	9,309	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1,284**	**1,751**	**1,681**	**1,681**	**1,131**	**826**	**735**	**221**	**0**	**0**	**0**	**0**	**0**	**0**

Inflation Rate	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
10 GUIDEWAY & TRACK ELEMENTS (route miles)	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	1.035	2.035	3.035	4.035
20 STATIONS, STOPS, TERMINALS, INTERMODAL (number)	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010
30 SUPPORT FACILITIES: YARDS, SHOPS, ADMIN. BLDGS	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015
40 SITEWORK & SPECIAL CONDITIONS	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020
50 SYSTEMS	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025
60 ROW, LAND, EXISTING IMPROVEMENTS	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030
70 VEHICLES (number)	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035
80 PROFESSIONAL SERVICES (applies to Cats. 10-50)	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040
90 UNALLOCATED CONTINGENCY	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045
100 FINANCE CHARGES	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050
Compounded Inflation Factor	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055
10 GUIDEWAY & TRACK ELEMENTS (route miles)	1.411	1.363	1.317	1.272	1.229	1.188	1.148	1.109	1.071	1.035	1.000	1.035	1.071	1.109	1.148	1.188	1.229	1.272	1.317	1.363	1.411	1.460	1.511	1.564	1.619	1.675	1.734	3.529	10.709	43.213	217.576
20 STATIONS, STOPS, TERMINALS, INTERMODAL (number)	1.105	1.094	1.083	1.072	1.062	1.051	1.041	1.030	1.020	1.010	1.000	1.010	1.020	1.030	1.041	1.051	1.062	1.072	1.083	1.094	1.105	1.116	1.127	1.138	1.149	1.161	1.173	1.184	1.196	1.208	1.220
30 SUPPORT FACILITIES: YARDS, SHOPS, ADMIN. BLDGS	1.161	1.143	1.126	1.110	1.093	1.077	1.061	1.046	1.030	1.015	1.000	1.015	1.030	1.046	1.061	1.077	1.093	1.110	1.126	1.143	1.161	1.178	1.196	1.214	1.232	1.250	1.269	1.288	1.307	1.327	1.347
40 SITEWORK & SPECIAL CONDITIONS	1.219	1.195	1.172	1.149	1.126	1.104	1.082	1.061	1.040	1.020	1.000	1.020	1.040	1.061	1.082	1.104	1.126	1.149	1.172	1.195	1.219	1.243	1.268	1.294	1.319	1.346	1.373	1.400	1.428	1.457	1.486
50 SYSTEMS	1.280	1.249	1.218	1.189	1.160	1.131	1.104	1.077	1.051	1.025	1.000	1.025	1.051	1.077	1.104	1.131	1.160	1.189	1.218	1.249	1.280	1.312	1.345	1.379	1.413	1.448	1.485	1.522	1.560	1.599	1.639
60 ROW, LAND, EXISTING IMPROVEMENTS	1.344	1.305	1.267	1.230	1.194	1.159	1.126	1.093	1.061	1.030	1.000	1.030	1.061	1.093	1.126	1.159	1.194	1.230	1.267	1.305	1.344	1.384	1.426	1.469	1.513	1.558	1.605	1.653	1.702	1.754	1.806
70 VEHICLES (number)	1.411	1.363	1.317	1.272	1.229	1.188	1.148	1.109	1.071	1.035	1.000	1.035	1.071	1.109	1.148	1.188	1.229	1.272	1.317	1.363	1.411	1.460	1.511	1.564	1.619	1.675	1.734	1.795	1.857	1.923	1.990
80 PROFESSIONAL SERVICES (applies to Cats. 10-50)	1.480	1.423	1.369	1.316	1.265	1.217	1.170	1.125	1.082	1.040	1.000	1.040	1.082	1.125	1.170	1.217	1.265	1.316	1.369	1.423	1.480	1.539	1.601	1.665	1.732	1.801	1.873	1.948	2.026	2.107	2.191
90 UNALLOCATED CONTINGENCY	1.553	1.486	1.422	1.361	1.302	1.246	1.193	1.141	1.092	1.045	1.000	1.045	1.092	1.141	1.193	1.246	1.302	1.361	1.422	1.486	1.553	1.623	1.696	1.772	1.852	1.935	2.022	2.113	2.208	2.308	2.412
100 FINANCE CHARGES	1.629	1.551	1.477	1.407	1.340	1.276	1.216	1.158	1.103	1.050	1.000	1.050	1.103	1.158	1.216	1.276	1.340	1.407	1.477	1.551	1.629	1.710	1.796	1.886	1.980	2.079	2.183	2.292	2.407	2.527	2.653
	1.708	1.619	1.535	1.455	1.379	1.307	1.239	1.174	1.113	1.055	1.000	1.055	1.113	1.174	1.239	1.307	1.379	1.455	1.535	1.619	1.708	1.802	1.901	2.006	2.116	2.232	2.355	2.485	2.621	2.766	2.918

YEAR OF EXPENDITURE DOLLARS (X$000)	YOE Dollars	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
10 GUIDEWAY & TRACK ELEMENTS (route miles)	6,328											0	0	0	0	0	0	0	1,338	1,497	1,315	1,329	628	166	55	0	0	0	0	0	0	0
20 STATIONS, STOPS, TERMINALS, INTERMODAL (number)	3,286											0	0	0	0	0	0	0	0	353	478	485	493	556	677	243	0	0	0	0	0	0
30 SUPPORT FACILITIES: YARDS, SHOPS, ADMIN. BLDGS	803											0	0	0	0	0	0	0	33	48	53	54	167	260	160	27	0	0	0	0	0	0
40 SITEWORK & SPECIAL CONDITIONS	107											0	0	0	0	0	0	0	9	16	19	20	20	12	6	4	0	0	0	0	0	0
50 SYSTEMS	0											0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
60 ROW, LAND, EXISTING IMPROVEMENTS	0											0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
70 VEHICLES (number)	0											0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
80 PROFESSIONAL SERVICES (applies to Cats. 10-50)	0											0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
90 UNALLOCATED CONTINGENCY	0											0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
100 FINANCE CHARGES	0																															0
Total Project Cost (10 - 100)	10,524	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1,380**	**1,915**	**1,866**	**1,888**	**1,308**	**994**	**899**	**275**	**0**	**0**	**0**	**0**	**0**	**0**

FRA INFLATION WORKSHEET

Maryland DOT and BWRR

Project Name and Location: **Baltimore-Washington SCMAGLEV**
Alt J1, MVS East, Cherry Hill, MD-198

Administrative Draft EIS

Issue Date of this worksheet	12/21/18
Today's Date	**3/31/20**
Yr of Base Year $	2018
Yr of Revenue Ops	2029

Orange cells - Costs prior to the Base Year (2015 in this example). PRODUCTS of the white cells at bottom (inputs) and purple cells (Category-specific compounded inflation factors)

Green cells - Category-specific annual INFLATION RATES. These are INPUTS. Note that the values shown for these inputs are arbitrary for the purpose of this example.

Purple cells - Category-specific compounded INFLATION FACTORS. Results of equations using purple and green cells.

Blue cells - Applies category-specific compounded inflation factors in the purple rows … this is for costs beginning in the Base Year (2015)

White cells - Base Year costs. These are INPUTS. Values prior to the Base Year are actuals. Values beginning in the Base Year are distributed over time according to the Project Schedule.

Insert comments, notes, etc.

BASE YEAR DOLLARS (X$000)	Base Yr Dollars	Double-Check Total	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
10 GUIDEWAY & TRACK ELEMENTS (route miles)	100,000	5,852	0	0	0	0	0	0	0	0	0	0					0	0	0	1,255	1,398	1,219	1,219	566	147	49	0	0	0	0	0	0	0
20 STATIONS, STOPS, TERMINALS, INTERMODAL (number)	30,000	2,789	0	0	0	0	0	0	0	0	0	0					0	0	0	0	314	418	418	418	465	558	198	0	0	0	0	0	0
30 SUPPORT FACILITIES: YARDS, SHOPS, ADMIN. BLDGS	10,000	842	0	0	0	0	0	0	0	0	0	0					0	0	0	50	69	72	72	162	236	154	27	0	0	0	0	0	0
40 SITEWORK & SPECIAL CONDITIONS	53,350	83	0	0	0	0	0	0	0	0	0	0					0	0	0	8	13	15	15	15	9	5	3	0	0	0	0	0	0
50 SYSTEMS	30,000	0	0	0	0	0	0	0	0	0	0	0					0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
60 ROW, LAND, EXISTING IMPROVEMENTS	35,175	0	0	0	0	0	0	0	0	0	0	0					0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
70 VEHICLES (number)	30,000	0	0	0	0	0	0	0	0	0	0	0					0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
80 PROFESSIONAL SERVICES (applies to Cats. 10-50)	77,168	0	0	0	0	0	0	0	0	0	0	0					0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
90 UNALLOCATED CONTINGENCY	20,000	0	0	0	0	0	0	0	0	0	0	0					0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
100 FINANCE CHARGES	14,582	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Project Cost (10 - 100)	400,275	9,567	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1,313**	**1,794**	**1,724**	**1,724**	**1,161**	**857**	**766**	**228**	**0**	**0**	**0**	**0**	**0**	**0**

Inflation Rate	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	1.035	2.035	3.035	4.035
10 GUIDEWAY & TRACK ELEMENTS (route miles)	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010
20 STATIONS, STOPS, TERMINALS, INTERMODAL (number)	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015
30 SUPPORT FACILITIES: YARDS, SHOPS, ADMIN. BLDGS	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020
40 SITEWORK & SPECIAL CONDITIONS	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025
50 SYSTEMS	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030
60 ROW, LAND, EXISTING IMPROVEMENTS	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035
70 VEHICLES (number)	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040
80 PROFESSIONAL SERVICES (applies to Cats. 10-50)	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045
90 UNALLOCATED CONTINGENCY	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050
100 FINANCE CHARGES	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055
Compounded Inflation Factor	1.411	1.363	1.317	1.272	1.229	1.188	1.148	1.109	1.071	1.035	1.000	1.035	1.071	1.109	1.148	1.188	1.229	1.272	1.317	1.363	1.411	1.460	1.511	1.564	1.619	1.675	1.734	3.529	10.709	43.213	217.576
10 GUIDEWAY & TRACK ELEMENTS (route miles)	1.105	1.094	1.083	1.072	1.062	1.051	1.041	1.030	1.020	1.010	1.000	1.010	1.020	1.030	1.041	1.051	1.062	1.072	1.083	1.094	1.105	1.116	1.127	1.138	1.149	1.161	1.173	1.184	1.196	1.208	1.220
20 STATIONS, STOPS, TERMINALS, INTERMODAL (number)	1.161	1.143	1.126	1.110	1.093	1.077	1.061	1.046	1.030	1.015	1.000	1.015	1.030	1.046	1.061	1.077	1.093	1.110	1.126	1.143	1.161	1.178	1.196	1.214	1.232	1.250	1.269	1.288	1.307	1.327	1.347
30 SUPPORT FACILITIES: YARDS, SHOPS, ADMIN. BLDGS	1.219	1.195	1.172	1.149	1.126	1.104	1.082	1.061	1.040	1.020	1.000	1.020	1.040	1.061	1.082	1.104	1.126	1.149	1.172	1.195	1.219	1.243	1.268	1.294	1.319	1.346	1.373	1.400	1.428	1.457	1.486
40 SITEWORK & SPECIAL CONDITIONS	1.280	1.249	1.218	1.189	1.160	1.131	1.104	1.077	1.051	1.025	1.000	1.025	1.051	1.077	1.104	1.131	1.160	1.189	1.218	1.249	1.280	1.312	1.345	1.379	1.413	1.448	1.485	1.522	1.560	1.599	1.639
50 SYSTEMS	1.344	1.305	1.267	1.230	1.194	1.159	1.126	1.093	1.061	1.030	1.000	1.030	1.061	1.093	1.126	1.159	1.194	1.230	1.267	1.305	1.344	1.384	1.426	1.469	1.513	1.558	1.605	1.653	1.702	1.754	1.806
60 ROW, LAND, EXISTING IMPROVEMENTS	1.411	1.363	1.317	1.272	1.229	1.188	1.148	1.109	1.071	1.035	1.000	1.035	1.071	1.109	1.148	1.188	1.229	1.272	1.317	1.363	1.411	1.460	1.511	1.564	1.619	1.675	1.734	1.795	1.857	1.923	1.990
70 VEHICLES (number)	1.480	1.423	1.369	1.316	1.265	1.217	1.170	1.125	1.082	1.040	1.000	1.040	1.082	1.125	1.170	1.217	1.265	1.316	1.369	1.423	1.480	1.539	1.601	1.665	1.732	1.801	1.873	1.948	2.026	2.107	2.191
80 PROFESSIONAL SERVICES (applies to Cats. 10-50)	1.553	1.486	1.422	1.361	1.302	1.246	1.193	1.141	1.092	1.045	1.000	1.045	1.092	1.141	1.193	1.246	1.302	1.361	1.422	1.486	1.553	1.623	1.696	1.772	1.852	1.935	2.022	2.113	2.208	2.308	2.412
90 UNALLOCATED CONTINGENCY	1.629	1.551	1.477	1.407	1.340	1.276	1.216	1.158	1.103	1.050	1.000	1.050	1.103	1.158	1.216	1.276	1.340	1.407	1.477	1.551	1.629	1.710	1.796	1.886	1.980	2.079	2.183	2.292	2.407	2.527	2.653
100 FINANCE CHARGES	1.708	1.619	1.535	1.455	1.379	1.307	1.239	1.174	1.113	1.055	1.000	1.055	1.113	1.174	1.239	1.307	1.379	1.455	1.535	1.619	1.708	1.802	1.901	2.006	2.116	2.232	2.355	2.485	2.621	2.766	2.918

YEAR OF EXPENDITURE DOLLARS (X$000)	YOE Dollars	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
10 GUIDEWAY & TRACK ELEMENTS (route miles)	6,391											0	0	0	0	0	0	0	1,346	1,514	1,333	1,346	631	166	55	0	0	0	0	0	0	0
20 STATIONS, STOPS, TERMINALS, INTERMODAL (number)	3,286											0	0	0	0	0	0	0	0	353	478	485	493	556	677	243	0	0	0	0	0	0
30 SUPPORT FACILITIES: YARDS, SHOPS, ADMIN. BLDGS	1,048											0	0	0	0	0	0	0	57	81	86	88	201	300	200	36	0	0	0	0	0	0
40 SITEWORK & SPECIAL CONDITIONS	107											0	0	0	0	0	0	0	9	16	19	20	20	12	6	4	0	0	0	0	0	0
50 SYSTEMS	0											0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
60 ROW, LAND, EXISTING IMPROVEMENTS	0											0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
70 VEHICLES (number)	0											0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
80 PROFESSIONAL SERVICES (applies to Cats. 10-50)	0											0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
90 UNALLOCATED CONTINGENCY	0											0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
100 FINANCE CHARGES	0																															0
Total Project Cost (10 - 100)	10,832	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1,412**	**1,964**	**1,916**	**1,939**	**1,345**	**1,033**	**939**	**284**	**0**	**0**	**0**	**0**	**0**	**0**

FRA MAIN WORKSHEET

Grantee Name: **Maryland DOT and Baltimore-Washington Rapid Rail (BWRR)**

Project Name and Location: **Baltimore-Washington SCMAGLEV** LB 4.3 SCC Alt J and J1 - MVS East - Camden Yard BARC.xls

Current Phase : **Administrative Draft Environmental Impact Statement**

Alignment: **J**

TMF **BARC**

Baltimore Station: **Camden Yards**

Note: Costs do not reflect Value Engineering opportunities

Issue Date	
Today's Date	**3/31/20**
Yr of Base Year $	**2018**
Yr of Revenue Ops	**2029**

	Standard Cost Category	Unit	Quantity	Base Year Dollars						YOE Dollars Total (X000) (from Inflation Worksheet)
				Without Contingency (X000)	Allocated Contingency (X000)	**TOTAL (X000)**	Unit Cost (X000)	Percent of Construction Cost	Percent of Total Project Cost	
10	**Guideway & Track Elements**	**Lineal Miles of Guideway**	39.17	5,756,616	-	**5,756,616**	146,961	57%	57%	
20	**Stations, Stops, Terminals, Intermodels**	**Stations**	3	3,612,903	-	**3,612,903**	1,204,301	36%	36%	
30	**Support Facilities: Yards, Shops, Admin. Bldgs**	**Number**	16.00	602,400	-	**602,400**	37,650	6%	6%	
40	**Sitework & Special Conditions**	**Lineal Miles of Guideway**	39.17	79,073	-	**79,073**	2,019	1%	1%	
50	**Systems**	**LUMP SUM**	0.00	-	-	**-**		0%	0%	
51	**Construction Subtotal (10-50)**	**Lineal Miles of Guideway**	39.17	10,050,992	-	**10,050,992**	256,592	100%	100%	
60	**Row, Land, Existing Improvements**	**Lineal Miles of Guideway**				**-**			0%	
70	**Vehicles**	**Vehicles**	0.00	-	-	**-**			0%	
80	**Professional Services**			-	-	**-**			0%	
81	**Subtotal (10-80)**	Lineal Miles of Guideway	39.17	10,050,992	-	10,050,992	256,592		100%	
90	**Unallocated Contingency**	Total Amount				**-**			0%	
91	**Subtotal (10-90)**	Lineal Miles of Guideway	39.17	10,050,992	-	**10,050,992**	256,592		100%	
100	**Finance Charges**	Total Amount		-	-	**-**			0%	
101	**Total Project Costs (10-100)**	Lineal Miles of Guideway	39.17	10,050,992	-	**10,050,992**	256,592		100%	

Allocated Contingency as % of Base Yr Dollars w/o Contingency	0.00%
Unallocated Contingency as % of Base Yr Dollars w/o Contingency	0.00%
Total Contingency as % of Base Yr Dollars w/o Contingency	0.00%

FRA MAIN WORKSHEET

Grantee Name: **Maryland DOT and Baltimore-Washington Rapid Rail (BWRR)**

Project Name and Location: **Baltimore-Washington SCMAGLEV** LB 4.3 SCC Alt J and J1 - MVS East - Camden Yard MD-198.xls

Current Phase : **Administrative Draft Environmental Impact Statement**

Alignment: **J**

TMF **MD-198**

Baltimore Station: **Camden Yards**

Note: Costs do not reflect Value Engineering opportunities

Issue Date	
Today's Date	**3/31/20**
Yr of Base Year $	**2018**
Yr of Revenue Ops	**2029**

	Standard Cost Category	Unit	Quantity	Base Year Dollars						YOE Dollars Total (X000) (from Inflation Worksheet)
				Without Contingency (X000)	Allocated Contingency (X000)	**TOTAL (X000)**	Unit Cost (X000)	Percent of Construction Cost	Percent of Total Project Cost	
10	**Guideway & Track Elements**	**Lineal Miles of Guideway**	40.97	5,810,616	-	**5,810,616**	141,822	56%	56%	
20	**Stations, Stops, Terminals, Intermodels**	**Stations**	3	3,612,903	-	**3,612,903**	1,204,301	35%	35%	
30	**Support Facilities: Yards, Shops, Admin. Bldgs**	**Number**	16.00	802,400	-	**802,400**	50,150	8%	8%	
40	**Sitework & Special Conditions**	**Lineal Miles of Guideway**	40.97	79,073	-	**79,073**	1,930	1%	1%	
50	**Systems**	**LUMP SUM**	0.00	-	-	**-**		0%	0%	
51	**Construction Subtotal (10-50)**	**Lineal Miles of Guideway**	40.97	10,304,992	-	**10,304,992**	251,519	100%	100%	
60	**Row, Land, Existing Improvements**	**Lineal Miles of Guideway**				**-**			0%	
70	**Vehicles**	**Vehicles**	0.00	-	-	**-**			0%	
80	**Professional Services**			-	-	**-**			0%	
81	**Subtotal (10-80)**	Lineal Miles of Guideway	40.97	10,304,992	-	10,304,992	251,519		100%	
90	**Unallocated Contingency**	Total Amount				**-**			0%	
91	**Subtotal (10-90)**	Lineal Miles of Guideway	40.97	10,304,992	-	**10,304,992**	251,519		100%	
100	**Finance Charges**	Total Amount		-	-	**-**			0%	
101	**Total Project Costs (10-100)**	Lineal Miles of Guideway	40.97	10,304,992	-	**10,304,992**	251,519		100%	

Allocated Contingency as % of Base Yr Dollars w/o Contingency	0.00%
Unallocated Contingency as % of Base Yr Dollars w/o Contingency	0.00%
Total Contingency as % of Base Yr Dollars w/o Contingency	0.00%

FRA MAIN WORKSHEET

Grantee Name: **Maryland DOT and Baltimore-Washington Rapid Rail (BWRR)**

Project Name and Location: **Baltimore-Washington SCMAGLEV** LB 4.3 SCC Alt J and J1 - MVS East - Cherry Hill BARC.xls

Current Phase : **Administrative Draft Environmental Impact Statement**

Alignment: **J**

TMF **BARC**

Baltimore Station: **Cherry Hill**

Note: Costs do not reflect Value Engineering opportunities

Issue Date	
Today's Date	**3/31/20**
Yr of Base Year $	**2018**
Yr of Revenue Ops	**2029**

Standard Cost Category		Unit	Quantity	Base Year Dollars						YOE Dollars Total (X000) (from Inflation Worksheet)
				Without Contingency (X000)	Allocated Contingency (X000)	TOTAL (X000)	Unit Cost (X000)	Percent of Construction Cost	Percent of Total Project Cost	
10	Guideway & Track Elements	Lineal Miles of Guideway	37.56	5,396,906	-	**5,396,906**	143,705	61%	61%	
20	Stations, Stops, Terminals, Intermodels	Stations	3	2,788,710	-	**2,788,710**	929,570	31%	31%	
30	Support Facilities: Yards, Shops, Admin. Bldgs	Number	16.00	602,400	-	**602,400**	37,650	7%	7%	
40	Sitework & Special Conditions	Lineal Miles of Guideway	37.56	79,073	-	**79,073**	2,105	1%	1%	
50	Systems	LUMP SUM	0.00	-	-	**-**		0%	0%	
51	Construction Subtotal (10-50)	Lineal Miles of Guideway	37.56	8,867,089	-	**8,867,089**	236,106	100%	100%	
60	Row, Land, Existing Improvements	Lineal Miles of Guideway				**-**			0%	
70	Vehicles	Vehicles	0.00	-	-	**-**			0%	
80	Professional Services			-	-	**-**			0%	
81	Subtotal (10-80)	Lineal Miles of Guideway	37.56	8,867,089	-	8,867,089	236,106		100%	
90	Unallocated Contingency	Total Amount				**-**			0%	
91	Subtotal (10-90)	Lineal Miles of Guideway	37.56	8,867,089	-	**8,867,089**	236,106		100%	
100	Finance Charges	Total Amount		-	-	**-**			0%	
101	Total Project Costs (10-100)	Lineal Miles of Guideway	37.56	8,867,089	-	**8,867,089**	236,106		100%	

Allocated Contingency as % of Base Yr Dollars w/o Contingency	0.00%
Unallocated Contingency as % of Base Yr Dollars w/o Contingency	0.00%
Total Contingency as % of Base Yr Dollars w/o Contingency	0.00%

FRA MAIN WORKSHEET

Grantee Name: **Maryland DOT and Baltimore-Washington Rapid Rail (BWRR)**

Project Name and Location: **Baltimore-Washington SCMAGLEV** LB 4.3 SCC Alt J and J1 - MVS East - Cherry Hill MD-198.xls

Current Phase : **Administrative Draft Environmental Impact Statement**

Alignment: **J**

TMF **MD-198**

Baltimore Station: **Cherry Hill**

Note: Costs do not reflect Value Engineering opportunities

Issue Date	
Today's Date	**3/31/20**
Yr of Base Year $	**2018**
Yr of Revenue Ops	**2029**

Standard Cost Category		Unit	Quantity	Base Year Dollars						YOE Dollars Total (X000) (from Inflation Worksheet)
				Without Contingency (X000)	Allocated Contingency (X000)	TOTAL (X000)	Unit Cost (X000)	Percent of Construction Cost	Percent of Total Project Cost	
10	Guideway & Track Elements	Lineal Miles of Guideway	39.36	5,450,906	-	**5,450,906**	138,504	60%	60%	
20	Stations, Stops, Terminals, Intermodels	Stations	3	2,788,710	-	**2,788,710**	929,570	31%	31%	
30	Support Facilities: Yards, Shops, Admin. Bldgs	Number	16.00	802,400	-	**802,400**	50,150	9%	9%	
40	Sitework & Special Conditions	Lineal Miles of Guideway	39.36	79,073	-	**79,073**	2,009	1%	1%	
50	Systems	LUMP SUM	0.00	-	-	**-**		0%	0%	
51	Construction Subtotal (10-50)	Lineal Miles of Guideway	39.36	9,121,089	-	**9,121,089**	231,761	100%	100%	
60	Row, Land, Existing Improvements	Lineal Miles of Guideway				**-**			0%	
70	Vehicles	Vehicles	0.00	-	-	**-**			0%	
80	Professional Services			-	-	**-**			0%	
81	Subtotal (10-80)	Lineal Miles of Guideway	39.36	9,121,089	-	9,121,089	231,761		100%	
90	Unallocated Contingency	Total Amount				**-**			0%	
91	Subtotal (10-90)	Lineal Miles of Guideway	39.36	9,121,089	-	**9,121,089**	231,761		100%	
100	Finance Charges	Total Amount		-	-	**-**			0%	
101	Total Project Costs (10-100)	Lineal Miles of Guideway	39.36	9,121,089	-	**9,121,089**	231,761		100%	

Allocated Contingency as % of Base Yr Dollars w/o Contingency	0.00%
Unallocated Contingency as % of Base Yr Dollars w/o Contingency	0.00%
Total Contingency as % of Base Yr Dollars w/o Contingency	0.00%

FRA MAIN WORKSHEET

Grantee Name: **Maryland DOT and Baltimore-Washington Rapid Rail (BWRR)**

Project Name and Location: **Baltimore-Washington SCMAGLEV** LB 4.3 SCC Alt J and J1 - MVS East - Camden Yard BARC.xls

Current Phase : **Administrative Draft Environmental Impact Statement**

Alignment: **J1**

TMF **BARC**

Baltimore Station: **Camden Yards**

Note: Costs do not reflect Value Engineering opportunities

Issue Date	
Today's Date	**3/31/20**
Yr of Base Year $	**2018**
Yr of Revenue Ops	**2029**

	Standard Cost Category	Unit	Quantity	Base Year Dollars: Without Contingency (X000)	Allocated Contingency (X000)	TOTAL (X000)	Unit Cost (X000)	Percent of Construction Cost	Percent of Total Project Cost	YOE Dollars Total (X000) (from Inflation Worksheet)
10	**Guideway & Track Elements**	**Lineal Miles of Guideway**	39.20	6,154,671	-	**6,154,671**	157,020	59%	59%	
20	**Stations, Stops, Terminals, Intermodels**	**Stations**	3	3,612,903	-	**3,612,903**	1,204,301	34%	34%	
30	**Support Facilities: Yards, Shops, Admin. Bldgs**	**Number**	17.00	642,400	-	**642,400**	37,788	6%	6%	
40	**Sitework & Special Conditions**	**Lineal Miles of Guideway**	39.20	83,409	-	**83,409**	2,128	1%	1%	
50	**Systems**	**LUMP SUM**	0.00	-	-	**-**		0%	0%	
51	**Construction Subtotal (10-50)**	**Lineal Miles of Guideway**	39.20	10,493,383	-	**10,493,383**	267,711	100%	100%	
60	**Row, Land, Existing Improvements**	**Lineal Miles of Guideway**	0.00			**-**			0%	
70	**Vehicles**	**Vehicles**	0.00	-	-	**-**			0%	
80	**Professional Services**			-	-	**-**			0%	
81	**Subtotal (10-80)**	Lineal Miles of Guideway	39.20	10,493,383	-	10,493,383	267,711		100%	
90	**Unallocated Contingency**	Total Amount				**-**			0%	
91	**Subtotal (10-90)**	Lineal Miles of Guideway	39.20	10,493,383	-	**10,493,383**	267,711		100%	
100	**Finance Charges**	Total Amount		-	-	**-**			0%	
101	**Total Project Costs (10-100)**	Lineal Miles of Guideway	39.20	10,493,383	-	**10,493,383**	267,711		100%	

Allocated Contingency as % of Base Yr Dollars w/o Contingency	0.00%
Unallocated Contingency as % of Base Yr Dollars w/o Contingency	0.00%
Total Contingency as % of Base Yr Dollars w/o Contingency	0.00%

FRA MAIN WORKSHEET

Grantee Name: **Maryland DOT and Baltimore-Washington Rapid Rail (BWRR)**

Project Name and Location: **Baltimore-Washington SCMAGLEV** LB 4.3 SCC Alt J and J1 - MVS East - Camden Yard MD-198.xls

Current Phase : **Administrative Draft Environmental Impact Statement**

Alignment: **J1**

TMF **MD-198**

Baltimore Station: **Camden Yards**

Note: Costs do not reflect Value Engineering opportunities

Issue Date	
Today's Date	**3/31/20**
Yr of Base Year $	**2018**
Yr of Revenue Ops	**2029**

	Standard Cost Category	Unit	Quantity	Base Year Dollars						YOE Dollars Total (X000) (from Inflation Worksheet)
				Without Contingency (X000)	Allocated Contingency (X000)	**TOTAL (X000)**	Unit Cost (X000)	Percent of Construction Cost	Percent of Total Project Cost	
10	**Guideway & Track Elements**	**Lineal Miles of Guideway**	41.13	6,212,571	**-**	**6,212,571**	151,060	58%	58%	
20	**Stations, Stops, Terminals, Intermodels**	**Stations**	3	3,612,903	-	**3,612,903**	1,204,301	34%	34%	
30	**Support Facilities: Yards, Shops, Admin. Bldgs**	**Number**	17.00	842,400	-	**842,400**	49,553	8%	8%	
40	**Sitework & Special Conditions**	**Lineal Miles of Guideway**	41.13	83,409	-	**83,409**	2,028	1%	1%	
50	**Systems**	**LUMP SUM**	0.00	-	-	**-**		0%	0%	
51	**Construction Subtotal (10-50)**	**Lineal Miles of Guideway**	41.13	10,751,283	-	**10,751,283**	261,419	100%	100%	
60	**Row, Land, Existing Improvements**	**Lineal Miles of Guideway**	0.00			**-**			0%	
70	**Vehicles**	**Vehicles**	0.00	-	-	**-**			0%	
80	**Professional Services**			-	-	**-**			0%	
81	**Subtotal (10-80)**	Lineal Miles of Guideway	41.13	10,751,283	-	10,751,283	261,419		100%	
90	**Unallocated Contingency**	Total Amount				**-**			0%	
91	**Subtotal (10-90)**	Lineal Miles of Guideway	41.13	10,751,283	-	**10,751,283**	261,419		100%	
100	**Finance Charges**	Total Amount		-	-	**-**			0%	
101	**Total Project Costs (10-100)**	Lineal Miles of Guideway	41.13	10,751,283	-	**10,751,283**	261,419		100%	

Allocated Contingency as % of Base Yr Dollars w/o Contingency	0.00%
Unallocated Contingency as % of Base Yr Dollars w/o Contingency	0.00%
Total Contingency as % of Base Yr Dollars w/o Contingency	0.00%

FRA MAIN WORKSHEET

Grantee Name: **Maryland DOT and Baltimore-Washington Rapid Rail (BWRR)**

Project Name and Location: **Baltimore-Washington SCMAGLEV** LB 4.3 SCC Alt J and J1 - MVS East - Cherry Hill BARC.xls

Current Phase : **Administrative Draft Environmental Impact Statement**

Alignment: **J1**

TMF **BARC**

Baltimore Station: **Cherry Hill**

Note: Costs do not reflect Value Engineering opportunities

Issue Date	
Today's Date	**3/31/20**
Yr of Base Year $	**2018**
Yr of Revenue Ops	**2029**

	Standard Cost Category	Unit	Quantity	Base Year Dollars						YOE Dollars Total (X000) (from Inflation Worksheet)
				Without Contingency (X000)	Allocated Contingency (X000)	**TOTAL (X000)**	Unit Cost (X000)	Percent of Construction Cost	Percent of Total Project Cost	
10	**Guideway & Track Elements**	**Lineal Miles of Guideway**	37.58	5,794,845	**-**	**5,794,845**	154,199	62%	62%	
20	**Stations, Stops, Terminals, Intermodels**	**Stations**	3	2,788,710	-	**2,788,710**	929,570	30%	30%	
30	**Support Facilities: Yards, Shops, Admin. Bldgs**	**Number**	17.00	642,400	-	**642,400**	37,788	7%	7%	
40	**Sitework & Special Conditions**	**Lineal Miles of Guideway**	37.58	83,409	-	**83,409**	2,219	1%	1%	
50	**Systems**	**LUMP SUM**	0.00	-	-	**-**		0%	0%	
51	**Construction Subtotal (10-50)**	**Lineal Miles of Guideway**	37.58	9,309,364	-	**9,309,364**	247,719	100%	100%	
60	**Row, Land, Existing Improvements**	**Lineal Miles of Guideway**	0.00			**-**			0%	
70	**Vehicles**	**Vehicles**	0.00	-	-	**-**			0%	
80	**Professional Services**			-	-	**-**			0%	
81	**Subtotal (10-80)**	Lineal Miles of Guideway	37.58	9,309,364	-	9,309,364	247,719		100%	
90	**Unallocated Contingency**	Total Amount				**-**			0%	
91	**Subtotal (10-90)**	Lineal Miles of Guideway	37.58	9,309,364	-	**9,309,364**	247,719		100%	
100	**Finance Charges**	Total Amount		-	-	**-**			0%	
101	**Total Project Costs (10-100)**	Lineal Miles of Guideway	37.58	9,309,364	-	**9,309,364**	247,719		100%	

Allocated Contingency as % of Base Yr Dollars w/o Contingency	0.00%
Unallocated Contingency as % of Base Yr Dollars w/o Contingency	0.00%
Total Contingency as % of Base Yr Dollars w/o Contingency	0.00%

FRA MAIN WORKSHEET

Grantee Name: **Maryland DOT and Baltimore-Washington Rapid Rail (BWRR)**

Project Name and Location: **Baltimore-Washington SCMAGLEV** LB 4.3 SCC Alt J and J1 - MVS East - Cherry Hill MD-198.xls

Current Phase : **Administrative Draft Environmental Impact Statement**

Alignment: **J1**

TMF **MD-198**

Baltimore Station: **Cherry Hill**

Note: Costs do not reflect Value Engineering opportunities

Issue Date	
Today's Date	**3/31/20**
Yr of Base Year $	**2018**
Yr of Revenue Ops	**2029**

	Standard Cost Category	Unit	Quantity	Base Year Dollars: Without Contingency (X000)	Allocated Contingency (X000)	TOTAL (X000)	Unit Cost (X000)	Percent of Construction Cost	Percent of Total Project Cost	YOE Dollars Total (X000) (from Inflation Worksheet)
10	**Guideway & Track Elements**	**Lineal Miles of Guideway**	39.50	5,852,445	-	**5,852,445**	148,162	61%	61%	
20	**Stations, Stops, Terminals, Intermodels**	**Stations**	3	2,788,710	-	**2,788,710**	929,570	29%	29%	
30	**Support Facilities: Yards, Shops, Admin. Bldgs**	**Number**	17.00	842,400	-	**842,400**	49,553	9%	9%	
40	**Sitework & Special Conditions**	**Lineal Miles of Guideway**	39.50	83,409	-	**83,409**	2,112	1%	1%	
50	**Systems**	**LUMP SUM**	0.00	-	-	**-**		0%	0%	
51	**Construction Subtotal (10-50)**	**Lineal Miles of Guideway**	39.50	9,566,964	-	**9,566,964**	242,199	100%	100%	
60	**Row, Land, Existing Improvements**	**Lineal Miles of Guideway**	0.00			**-**			0%	
70	**Vehicles**	**Vehicles**	0.00	-	-	**-**			0%	
80	**Professional Services**			-	-	**-**			0%	
81	**Subtotal (10-80)**	Lineal Miles of Guideway	39.50	9,566,964	-	9,566,964	242,199		100%	
90	**Unallocated Contingency**	Total Amount				**-**			0%	
91	**Subtotal (10-90)**	Lineal Miles of Guideway	39.50	9,566,964	-	**9,566,964**	242,199		100%	
100	**Finance Charges**	Total Amount		-	-	**-**			0%	
101	**Total Project Costs (10-100)**	Lineal Miles of Guideway	39.50	9,566,964	-	**9,566,964**	242,199		100%	

Allocated Contingency as % of Base Yr Dollars w/o Contingency	0.00%
Unallocated Contingency as % of Base Yr Dollars w/o Contingency	0.00%
Total Contingency as % of Base Yr Dollars w/o Contingency	0.00%