BWRR
BALTIMORE-WASHINGTON RAPID RAIL

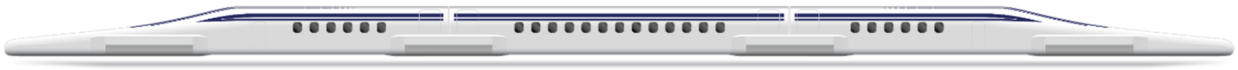

Exhibit J

Trainset Maintenance Facility (TMF) Alternatives Assessment Comparison

BALTIMORE-WASHINGTON SCMAGLEV PROJECT

TRAINSET MAINTENANCE FACILITY (TMF)
ALTERNATIVES ASSESSMENT COMPARISON

REVISION: 3

DATE: August 18, 2020

BWRR
BALTIMORE-WASHINGTON RAPID RAIL

TABLE OF CONTENTS

TABLES

FIGURES

NOTES/REVISIONS FOR VERSION CONTROL

Revision 0: 2020-02-07

Revision 1: 2020-03-27

Revision 2: 2020-04-14

Revision 3: 2020-08-18

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1. EXECUTIVE SUMMARY

This report presents the site and configuration options for the Superconducting Maglev (SCMAGLEV) Trainset Maintenance Facility (TMF), formerly called the Rolling Stock Depot (RSD), and explores the various considerations for the Washington, D.C. to Baltimore, MD project corridor. The evaluation in this report is based on the project sponsor's best assessments including environmental impacts. Final determination of environmental impacts will be made through the NEPA process.

The TMF is the home for the trainsets. All inspection, maintenance, repairs, and periodic or programmatic work is performed at the TMF. Light trainset servicing and cleaning is done at terminal stations during the operating day. Several hundred people will report to work at the TMF daily.

The Alternatives Report[1] evaluated two TMF locations along the Baltimore-Washington Parkway corridor using a 235-acre facility footprint. As recommended in the Alternatives Report, a subsequent TMF study was undertaken. BWRR considered the possible use of a reduced and disaggregated footprint (approximately 120 acres, later found not viable) to minimize impacts and allow additional sites to be considered. Eleven sites were studied, and the newly identified Patapsco Avenue site was selected along with a new layout within the existing MD-198 site as the two TMF sites to be studied in detail in the Draft Environmental Impact Statement (DEIS). However, a subsequent operational review conducted in the summer of 2019 concluded that the reduced and disaggregated footprints would not meet the operational and maintenance requirements of the fleet. Additional equipment, logistics, and time required for trainset maneuvers in the inefficient TMF layout would preclude completing required inspections and maintenance during the required six-hour nighttime maintenance window and introduce unacceptable operating risks.

A new site evaluation was conducted in the fall on 2019, based on a 180-acre TMF footprint as designed and currently under construction in Chubu, Japan. This site is 55 acres smaller than the 235-acre footprint considered in the Alternatives Report. In this assessment report fourteen sites are considered against key factors and operational considerations of overall size and shape, the ability to provide connecting ramps to the mainline, proximity to Washington DC, avoidance of residential impacts, and elimination or minimization of impacts that would be difficult or impossible to mitigate. These factors are consistent with the Purpose and Need for the project, specifically to achieve SCMAGLEV operational and safety metrics and to avoid, minimize and mitigate impacts to the human and natural environment.

Two locations, #4 Beltsville Agricultural Research Center (BARC) East and #5 BARC West are identified by BWRR as the only reasonable site alternatives for a TMF that meet the project criteria, including no residential displacements. The proposed TMF sites on BARC land were developed avoiding the TMF site BARC objected to in the ARDS and incorporating other comments from the Alternatives Report. The BARC proposed sites are consistent with other non-agricultural uses on BARC property including buildings, a rail maintenance facility for WMATA, a new Bureau of Engraving and Printing facility, and many other uses. Additional non-agricultural uses of BARC are outlined in this report.

The MD-198 site (#10A) is the only other site that does not require residential displacements. However, it is appreciably more environmentally harmful. In addition, there are increased cost, aviation safety, permitting and infrastructure challenges. Nevertheless, the MD-198 (#10A) TMF site will be progressed in the DEIS for further comment to allow for greatest transparency and input by agencies and the public in assessing the best TMF site in comparison with a non-BARC alternative.

[1] Baltimore-Washington Superconducting Maglev Project, Final Alternatives Report, November 2018. http://baltimorewashingtonscmaglevproject.com/images/document_library/reports/alternatives_report/SCMAGLEV_Alts_Report_Body-Append-A-B-C_Nov2018.pdf

The BARC West, BARC East, and MD-198 alternatives are recommended for further assessment in the DEIS, with the caveats noted above concerning MD-198 (#10A).

2. PURPOSE

This report reviews options for the Trainset Maintenance Facility (TMF): its function and requirements, alternatives for siting a facility in the Baltimore-Washington corridor, and conclusions and Sponsor's recommendations for alternatives for inclusion in the Draft Environmental Impact Statement (DEIS).

3. BACKGROUND

The project is a high-speed public transportation system between Washington DC and Baltimore MD via a Superconducting Maglev (SCMAGLEV) train. The project requires new infrastructure, stations, and facilities to implement technology developed by Central Japan Railway Company (JRC).

The U.S. Federal Railroad Administration (FRA), in collaboration with Maryland Department of Transportation (MDOT) and Maryland Economic Development Corporation (MEDCO), is preparing an Environmental Impact Statement (EIS) to evaluate alternatives for the project pursuant to the National Environmental Policy Act (NEPA). The project sponsor is Baltimore Washington Rapid Rail (BWRR).

The November 2018 Alternatives Report (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 53 to 56 kilometers (33 to 35 miles) long, depending on terminal station options, with approximately 75 to 83 percent of the alignment in underground tunnel, and the balance elevated on viaduct.

Alternatives J and J1 utilize the same TMF options, with variations to ramps connecting the TMF to the mainline. When the TMF is on the opposite side of the Baltimore-Washington Parkway from an alignment alternative, the connecting ramps cross over the Parkway on a bridge structure.

4. TMF DESCRIPTION

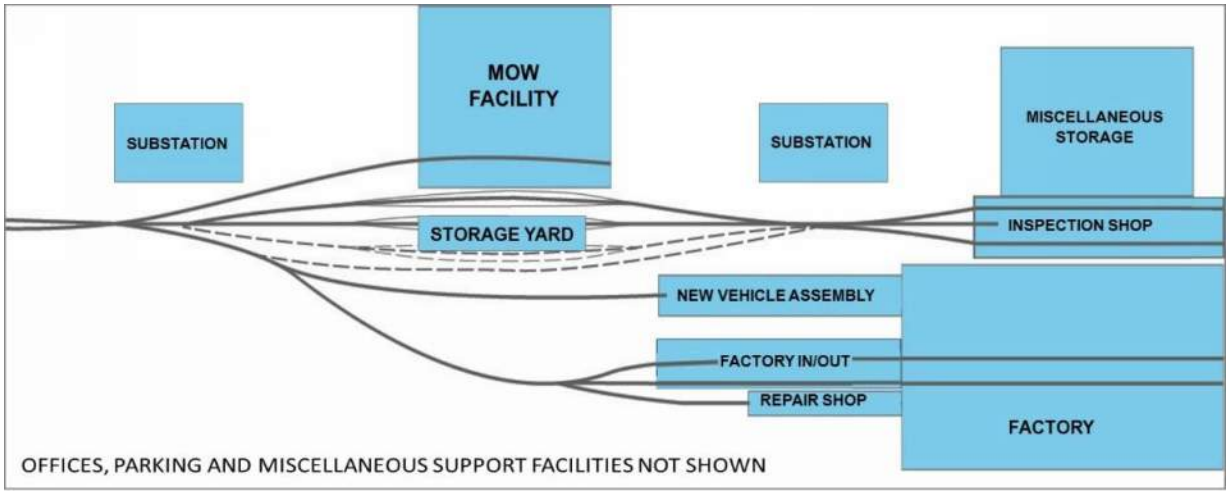
4.1 TMF COMPONENTS

The TMF serves as the home to the system's trainsets where they are stored, maintained, cleaned, inspected, repaired, and overhauled. Nearly 300 workers are employed at the TMF. See Figure 1 for a conceptual layout of TMF elements.

The TMF would house the following facilities:

- Storage yard, with guideways for staged trainsets during nighttime and off-peak periods
- Factory building where scheduled heavy maintenance work would be performed
- Inspection shop for performing daily inspections, daily service, and maintenance, etc.
- Repair facility for unscheduled repairs
- Factory "In/Out" shop for disassembling and assembling trainsets into individual coaches for major overhaul
- New vehicle assembly shop for assembling new component parts into complete trainsets and conducting major maintenance.
- Miscellaneous storage facility for materials used for inspection, maintenance and repair of trainsets
- Two substations for train control and power supply within the TMF, each approximately five acres
- Miscellaneous support facilities (e.g., tire shop, battery shop, etc.)
- Parking for employees, material suppliers and guests
- Office space
- Maintenance of Way (MOW) facility, depending on TMF location

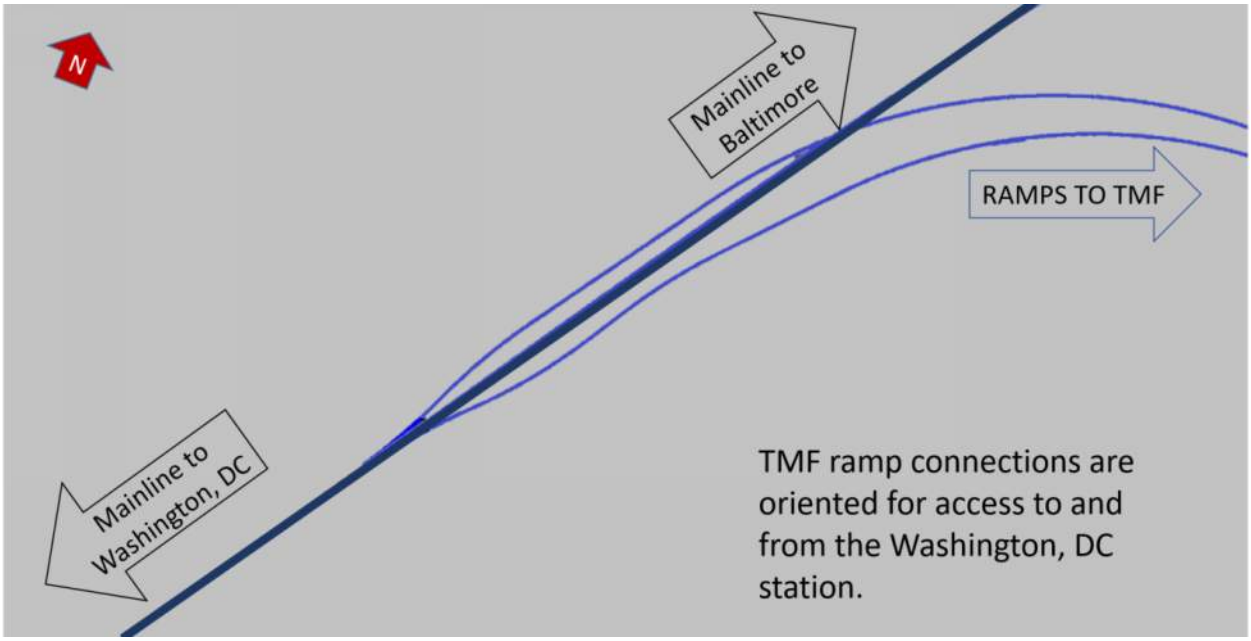
Figure 1. Conceptual Layout of TMF Elements



4.2 TMF RAMPS

Trains on the mainline access the TMF with ramps that connect to the Northbound and Southbound guideways. The turnouts on the mainline are oriented for trains traveling to and from the Washington, DC terminus station (Figure 2). Trains from the TMF that are going towards the Baltimore station would have to enter the mainline headed towards Washington and reverse direction to proceed Northward. Trains entering or exiting the mainline would operate at slow speed to maneuver the TMF turnouts.

Figure 2. TMF Ramp Configuration



The single guideway ramp structures are approximately 8.2 meters (27 feet) wide, supported on piers spaced at approximately 38 to 50 meters (125 to 164 feet).

The mainline guideway at the location of the TMF turnouts needs to be straight and have a profile grade of 0.3 percent or less, with no vertical curvature. The Northbound and Southbound ramps connecting the TMF to the mainline would have a minimum horizontal radius of 800 meters (2600 feet) and a maximum grade of 4 percent, however a reduced grade is preferred for one of the two ramps to facilitate towing of a disabled trainset.

Ramps within the TMF complex have a minimum horizontal radius of 800 meters and 0.0 percent vertical grade.

4.3 MOW FACILITY

Two MOW facilities are required between Baltimore and Washington, one in the Northern portion of the alignment and one in the Southern area. The MOW facility would have a total area of approximately 13 acres, with a maintenance garage for MOW equipment, a material storage facility, a crew building and a parking area. MOW equipment would be staged, inspected and repaired in the garage.

Workers reporting to the crew building would be dispatched to perform nightly inspection and maintenance operations along the guideway. Ramps connecting the MOW facility to the mainline would allow maintenance vehicles access onto the guideways. A MOW facility co-located with the TMF would

use the TMF ramps for mainline guideway access. Inspection and maintenance of the guideway would occur nightly between 11pm and 5 am, when no trains are allowed on the mainline guideways.

4.4 POTENTIAL TMF IMPACTS

The TMF has both day and night operations. Impacts associated with a TMF are described below.

Traffic. TMF personnel will work in various shifts and schedules with concentrated levels of traffic at normal shift change times. Truck traffic will consist of deliveries made to the material management facility generally during the day shift.

Light. Most of the trainset inspection, servicing and repair work would be performed within buildings at the TMF. Therefore, light and noise from the TMF would be kept to a minimum. Movement of trainsets between mainline, TMF work areas, and the storage yard would generally occur on evening and overnight shifts. Aside from the area lighting around the facilities, the most noticeable visual impact from operations may be from headlights of the trainsets and directional lighting throughout the facility, including the parking lot.

Coach lighting for trainsets while in the storage yard would be kept to a minimum. Yard lighting would be consistent with appropriate safety and security measures and combined with perimeter security. Directional lighting will be used to minimize offsite light impacts.

Noise. Noise impacts from the TMF would be minimal for equipment such as HVAC units, audible warning devices, etc. Trainsets would travel between the storage tracks and the inspection shop or factory on rubber tires, there is no steel on steel or catenary noise like a conventional trainset.

Safety and Security. Safety and security are key elements both to the entire rail operation, and to the TMF. The TMF facility would be designed and operated to protect both employee safety and to ensure the safe handling and storage of materials on site. As an element of the public transport network, the TMF would be made secure from encroachment or sabotage. The facilities would be designed with appropriate safety devices and procedures, directional lighting, and perimeter fencing. Security would be part of all plans, both during construction and during operation.

Onsite Storage. There would be a range of materials stored at the TMF, including trainset parts. Appropriate safety and material handling plans would be developed for any and all such materials. There would be regular truck traffic to support the material management function, including material deliveries, and outbound material for refurbishment or disposal.

Stormwater. Best management practices will be implemented during construction and continued through operations of the TMF site.

5. CONCEPTUAL ENGINEERING ALTERNATIVES (TMF)

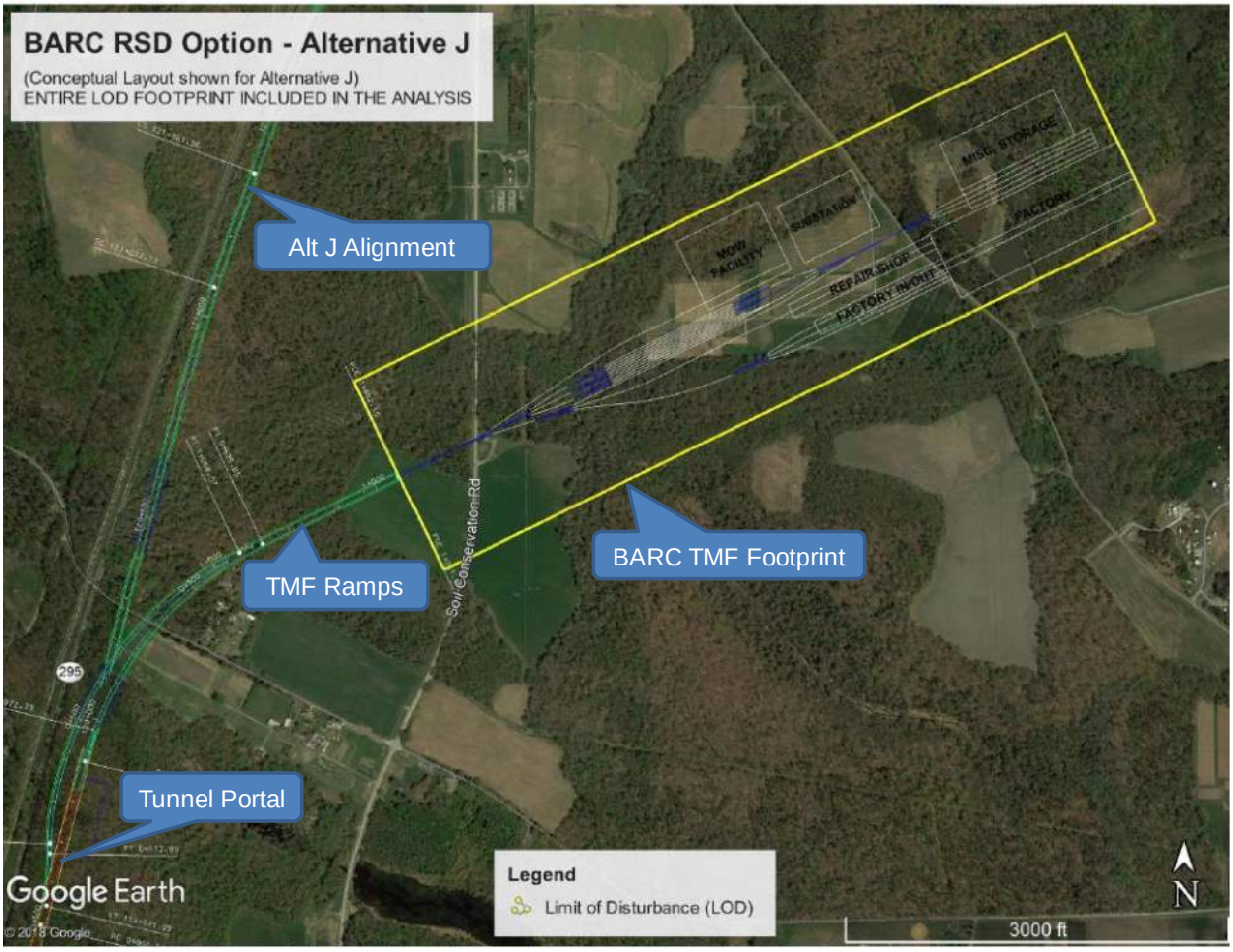
5.1 ALTERNATIVES REPORT

Studies conducted during conceptual engineering in support of the Alternatives Report used a 235-acre TMF footprint. The TMF footprint was applied to multiple locations along the two alignment Alternatives J and J1. TMF plans were developed and studied in the Alternatives Report for the following locations.

- Beltsville Agricultural Research Center (BARC) facility on the East side of the Baltimore-Washington Parkway, Prince George's County, MD. See Figure 3.
- North of MD-198 on the East side of the Baltimore-Washington Parkway, Anne Arundel County, MD. See Figure 4. (The footprint was slightly modified to avoid the Little Patuxent River).

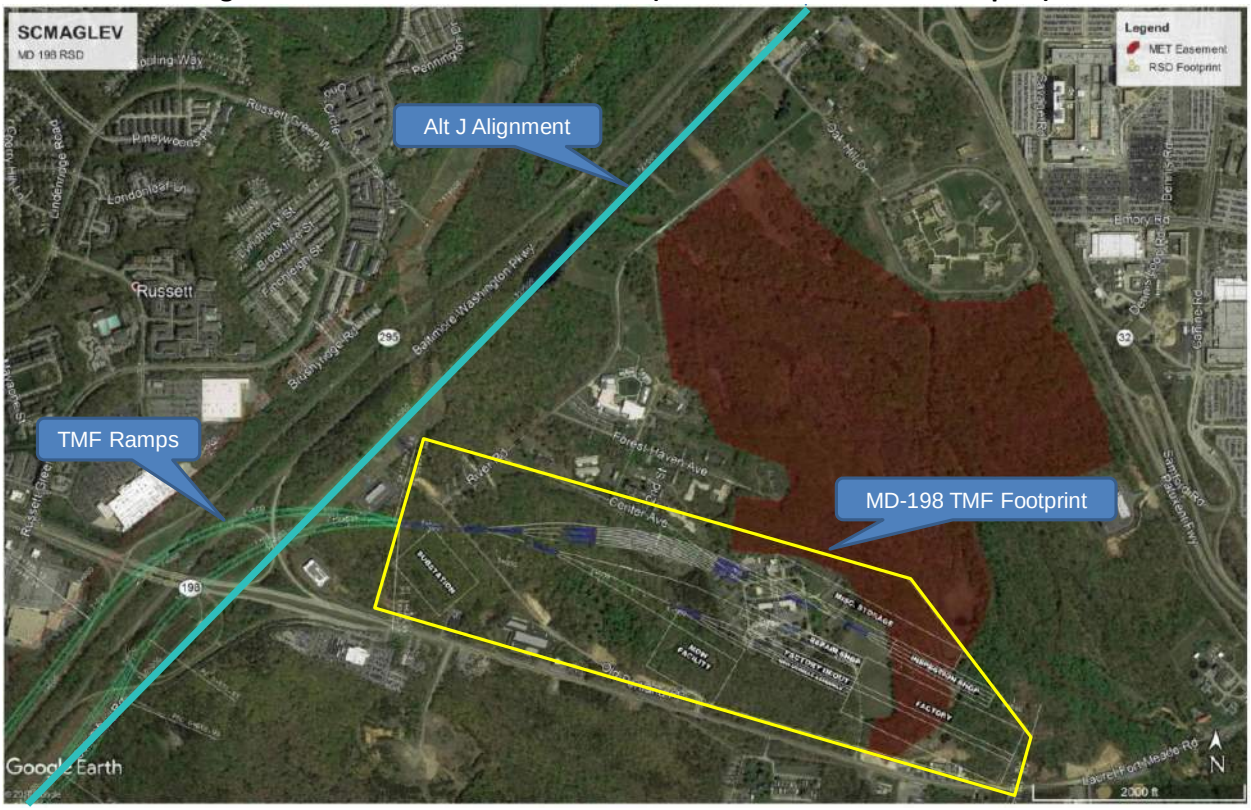
The Alternatives Report eliminated the original 235-acre BARC TMF location due to agency comments and concerns. The report retained the MD-198 alternative and outlined that further sites would be studied.

Figure 3. Original TMF Alternative at BARC (Eliminated in Alternatives Report)



Source: Alternatives Report (Nov 2018)

Figure 4. TMF Alternative at MD-198 (Retained in Alternatives Report)



Source: Alternatives Report (Nov 2018)

5.2 MODIFIED TMF LAYOUT

After the Alternatives Report was issued, BWRR explored options to reduce the site size of the TMF, including disaggregating the major operational elements onto separate parcels. If confined to approximately 120 acres, the reduced footprint and dispersed layout allowed additional sites to be considered. A total of eleven sites were explored along the Baltimore-Washington Parkway corridor for potential suitability. A location for the modified TMF layout with compatible land use was identified along Patapsco Avenue in the Cherry Hill area. That alternative is shown in Figure 5.

A smaller footprint was also explored at the MD-198 TMF site (Figure 6). The factory, inspection shop, repair shop and storage facility were combined into one building to reduce the overall footprint.

5.3 OPERATIONAL REVIEW

BWRR looked at other configurations for a TMF facility considering unique spatial limitations in certain locations. For example, could the various functions of a TMF be "disaggregated" to allow for a smaller footprint than Chubu's streamlined layout. Specifically, BWRR considered disaggregated TMF layouts for the Patapsco Avenue and MD-198 TMF sites. Rather than arranging the storage yard and inspection shop in series, BWRR looked at whether trains could enter the storage yard and then switch back to enter the inspection shop, which was located further from the storage tracks than would be the case using the Chubu configuration.

An operational review was conducted with Japan Central Railroad (JRC) of the 120-acre reduced/disaggregated TMF. BWRR concluded the risk to efficient and reliable operations was simply too great to make a disaggregated TMF feasible. The trains would have to travel a longer distance from

the storage tracks to the inspection shop adding a minimum of five minutes to each train movement between the storage yard and the inspection shop. This would add a total of two hours of travel time, thereby reducing revenue service hours since the required 6-hour maintenance window cannot be reduced. The addition of multiple switches and train movements also increased the risk that a technical malfunction would prevent timely inspections and maintenance.

The disaggregated layout also created inefficient material storage and handling since the inspection shop and factory share materials and equipment. At the Patapsco site, these were separated by approximately 1.7 kilometers (1.1 miles) and required bridging across a four-lane highway. The additional distance between maintenance operations required duplication of the shared resources and/or added travel time to retrieve resources that cannot be feasibly duplicated.

With extensive coordination with JRC BWRR determined that the layout of the Chubu TMF in Japan, which has been fully designed and is under construction, could be utilized for the Baltimore-Washington Project. It is approximately 180 acres and would result in a 24% reduction in size from the original proposal. The original layout at the MD-198 was dropped from consideration since the Chubu TMF layout was the most efficient and compact to have been designed. It requires 55 fewer acres than the original 235-acre MD-198 site in the ARDS report.

The Chubu TMF was designed based upon JRC's extensive experience with train operations and maintenance and is the smallest practicable size. JRC designed the Chubu TMF to allow trains to enter the facility directly from the mainline, and proceed immediately to the storage yard, from which individual trains can be moved into and out of the inspection shop. Similarly, trains can move to and from the assembly shop or factory directly from the mainline. This configuration minimizes the distance and time required for train movements, which is particularly important for ensuring that all necessary inspection and maintenance can be completed as expeditiously as possible, within the six hour window while maximizing the time available for revenue service operations.

It should be noted that JRC high speed trains operate at a very high standard for reliability and safety. JRC moves 150 million people a year on its system and the average passenger delay for a year is 20 seconds. In addition, there have been no fatalities since high speed rail operations began in 1964. In the United States, on-time performance between Washington DC and New York is defined as arriving within 30 minutes of scheduled time. According to the Department of Transportation there are 5,800 train car crashes each year in the United States, most of which occur at railroad crossings. These accidents cause 60 deaths and injure about 2,300, compared with zero on Japanese high-speed rail. Much of this is attributed to design, construction choices (viaducts and tunnels, no curves outside train geometry), and daily inspection and maintenance.

The operational inefficiencies produced by the disaggregated layout are similar for both the Patapsco and MD-198 TMF sites. Therefore, BWRR concluded that the only acceptable approach was to replicate the streamlined and thoroughly considered layout of the Chubu TMF.

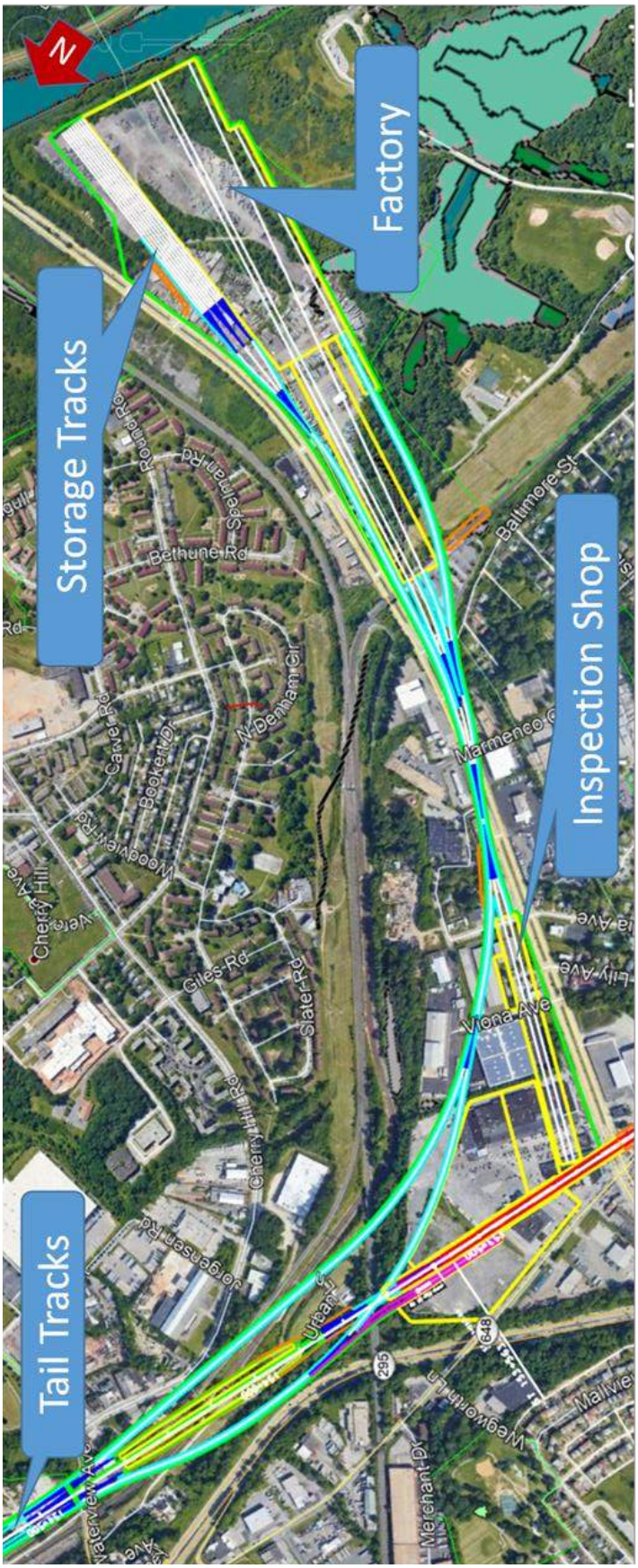


Figure 5. Disaggregated TMF Site at Patapsco Avenue

Figure 6. Reduced TMF Site at MD-198

6. REDESIGNED TMF

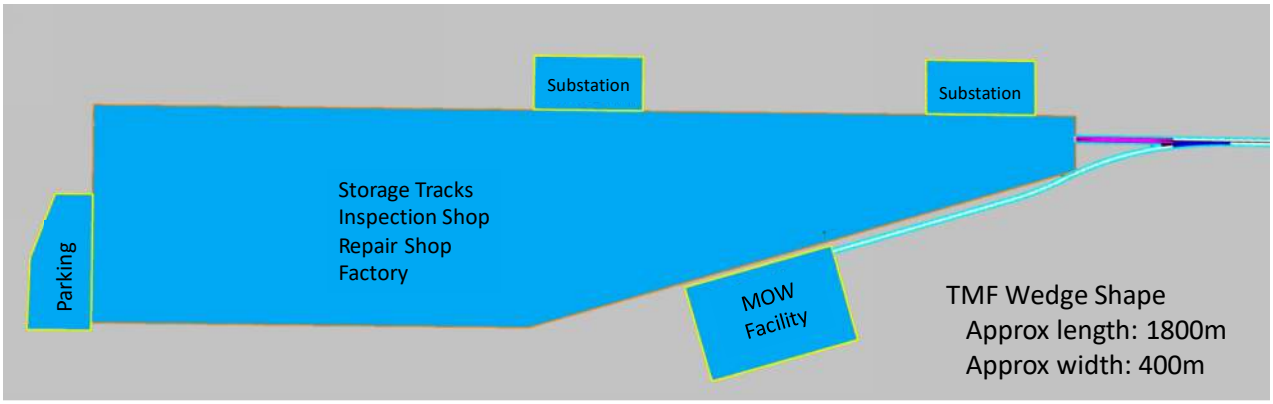
6.1 OPTIMAL TMF FOOTPRINT

Through additional coordination with JRC, and further evaluation of the facility layout and footprint, a 180-acre wedge shape was finalized with a length of 1800 meters (5,800 feet) and a width of 400 meters (1300 feet). This layout optimizes the operations for maintenance of the fleet. The footprint standardizes the TMF that is fully designed and is under construction in Chubu, Japan. The final TMF footprint is provided in Figure 7.

The 180-acre footprint is approximately 55 acres (24%) smaller than the original 235-acre site used in the Alternatives Report. The breakdown of the footprint is as follows:

- TMF wedge shape area of approximately 142 acres.
- Each substation of approximately 5 acres and enables the movement of different trainsets in the TMF.
- MOW facility of approximately 12 acres.
- Parking of approximately 6 acres.
- Ramps to the mainline of approximately 10 acres.

Figure 7. Final TMF Layout



The two substations would be optimally sited on the long side of the TMF, with one located near the entrance and the second substation approximately halfway along the length. For an optimal design, the parking area would be located with easy access to the roadway network, and the MOW facility would be positioned as close to the mainline as possible.

6.2 LOCATION CONSIDERATIONS

BWRR assessed fourteen (14) sites against the following key factors[2]:

- Sufficient size and shape for the 180-acre footprint
- Proximity to the Washington, D.C. terminus station, between D.C. and Baltimore
- Proximity to the mainline alignment with suitable geometry and orientation for TMF ramp connections
- Worker and material delivery access
- Avoidance of residential impacts

In response to agency input, an underground TMF alternative on BWI Airport property and a partially depressed TMF at MD-198 were explored. An underground TMF would require top down construction including the ramp connections to the mainline turnouts, resulting in temporary surface impacts over the full dimensions of the site. Additional permanent surface impacts would be imposed by a comprehensive system of ventilation and emergency egress facilities. According to engineering estimates, BWRR estimated the additional cost for construction would be over $1 billion compared to a conventional TMF on the surface. This additional cost results from a number of factors including, for example, the extensive excavation and movement of spoils, the need to construct walls and to cover the TMF, etc. Therefore, an underground TMF is not a reasonable or cost effective and economically infeasible.

Supported by this analysis, the TMF must be built above ground along a portion of the mainline alignment that is also above ground (viaduct). Both alignment alternatives have an elevated viaduct along the Baltimore-Washington Parkway, between Greenbelt and Fort Meade for Alternative J, and between Greenbelt and Maryland City for Alternative J1. Both alignment alternatives also have a short viaduct section around the Cherry Hill station alternative.

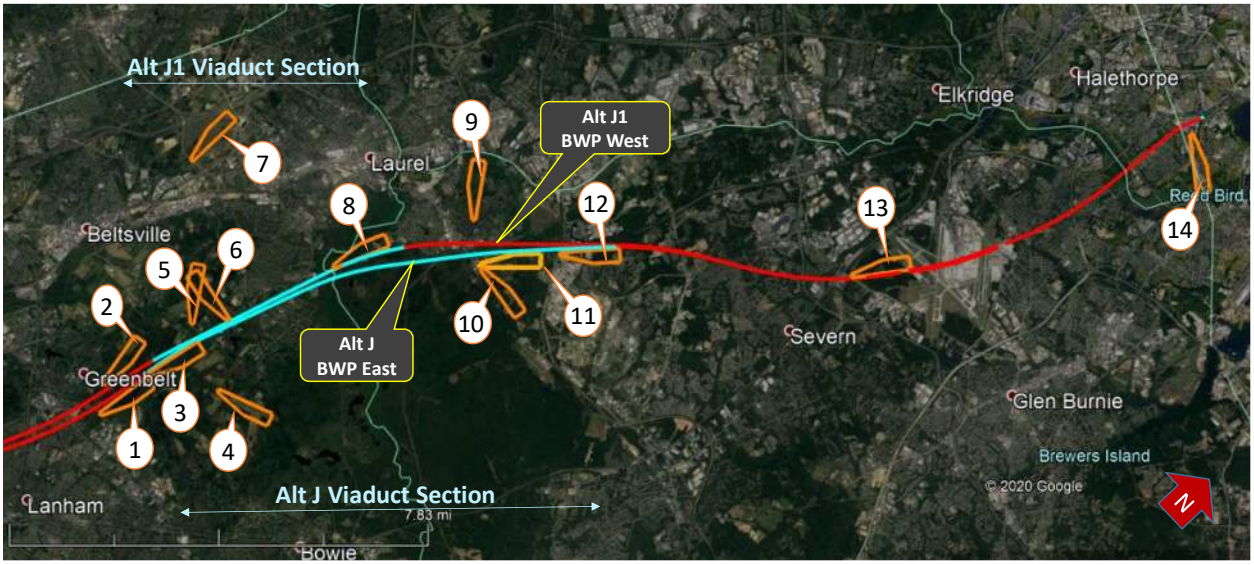
[2] Key factors were developed based on the subsequent operational analysis to ensure the TMF was located in an area along the alignment that meets the operational and maintenance requirements of the system.

7. TMF ALTERNATIVES

7.1 DESCRIPTION OF ALTERNATIVES

Using the 180-acre final footprint shown in Figure 7, a study was undertaken that included eleven sites that were previously evaluated plus three new locations that were subsequently identified, resulting in a total of fourteen sites shown in Figure 8 and assessed in Table 1.

Figure 8. TMF Site Alternatives



Each site is further described in Table 1.

All of the TMF sites are above ground and adjacent to a viaduct section of the mainline alignment, with the exception of Site #13, BWI Airport, and site #7. The MD-198 site was assessed two ways, #10A and #10B, with #10B excavated and depressed ~20m (66 feet) to avoid encroaching on Tipton Airport airspace.

TMF options on the West side of the Baltimore-Washington Parkway require TMF ramps to bridge over the Parkway to connect Alignment Alternative J. Similarly, TMF options on the East side of the Parkway require TMF ramps to cross over the Parkway to connect to Alignment Alternative J1.

7.2 EVALUATION CRITERIA

Table 1 provides information on each site, including ownership, surface characteristics, land use, feasibility of providing connecting ramps to the mainline, and impacts for each TMF alternative.

The first five columns in Table 1 provide site characteristics as described below.

- **Number (No.)** – Corresponds to numbers on Figure 8
- **Stationing** – Location along the Alternative J or J1 alignment
- **Location Descriptor** – Brief word identification
- **Property Owner** – Public or private owner
- **Characteristics / Land Use** – Surface characteristics such as woods, cropland, wetlands, rivers, and land use: residential, commercial, institutional parkland, etc. The elevation differential across the TMF footprint is provided.

The remaining columns provide additional details about each site that can be considered in an evaluation of alternatives. The following discussion describes the characteristics and how they are evaluated for consistency with the Purpose and Need of the project.

- **TMF Ramps to Mainline** – Ramps that connect the TMF site to the Northbound and Southbound guideways on the mainline alignment.
    - Ramps that do not connect above ground were considered inconsistent with the Purpose and Need adding cost on the order of $500 million, adversely impacting financial viability. Additionally, surface impacts associated with the construction of underground switchboxes, tunnel transition portals and ventilation facilities would pose substantial impacts to the human and natural environment.
    - Ramps in tunnel are therefore deemed **UNACCEPTABLE.**
- **Residential Impacts** – Direct impacts to residential properties by either the TMF or the TMF ramps.
    - Impacts to residences were considered **UNACCEPTABLE** based on the Purpose and Need objective to avoid, minimize and mitigate impacts to the human environment.
    - Impacts to residentially zoned properties that are not developed were considered **ACCEPTABLE**.
- **Wetland Impacts** – Wetland impacts quantified based on GIS data, supplemented by AECOM field studies, where available. The Purpose and Need has an objective to avoid, minimize and mitigate impacts to the natural environment. The impacts noted are gross impacts and do not reflect mitigation, construction methods or post-construction impacts.
- **Parkland Impacts** – Impacts identified for areas that are designated as parkland. The Purpose and Need has an objective to avoid, minimize and mitigate impacts to the human and natural environment.

- **Other Impacts** – Impacts to institutional facilities, major utilities, churches, cemeteries, transportation infrastructure, etc. The Purpose and Need has an objective to avoid, minimize and mitigate impacts to the human and natural environment.
    - Completion of the TMF is a critical component of the project schedule as it is required to take delivery of the trainsets and commence assembly and testing.
    - Impacts were considered **UNACCEPTABLE** if the mitigation efforts required would add two or more years to the project schedule. Extensive delay to the start of service would not meet the project Purpose and Need to address inadequate transportation capacity. The cost of overall construction would increase with a delay.
- **Cost Increment** – The additional cost of an alternative compared to all other alternatives due to site specific conditions, such as a requirement for underground construction.
    - Substantial cost increases were deemed **UNACCEPTABLE** due to a substantial adverse impact on the economic viability of the project, which would be inconsistent with the Purpose and Need of the project.
- **Distance to Washington, DC Station** – The deadhead travel distance between the TMF and the Washington, DC terminal station. The operating assumption is that all revenue trains end their service at the DC station. The distance is important because a longer distance reduces time available for maintaining trainsets and guideway infrastructure during the 6-hour maintenance window.

Table 1. Evaluation of Fourteen Potential TMF Sites (180-acre footprint)

No.	Stationing	Location Description	Property Owner	Characteristics / Land Use	TMF Ramps to Mainline	Residential Impacts	Wetland Impacts (acres)	Parkland Impacts	Other Impacts / Cost Differential	Distance to DC Station km (miles)
1	118+500	Greenbelt, MD East of BWP	BARC, NASA, Prince George's County	Woods, cropland Institutional - USDA facilities 18m (60 ft) elevation differential	Ramps would connect to mainline in tunnel Unacceptable	None	1	Yes	Relocate Explorer Rd	18.5 (11)
2	119+500	Greenbelt, MD West of BWP	BARC, Greenbelt	Greenbelt Forest Preserve Woods, cropland Institutional - USDA facilities 29m (95 ft) elevation differential	Ramps would connect to mainline in tunnel Unacceptable	44 acres zoned residential, not developed	4	Yes	Relocate access road to Northway Fields ballpark	19.5 (12)
3	121+000	BARC East Parallel to BWP	BARC	Woods, rivers, wetlands, cropland Institutional - USDA facilities 12m (40 ft) elevation differential	Ramps would connect to mainline in tunnel Unacceptable	None	34	No	Relocate Beaver Dam Rd	21 (13)
4[3]	121+000	BARC East	BARC, NASA	Airstrip, wooded, wetlands Institutional - USDA facilities 15m (50 ft) elevation differential	Ramps connect above ground to viaduct. No issue.	None	4	No	Relocate Springfield Rd Adjacent to NASA GGAO Ramps would be adjacent to BARC research fields may influence evapotransporation research, impacts to be assessed and mitigations to be developed in consultation w/BARC.	21 (13)
5[4]	121+500	BARC West	BARC, private	Woods, wetlands Institutional - USDA facilities: Several deteriorating buildings, 14 of which are slated for demolition per the recent EA (United States Department of Agriculture, 2020) 15m (50 ft) elevation differential	Ramps connect above ground to viaduct. No issue.	0.5 acre zoned residential, not developed	4	No	Relocate Entomology Rd Adjacent to DoS Beltsville Information Management Center Ramps in vicinity of BARC research fields may influence evapotransporation research, impacts to be assessed and mitigations to be developed in consultation w/BARC.	21 (13)
6	122+500	BARC West Perpendicular	BARC, GSA	Woods, wetlands Institutional - USDA facilities	East-West orientation of TMF requires ramps across US Secret Service Alt J1 ramps cross BW Parkway two times	None	11	No	Adjacent to DoS Beltsville Information Management Center Relocate US Secret Service training facility due to TMF ramp traversing through the middle of the campus. Unacceptable	22.5 (14)

[3] Alternative recommended for further study in the DEIS

[4] Alternative recommended for further study in the DEIS

No.	Stationing	Location Description	Property Owner	Characteristics / Land Use	TMF Ramps to Mainline	Residential Impacts	Wetland Impacts (acres)	Parkland Impacts	Other Impacts / Cost Differential	Distance to DC Station km (miles)
7	124+000	Konterra, Beltsville, MD	PEPCO, Konterra Associates LLC	Open, disturbed 30m (100 ft) elevation differential	3 miles of ramps through residential and commercial areas	Ramps cross through several residential neighborhoods. Unacceptable	2	No	Site development is planned	24 (15)
8	127+500	Suburban Airport, Maryland City, MD	Commercial, Anne Arundel County	Woods, parkland Residential Former Suburban Airport site 14m (45 ft) elevation differential	Ramps connect above ground to viaduct. No issues	Over 50 homes Unacceptable	44	Yes	Relocate Brock Bridge Road Relocate Maryland City Wastewater Treatment Facility Relocate Maryland City Park ball fields	27.5 (17)
9	130+500	Russett, MD	Anne Arundel County, Private Owners	Woods, Wetlands 37m (120 ft) elevation differential	1 mile of ramps through residential and commercial areas	5 to 10 homes for TMF and ramps Unacceptable	23	No	Relocate Resurrection Roman Catholic Church Relocate Brock Bridge Rd	30.5 (19)
10A[5]	130+500	MD-198 East-West Laurel, MD	Federal Gov't (DC use) BGE Private	Woods, Wetlands, Commercial, Rivers Institutional Conservation easement 30m (100 ft) elevation differential	Ramps connect above ground to viaduct. No issues	None	32	Yes	Encroaches 10m (30 ft) into Tipton Airport airspace Oak Hill Conservation Easement 61m (200 ft) high shop next to residential area Relocate BGE critical infrastructure, relocate Job Corps Relocate Old Portland Rd	30.5 (19)
10B	130+500	MD-198 East-West Laurel, MD Same as Alternative 10A, except TMF depressed 20m (66 ft) to avoid Tipton airspace	Federal Gov't (DC use) BGE Private	Woods, Wetlands, Commercial, Rivers Institutional Conservation easement 30m (100 ft) elevation differential	Ramps are depressed in tunnel, with tunnel portals and switchbox in Patuxent Research Refuge Unacceptable	None	32	Yes	Avoids Tipton Airport airspace impact Oak Hill Conservation Easement 52m (170 ft) high shops next to residential area Relocate BGE critical infrastructure, relocate Job Corps Relocate Old Portland Rd Portal and switchbox in Patuxent Refuge Unacceptable Added cost of approximately $500 million for depressed TMF and ramps Unacceptable	30.5 (19)

[5] Alternative recommended for further study in the DEIS

No.	Stationing	Location Description	Property Owner	Characteristics / Land Use	TMF Ramps to Mainline	Residential Impacts	Wetland Impacts (acres)	Parkland Impacts	Other Impacts / Cost Differential	Distance to DC Station km (miles)
11	130+500	MD-198 North-South Laurel, MD	Federal Gov't (DC use)	Woods, Institutional River valley Cemetery Conservation easement 24m (80 ft) elevation differential	Ramps connect above ground to viaduct. No issues	None	17	Yes	Historic Forest Haven Cemetery Oak Hill Conservation Easement Relocate critical BGE infrastructure Relocate Maya Angelou Academy / Youth Rehabilitation Services Department (DC) 61m (200 ft) high shops Relocate River Rd, Center Ave, Forest Haven Ave, Old Portland Rd Unacceptable	30.5 (19)
12	133+500	Fort Meade	Fort Meade (NSA Exclusive Use)	Institutional, Woods 29m (95 ft) elevation differential	OK for Alt J. Alt J1 is in tunnel, requires 3 mile long ramps to North portal	30 homes Unacceptable	0	No	Relocate multiple NSA facilities Relocate Connector Rd Unacceptable	33.5 (21)
13	142+500	BWI Airport	State of Maryland	Airport, Woods 21m (70 ft) elevation differential	Ramps would connect to mainline in tunnel Unacceptable	Switchboxes for ramps would impact dozens of homes. Unacceptable	0	No	Relocate active BWI freight facilities Relocate planned new runway at BWI Relocate Mathison Way Unacceptable Requires underground facility, and underground ramps, with additional cost of approximately $1 billion Unacceptable	42.5 (26)
14	153+500	Patapsco/ Cherry Hill	Private commercial/ industrial CSX, MTA Residential Baltimore County	Developed area Parkland Utilities 18m (60 ft) elevation differential	Ramps would connect to mainline in tunnel Unacceptable	Hundreds of residences in 20 acres of Cherry Hill apartment buildings Unacceptable	0	Yes	Relocate CSX Relocate MTA Light Rail Relocate W. Patapsco Ave Southwest Area Park	53.5 (33)

7.3 EVALUATION OF ALTERNATIVES

Based on the evaluation provided in Table 1, all but two alternatives were found to have conditions that were unacceptable based on the Purpose and Need for the project. Given both alternatives were located on BARC property it was determined to retain a third non-BARC alternative for purposes of study and comparison to the two BARC alternatives.

- Six alternatives did not allow connecting ramps to the viaduct section of the mainline: #1, #2, #3, #10B, #13 and #14
- Six alternatives impact existing residences: #7, #8, #9, #12, #13 and #14
- Six alternatives had other impacts of a severity that mitigation would be difficult or impossible: #6, #10A, #10B, #11, #12 and #13
- Two alternatives, #10B and #13, had an unreasonable cost penalty for all underground construction

Impacts to parks and wetlands were also assessed:

- Four sites have over 20 acres of wetland impacts: #3, #8, #9, #10A and #10B
- Seven sites impact parkland: #1, #2, #8, #10A, #10B, #11 and #14

The original MD-198 (#10A) location that was recommended for further study in the Alternatives Report was found to be not viable in the opinion of BWRR based on adverse impacts. The following impacts were identified (see Figure 9):

- Substantial elevation changes across the site resulting in a 60m high (200 feet or 20 stories) maintenance shop within a river valley and adjacent to a new residential development.
- Encroachment into the Tipton Airport airspace (Note: an EA is under review by the FAA to extend the airport's runway and expand the clear zones at both ends of the runway).
- Encroachment on the Oak Hill Conservation Easement that was created as part of a consent agreement with USEPA.
- Impacts to critical BGE infrastructure, including aerial and underground power lines feeding NSA and underground gas lines. BGE has stated it is unacceptable to impact power supply to NASA.

With the exception of mitigating airspace encroachment, the excavated and depressed version of the MD-198 site (#10B) does not eliminate these impacts. A depressed facility would add substantial cost (near $500 million).

Aside from the sites located on BARC property, the MD-198 site (#10A) is the only other site that does not require residential displacements. It is the only non-BARC alternative and so is retained for further discussion and comparison with the two BARC alternatives.

The Patapsco / Cherry Hill TMF location that was identified following the Alternatives Report is no longer considered viable with the final TMF footprint. The following impacts were identified:

- Substantial residential impacts;
- TMF ramps would not be able to connect to the mainline in a viaduct section, see Figure 10.

Figure 9. Alternative #10 MD-198 TMF

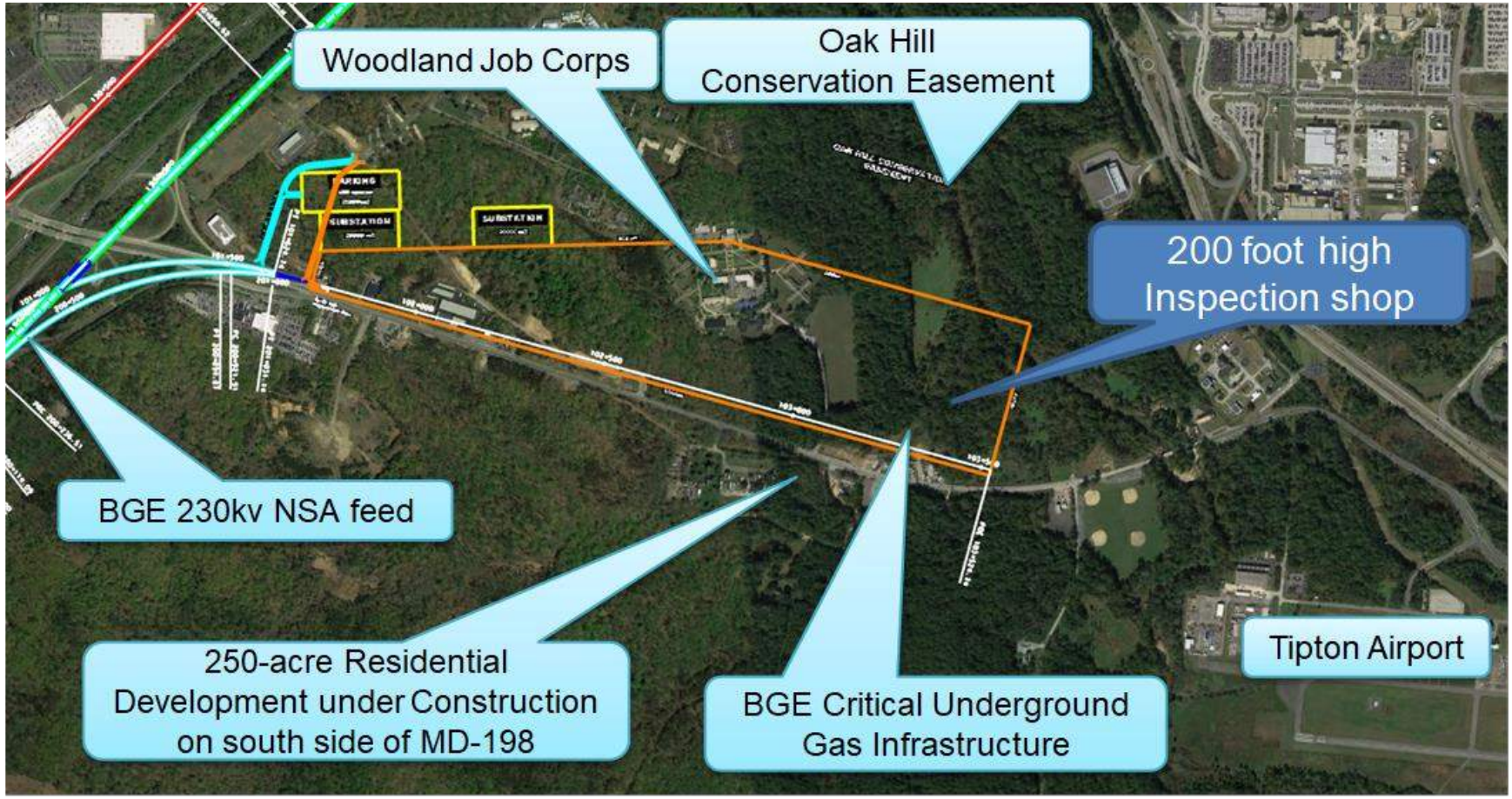
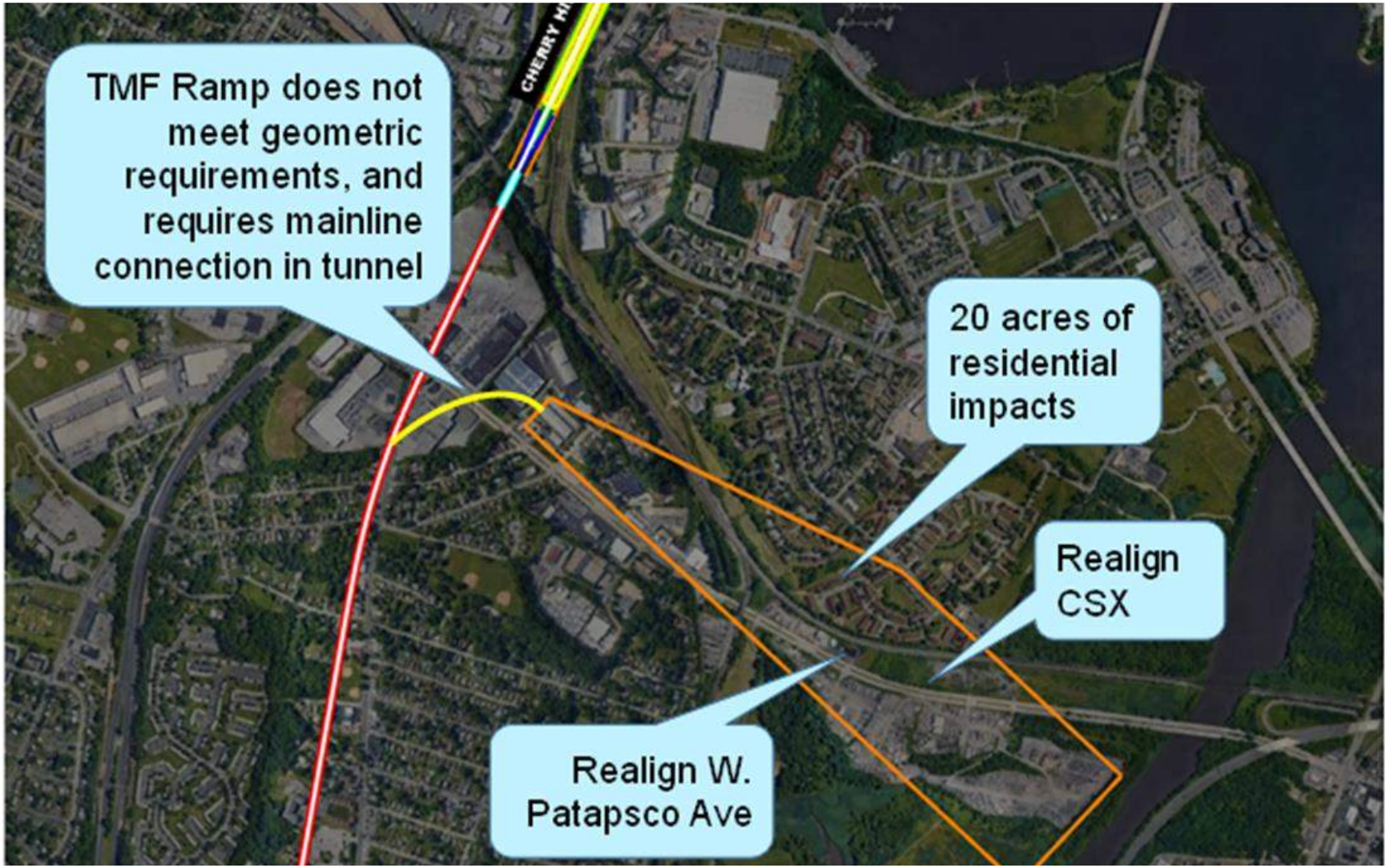


Figure 10. Alternative #14 Patapsco Avenue TMF



8. CONCLUSIONS AND RECOMMENDATIONS

Avoiding impacts to residential properties through this densely populated corridor presents the single biggest challenge to siting a TMF. If the alternatives recommended for further study are found unacceptable by the FRA, alternatives with residential displacements would have to be reconsidered. Of the alternatives studied, only two were found to be viable by BWRR and a third, while considered unacceptable by BWRR pursuant to the criteria in the Purpose and Need is retained for further review and comment in comparison with BARC alternatives in the DEIS:

- **#4 BARC East** – Located on the USDA BARC Eastern campus on land formerly used as an airstrip. Adjacent to NASA Goddard Geophysical and Astronomical Observatory (GGAO). NASA raised issues related to frequency interference, EMF, vibrations, and light impacts; BWRR believes these concerns can be mitigated. For example, the primary frequencies used by SCMAGLEV are outside the frequency range identified by NASA as a concern. BWRR believes additional concerns can be mitigated upon detailed review and discussion.
- **#5 BARC West** – Located on the USDA BARC Central Farm on forested land; adjacent to the Department of State (DoS) Beltsville Information Management Center and a residential area. In a discussion between BWRR and DoS on November 22, 2019, the DoS representative indicated there would be no concerns about potential interference from the TMF.
- **#10A MD-198 –** Located on the North side of MD-198 encroaching 10m (30 ft) into Tipton Airport airspace, into the Oak Hill Conservation Easement, with a 61m (200 ft) high shop next to residential area, requiring relocation of BGE critical infrastructure, and relocation of Job Corps. The MD-198 TMF option while deemed unacceptable by BWRR is included in the DEIS because it does not require any residential takings. Though technically feasible from an engineering perspective, in the opinion of BWRR it is not feasible from an impact and permitting perspective and serves a clear purpose as a non-BARC alternative.

The BARC property sites are reasonable choices for full NEPA evaluation given BARC's ability to house a 180-acre facility without residential impacts and its proximity to the Washington, DC terminus station. It is similar to public uses currently occupying BARC (or former BARC) property and new proposed uses. Of note, BARC recently was issued a Finding of No Significant Impact for the demolition of 22 derelict buildings, 14 of which are within the TMF footprint. This highlights the fact that BARC West is not a pristine untouched habitat.

To help mitigate concerns expressed by BARC in the Alternatives Report, BWRR proposes to explore hardscaping mitigations such as engineered drainage management and "green roof" systems as well as solar panel installations on the approximately 100-acres of TMF roofs.

These mitigations would be beneficial to BARC for the following reasons:

- The project mainline will be constructed on an elevated viaduct, which may offer other opportunities for the study of vegetation control measures for grasses, low shrubs, and other flora located adjacent to cropland and transportation infrastructure.
- Possible use of TMF Site facilities to preserve 100+ acres of green rooftop for the study of:
    - Cropping efficiency, productivity, and quality using roofs and other hard infrastructure as a sustainable crop production system (See National Programs # 216 "Sustainable Agricultural Systems Research;" # 305 "Crop Production").

- Soil biodiversity and nutrient retention on green-rooftop and other hard-infrastructure systems (See National Program # 212 “Soil and Air”).
- Innovative green-rooftop technologies for stormwater storage and retention and improved watershed management (See National Program # 211 “Water Availability and Watershed Management”).

- Utilization of the TMF to construct a modern greenhouse over a portion of the site.
  - USDA would benefit from a large-scale facility for greenhouse research projects.

Figure #11 shows Alternative #4, BARC East, including a MOW facility, substations, parking facility, and connecting ramps to the Alternative J alignment. Figure #12 shows the same TMF connecting to the Alternative J1 alignment, with TMF ramps crossing over the Baltimore-Washington Parkway.

Figure #13 shows Alternative #5, BARC West, with the supplemental facilities and connecting ramps to the Alternative J alignment across the Baltimore-Washington Parkway. Figure #14 shows the TMF with ramps connecting to the Alternative J1 alignment.

Figure #15 shows Alternative #10A, MD-198, developed with the supplemental facilities and connecting ramps to the Alternative J alignment. Figure #16 shows the TMF with ramps connecting across the Baltimore-Washington Parkway to the Alternative J1 alignment.

Figure 11. Alternative #4 BARC East TMF with Alternative J Alignment

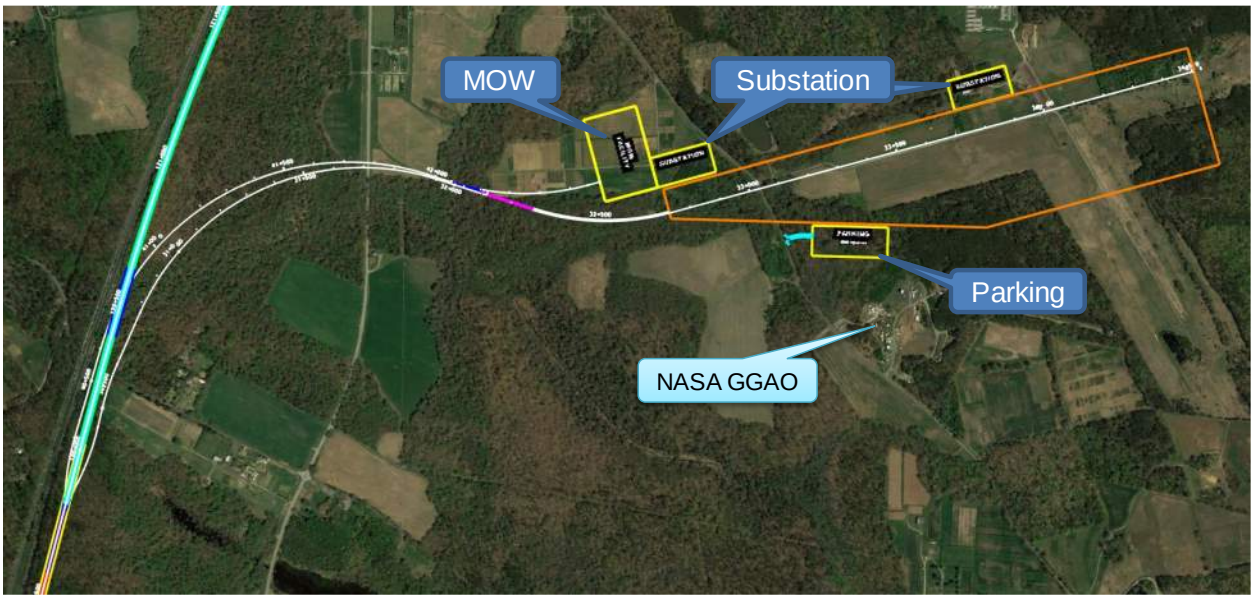


Figure 12. Alternative #4 BARC East TMF with Alternative J1 Alignment

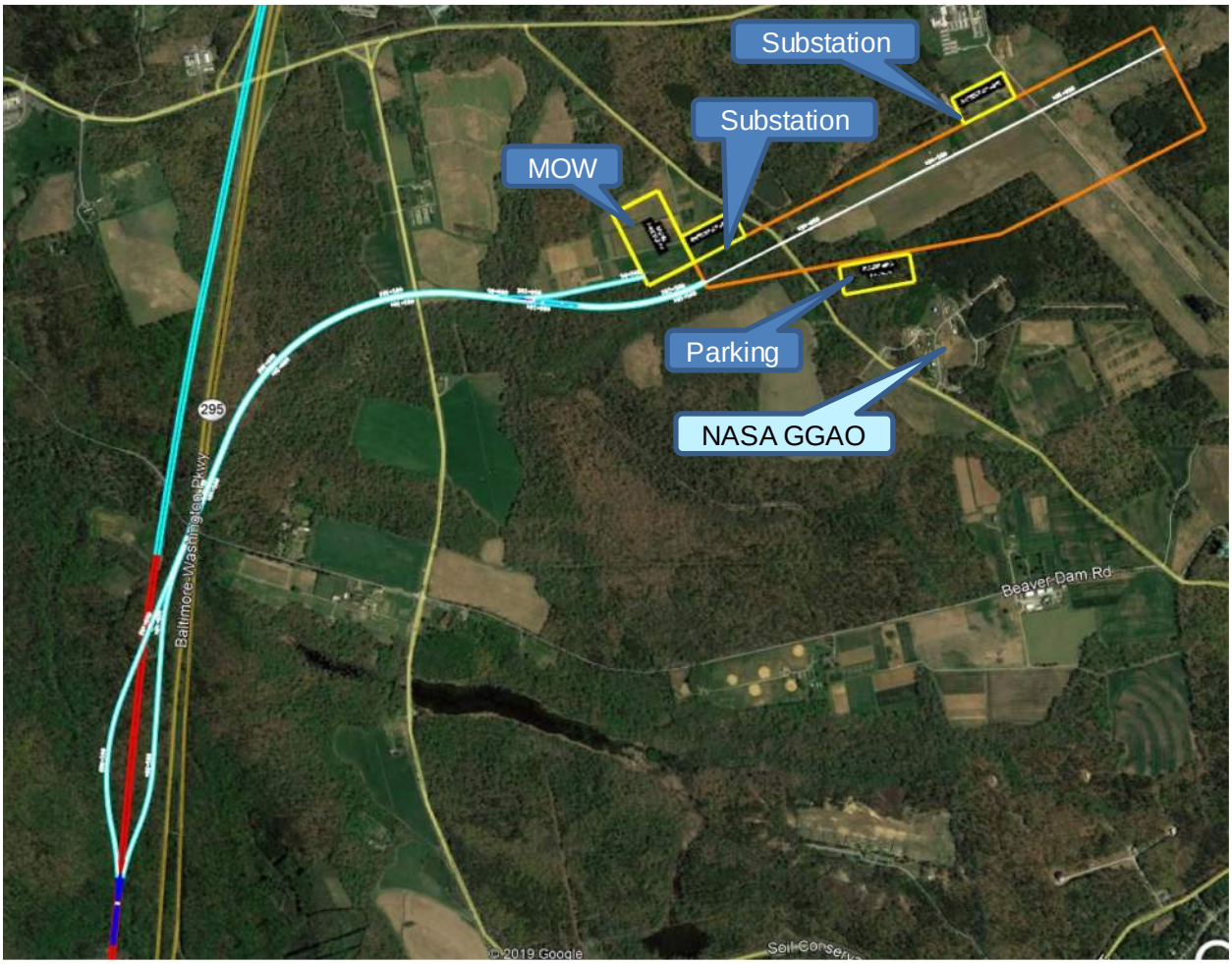


Figure 13. Alternative #5 BARC West TMF with Alternative J Alignment

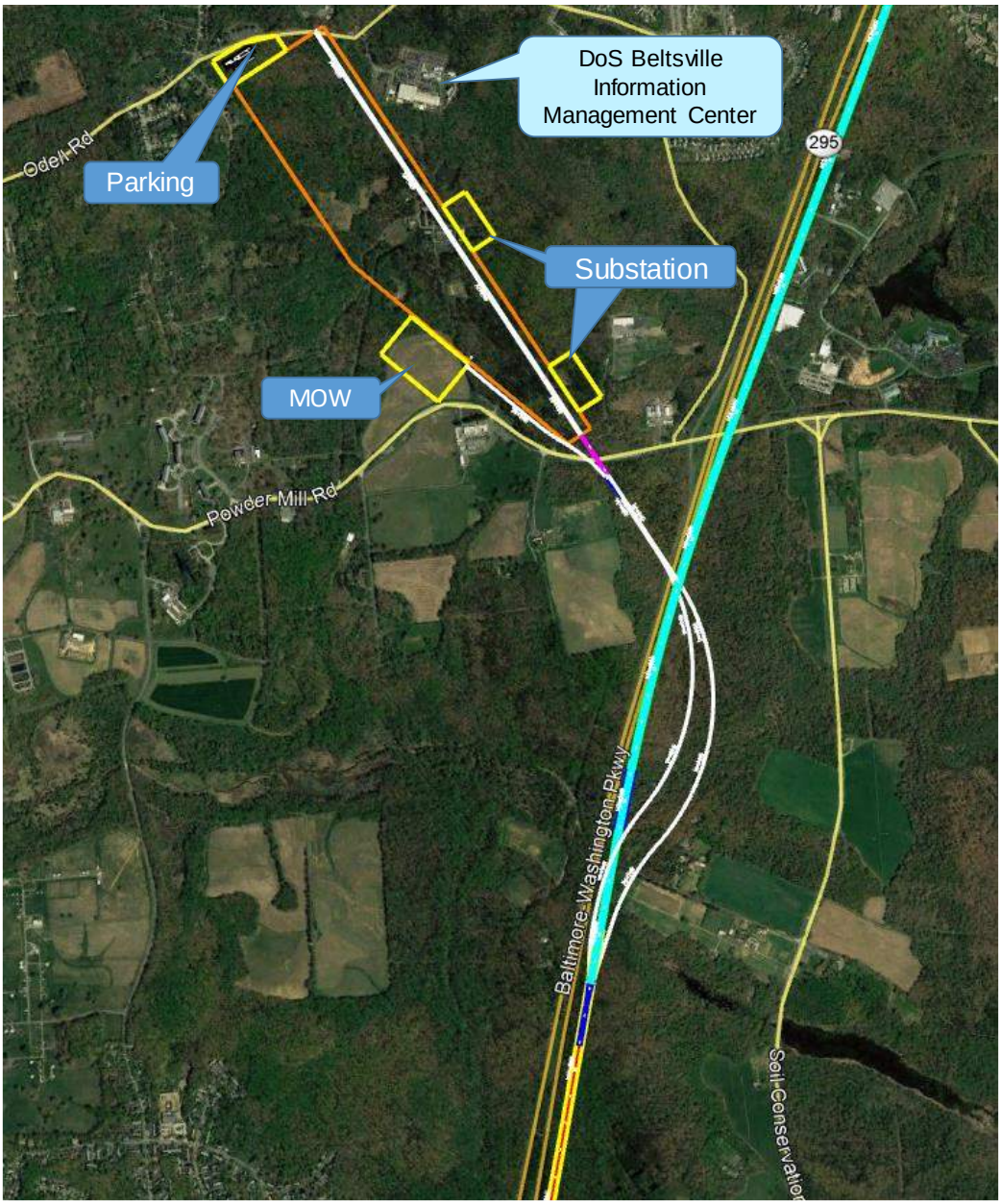


Figure 14. Alternative #5 BARC West TMF with Alternative J1 Alignment

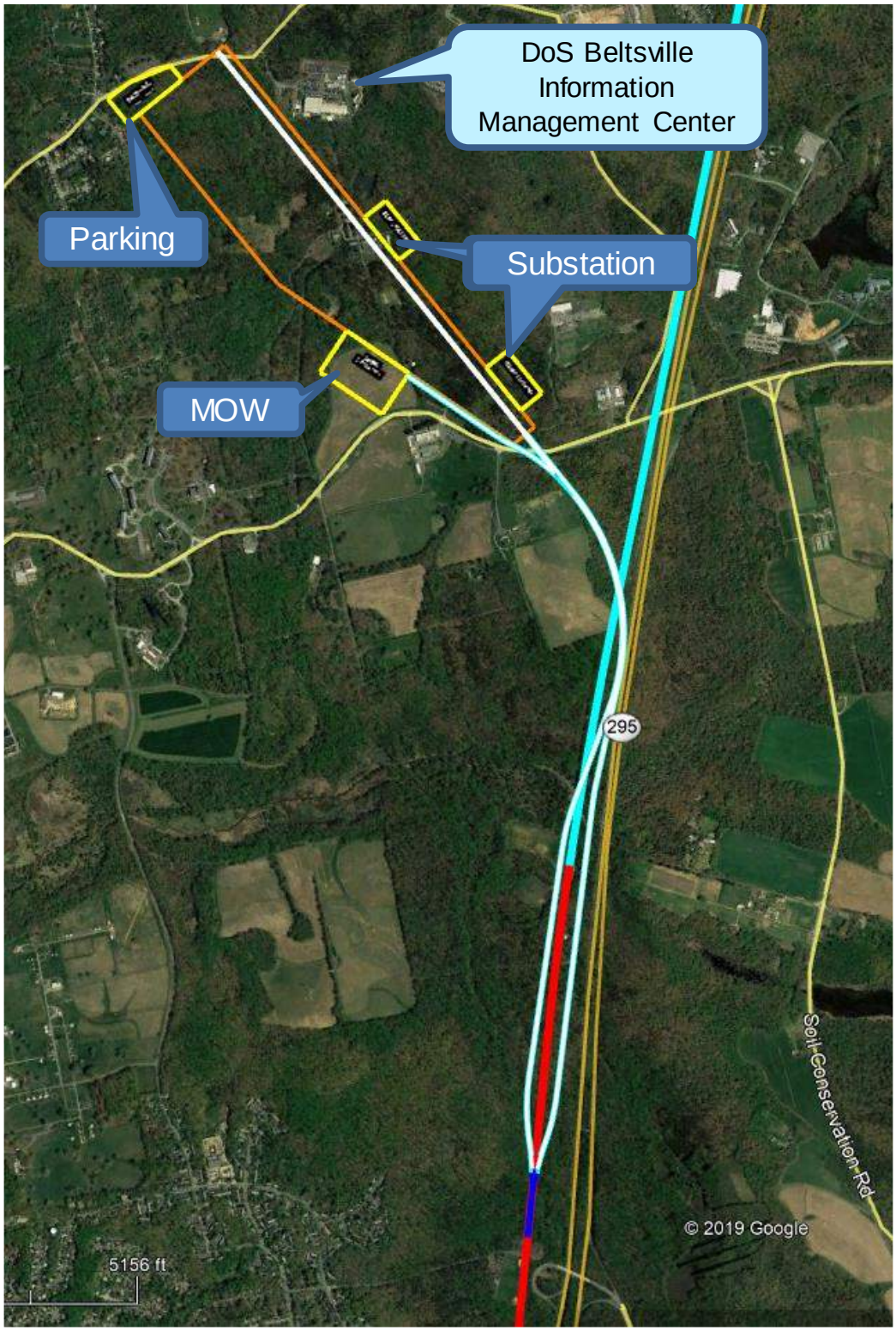


Figure 15. Alternative #10A MD-198 TMF with Alternative J1 Alignment

Figure 16. Alternative #10A MD-198 TMF with Alternative J1 Alignment