Appendix D10:
Construction Effects Supplemental Information

Contents

Figures

Tables

Acronyms and Abbreviations

ACHP ..... Advisory Council for Historic Preservation
ACOE ..... Army Corps of Engineers
ACM ..... Asbestos-Containing Materials
BMP ..... Best Management Practices
BRT ..... Bus Rapid Transit
CFR ..... Code of Federal Regulations
CTMP ..... Construction Traffic Management Plan
EIS ..... Environmental Impact Statement
ESA ..... Environmental Site Assessment
FTA ..... Federal Transit Administration
GRG ..... Green House Gas
ICR ..... Industrial Code Rule
LRT ..... Light Rail Transit
Metro ..... Niagara Frontier Transit Metro System, Inc.
Metro Rail ..... Metro Light Rail Transit System
MOU ..... Memorandum of Understanding
NYCCR ..... New York Codes, Rules, and Regulations
NYSDEC ..... New York State Department of Environmental Conservation
NYSDOL ..... New York State Department of Labor
NYSDOT ..... New York State Department of Transportation
NO_2 ..... Nitrogen Dioxide
OCS ..... Overhead Contact System
PA ..... Purchase Agreement
RCRA ..... Resource Conservation and Recovery Act
ROD ..... Record of Decision
SEM ..... Sequential Excavation Method
SHPO ..... State Historic Preservation Office
TCE ..... Temporary Construction Easement
UB ..... University at Buffalo
USDOT ..... United States Department of Transportation
VdB ..... Vibration Decibels

Appendix D. Construction Effects Supplemental Information

This appendix provides an overview of typical construction activities required to construct either the LRT Build Alternative or the BRT Build Alternative and associated stations, systems, and other supporting facilities. Figure D-1 presents the LRT Build Alternative, including the tunnel and at-grade alignment segments, portal locations, 10 stations, two park-and-ride facilities, and the light maintenance/storage facility. Figure D-2 presents the BRT Build Alternative, including the alignment, 10 stations, two park-and-ride facilities, and the light maintenance/storage facility. Chapter 2, "Alternatives Considered," provides a description of the Project alignment.

The construction activities summarized in this appendix are based on the current level of design for the Project alternatives, discussions with construction specialists, and experience on similar projects. Actual construction methods and materials would be site specific and at the discretion of the contractor. All construction methods and materials would be conducted per Metro requirements and would comply with New York State Department of Transportation regulatory requirements. The final means and methods may differ from what is included in this analysis. Final construction sequencing and methods would be adopted during final design.

Table D-1Summary of Anticipated Work Activities summarizes work activities anticipated (organized by roadway associated with the Project alignment) as it pertains to the construction of the LRT Build Alternative and BRT Build Alternative.

Table D-1. Summary of Anticipated Work Activities

Location (Roadway)	Summary of Work Activities	
	LRT Build Alternative	BRT Build Alternative
Main Street and Kenmore Avenue	▪ Construction of underground configuration (tunneling), substations, and supporting infrastructure. ▪ Construction staging. ▪ Construction of Stormwater management practices.	▪ Construction of proposed station on UB South Campus (at-grade station at existing Metro Rail University Station). ▪ Construction of traffic operational improvements. ▪ Construction staging. ▪ Construction of Stormwater management practices.
Niagara Falls Boulevard	▪ Construction of underground configuration (tunneling), substations, and supporting infrastructure. ▪ Construction of at-grade track configuration, substations, and supporting infrastructure. ▪ Construction of proposed stations. ▪ Construction of park-and-ride facility at Boulevard Mall. ▪ Construction of traffic capacity and operational improvements. ▪ Construction of pedestrian and bicycle improvements. ▪ Construction staging.	▪ Construction of at-grade busway configuration and supporting infrastructure. ▪ Construction of proposed stations. ▪ Construction of park-and-ride facility at Boulevard Mall. ▪ Construction of traffic capacity and operational improvements. ▪ Construction of pedestrian and bicycle improvements. ▪ Construction staging. ▪ Relocation of existing stormwater management practices and construction of stormwater management practices.

Location (Roadway)	Summary of Work Activities	
	LRT Build Alternative	BRT Build Alternative
	▪ Relocation of existing stormwater management practices and construction of stormwater management practices.	
Maple Road	▪ Construction of at-grade track configuration, substations, and supporting infrastructure. ▪ Construction of underground configuration (Maple and Sweet Home Intersection) ▪ Construction of proposed stations. ▪ Construction of traffic capacity and operational improvements. ▪ Construction of pedestrian and bicycle facilities. ▪ Construction staging ▪ Construction of stormwater management practices.	▪ Construction of at-grade busway configuration and supporting infrastructure. ▪ Construction of proposed stations. ▪ Construction of traffic capacity and operational improvements. ▪ Construction of pedestrian and bicycle facilities. ▪ Construction staging ▪ Construction of stormwater management practices.
Sweet Home Road	▪ Construction of at-grade track configuration, substations, and supporting infrastructure. ▪ Construction of proposed station. ▪ Construction of traffic capacity and operational improvements. ▪ Construction of pedestrian and bicycle facilities. ▪ Construction staging ▪ Construction of stormwater management practices.	▪ Construction of at-grade busway configuration and supporting infrastructure. ▪ Construction of proposed station. ▪ Construction of traffic capacity and operational improvements. ▪ Construction of pedestrian and bicycle facilities. ▪ Construction staging ▪ Construction of stormwater management practices.
Rensch Road, Mary Talbert Way, and Lee Road (UB North Campus)	▪ Construction of at-grade track configuration, substations, and supporting infrastructure. ▪ Construction of a new structured crossing over Bizer Creek. ▪ Construction of proposed stations. ▪ Construction of pedestrian and bicycle facilities. ▪ Construction staging ▪ Relocation of existing stormwater management practices and construction of stormwater management practices.	▪ Construction of at-grade busway configuration and supporting infrastructure. ▪ Construction of a new structured crossing over Bizer Creek. ▪ Construction of proposed stations. ▪ Construction of pedestrian and bicycle facilities. ▪ Construction staging ▪ Relocation of existing stormwater management practices and construction of Stormwater management practices.
John James Audubon Parkway	▪ Construction of at-grade track configuration, substations, and supporting infrastructure. ▪ Construction of new bridge span over Ellicott Creek (using existing piers). ▪ Construction associated with relocating and replacing the Ellicott Creek Trailway. ▪ Construction of proposed stations. ▪ Construction of park-and-ride facility at I-990 proposed station. ▪ Construction of pedestrian and bicycle facilities. ▪ Construction of geometric changes to the I-990 off-ramp roundabout. ▪ Construction of storage and light maintenance facility. ▪ Construction of park-and-ride facility at the proposed I-990 station. ▪ Construction staging ▪ Relocation of existing stormwater management practices and construction of stormwater management practices.	▪ Construction of at-grade busway configuration and supporting infrastructure. ▪ Construction of new bridge span over Ellicott Creek (using existing piers). ▪ Construction associated with relocating and replacing the Ellicott Creek Trailway. ▪ Construction of proposed stations. ▪ Construction of traffic capacity and operational improvements. ▪ Construction of pedestrian and bicycle facilities. ▪ Construction of geometric changes to the I-990 off-ramp roundabout. ▪ Construction of storage and light maintenance facility. ▪ Construction of park-and-ride facility at the proposed I-990 station. ▪ Construction staging ▪ Relocation of existing stormwater management practices and construction of stormwater management practices.

Figure D-1. LRT Build Alternative

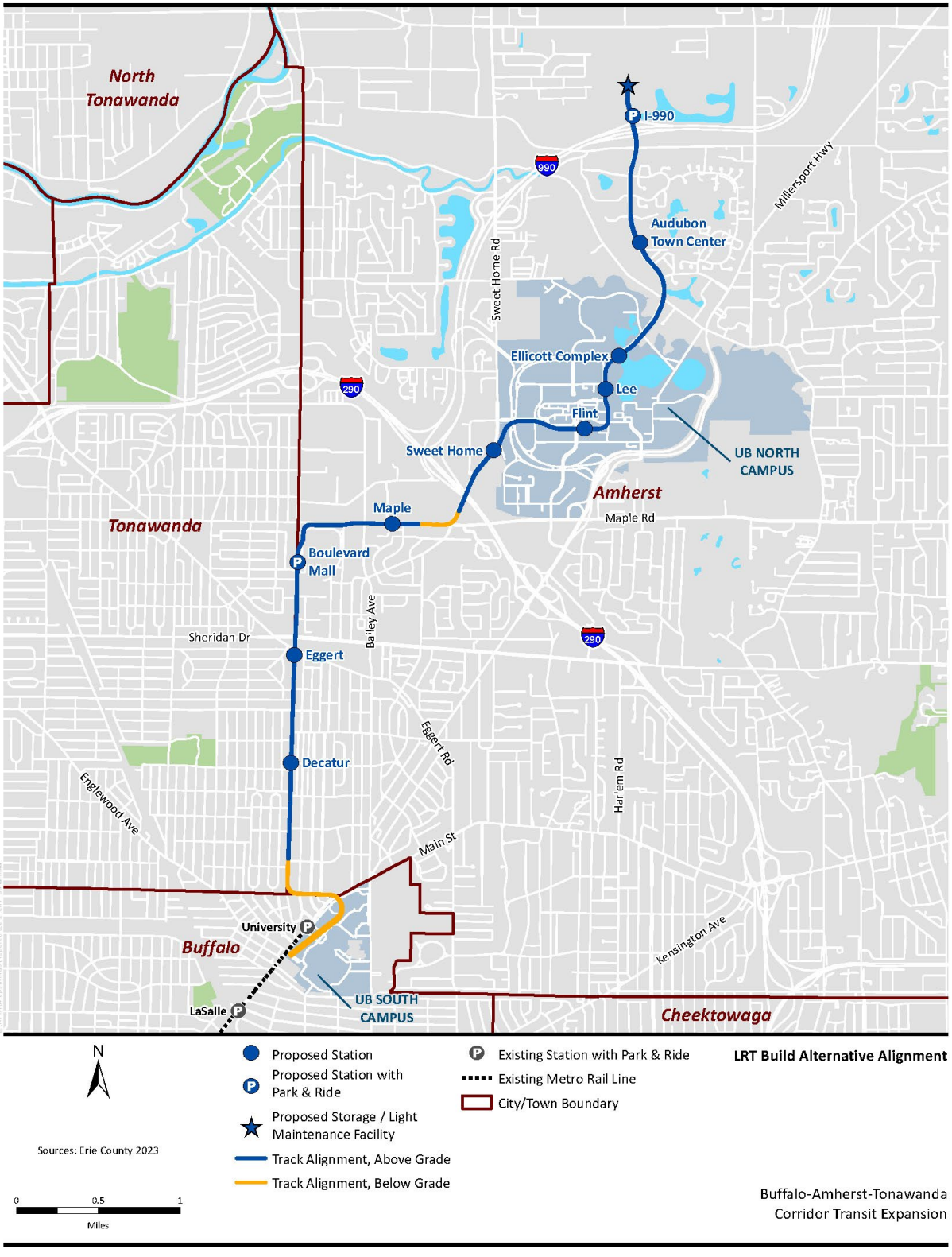
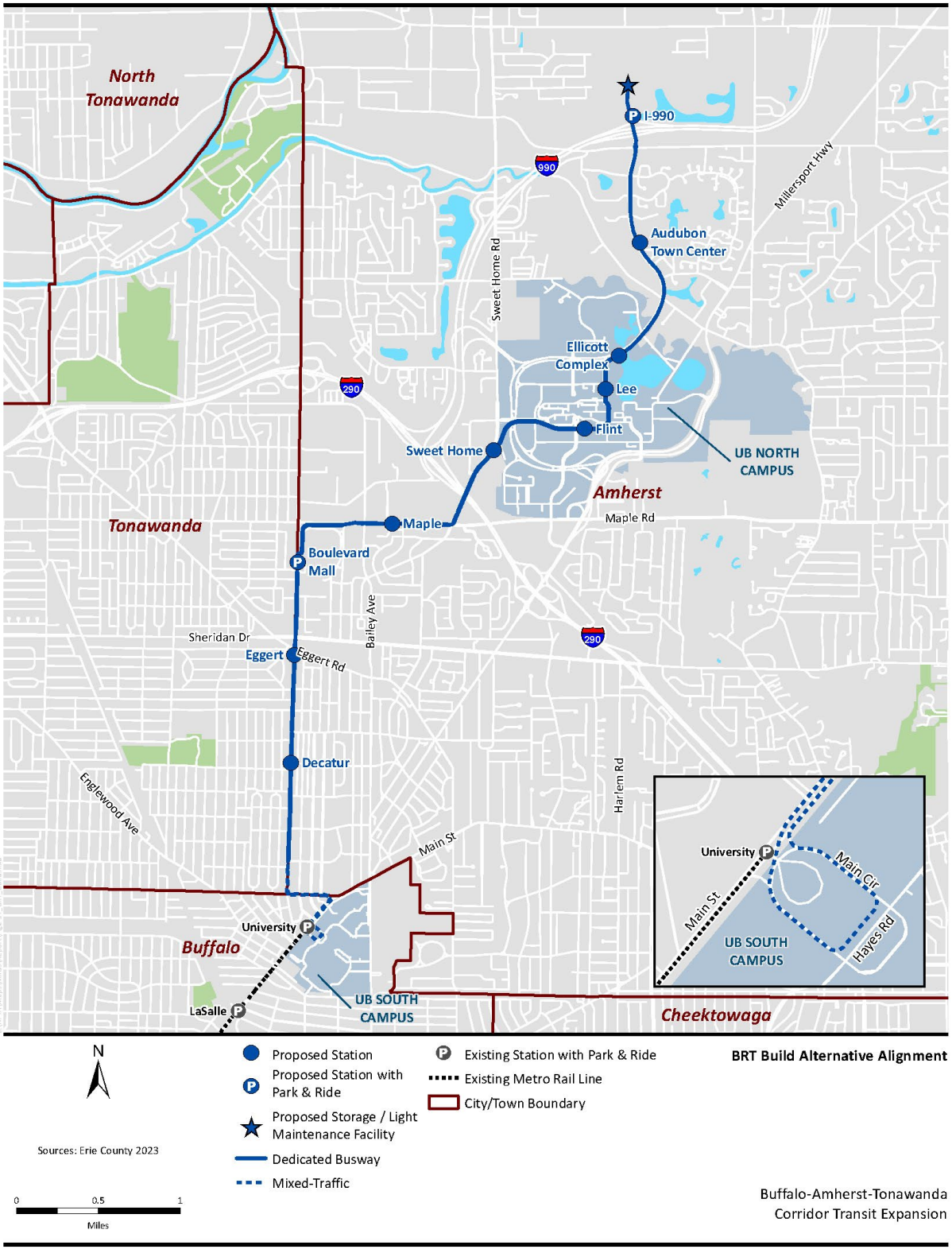


Figure D-2. BRT Build Alternative



D1. NO BUILD ALTERNATIVE

The No Build Alternative would maintain the roadways along the Project alignment in their existing configuration. Routine maintenance efforts would be undertaken as part of an annual maintenance program conducted by the appropriate transportation agencies. There are no construction impacts as a result of the No Build Alternative.

D2. AFFECTED ENVIRONMENT

This section characterizes temporary effects associated with construction of either Build Alternative. All construction methods and materials would be conducted per Metro requirements and would comply with New York State Department of Transportation regulatory requirements. The final means and methods may differ from what is included in this analysis. Sequencing and methods would largely be adopted during final design. During final design and prior to any construction, preconstruction evaluations would be completed to determine existing conditions that would affect construction methods, sequencing, and scheduling.

If elements of the Project developed during final design substantially vary from the environmental commitments documented within this Draft EIS, additional environmental documentation may be necessary. This additional documentation, as applicable, will include environmental reevaluation. As construction contracts are awarded, different contractors may arrange for use of properties outside of the public right-of-way for various uses. In these instances, the contractor would be subject to normal city, county, and state building and zoning regulations and be fully responsible for obtaining any necessary permits and environmental approvals for the proposed use.

D.2.1 Project Construction Phases for Each Build Alternative

The Project will involve a multiyear design and construction phase that would be completed following completion of the environmental process and pending available funding. Before revenue service (start of service open to the public) could begin, the following major steps would occur:

- **Preliminary and Final Design** begins with the conceptual engineering plans presented in this Draft EIS (see Appendix B2, "Conceptual Design Plans") being further developed through preliminary design. Environmental, cultural, and geotechnical surveys would be conducted during preliminary design. Upon approval of the preliminary design plans, final design would be completed and will include all required permitting. The final design submission would include sealed construction plans; erosion and sediment control plans; traffic control plans; traffic signal plans; construction specifications/special provisions; quantity summary; and cost estimates.
- **Pre-Construction Activities** typically include construction contract development; procurement of a preferred contractor, community outreach and education programs; environmental permits and approvals; property acquisition; advance utility relocations; and

vehicle procurement. Metro will define the preferred method for procuring a contractor prior to construction.

- **Construction Activities** include those items required to physically operate the Project for revenue service. Construction of the LRT Build Alternative would include dedicated light-rail tracks, overhead contact system (OCS) or catenary systems, stations, traffic signal and safety systems, power substations, tunneling and grade separations, structures, maintenance and storage facilities, and ancillary facilities. Construction of the BRT Build Alternative would include dedicated running BRT travel lanes (busways), stations, structures, traffic signal and safety systems, maintenance and storage facilities, and ancillary facilities. Construction of both Build Alternatives would also include temporary work, defined by the approved traffic management plan, to maintain vehicular and pedestrian traffic.
- **Testing and Commissioning** of either the LRT Build Alternative or BRT Build Alternative vehicles and systems would follow construction, along with Project-wide systems testing. Systems to be tested include communication systems, fare collection systems, and traffic signal systems. For the LRT Build Alternative only, new LRT vehicle testing could be conducted on the existing system during non-revenue hours. Because there is limited ability to store new or replace LRT vehicles in the existing yard, construction from University Station to the planned light-rail vehicle maintenance and storage facility at the I-990 Station would be sufficiently complete in order to test the light-rail vehicles prior to operation. Additional project-wide systems testing for the LRT Build Alternative would also follow construction activities, including traction power substations and the OCS.

D.2.2 Construction Education and Outreach Plan for Each Build Alternative

A community education and outreach plan will be developed for the preferred Project Build Alternative. The purpose of this plan is to address any construction-related impacts and provide general construction scheduling information, coordinate construction work with adjacent business activities, and assist with the resolution of issues that could develop between residents, motorists, the contractor, and Metro. The details of the program would be included in a Construction Education and Outreach Plan, which would be completed pre-construction and implemented by Metro during construction. The plan would include, but not be limited to, the following:

- Maintain access to community assets (such as bike trails) and neighborhoods during construction, as practicable.
- Maintain access to businesses during the operating hours of the businesses, as practicable.
- Provide signage to direct pedestrians and motorists around construction areas; around sidewalk, street, and lane closures; to entrances of businesses and community assets; and to maintain the flow of traffic around the construction area.
- Provide appropriate signage, barriers, and fencing for pedestrian and bicycle detour routes to prevent pedestrians and bicyclists from entering the construction zones.

- Provide signage alerting potential customers that businesses are open during construction and clearly mark detours, as appropriate.
- Provide the public with construction updates, alerts, and schedules through informational meetings, the project website, and other forms of communication such as mailings and flyers to businesses and residences with 0.25-mile of the construction zone.
- Develop a strategic marketing plan to help reduce impacts to businesses during construction.
- Coordinate construction activities with other capital improvement projects being carried out nearby to minimize construction impacts and detours.

D.2.3 Construction Methods

The Project would require the construction of infrastructure elements not found in typical roadway projects. For the LRT Build Alternative, construction elements include tunnels, emergency exit stair shafts, transit vehicle storage yard, power substations, signal bungalows, safety warning systems, track bed, trackwork, and OCS poles and wires. For the BRT Build Alternative, construction elements include transit vehicle storage yard, safety warning systems, and dedicated busways. Various methods would be used to construct the Project, depending on the geography, soil conditions, and the design. Based on the conceptual design, the following locations have been identified as potential construction staging areas, subject to property owner approval.

- Northeast corner property of Kenmore Avenue and Niagara Falls Boulevard
- Southeast corner property of Eggert Road and Niagara Falls Boulevard
- Southeast corner property of Maple Road and Niagara Falls Boulevard
- Northwest corner property of Maple Road and Sweet Home Road
- UB Jacobs A parking lot east of Flint Entrance and north of Augspurger Road
- UB parking lot on NW corner of Lee Road and Audubon Parkway
- Northeast corner of Audubon Parkway and Gordon Yaeger Drive
- Property north of the I-990 and Audubon Parkway interchange

The contractor would be responsible for verifying and identifying any additional staging areas and may consider staging construction equipment and materials within the Project corridor, if applicable and available.

At-Grade Configuration

An at-grade configuration would position the LRT Build Alternative and the BRT Build Alternative at the same level as the existing ground surface. The LRT Build Alternative would be primarily at-grade with the exception of the tunnel from Main Street to Kenmore Avenue and the underground configuration at the Maple Road and Sweet Home Road intersection. The BRT Build Alternative would be at-grade for the entire route. To accommodate the transit guideway, reconfiguration or reconstruction of streets would be required along Niagara Falls Boulevard,

Maple Road, Sweet Home Road, Mary Talbert Way, and John James Audubon Parkway. Street reconstruction activities would be required at proposed at-grade crossing locations and within the affected street right-of-way, and would allow for track or busway construction, crossing gates or safety warning systems, and traffic signals. Street reconfiguration and reconstruction activities would also provide beneficial infrastructure modifications to the existing intersection geometry, street curbs, gutters, medians, and sidewalks to accommodate the at-grade configuration of both Build Alternatives. Construction of the at-grade configurations would involve vehicular and pedestrian traffic detours, temporary lane closures, and temporary driveway closures. Additional temporary lane and roadway closures will be defined by the approved construction plans. The equipment utilized during construction would be consistent with street construction; pavement cutting machinery, excavators, and cranes necessary for at-grade construction.

Underground Configuration (LRT Build Alternative only)

The LRT Build Alternative will require the construction of the following underground configurations.

UNIVERSITY STATION

Construction of the underground portion of the LRT Build Alternative, running from the existing University Station, under Main Street and Kenmore Avenue would use the sequential excavation method (SEM) process. The SEM would utilize a combination of hard rock drill-and-blast methods to connect the tunneling section between Main Street and the existing end of the Metro Rail line, along with segments of cut-and-cover under Kenmore Avenue and Niagara Falls Boulevard. Any hard rock blasting would utilize the latest in strategic controlled explosive techniques that minimize construction impacts and include techniques such as predictive blast damage modeling and contour blasting. Contour blasting involves small-diameter and decoupled charges in a closely spaced and lightly weighted blasting pattern.

The SEM which would be used in the segment north of University Station and continue eastbound, then loop westbound at the intersection of Main Street and Kenmore Avenue, involves explosives and is typically performed using the following steps: drilling blast holes and loading them with explosives, detonating the blast followed by ventilation to remove blast fumes, removal of the blasted rock (mucking), dewatering existing underground water through piping, scaling crown and walls to remove loosened pieces of rock, installing initial ground support, and repeating the cycle; periodically advancing the construction ventilation systems and utilities.

The SEM process will be designed to control vibrations to within allowable limits as defined by the construction type (drywall / masonry / stone / historical structures / etc.) of nearby structures. Any controlled blasting will be performed by qualified blasting specialists using pre-construction surveys to identify baseline conditions. Test blasts to confirm vibrations and noise are within limits will occur, within the Project corridor, prior to production blasting. Instrumentation and a monitoring program will be established to record vibration and noise throughout blasting program.

Dewatering

Groundwater encountered during deep excavation activities will need to be properly tested and treated prior to discharge in accordance to state and federal regulations. Temporary water storage will be established to test groundwater as defined by the discharge and treatment protocols established by final construction plans. The tunnel design concept includes the construction of a low point pump station that would tie directly into the existing Metro Rail drainage system. The pump system will be designed to accommodate water volume. If the drainage system requires replacement to accommodate the increased volume, then the drainage system will be upgraded to handle the additional drainage needs associated with the construction of the proposed LRT Build Alternative tunnel.

KENMORE AVENUE AND NIAGARA FALLS BOULEVARD

Construction of the underground portion of the LRT Build Alternative, running under Kenmore Avenue and Niagara Falls Boulevard would use a cut-and-cover tunnel method. The alignment would continue west and then make a tight turn north from Kenmore Avenue onto Niagara Falls Boulevard. The LRT Build Alternative alignment would continue underground on Niagara Falls Boulevard until emerging from a portal near the intersection of Niagara Falls Boulevard and Kenilworth Avenue.

Cut-and-cover is a method of construction for shallow tunnels where a section is first excavated and then covered with a temporary deck for traffic while the permanent tunnel roof is constructed. Equipment for the underground configuration would include large-diameter augers for drilling, dewatering of existing underground water, excavators, cranes, trucks for hauling materials and equipment, and concrete mixers.

MAPLE ROAD AND SWEET HOME ROAD INTERSECTION (LRT BUILD ALTERNATIVE ONLY)

The LRT Build alternative would traverse under the intersection of Maple Road and Sweet Home Road through the construction of a structured underground configuration. Construction is expected to include excavation of shallow bathtub sections and bridges and/or structures to facilitate vehicle travel over the track. Equipment for the grade separation would include large-diameter augers for drilling, excavators, cranes, trucks for transporting materials and equipment, and concrete mixers.

Trackwork Installation (LRT Build Alternative only)

Light-rail track construction for the LRT Build Alternative would include the installation of the fixed-guideway elements, such as ballast, ties, rail, track embedment (non-ballasted), train signals and the OCS. The OCS includes poles, support hardware, and wires. These items would be placed in construction staging areas throughout the corridor to minimize haul distances and facilitate construction. All construction staging areas would be the responsibility of the contractor.

Busway Installation (BRT Build Alternative only)

Busway construction for the BRT Build Alternative would include installing the dedicated bus guideway elements. Similar to roadway construction, this would include subgrade preparation,

paving, striping, and signage. Construction equipment and materials would be placed in construction staging areas throughout the corridor to minimize haul distances and facilitate construction. All construction staging areas would be the responsibility of the contractor.

Stations

Ten stations would be constructed along the Project alignment. Stations for both the LRT Build Alternative and the BRT Build Alternative would be similar as they would provide platforms for level entry onto transit vehicles. Construction of the LRT Build Alternative at-grade stations would construct the 300-foot long high level station platforms, along with stairs and ramps. Station furnishings, including canopies, railings, lighting, seating, signage, bike racks, and fare vending equipment, would be installed. For the BRT Build Alternative, the same type of construction would occur except that the platforms would be 150-feet long low-level station platforms. Construction of the stations would utilize equipment used in typical highway and building construction. The facility would require foundation construction by means of excavators, backhoes, concrete pumps, and vibrators. The platform and canopy construction would utilize cranes and concrete placing equipment.

Parking Facilities

Park-and-ride lots would be constructed at two proposed station locations for the Project, including the Boulevard Mall and I-990 Stations. Construction of the two park-and-ride surface facilities would involve initial demolition of each site where existing structures and pavement are present, subgrade preparation of the parking area, paving, and striping. Concrete curbs, lighting, driveways, sidewalks, and landscaping would be installed, as necessary. Construction would utilize excavation and grading equipment, asphalt pavers, rollers, and trucks for materials and equipment.

Access Modification of I-990 Offramp at John James Audubon Parkway

The Access Modification Report (AMR) provided within Appendix C3, "Access Modification Report" documents the proposed modifications to the roundabout recently constructed at John James Audubon Parkway and the Southbound I-990 ramps. The Project would need to modify the roundabout to implement a transit service along the Project alignment.

During conceptual design for the Project, the roundabout was constructed as part of the roadway improvements required for the construction of the Muir Woods Student Housing development. Safety concerns were identified related to the Project alignment traversing through the middle of the recently constructed roundabout, creating multiple points of conflicts between the Project and the traveling public. The Project will reconstruct the roundabout, shifting the roundabout to the west by approximately 60 feet. The Project will also install gates and signals to enhance the safety operations on the off ramp. A signage plan has also been developed identifying the proper signage required for the roundabout.

Light Maintenance/Storage Facility

North of the I-990 and John James Audubon Parkway interchange, the Project would include a storage facility to store either LRT vehicles or BRT vehicles overnight and perform end-of-line light maintenance and cleaning. Construction of the light maintenance and storage facility would utilize equipment used in typical highway and building construction. Light-rail tracks would also be installed for the LRT Build Alternative. The facility would require foundation construction by means of excavators, backhoes, concrete pumps, and vibrators. The building construction would utilize cranes and concrete placing equipment.

Construction Staging Area and Truck Routes

Staging areas would be used for storage of construction materials and equipment, location of temporary offices for field personnel, and fabrication of construction materials. For any parcel that would be identified as a staging area, site clearance and demolition of existing structures (as needed) would occur before major construction activity. Construction staging areas would be primarily located on acquired or leased sites characterized as industrial, commercial, or vacant. The Project will also temporarily utilize the Gateway Park for construction staging as described in Chapter 5, "Section 4(f)". Parcels to be fully acquired (none have been identified) will require the relocation of existing businesses and residences. Temporary construction easements (TCEs) would not impact existing buildings on the properties or change the primary function of the existing use. TCEs are temporary and would only be required for Project related construction activities, and the sites would be returned to preconstruction conditions once construction is completed. No parcels have been identified for full acquisition to be used for construction staging only.

Construction staging would be located on the proposed parking facility for the Boulevard Mall park-and-ride. This would be a permanent acquisition that would be converted from a construction staging to the Project to the park-and-ride facility to support operation of the Project. Coordination with the Town of Amherst and UB North Campus are on-going to identify publicly owned parcels for potential staging areas.

Staging areas associated with the tunnel blasting and well as cut-and-cover construction would also be used for storage and preparation of precast type segments, ventilation lines, shaft support (air, water, electricity), workshops, mixing and processing slurry for excavation, and post-excavation slurry treatment. Two sites have been identified, UB South Campus parking lot fronting Main Street, and the Northeast corner property of Kenmore Avenue and Niagara Falls Boulevard.

D3. CONSTRUCTION CONSEQUENCES OF THE BUILD ALTERNATIVES

This section summarizes the temporary impacts associated with Project construction activities. Typical construction-related impacts would include traffic, air quality, noise and vibration, contaminated soils, and hazardous materials. Construction impacts and corresponding mitigation strategies will be accounted for during preliminary and final design. Proposed mitigation strategies and adherence to applicable construction regulations will reduce the severity of temporary impacts to neighborhoods, businesses, and the natural environment.

D.3.1 Transportation

Construction of Project transportation capacity improvements, modifications, and operational improvements are described in Chapter 3, "Transportation." Temporary activities include the following:

- Temporary interruptions to transit, pedestrian, and bicycle traffic patterns.
- Temporary interruptions to vehicular traffic patterns.

Transit, Pedestrian, and Bicycle

Construction activities would result in temporary interruptions to transit service, as well as pedestrian, and bicycle traffic patterns. The following is a list of transit services, pedestrian, and bicycle interruptions anticipated as a result of Project construction:

- Existing Metro Rail service disruptions
- Metro Bus disruptions to routes 34, 44, 47, and 48, which are associated with Project tunnel construction (LRT Build Alternative only) along Main Street and Kenmore Avenue.
- Metro Bus disruptions to routes 34, 35, 49, 64, and 66 associated with Project alignment construction along Niagara Falls Boulevard, Maple Road, Sweet Home Road.
- Metro Bus disruptions to route 34 associated with Project alignment construction along John James Audubon Parkway.
- Pedestrian and bicycle disruptions along the Project alignment which are associated with construction.
- Disruptions and temporary detours of the Ellicott Creek Trail which are associated with Project alignment construction.

To mitigate these temporary construction impacts, Metro will direct contractor(s) to maintain safe public access to intersecting roads, residences, business establishments, adjacent property, bus stops, and pedestrian and bicycle facilities. These proposed mitigation strategies will be defined within the traffic management plan and incorporated within the final construction plans. Where sidewalks, walkways, trails or shoulders must be temporarily closed to facilitate construction, safe pedestrian and bicycle passage will be maintained on one side of the roadway, unless other temporary pedestrian accommodations are provided in the final design documents. Construction zone pedestrian access would be maintained in accordance with the Accessibility

Guidelines for Pedestrian Facilities in the Public Right of Way developed by the Architectural and Transportation Barriers Compliance Board.

Traffic

Careful planning during preliminary and final design would be required to reduce disruptions to traffic. A Construction Traffic Management Plan (CTMP) will be prepared prior to construction and will identify potential truck routes. As part of the CTMP, evaluation of key intersections will be conducted, as necessary, to identify potential mitigation measures required (e.g., signal timing improvements, temporary traffic control improvements, signage, etc.). Some access to residences and businesses could be limited temporarily, though access would be maintained to the extent possible. Additional traffic could be generated by construction workers for the hauling of construction materials and equipment, debris, and building materials. Work plans and schedules for hauling mass amounts of equipment and construction materials to and from the construction site will be staggered and planned for times when local traffic is off peak or limited. A summary of anticipated transportation construction impacts, and associated mitigation measures are provided in Table D-2.

Table D-2. Summary of Transportation Construction Impacts and Mitigation Measures

Construction Impact	LRT Build Alternative Mitigation	BRT Build Alternative Mitigation
Transit, Pedestrian and Bicycle Interruptions	▪ Direct Contractor to maintain safe pedestrian traffic and to maintain public access to intersecting roads, residences, business establishments, adjacent property, bus stops, pedestrians, and bicyclists. Where sidewalks, walkways, trails or shoulders must be temporarily closed to facilitate construction, safe pedestrian and bicycle passage will be maintained on one side of the roadway, unless other temporary pedestrian accommodations are provided in the contract documents. Construction zone pedestrian access would be maintained in accordance with the Accessibility Guidelines for Pedestrian Facilities in the Public Right of Way.	▪ Direct Contractor to maintain safe pedestrian traffic and to maintain public access to intersecting roads, residences, business establishments, adjacent property, bus stops, pedestrians, and bicyclists. Where sidewalks, walkways, trails or shoulders must be temporarily closed to facilitate construction, safe pedestrian and bicycle passage will be maintained on one side of the roadway, unless other temporary pedestrian accommodations are provided in the contract documents. Construction zone pedestrian access would be maintained in accordance with the Accessibility Guidelines for Pedestrian Facilities in the Public Right of Way.
Traffic Interruptions	▪ Development and execution of a CTMP. ▪ Establish milestone dates to minimize construction durations. ▪ Refine the construction staging plan to reduce the need for street closures and detours. ▪ Implement capacity and safety enhancements early in construction phase to reduce the impacts of later phases of the Project. ▪ Direct Contractor to shuttle construction workers from remote parking sites to construction areas, when reasonable.	▪ Development and execution of a CTMP. ▪ Establish milestone dates to minimize construction durations. ▪ Refine the construction staging plan to reduce the need for street closures and detours. ▪ Implement capacity and safety enhancements early in construction phase to reduce the impacts of later phases of the Project. ▪ Direct Contractor to shuttle construction workers from remote parking sites to construction areas, when reasonable.
Parking displaced by property easements	▪ Property owner compensation according to federal requirements dictated by the	▪ Property owner compensation according to federal requirements dictated by the

	Uniform Standards of Professional Appraisal Practice (USPAP) and Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, as codified in 42 USC Sections 4601 et seq., and the applicable implementing regulations set forth in 49 CFR Part 24 (collectively, "the Uniform Act"). ▪ Property owner compensation according to the NYS Eminent Domain Procedure Law and the Uniform Relocation Assistance and Real Property Acquisition Policies Act.	Uniform Standards of Professional Appraisal Practice (USPAP) and Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, as codified in 42 USC Sections 4601 et seq., and the applicable implementing regulations set forth in 49 CFR Part 24 (collectively, "the Uniform Act"). ▪ Property owner compensation according to the NYS Eminent Domain Procedure Law and the Uniform Relocation Assistance and Real Property Acquisition Policies Act.

D.3.2 Acquisitions and Displacements

Property acquisitions would be required for the LRT Build Alternative and BRT Build Alternative. Section 4.1, "Property Acquisitions and Displacements," provides a detailed list of the property acquisitions and displacements. For documentation regarding Gateway Park refer to Chapter 5, "Section 4(f)."

The contractor would be responsible for finalizing Project TCEs, potential staging areas, and negotiating with individual property owners to secure mutually agreeable terms of permission for their use. For the purpose of this Draft EIS, TCEs are assumed to occur within a five-foot buffer of the permanent Project alignment along Niagara Falls Boulevard and a ten-foot buffer of the permanent Project alignment for remainder of the corridor. Temporary activities include construction staging, materials stockpiling, hauling of dirt and materials, temporary street and lane closures, and temporary bike trail detours. To mitigate this temporary Project construction impact, property owners would be compensated according to local, state, and federal guidelines. Specifically, the NYS Eminent Domain Procedure Law and the Uniform Relocation Assistance and Real Property Acquisition Policies Act. A summary of anticipated temporary acquisitions and displacement construction impacts, and associated mitigation measures are provided in Table D-3.

Table D-3. Summary of Acquisition and Displacement Construction Impacts and Mitigation Measures

Construction Impact	LRT Build Alternative Mitigation	BRT Build Alternative Mitigation
Temporary activities include construction staging, materials stockpiling, and hauling of dirt and materials within final TCE	▪ Property owner compensation according to federal requirements dictated by the Uniform Standards of Professional Appraisal Practice (USPAP) and Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, as codified in 42 USC Sections 4601 et seq., and the applicable implementing regulations set forth in 49 CFR Part 24 (collectively, "the Uniform Act"). ▪ Property owner compensation according to the NYS Law and the Uniform Relocation Assistance and Real Property Acquisition Policies Act.	▪ Property owner compensation according to federal requirements dictated by the Uniform Standards of Professional Appraisal Practice (USPAP) and Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, as codified in 42 USC Sections 4601 et seq., and the applicable implementing regulations set forth in 49 CFR Part 24 (collectively, "the Uniform Act"). ▪ Property owner compensation according to the NYS Law and the Uniform Relocation Assistance and Real Property Acquisition Policies Act.

D.3.3 Land Use Considerations

Temporary land use changes are anticipated during the construction of the Project, resulting from easements needed for staging areas and construction access, and from temporary parking loss. Construction staging areas would be obtained as temporary construction easements, and where possible, staging areas would provide additional access points to the construction. Refer to Chapter 5, "Section 4(f)," for documentation related to temporary construction staging at the Gateway Park. If TCEs change short-term access to properties, alternative access would be provided to the extent feasible and practical. Construction activities would be temporary, and areas of the TCE would be returned to preconstruction conditions after construction is complete. Construction activities would not conflict with applicable regional land use plans, policies, and regulations. Temporary impacts to residential, commercial, industrial, community, and transportation land uses would include the presence and movement of construction machinery, equipment, building materials, temporary roads and access ways, construction cranes, temporary construction fences and screens.

A summary of anticipated temporary land use construction impacts, and associated mitigation measures are provided in Table D-4.

Table D-4. Summary of Land Use Impacts and Mitigation Measures

Construction Impact	LRT Build Alternative Mitigation	BRT Build Alternative Mitigation
Temporary activities include construction staging, construction access, temporary changes to access, and temporary parking loss	▪ As part of the final contractor agreement, construction incentives and disincentives to minimize construction durations will be provided as feasible and practical ▪ Require Contractor to maintain safe storage of construction materials and utilize construction barriers and tarps that are uniform and well maintained. ▪ Require that temporary construction lighting avoid glare that affects traffic on the roadway or that causes annoyance or discomfort for residences adjoining the alignment, when reasonable. ▪ Coordinate with emergency service providers as well as schools and hospitals near the construction zone to minimize the impact of construction activities on their operations. ▪ Require that there are no short-term temporary lane and/or shoulder closures during major holidays and major events.	▪ As part of the final contractor agreement, construction incentives and disincentives to minimize construction durations will be provided as feasible and practical ▪ Require Contractor to maintain safe storage of construction materials and utilize construction barriers that are uniform and well maintained. ▪ Require that temporary construction lighting avoid glare that affects traffic on the roadway or that causes annoyance or discomfort for residences adjoining the alignment, when reasonable. ▪ Coordinate with emergency service providers as well as schools and hospitals near the construction zone to minimize the impact of construction activities on their operations. ▪ Require that there are no short-term temporary lane and/or shoulder closures during major holidays and major events.

D.3.4 Economic Considerations

Local businesses would be affected by the construction of the Project due to temporary access restrictions, loss of parking and landscaping, business signage removal, traffic congestion, noise, dust, and aesthetic disruptions. Metro would provide local business owners with notification of traffic and parking interruptions and descriptions of alternative routes. Furthermore, attempts would be made to minimize the duration of disruptions.

A community education and outreach plan will be developed for the Project. As part of this plan, Metro will work with local businesses to develop a marketing plan to alert the public to the availability of these local businesses in attempt to reduce construction impacts. A summary of anticipated temporary economic construction impacts, and associated mitigation measures are provided in Table D-5. .

Table D-5. Summary of Economic Impacts and Mitigation Measures

Construction Impact	LRT Build Alternative Mitigation	BRT Build Alternative Mitigation
Temporary activities include construction staging, construction access, and temporary parking loss, access restrictions, loss of landscaping, loss of business signage, traffic congestion, noise, dust, and aesthetic disruptions	▪ Provide timely construction information regarding construction zones, traffic delays, road closures, and detours to the public, public agencies, emergencies services, and others. ▪ Direct Contractor to maintain safe and adequate public access to businesses for vehicles, pedestrians, and bicyclists. If access cannot be maintained, the Contractor would be required to notify the affected business in a timely manner and will be directed to conduct work in off peak business hours when reasonable. ▪ Direct Contractor to install temporary business signs to identify business entrances and to direct customers to affected businesses. ▪ Develop a strategic marketing plan to help reduce impacts to businesses during construction.	▪ Provide timely construction information regarding construction zones, traffic delays, road closures, and detours to the public, public agencies, emergencies services, and others. ▪ Direct Contractor to maintain safe and adequate public access to businesses for vehicles, pedestrians, and bicyclists. If access cannot be maintained, the Contractor would be required to notify the affected business in a timely manner and will be directed to conduct work in off peak business hours when reasonable. ▪ Direct Contractor to install temporary business signs to identify business entrances and to direct customers to affected businesses. ▪ Develop a strategic marketing plan to help reduce impacts to businesses during construction.

D.3.5 Neighborhoods and Communities

Construction of the Project would cause temporary impacts to community facilities (*e.g.,* police stations, fire stations, schools) due to access restrictions related to increased traffic congestion, lane closures, and detours. Community facilities immediately adjacent to Project construction which are anticipated to experience temporary construction related impacts include:

- St. Joseph University School
- Sweet Home Middle School
- University at Buffalo
- Jewish Heritage Day School
- CHC Learning Center
- Health Sciences Library at UB South Campus
- Libraries Annex – UB Facility
- Amherst Public Library – Audubon Branch
- Just for Kids Daycare
- Grace Point Alliance
- Cornerstone Community Church
- Kenilworth United Church
- Trinity United Methodist Church
- Christian Fellowship Baptist Church
- The Prayer Furnace at UB North Campus
- Amherst Police Department

- North Bailey Fire Company
- Kenilworth Fire Company
- Team Health Ambulatory Care Division

Accessibility to community facilities along the Project alignment could be affected during construction. Access to community facilities would be maintained during construction; however, detours could be required. Changes to accessibility would be temporary and a CTMP will be prepared to mitigate potentially adverse impacts.

The availability of alternative routes would maintain access to community facilities during construction. Alternative routes would be reasonably marked with clear signage for the community to follow. The temporary duration of construction periods would minimize the disruptions to the community facilities. Metro's local fixed bus routes would continue to operate during construction, but there would be temporary delays or route detours. Metro would provide early notification of any disruption of service.

A summary of anticipated community facility construction impacts, and associated mitigation measures are provided in Table D-6.

Table D-6. Summary of Community Facility Impacts and Mitigation Measures

Construction Impact	LRT Build Alternative Mitigation	BRT Build Alternative Mitigation
Temporary activities include access restrictions, increased traffic congestion, lane closures, and detours	▪ Provide construction incentives and disincentives to minimize construction durations. ▪ Require that temporary construction lighting avoid glare that affects or causes annoyance or discomfort for facilities adjoining the alignment, when reasonable. ▪ Coordinate with emergency service providers as well as schools and hospitals near the construction zone to minimize the impact of construction activities on their operations. ▪ Require that there are no short-term temporary lane and/or shoulder closures during major holidays and major events.	▪ Provide construction incentives and disincentives to minimize construction durations. ▪ Require that temporary construction lighting avoid glare that affects or causes annoyance or discomfort for facilities adjoining the alignment, when reasonable. ▪ Coordinate with emergency service providers as well as schools and hospitals near the construction zone to minimize the impact of construction activities on their operations. ▪ Require that there are no short-term temporary lane and/or shoulder closures during major holidays and major events.

D.3.6 Visual Resources

While the construction activities related to the Project would be highly visible, most would only temporarily affect the visual environment. Construction areas would be clearly marked with appropriate signage. Visual resources would be temporarily impacted by Project construction resulting from temporary removal of vegetation, presence and movement of construction machinery, equipment, building materials, temporary roads and access ways, construction cranes, temporary construction fences, construction screens, and construction site lighting. Furthermore, staging areas would be dispersed along the Project alignment and would require temporary access for the storage of equipment and materials. Subject to local regulation, nighttime construction could occur, and lights could affect residents within one or two blocks of construction or staging areas. Impacts from lights used during nighttime operations would be

minimized by aiming construction lights directly at the work area and shielding the lights to avoid disturbing nearby residences. Construction of the Project would also affect existing landscaping. Where the existing vegetation is altered or removed, vegetation or other screening would be restored to pre-construction conditions.

A summary of anticipated visual resource construction impacts, and associated mitigation measures are provided in Table D-7. .

Table D-7. Summary of Visual Resource Impacts and Mitigation Measures

Construction Impact	LRT Build Alternative Mitigation	BRT Build Alternative Mitigation
Temporary activities include removal of vegetation (including existing landscaping), presence and movement of construction machinery, equipment, building materials, temporary roads and access ways, construction cranes, temporary construction fences, construction screens, signage, and construction site lighting.	▪ Direct Contractor to minimize removal of existing vegetation, where applicable. In the event of vegetation removal for construction, the Contractor will replace the vegetation and return conditions equivalent to existing conditions. ▪ Direct Contractor to manage all surplus construction materials and waste generated in accordance with applicable federal, state, and local laws and regulations. ▪ Require Contractor to maintain safe storage of construction materials; remove construction waste and debris from the work site and dispose of waste containers at regular intervals; and utilize construction barriers that are uniform and well maintained. ▪ Require construction equipment to be stored at Project construction staging areas and construction staging areas to be well maintained and screened from view of sensitive land uses like residences, when reasonable. ▪ Require that temporary construction lighting be designed, installed, and operated to avoid glare that affects traffic on the roadway or that causes annoyance or discomfort for residences adjoining the alignment, when reasonable. ▪ Require that temporary construction signage be installed.	▪ Direct Contractor to minimize removal of existing vegetation, where applicable. In the event of vegetation removal for construction, the Contractor will replace the vegetation and return conditions equivalent to existing conditions. ▪ Direct Contractor to manage all surplus construction materials and waste generated in accordance with applicable federal, state, and local laws and regulations. ▪ Require Contractor to maintain safe storage of construction materials; remove construction waste and debris from the work site and dispose of waste containers at regular intervals; and utilize construction barriers that are uniform and well maintained. ▪ Require construction equipment to be stored at Project construction staging areas and construction staging areas to be well maintained and screened from view of sensitive land uses like residences, when reasonable. ▪ Require that temporary construction lighting be designed, installed, and operated to avoid glare that affects traffic on the roadway or that causes annoyance or discomfort for residences adjoining the alignment, when reasonable. ▪ Require that temporary construction signage be installed.

D.3.7 Historic and Cultural Resources

Built Resources

Temporary construction activities related to the Project would be highly visible, however most of them would only temporarily affect study area built historic resources. As defined in Section

4.7, "Historic and Cultural Resources," the following built historic properties have been identified and assessed for long-term Project impacts[1]:

- University at Buffalo South Campus
- Edmund B. Hayes Hall
- University Park Historic District
- University Presbyterian Church
- Charles and Rose Waldow House
- University Court Apartments
- Capen Boulevard Historic District
- Lincoln Park Village
- Marvin Gardens
- University at Buffalo North Campus

As stated within Section 4.7, "Historic and Cultural Resources," the project is not anticipated to impact these historic properties. Metro will ensure that all stipulations specified in the Project's Section 106 Memorandum of Agreement [UPDATE pending response from SHPO] are implemented. Metro will coordinate with the State Historic Preservation Office (SHPO), FTA, and the Advisory Council for Historic Preservation (ACHP) regarding the Project's temporary construction impacts on historic properties.

Archaeological Resources

Temporary construction activities related to the Project will include tunneling (LRT Build Alternative only), construction of the Project alignment, and construction of Project stations that will result in ground disturbances. As described in Section 4.7, "Historic and Cultural Resources," there are four general areas of archaeological potential along the Project alignment (from south to north):

- Portions of the UB South Campus.
- Undisturbed grassy areas and residential lawns within the Niagara Falls Boulevard TCE.
- Portions of the UB North Campus.
- Deeply buried habitable landforms beneath portions of John James Audubon Parkway.

In a response letter dated January 25, 2024, SHPO requested a Phase 1B archaeological testing plan. A Phase 1B archaeological investigation and its findings will be included within the Final EIS. As documented in Appendix F5, "Archaeological Testing Work Plan," A Phase 1B testing plan was submitted to SHPO for review and comment on February 16, 2024. The findings of the Phase 1B Field Investigation will determine the presence or absence of archaeological resources in this area.

If archaeological resources are present, and if they meet the eligibility requirements of the NRHP, then Metro will coordinate with SHPO regarding the completion of a Phase II Site Evaluation and Phase III Data Recovery—or another form of mitigation developed in consultation with the New York State Office of Parks, Recreation and Historic Preservation and

[1] Sources: NFTA-Metro, Metro Rail Expansion Project: Historic Resources Report (2020); Cultural Resource Information System, New York State, https://cris.parks.ny.gov; Jennifer Walkowski, Historic Preservation Program Analyst, Survey and National Register Unit – Western NY Region to Rachel Maloney Joyner, "Re: FTA Metro Rail Expansion Construction Project Amherst, Tonawanda and Buffalo, Erie County, NY, 19PR01900," April 29, 2020. Information included in the table reflects known available information.

other consulting parties—that mitigates the unavoidable effects of a project by recovering the data value of the resource.

On May 17, 2024, an unanticipated discoveries plan was submitted to SHPO for review and comment (Appendix F5, "Archaeological Testing Work Plan"). The unanticipated discoveries plan describes coordination and protective actions that would occur in the event of the discovery of an archaeological resource during construction and the roles of construction personnel, the timing of notifications and consultation with the SHPO and other consulting parties, and protective actions that would be taken until the significance of the discovery can be assessed. If required, FTA will enter into a Project-specific Memorandum of Agreement to provide stipulations for future investigations and ways to avoid, minimize, or resolve any adverse effects to archaeological resources as a result of the construction of the Project. As needed, the FTA will continue to consult with the SHPO and other consulting parties to develop the Memorandum of Agreement and identify additional measures and responsibilities to avoid, minimize, and mitigate potential adverse effects to archaeological resources.

A summary of anticipated historic resource construction impacts and associated mitigation measures are provided in Table D-8. .

Table D-8. Summary of Archaeological Resource Impacts and Mitigation Measures

Construction Impact	LRT Build Alternative Mitigation	BRT Build Alternative Mitigation
Ground disturbances as a result of the construction of Project tunnels, alignment, stations, and other ancillary or supporting Project infrastructure	▪ The Project will continue to survey for the presence of archaeological resources in advance of Project construction. ▪ Implement all stipulations specified in the Project's Memorandum of Understanding. Coordinate with SHPO and FTA regarding the Project's impacts on archaeological resources. ▪ Direct Contractor to manage and implement the stipulations of the unanticipated discoveries plan in the event of the discovery of an archaeological resource during construction.	▪ The Project will continue to survey for the presence of archaeological resources in advance of Project construction. ▪ Implement all stipulations specified in the Project's Memorandum of Understanding. Coordinate with SHPO and FTA regarding the Project's impacts on archaeological resources. ▪ Direct Contractor to manage and implement the stipulations of the unanticipated discoveries plan in the event of the discovery of an archaeological resource during construction.

D.3.8 Parks and Recreational Resources

Temporary construction activities related to the Project will include tunneling (LRT Build Alternative only), construction of the Project alignment, and construction of Project stations that would temporarily affect park and recreational resources. Temporary impacts as a result of Project construction activities would include the following:

- Temporary interruptions to vehicular, pedestrian, and bicycle traffic patterns due to the presence and movement of construction machinery, equipment, building materials, temporary roads and access ways, construction cranes, temporary construction fences and screens.
- Tunnel construction for underground Project segments at Gateway Park (LRT Build Alternative only).

- Staging area for Project alignment construction located at Gateway Park that would require temporary occupancy for the storage of equipment and materials.
- Temporary interruptions to pedestrian and bicycle patterns at Ellicott Creek Trailway as the Project alignment is constructed.

A summary of anticipated park and recreational resource construction impacts, and associated mitigation measures are provided in Table D-9. .

Table D-9. Summary of Park and Recreational Resource Impacts and Mitigation Measures

Construction Impact	LRT Build Alternative Mitigation	BRT Build Alternative Mitigation
Temporary disturbances to parks and recreational facilities because of the construction of Project tunnels only for the LRT Build Alternative, alignment, stations, and other ancillary or supporting Project infrastructure.	▪ Provide construction incentives and disincentives to minimize construction durations. ▪ Require Contractor to maintain safe storage of construction materials; remove construction waste and debris from the work site and dispose of waste containers at regular intervals; and utilize construction barriers that are uniform and well maintained ▪ At Gateway Park, direct Contractor to follow all stipulations required by Metro and the Town of Amherst as it relates to returning the park to existing conditions (if not improved) after Project construction is complete. ▪ Direct Contractor to minimize removal of existing vegetation, where applicable. In the event of vegetation removal for construction, the Contractor will replace the vegetation and return conditions equivalent to existing conditions. ▪ Require that temporary construction lighting be designed, installed, and operated to avoid glare that affects park and recreational users or that causes annoyance or discomfort, when reasonable. ▪ Direct Contractor to maintain safe public access to park and recreational resources, when reasonable. Where sidewalks, walkways, or shoulders must be temporarily closed to facilitate construction, safe pedestrian passage be maintained on one side of the roadway, unless other temporary pedestrian accommodations are provided in the contract documents. ▪ Construction zone pedestrian access would be maintained in accordance with the Accessibility Guidelines for Pedestrian Facilities in the Public Right of Way. ▪ Direct Contractor to include specific provisions for pedestrian and bicycle	▪ Provide construction incentives and disincentives to minimize construction durations. ▪ Require Contractor to maintain safe storage of construction materials; remove construction waste and debris from the work site and dispose of waste containers at regular intervals; and utilize construction barriers that are uniform and well maintained. ▪ At Gateway Park, direct Contractor to follow all stipulations required by Metro and the Town of Amherst as it relates to returning the park to existing conditions (if not improved) after Project construction is complete. ▪ Direct Contractor to minimize removal of existing vegetation, where applicable. In the event of vegetation removal for construction, the Contractor will replace the vegetation and return conditions equivalent to existing conditions. ▪ Require that temporary construction lighting be designed, installed, and operated to avoid glare that affects park and recreational users or that causes annoyance or discomfort, when reasonable. ▪ Direct Contractor to maintain safe public access to park and recreational resources, when reasonable. Where sidewalks, walkways, or shoulders must be temporarily closed to facilitate construction, safe pedestrian passage be maintained on one side of the roadway, unless other temporary pedestrian accommodations are provided in the contract documents. ▪ Construction zone pedestrian access would be maintained in accordance with the Accessibility Guidelines for Pedestrian Facilities in the Public Right of Way. ▪ Direct Contractor to include specific provisions for pedestrian and bicycle

Construction Impact	LRT Build Alternative Mitigation	BRT Build Alternative Mitigation
	access to Ellicott Creek Trailway during construction of the Project Alignment along John James Audubon Parkway. Where applicable and practical, this will include information on available detours, trail alternatives, and signage.	access to Ellicott Creek Trailway during construction of the Project Alignment along John James Audubon Parkway. Where applicable and practical, this will include information on available detours, trail alternatives, and signage.

D.3.9 Geology, Soils, and Prime Farmlands

Temporary construction activities related to the Project would include tunneling (LRT Build Alternative only), construction of the Project alignment, construction of Project stations, sub stations (LRT Build Alternative only), park and ride facilities, and storage and light maintenance facility that would temporarily affect geology, and soils. Temporary impacts as a result of Project construction activities would include the following:

- Tunnel construction for underground Project segments (LRT Build Alternative only).
- Construction of at-grade alignment configurations
- Construction of proposed stations, storage and light maintenance facility, and supporting systems and infrastructure

Geology

Using data collected from boring samples documented in the Geotechnical Data Report (Appendix G3, " Geotechnical Data Report"), blasting is not expected to impact geology due to low gradient of bedrock, and well-drained, densely packed overburden. During final design, the Project will conduct additional analyses to confirm geologic impact as a result of tunnel construction. Tunnel construction (SEM and cut-and-cover) would occur below Kenmore Avenue and Niagara Falls Boulevard. This portion of the study area is defined by the transition from the underline Akron dolostone to the Camillus shale. Underground configuration construction of the LRT Build Alternative alignment through the intersection of Maple Road and Sweet Home Road is underlain by well-drained soils and Salina group shale, dolostone, salt, and gypsum.

The vertical alignment of the SEM tunnels was selected to minimize the unpredictable fractured Camillus, utilize the preferential ground properties of the Bertie formation, and minimize disturbance due to tunnelling including groundwater inflow and stability. Minimal grouting is anticipated and will be further assessed during preliminary and final design. Dewatering requirements and mitigation, during both construction and operation of the tunnels, has not been assessed at this time but will be included in the preliminary and final design. In addition, potential settlement impacts and development of settlement mitigation plans will be further assessed during preliminary and final design.

Due to the optimization of the alignment, systematic grouting is not anticipated; however, localized grouting may be required to support the tunnels and to reduce water ingress. Water ingress for the SEM tunnels will be addressed in the preliminary and final design with localized

pumping, as required. The need for tunnel grouting and lining will be assessed further during the preliminary and final design of the tunnels.

The presence of sulfide gas will be investigated during preliminary and final design. If the investigation confirms the existence of sulfide gas, appropriate excavation methods and techniques will be implemented. Spoils from the excavation will be managed through the SMMP, and gas within the excavation's water laden with analytes that include sulfates, sulfides, and chlorides, will be treated as required by the local municipal sewer agency. Additionally, a ventilation and monitoring system will be designed in accordance with OSHA standards and all applicable state and federal requirements to ensure worker and public safety.

Tunnel-wide dewatering for the SEM tunnels or construction of the cut and cover structure has not been assessed at this time but will be included in the 30% design. Localized dewatering will be required during construction to account for shallow groundwater table, weather, and localized conditions. There would be some groundwater inflow as a result of the cut and cover structure excavation; however, this will be mitigated with sumps for localized groundwater inflow. Impacts due to groundwater inflows, such as recharge rate or anticipated inflow volume, will be addressed during preliminary and final design. Tunnel lining will be designed to control water inflow.

Cut and cover construction would also take place for the grade-separated portion of the LRT Build Alternative alignment through the intersection of Maple Road and Sweet Home Road (underlain by well-drained soils and Salina group shale, dolostone, salt, and gypsum), where the alignment would traverse under the intersection. Design of this portion of the LRT will include the same identification and assessment of geologic issues as presented for the tunnel portion from the existing University Station, under Main Street and Kenmore Avenue.

Soils

Erosion and suitability for construction are the primary concerns with respect to soils. Erosion would be the primary potential impact during construction because soils would be exposed to wind, rain, and other erosive forces. Subsection 4.18.4.9, "Geology, Soils, and Prime Farmlands" contains further discussion of these impacts.

Soil types and their limitations for construction would be evaluated in detail during final design. Detailed geotechnical investigations would be conducted to assess soil characteristics along the Project alignment, so that construction techniques and environmental safeguards can be developed to address any limitations. Any areas of soil exposed during construction would be revegetated. Soil stabilization techniques would be used in work areas, both during and after construction, to prevent potential sedimentation of nearby waterways. Sediment and erosion controls and stormwater maintenance facilities would be implemented in accordance with the 2010 Western New York Stormwater Coalition Stormwater Management Plan as well as all

applicable state and federal permit requirements.[2] In addition, a Dust Control Plan that includes pro-active measures to prevent discharge of dust into the atmosphere will be developed. As such, erosion would not be a substantial concern during construction of the Project.

A summary of anticipated geology, soils, and prime farmlands resource construction impacts and associated mitigation measures are provided in Table D-10.

Table D-10. Summary of Geology, Soils, and Prime Farmlands Resource Impacts and Mitigation Measures

Construction Impact	LRT Build Alternative Mitigation	BRT Build Alternative Mitigation
Construction for underground Project segments (LRT Build Alternative only), at-grade alignment configurations, proposed stations, storage and light maintenance facility, and supporting systems and infrastructure	▪ Direct Contractor to execute SEM protocols for tunnel excavation and controlled blasting as defined by the final construction plans, including monitoring program. ▪ Direct Contractor to properly treat, manage, and dewater groundwater encountered during deep excavation activities in accordance to state and federal regulations. ▪ Direct Contractor to properly treat and manage contaminated soils and groundwater in accordance to state and federal regulations. ▪ Direct Contractor to execute safety protocols associated with the potential to encounter hydrogen sulfide gas encountered during excavation. ▪ Require the Contractor to develop and implement a Dust Control Plan that includes pro-active measures to prevent discharge of dust into the atmosphere. In areas not subject to traffic, apply products and materials including vegetative cover, mulch, and spray adhesives on soil surfaces to prevent airborne migration of soil particles. In areas subject to traffic, apply products and materials including water sprinkling, polymer additives, barriers, windbreaks, and wheel washing. ▪ Require sediment and erosion controls and stormwater maintenance facilities to be implemented in accordance with the 2010 Western New York Stormwater Coalition Stormwater Management Plan as well as all applicable state and federal permit requirements.	▪ Direct Contractor to properly treat and manage contaminated soils in accordance to state and federal regulations. ▪ Require the Contractor to develop and implement a Dust Control Plan that includes pro-active measures to prevent discharge of dust into the atmosphere. In areas not subject to traffic, apply products and materials including vegetative cover, mulch, and spray adhesives on soil surfaces to prevent airborne migration of soil particles. In areas subject to traffic, apply products and materials including water sprinkling, polymer additives, barriers, windbreaks, and wheel washing. ▪ Require sediment and erosion controls and stormwater maintenance facilities to be implemented in accordance with the 2010 Western New York Stormwater Coalition Stormwater Management Plan as well as all applicable state and federal permit requirements.

[2] Western New York Stormwater Coalition Stormwater Management Plan. 2010. *http://www2.erie.gov/environment/sites/www2.erie.gov.environment/files/uploads/pdfs/ECS_SWMP_2010.pdf/*

D.3.10 General Ecology and Wildlife Resources

Construction effects are temporary or short term in nature, such as the land disturbance and removal of vegetation associated with constructing the transit right-of-way and lighting, dust, and noise disturbances to wildlife from construction equipment. This subsection provides a conservative assessment of construction effects to natural resources. These effects may be reduced as design advances. A summary of anticipated general ecology and wildlife construction impacts and associated mitigation measures are provided in Table D-11. .

Ecological Communities

As described in Section 4.9, "General Ecology and Wildlife Resources", both Build Alternatives would affect approximately 38 acres. In addition to the operational impacts, the Build Alternatives would temporarily affect approximately 14 acres of land, which includes the TCE defined as a five-foot buffer of the permanent Project alignment along Niagara Falls Boulevard and a ten-foot buffer of the permanent Project alignment for remainder of the corridor. Ecological communities affected represent fragmented habitat as they are limited to maintained transportation right-of-way and are generally characterized by disturbance and non-native or invasive species.

In addition to the land identified for temporary disturbance during construction, the contractor would be responsible for identifying construction staging sites. It is expected that the contractor would seek out underutilized sites, such as vacant parcels or land currently used for surface parking. The study area contains disturbed habitats including terrestrial cultural, successional old field, successional shrubland, and floodplain forest ecological communities. Ecological communities are widespread and common in the region, and the use of these areas for construction staging would represent a negligible reduction in the coverage of these ecological communities within the region. Furthermore, it is expected that the contractor would select sites close to the construction zone that require minimal pre-construction preparation (e.g., clearing of vegetation and trees) and post-construction restoration (e.g., planting of trees), when practicable.

Anticipated in-stream impacts would take place across Bizer Creek, where a bridge would need to be constructed across the creek for the Project. Bizer Creek is dominated by non-native (including invasive) plants and the creek has been straightened and armored by the construction of concrete walls and concrete/stone creek bed, it does not reflect a native habitat. Construction of the bridge would result in the long-term loss of daylight exposure to approximately 225 linear feet of Bizer Creek. This loss of daylight is likely to result in a change in the aquatic flora and fauna species composition in the immediate area (under the bridge) and potentially downstream as a result of the potential for a change in water temperature due to shading. In addition, the vegetated stream banks will be converted to developed land in the area of the bridge.

During construction, measures (e.g., cleaning of construction equipment and proper transportation/disposal of soils containing invasive species) would be implemented to avoid the spread of invasive plant species that may occur in the disturbed ecological communities of these sites. Following construction, ecological communities would be restored to existing conditions

and would adapt to their localized habitat changes. Therefore, it is not anticipated that the temporary loss and long-term conversion of these ecological communities due to construction and operation of the project would result in significant adverse effects to the overall diversity and abundance of the currently present species.

Wildlife

Clearing of the previously mentioned communities as part of the construction would occur during construction of the Build Alternatives. These habitats are widespread and common in the region, and the use of these areas for construction staging would represent a negligible reduction in the amount of habitat available to wildlife in the area. Any reductions in the number of individuals inhabiting these communities would not affect the size or viability of their local populations and would not change the assemblage of wildlife species present. Overall, construction activities would not have adverse effects to wildlife at the population or community level. Because construction and operation of the LRT Build Alternative or BRT Build Alternative would not result in the direct take of birds, it would be in compliance with the Migratory Bird Treaty Act.

Noises generated during the construction (e.g., heavy machinery or generators) of the Project would be unlikely to affect wildlife in the study area due to high existing levels of noise and other human disturbance from automobile traffic and other sources. Wildlife communities in the study areas have been established under noisy existing conditions, and as such, are inherently disturbance tolerant. Visual and auditory disturbances during construction would potentially displace some individuals of some species from the immediate vicinity of the site of activity, but overall, construction activities would not be expected to increase levels of disturbance to the extent that there would be alterations in species assemblages or otherwise negative changes to wildlife communities in the surrounding area relative to the present state. Individuals that would potentially briefly relocate in response to the construction noise would be likely to easily acquire suitable alternative habitat given that comparable areas of terrestrial cultural communities, successional old field, and floodplain forest communities are abundant in the surrounding landscape. Overall, noises generated during construction would not be likely to affect wildlife within the vicinity of the study areas.

Threatened or Endangered Species

During construction of either Build Alternative, removal of approximately 60 trees is expected. The removal of trees would be limited to the winter hibernation period (November 1 to March 31) when northern long-eared bats would not be present. Metro has made the following preliminary effect determinations for Federally listed species with the potential to occur in the study area during the construction of either of the Build Alternatives: “May Affect, Not Likely to Adversely Affect” for northern long-eared bat. Coordination among FTA, USFWS and NYSDEC regarding Federally- and State-listed species is ongoing. A formal consultation will be conducted when Project construction effects are finalized.

Mussel species confirmed to occur in Ellicott Creek would not be impacted by either of the Build Alternatives. As currently designed, construction of the LRT Build Alternative and BRT Build Alternative would take place on already constructed in-stream piers, and new piers would not be constructed in the area where mussels are documented to occur. Construction equipment would be located on either side of the creek and would not be located within Ellicott Creek. However, if the design plans change and in-stream activities are required, appropriate mitigation measures will be developed, in consultation with the regulatory agencies, and implemented to ensure the mussel species are protected. Therefore, no permanent adverse effects to proposed threatened or endangered species are expected to result from either Build Alternative.

D.3.11 Water Resources

Temporary construction activities related to the Project will include tunneling (LRT Build Alternative only), construction of the Project alignment, and construction of Project stations that would temporarily affect water resources. Temporary impacts as a result of Project construction activities would include the following:

- Constructing the tunnel segments will require dewatering of groundwater during construction. In addition, it is anticipated that pumping or draining of groundwater would be required in the areas of tunnel operations as such the LRT Build Alternative tunnels would be designed to operationally handle groundwater. The dewatering water will be required to route through a settling basin and through temporary erosion and sediment control treatments prior to discharge to a sewer system.
- Project construction activities may occur in surface waters including bridges, culvert extension, and new stormwater outfalls with no increase in flow to the waterbody.
- As currently designed, construction impacts to Ellicott Creek are not anticipated. Bridge deck construction would take place on already constructed in-stream piers, and new piers would not be constructed in Ellicott Creek. Construction of this new deck would use construction equipment located on either side of the creek and would not be located within Ellicott Creek. Additional measures, such as construction netting would be used to capture construction debris and avoid its potential to fall within the Ellicott Creek. Stormwater will be treated for water quality and quantity controls as required by the stormwater design manual. If the design plans change and in-stream activities are required, appropriate mitigation measures will be developed, in consultation with the regulatory agencies, and implemented to ensure the water resource is protected.
- Impacts associated with the Bizer Creek bridge will be mitigated as required for permitting. Stormwater entering Bizer creek will have no increase in flow and be treated for water quality as required.
- Temporary construction and permanent operation impacts would occur in Federal and State-regulated wetlands. These temporary impacts would be a result of temporary disturbances that would be required to access work areas and additional right-of-way required to accommodate the project. During final design, impacts to regulated wetlands will be assessed

to determine avoidance, minimization, or mitigation measures. If there are jurisdictional wetlands and they cannot be avoided, NFTA would provide compensatory mitigation.

A summary of anticipated water resource construction impacts, and associated mitigation measures are provided in Table D-11.

Table D-11. Summary of General Ecology, Wildlife, and Water Resource Impacts and Mitigation Measures

Construction Impact	LRT Build Alternative Mitigation	BRT Build Alternative Mitigation
Construction activities will include tunneling (LRT Build Alternative only), construction of the Project alignment, and construction of Project stations, construction of a bridge across Bizer Creek, and other ancillary or supporting Project infrastructure that would result in short-term and long-term impacts to natural resources.	▪ Direct Contractor to conduct tree clearing during the winter hibernation period for Northern Long-Eared Bat. ▪ Direct Contractor to conduct tree clearing during, as much as possible, outside the migratory bird nesting season: ▪ Tree removal would be timed, as much as possible, to occur outside the migratory bird nesting season, which occurs generally from April 1–September 15 and as early as March 1 for some species. ▪ If tree removal must occur during the nesting season, two biological surveys would be conducted: one 15 days before and a second 72 hours before the construction. The surveys would be performed by a biologist and survey reports will document the presence or absence of any protected bird in TCE and any other such habitat within 300 feet of the construction work area. If a protected bird were found, surveys would be continued to locate any nests. If an active nest were located, construction within 300 feet of the nest would be postponed until the nest is vacated and juveniles have fledged and when there is no evidence of a second attempt at nesting. ▪ Avoidance measures would be incorporated into the design of the project, where feasible. If construction were to require removal of a protected tree, a permit would be required in accordance with applicable local codes and ordinances. ▪ After construction is complete, trees will be planted that are at least three inches in diameter and three to four feet in height. Planted trees would be maintained such that 90 percent are in good condition after 6 months and irrigation would be carried out until the tree is established. ▪ Direct Contractor to revegetate disturbed areas in accordance with a Landscape Restoration Plan to include native plant species. ▪ Disturbed areas not used for transportation infrastructure would be revegetated with species indigenous to	▪ Direct Contractor to conduct tree clearing during the winter hibernation period for Northern Long-Eared Bat. ▪ Direct Contractor to conduct tree clearing during, as much as possible, outside the migratory bird nesting season. ▪ Tree removal would be timed, as much as possible, to occur outside the migratory bird nesting season, which occurs generally from April 1–September 15 and as early as March 1 for some species. ▪ If tree removal must occur during the nesting season, two biological surveys would be conducted: one 15 days before and a second 72 hours before the construction. The surveys would be performed by a biologist and survey reports will document the presence or absence of any protected bird in the TCE and any other such habitat within 300 feet of the construction work area. If a protected bird were found, surveys would be continued to locate any nests. If an active nest were located, construction within 300 feet of the nest would be postponed until the nest is vacated and juveniles have fledged and when there is no evidence of a second attempt at nesting. ▪ Avoidance measures would be incorporated into the design of the project, where feasible. If construction were to require removal of a protected tree, a permit would be required in accordance with applicable local codes and ordinances. ▪ After construction is complete, trees will be planted that are at least three inches in diameter and three to four feet in height. Planted trees would be maintained such that 90 percent are in good condition after 6 months and irrigation would be carried out until the tree is established. ▪ Direct Contractor to revegetate disturbed areas in accordance with a Landscape Restoration Plan to include native plant species. ▪ Disturbed areas not used for transportation infrastructure would be

Construction Impact	LRT Build Alternative Mitigation	BRT Build Alternative Mitigation
	Western New York to the extent practicable in accordance with a landscape plan. ▪ Direct Contractor to use netting to capture construction debris and avoid its potential to fall within waterways. ▪ Require erosion and sediment controls in accordance with the 2016 New York State Standards and Specifications for Erosion and Sediment Control ("Blue Book") ▪ Require a Stormwater Pollution Prevention Plan that would meet the requirements of State Pollutant Discharge Elimination System General Permit for Stormwater Discharges from Construction Activity (GP-0-25-001). ▪ Direct contractor to follow the requirements of the NYSDOT Highway Design Manual, Chapter 8 Highway Drainage, specifically Inlet protection at existing stormwater inlets, sediment controls to prevent erosion and sediment from leaving the construction sites, dust control measures, spill prevention and containment measures, stabilized construction entrance/exits, and vegetative measures to stabilize exposed soils. ▪ Constructing the tunnel segments will require dewatering of groundwater. Monitoring wells were installed along the tunnel segments, as well as geotechnical subsurface soil conditions identifying the water table levels. The Project will be designed to protect adjacent structures from changes in groundwater flow and elevation. ▪ Yearly water table measurements will occur through final design and construction to continue to monitor relative pre-construction conditions to minimize changes in the water table levels. ▪ During construction, design requirements would limit the amount of dewatering as a protection measure, utilizing the yearly water table measurements. ▪ Depending on the volume of ground water to be removed during construction, groundwater would be removed via dewatering utilizing one of these methods: existing dewatering systems present within the existing Metro Rail system, centrifuges, filter presses, drying beds, sludge lagoons, or gravity and low-pressure devices. The groundwater would be pumped into the local sewer system or to a nearby water body under the State	revegetated with species indigenous to Western New York to the extent practicable in accordance with a landscape plan. ▪ Direct Contractor to use netting to capture construction debris and avoid its potential to fall within waterways. ▪ Require erosion and sediment controls in accordance with the 2016 New York State Standards and Specifications for Erosion and Sediment Control ("Blue Book") ▪ Require a Stormwater Pollution Prevention Plan that would meet the requirements of State Pollutant Discharge Elimination System General Permit for Stormwater Discharges from Construction Activity (GP-0-25-001). ▪ Direct contractor to follow the requirements of the NYSDOT Highway Design Manual, Chapter 8 Highway Drainage, specifically Inlet protection at existing stormwater inlets, sediment controls to prevent erosion and sediment from leaving the construction sites, dust control measures, spill prevention and containment measures, stabilized construction entrance/exits, and vegetative measures to stabilize exposed soils. ▪ Depending on the volume of ground water to be removed during construction, groundwater would be removed via dewatering utilizing one of these methods: existing dewatering systems present within the existing Metro Rail system, centrifuges, filter presses, drying beds, sludge lagoons, or gravity and low-pressure devices. The groundwater would be pumped into the local sewer system or to a nearby water body under the State Pollutant Discharge Elimination System (SPD) permit. ▪ Dewatering of groundwater will be tested, treated, and disposed in accordance with all applicable local, State, and Federal regulations. ▪ Direct Contractor to document and execute best management measures to protect surface waters such as turbidity curtains, cofferdams, and temporary piping or diversion of waterways for any in-water construction activities, as necessary, to maintain stream flow and minimize increases in suspended sediment. ▪ Require that new culverts intended to convey surface water have a minimum width of 1.25 x bankfull and would be embedded or three sided (open bottom) to

Construction Impact	LRT Build Alternative Mitigation	BRT Build Alternative Mitigation
	Pollutant Discharge Elimination System (SPD) permit. ▪ Dewatering of groundwater will be tested, treated, and disposed in accordance with all applicable local, State, and Federal regulations. ▪ Direct Contractor to document and execute best management measures to protect surface waters, such as turbidity curtains, cofferdams, and temporary piping or diversion of waterways for any in-water construction activities, as necessary, to maintain stream flow and minimize increases in suspended sediment. ▪ Require that new culverts intended to convey surface water have a minimum width of 1.25 x bankfull and would be embedded or three sided (open bottom) to allow for passage of aquatic organisms and small terrestrial species. Provisions for wildlife passage will be incorporated in the culvert design where practicable. ▪ Require measures to reduce and avoid temporary fill placement in wetlands. Should temporary fill placement be unavoidable, these impacts would be included within the Section 401 and 404 permits and an Article 24 "Freshwater Wetlands" permit would be obtained from the USACE and NYSDEC. ▪ Require the Contractor to include erosion and sediment control practices during construction to protect wetlands within the Project study area. ▪ Require post-construction stabilization of the stream banks near in-water construction activities. The disturbed areas would be stabilized with erosion control matting (to prevent sediment from entering the creek) and planted with native riparian and upland vegetation (to prevent invasive species from colonizing and to further stabilize the embankment). ▪ Any wetlands that would be temporarily affected would be restored subsequent to construction following a soil and landscape restoration plan. Restoration measures would include restoring the grade to pre-construction (or better) conditions and seeding and planting native species, where applicable. ▪ Require Contractor to implement standard environmental protection practices for water quality. ▪ The contractor would schedule and conduct their work to minimize soil erosion, not cause or contribute to a	allow for passage of aquatic organisms and small terrestrial species. Provisions for wildlife passage will be incorporated in the culvert design where practicable. ▪ Require measures to reduce and avoid temporary fill placement in wetlands. Should temporarily fill placement be unavoidable, these impacts would be included within the Section 401 and 404 permits and an Article 24 "Freshwater Wetlands" permit would be obtained from the USACE and NYSDEC. ▪ Require the Contractor to include erosion and sediment control practices during construction to protect wetlands within the Project study area. ▪ Require post-construction stabilization of the stream banks near in-water construction activities. The disturbed areas would be stabilized with erosion control matting (to prevent sediment from entering the creek) and planted with native riparian and upland vegetation (to prevent invasive species from colonizing and to further stabilize the embankment). ▪ Any wetlands that would be temporarily affected would be restored subsequent to construction following a soil and landscape restoration plan. Restoration measures would include restoring the grade to pre-construction (or better) conditions and seeding and planting native species, where applicable. ▪ Require Contractor to implement standard environmental protection practices for water quality. ▪ The contractor would schedule and conduct their work to minimize soil erosion, not cause or contribute to a violation of water quality standards and prevent sedimentation on lands adjacent to or affected by the work.

Construction Impact	LRT Build Alternative Mitigation	BRT Build Alternative Mitigation
	violation of water quality standards and prevent sedimentation on lands adjacent to or affected by the work.	

D.3.12 Noise

As defined in Section 4.12, "Noise," the results of the operational noise analysis associated with the long-term operations of the Project are documented. Similarly, Project construction noise analysis adheres to the procedures outlined in the FTA *Transit Noise and Vibration Impact Assessment* (FTA Guidance Manual) for rail and bus-related noise impacts[3] Appendix D7, "Noise and Vibration Supplemental Information," provides more details on the procedures to determine operational and construction noise impacts.

Project construction activities associated with this noise assessment include the following:

- Extension of the existing rail tunnel including tunnel excavation and controlled blasting (SEM), cut-and-cover tunnel construction, and tunnel shaft construction (LRT Build Alternative only)
- Cut-and-cover construction of an underground configuration at the intersection of Maple Road and Sweet Home Road (LRT Build Alternative only).
- At-grade alignment configuration and station construction.
- Construction of electrical substations.
- Construction of a light maintenance/storage facility north of I-990.
- Construction activities that include on-site equipment at the construction staging areas, construction-related vehicles (e.g., delivery trucks, dump trucks, worker vehicles) traveling to and from the construction work areas.

LRT Build Alternative

Appendix D7, "Noise and Vibration Supplemental Information," describes the methodology used to determine construction noise impacts, including the assumptions on the potential layout of the construction staging sites; types, numbers, and usage of equipment on the construction sites; and potential worst-case truck volumes traveling on truck routes to and from the staging areas. For each construction work area, the distance from the construction work area to where construction noise would fall below FTA's general noise impact criteria was determined. Receptors within this the distances listed in this table would experience noise levels that exceed the evaluation criteria and would potentially experience construction noise impacts. While lower construction noise levels outside of these zones could be occasionally audible, they would not be considered an impact. Table D-12 summarizes the results of this construction noise analysis.

[3] *Transit Noise and Vibration Impact Assessment Manual.* 2018. Prepared by John A. *https://www.transit.dot.gov/sites/fta.dot.gov/files/docs/research-innovation/118131/transit-noise-and-vibration-impact-assessment-manual-fta-report-no-0123_0.pdf.*

Table D-12. General Construction Noise Assessment

Construction Activity/Location	Construction Noise Impact Zone (feet)[1]	Receptors in Zone?
Tunnel Cut-and-Cover (Kenmore Avenue)	40	No
Grade-Separated Cut-and-Cover (Sweet Home and Maple Roads)	40	Yes
Main Street Shaft Construction	35	No
Kenmore Ave/Niagara Falls Boulevard Staging Area	40	No
Typical At-Grade Track Work	40	No
Station Construction	38	Yes
Substation Construction	40	Yes
Light Maintenance/Storage Facility Construction	40	No
Truck Routes	35	No

Notes: [1]Distance at which predicted L_{max} would be at least 90 dBA per FTA General Construction Noise Analysis Method

Based on the construction noise analysis related to the LRT Build Alternative described above, the following section describes anticipated construction noise impacts of the LRT Build Alternative.

Tunnel Construction

Construction of the underground segments of the LRT Build Alternative would consist of a sequential excavation method (SEM) process that utilizes a combination of hard rock drill-and-blast methods to connect the tunneling section between Main Street and the existing end of the LRT line, along with segments of cut-and-cover construction; it would include a staging area on UB South Campus within the Allen Parking Lot near Main Street and Kenmore Avenue.

Drilling and blasting would consist of approximately one to two blasts per day followed by soils removal. Because the blasts would occur underground without line of sight to any receptors and would occur infrequently, this activity would not result in any noise impacts. The spoils removal would be achieved by use of trucks, which are discussed below.

The cut-and-cover tunnel construction would progress along the LRT Build Alternative alignment along Kenmore Avenue to the tunnel portal on Niagara Falls Boulevard between Kenilworth and Princeton Avenues. In addition, it would occur at the underground configuration at the Sweet Home Road and Maple Road intersection. Figure 1-3 shows that the noise reduction commitments included in the LRT Build Alternative would prevent construction noise from exceeding the FTA general construction noise impact criteria (i.e., L_{max} of 90 dBA for residential use) at a distance greater than 40 feet from the alignment. Figure 1-3 shows that adverse construction noise impacts are predicted at residences within 40 feet of tunnel cut-and-cover construction along Kenmore Avenue and Niagara Falls Boulevard.

Figure D-3. LRT Construction Noise Residential Adverse Impacts

At-Grade Track, Station, and Substation Construction

Construction of at-grade track would progress along the LRT Build Alternative alignment in multiple phases, resulting in periods of potential construction noise. The noise reduction commitments included in the LRT Build Alternative would prevent construction noise from exceeding the FTA construction noise impact criteria (40 feet from construction). No receptors (*e.g.,* residences) would experience noise levels that would constitute an impact from at-grade track construction. Consequently, at-grade track construction would not result in noise impacts.

Station and substation construction for the LRT Build Alternative would each be expected to occur over the course of less than one year. Construction noise would not exceed the FTA construction noise impact criteria (38–40 feet from construction). Some station or substation locations could have residences within this range, resulting in slight exceedances of the criteria during the most noise-intensive construction activities. However, due to the short duration of station and substation construction and the small magnitude of potential noise level exceedances, noise from construction of stations and substations would not constitute significant noise impacts.

Light Maintenance and Storage Facility

Because construction of the light maintenance/storage facility north of I-990 would not exceed FTA construction noise impact criteria (40 feet from this construction), no receptors would experience noise levels that would constitute an impact from this construction.

Construction Truck Routes

Construction trucks would typically utilize major roadways (*e.g.,* Main Street, Niagara Falls Boulevard, John James Audubon Parkway) to access construction work areas. Construction trucks would not result in noise levels exceeding the FTA construction noise impact criteria (35 feet from the travel lane). Because the roadways that would be used by construction trucks are wide, construction trucks would not come within this distance to residences; consequently, this would not result in construction noise impacts.

LRT BUILD ALTERNATIVE CONSTRUCTION NOISE IMPACT AND MITIGATION

For the LRT Build Alternative, the potential for adverse construction noise impacts was identified at receptors within 40 feet of station construction activity. While the construction noise analysis indicates that other receptors may experience noise levels from construction of the LRT Build Alternative that would be noticeable, these noises would not exceed FTA general construction noise impact criteria of 90 dBA L_{max} for residences, would occur over only a limited period, and would occur infrequently, not resulting in an adverse impact level. A summary of anticipated LRT Build Alternative noise construction impacts, and associated mitigation measures are provided in Table D-13.

Table D-13. Summary of LRT Build Alternative Noise Impacts and Mitigation Measures

Construction Impact	LRT Build Alternative Mitigation
LRT Build Alternative construction activities would include tunneling, construction of the Project alignment, and construction of Project stations, and other ancillary or supporting Project infrastructure that would result in construction related noise impacts.	▪ During Project final design and final construction plans, develop noise criteria and monitoring plan for noise impacts from tunneling to sensitive receptors to ensure there are no detrimental impacts. ▪ Coordinate work operation to coincide with time periods that would least affect neighboring residences and businesses. Normal work hours would be scheduled per municipal requirements and construction activities would be limited to 70dBA Lmax at 50' in Noise Sensitive Areas when reasonable (schools, places of worship, medical facilities, residential areas). ▪ Implement temporary construction noise abatement measures that would include shrouds or other noise curtains, acoustic fabric, soundproof housings, physical barriers, and/or enclosures to reduce noise from pile drivers, compressors, generators, pumps, and other loud equipment when reasonable. ▪ Restrict the use of impact and drilling equipment including pile drivers, jackhammers, hoe rams, core drills, direct push soil probes (e.g., Geoprobe), pavement breakers, pneumatic tools, and rock drills when reasonable. ▪ Require motorized construction equipment to be equipped with an appropriate well-maintained muffler and require silencers to be installed on both air intakes and air exhaust when reasonable. ▪ Require all construction devices with internal combustion engines to be operated with engine doors closed and with noise-insulating material mounted on the engine housing that does not interfere with the manufacturer guidelines. ▪ Direct Contractor to transport construction equipment and vehicles carrying rock, concrete, or other materials along designated routes that would cause the least disturbance to noise sensitive receptors when reasonable.

Construction Impact	LRT Build Alternative Mitigation
	▪ Require self-adjusting or manual audible back up alarms for vehicles and equipment used in areas adjacent to sensitive noise receptors. ▪ Direct Contractor to use pre-auguring equipment to reduce the duration of impact or vibratory pile driving when reasonable.

BRT Build Alternative Construction Noise Impact and Mitigation

The BRT Build Alternative is also anticipated to result in temporary constructions noise impacts related to the construction of an at-grade busway, stations, substations, light maintenance and storage facility, and construction truck routes. A summary of anticipated BRT Build Alternative noise construction impacts, and associated mitigation measures are provided in Table D-14.

Table D-14. Summary of BRT Build Alternative Noise Impacts and Mitigation Measures

Construction Impact	BRT Build Alternative Mitigation
BRT Build Alternative construction activities will include construction of the Project alignment, and construction of Project stations, and other ancillary or supporting Project infrastructure that would result in construction related noise impacts.	▪ Coordinate work operation to coincide with time periods that would least affect neighboring residences and businesses. Normal work hours would be scheduled per municipal requirements. Nighttime, Saturday morning, and Sunday construction activities would be limited to 70dBA Lmax at 50' in Noise Sensitive Areas when reasonable. ▪ Implement temporary construction noise abatement measures that would include shrouds or other noise curtains, acoustic fabric, soundproof housings, physical barriers, and/or enclosures when reasonable. ▪ Restrict the use of impact and drilling equipment including pile drivers, jackhammers, hoe rams, core drills, direct push soil probes (e.g., Geoprobe), pavement breakers, pneumatic tools, and rock drills when reasonable. ▪ Require motorized construction equipment to be equipped with an appropriate well-maintained muffler and require silencers to be installed on both air intakes and air exhaust when reasonable. ▪ Require all construction devices with internal combustion engines to be operated with engine doors closed and with noise-insulating material mounted on the engine housing that does not interfere with the manufacture guidelines. ▪ Direct Contractor to transport construction equipment and vehicles carrying rock, concrete, or other materials along designated routes that would cause the least disturbance to noise sensitive receptors when reasonable. ▪ Require self-adjusting or manual audible back up alarms for vehicles and equipment used in areas adjacent to sensitive noise receptors. ▪ Direct Contractor to use pre-auguring equipment to reduce the duration of impact or vibratory pile driving when reasonable.

D.3.13 Vibration

Section 4.13, "Vibration," presents the results of the operational vibration analysis of the Project, and this section describes the potential vibration impacts from construction. The FTA Guidance Manual for rail and bus-related noise impacts[4] outlines the procedures to identify vibration-sensitive receptors and their land use category and to determine vibration levels associated with the Project for comparison to the FTA impact criteria. Appendix D7, "Noise and Vibration

[4] *Transit Noise and Vibration Impact Assessment Manual.* 2018. Prepared by John A. *https://www.transit.dot.gov/sites/fta.dot.gov/files/docs/research-innovation/118131/transit-noise-and-vibration-impact-assessment-manual-fta-report-no-0123_0.pdf.*

Supplemental Information," provides more details on the procedures to determine operational and construction vibration impacts.

Construction could result in vibration from tunneling (LRT Build Alternative only), from construction work areas, at the staging areas used to facilitate construction, and along major truck routes to and from the construction work areas. Section 4.18.3, "Construction Methods," provides construction details for the Project.

Vibration Resulting From The COnstruction of the LRT Build Alternative

Appendix D7, "Noise and Vibration Supplemental Information," explains that construction-related vehicles (*e.g.,* delivery trucks, dump trucks, worker vehicles) do not generally create vibration levels that annoy people or damage buildings and therefore do not typically result in adverse construction vibration impacts. However, construction equipment operating within the LRT Build Alternative study area or in construction staging areas, as well as trucks carrying heavy loads, could produce perceptible vibration levels. The LRT Build Alternative construction equipment with the greatest potential to result in elevated vibration levels includes caisson drill rigs and loaded trucks, and Appendix D7 shows their vibration levels. Based on the general vibration analysis techniques described in the FTA Guidance Manual, the maximum vibration levels were identified for the equipment used in each construction area and compared to the vibration evaluation criteria shown in Appendix D7 for human annoyance and potential building damage.

CONSTRUCTION OF AT-GRADE ALIGNMENT CONFIGURATION

The nearest vibration receptors to the surface alignment construction work area would be the residences along Niagara Falls Boulevard (Receptors 5 and 6) and the Lockwood Memorial Library (Receptor 16). The residences would be as close as 52 feet to track construction, and the library would be as close as 43 feet. Caisson drilling would occur within all surface track work areas and could produce high levels of vibration. This vibration could be perceptible at distances of up to 63 feet and would exceed the threshold for human annoyance from vibration, although it would not result in damage to any buildings. Vibration would be perceptible to approximately 19 residences along Niagara Falls Boulevard for a very limited period. Because the drilling would not result in vibration that could damage buildings, and because the drilling would result in potentially annoying vibration for a very limited portion of construction activity, the drilling would not result in adverse construction vibration impacts. At other receptors—farther from the surface track construction work areas than the Niagara Falls Boulevard residences and Lockwood Memorial Library—vibration levels would be lower and would also not constitute adverse vibration impacts.

TUNNEL AND UNDERGROUND CONSTRUCTION

Section D.1.3 explains that construction of the tunnel segments of the LRT Build Alternative would consist of blasting and drilling as well as cut-and-cover construction. Vibration from blasting depends on geological conditions, depth, methodology, and other factors that must be evaluated at the time of construction. All blasting would occur underground, and the blasting

program would be carefully designed and monitored to minimize impacts, including noise and vibration impacts. The tunnel segment along which blasting and drilling would occur is between the existing University Station and at the intersection of Maple Road and Sweet Home Road. During final design, a Blast Management Plan will be developed providing detailed blasting sequences, operations, safety protocol, mitigation, and monitoring efforts. The Blast Management Plan will specify blasting design that would avoid producing vibration levels that could potentially result in damage in any nearby structures. The Plan will also specify vibration monitoring to confirm that vibration does not reach levels that would potentially result in damage. The only vibration-sensitive structure within 200 feet of the alignment of the tunnel where drilling and blasting would occur would be Allen Hall on the University of Buffalo South Campus. This building houses a performance space that could potentially be affected by ground-borne noise from drilling and blasting. The Blast Management Plan will include provisions to avoid blasting during times when this performance space would be in use. Because of the Blast Management Plan requirements described above, the tunnel blasting would not have an adverse impact at any receptors. No tunnel boring devices are anticipated at this time.

KENMORE AVENUE SHAFT

A construction access shaft on Kenmore Avenue would be constructed utilizing a variety of excavation equipment, including caisson drills, loaders, and heavy trucks. The shaft would take approximately six months to construct and would be utilized for approximately three years as a staging and material removal area for the tunnel construction. Caisson drilling could produce high levels of vibration near the shaft, and heavily loaded trucks could produce vibration at nearby receptors. No sensitive receptors are near the proposed shaft; however, residential receptors in the area that could experience heavily loaded truck traffic within 63 feet of Kenmore Avenue and Niagara Falls Boulevard could experience perceptible vibration for approximately three years. Truck traffic routes have not yet been established.

Vibration caused by caisson drilling or movement of heavily loaded trucks would be anticipated to generate ground-borne vibration levels up to 72 VdB (which is perceptible) at distances of up to 63 feet and would exceed the threshold for human annoyance from vibration, although it would not result in damage to any buildings. At residences greater than 63 feet from truck routes, vibration levels resulting from heavily loaded truck traffic would be neither perceptible nor have the potential to result in damage; consequently, these residences would not experience a vibration impact due to construction. At residences within 63 feet of truck routes, vibration may be perceptible during heavily loaded truck pass-by events but would still not have the potential to result in damage. Due to the limited duration of perceptible vibration resulting from heavily loaded truck traffic, and because it would not result in vibration at a level that could result in damage, vibration from construction would not rise to the level of a significant adverse impact at residences within 63 feet of truck routes.

WORK AREA – KENMORE AVENUE AND NIAGARA FALLS BOULEVARD

Construction activity in the property at the intersection of Kenmore Avenue and Niagara Falls Boulevard would include the use of excavation equipment, including caisson drills, loaders, and

trucks. The work area would initially be used to facilitate the cut-and-cover staging and material removal for the tunnel construction and would remain in use for approximately four years. Caisson drilling would have the greatest potential to produce high levels of vibration near the shaft. However, heavily loaded trucks could produce vibration at nearby receptors. Truck traffic routes would be determined during final design. Truck routes to and from this work area are anticipated along Kenmore Avenue and Niagara Falls Boulevard. While this vibration could be perceptible at distances of up to 63 feet, which would exceed the threshold for human annoyance, it would not result in damage to any buildings. At residences greater than 63 feet from truck routes, vibration levels resulting from heavily loaded truck traffic would be neither perceptible nor have the potential to result in damage; consequently, these residences would not experience a vibration impact due to construction. At residences within 63 feet of truck routes, vibration may be perceptible during heavily loaded truck pass-by events but would still not have the potential to result in damage. Due to the limited duration of perceptible vibration resulting from heavily loaded truck traffic, and because it would not result in vibration at a level that could result in damage, vibration from construction would not rise to the level of a significant adverse impact at residences within 63 feet of truck routes.

MAPLE ROAD AND SWEET HOME ROAD

Grade-separated or underground configuration of the LRT Build Alternative at the Maple Road and Sweet Home Road intersection would utilize cut-and-cover methodology. Caisson drilling could produce high levels of vibration near the shaft. However, heavily loaded trucks could also produce vibration at nearby receptors. Truck traffic routes have not yet been established. Truck routes to and from this area of grade-separated construction are anticipated along Maple Road and Sweet Home Road. While this vibration could be perceptible at distances of up to 63 feet, no sensitive receptors are within 63 feet of the Maple Road and Sweet Home Road grade-separated area. At residences greater than 63 feet from truck routes, vibration levels resulting from heavily loaded truck traffic would be neither perceptible nor have the potential to result in damage; consequently, these residences would not experience a vibration impact due to construction. At residences within 63 feet of truck routes, vibration may be perceptible during heavily loaded truck pass-by events but would still not have the potential to result in damage. Due to the limited duration of perceptible vibration resulting from heavily loaded truck traffic, and because it would not result in vibration at a level that could result in damage, vibration from construction would not rise to the level of a significant adverse impact at residences within 63 feet of truck routes.

STATION AND LIGHT MAINTENANCE AND STORAGE FACILITY CONSTRUCTION

During construction of the proposed stations and light maintenance/storage facility, caisson drilling—the most vibration-inducing construction activity proposed—would occur within the construction work areas and could produce high levels of vibration. This vibration could be perceptible at distances of up to 63 feet and would exceed the threshold for human annoyance from vibration, although it would not result in damage to any buildings. Because limited construction would occur within 63 feet of any receptor, vibration would be perceptible for only a very limited period of time. At residences within 63 feet of caisson drilling areas, vibration

may be perceptible during drilling but would still not have the potential to result in damage. Due to the limited duration of perceptible vibration resulting from caisson drilling, and because it would not result in vibration at a level that could result in damage, vibration from construction would not rise to the level of a significant adverse impact at residences within 63 feet of caisson drilling areas. At other receptors farther from the station construction work areas, vibration levels would be lower and would also not constitute adverse vibration impacts.

CONSTRUCTION TRUCK ROUTES

For both the LRT Build Alternative and BRT Build Alternative, construction trucks would typically utilize major roadways (*e.g.,* Main Street, Niagara Falls Boulevard, John James Audubon Parkway) to access construction work areas. Construction-related vehicles (*e.g.,* delivery trucks, dump trucks, worker vehicles) do not generally result in vibration levels that could damage buildings or annoy people and consequently do not typically result in adverse construction vibration impacts. However, heavily loaded trucks along truck routes could produce perceptible vibration levels. At residences greater than 63 feet from truck routes, vibration levels resulting from heavily loaded truck traffic would be neither perceptible nor have the potential to result in damage; consequently, these residences would not experience a vibration impact due to construction. At residences within 63 feet of truck routes, vibration may be perceptible during heavily loaded truck pass-by events but would still not have the potential to result in damage. Due to the limited duration of perceptible vibration resulting from heavily loaded truck traffic, and because it would not result in vibration at a level that could result in damage, vibration from construction would not rise to the level of a significant adverse impact at residences within 63 feet of truck routes

CONSTRUCTION VIBRATION IMPACT MITIGATION

Vibration from construction could result in slight exceedances of the FTA ground-borne vibration thresholds during the most vibration-intensive construction activities. While there is potential for vibration impacts at the nearest receptors and perceptible ground-borne noise at receptors nearest the portion of the tunnel where drill and blast methods would be used, the calculated vibration levels for the LRT Build Alternative are below the threshold for damage to extremely fragile/susceptible structures provided by the FTA Guidance Manual. Due to the short duration of construction activities causing vibration and the small magnitude of potential exceedances, vibration from construction of stations would not constitute significant vibration impacts.

Most construction-related vibration would be generated by caisson drilling and loaded trucks along routes to and from the construction work areas. Trucks would be routed to avoid passing by noise-sensitive land uses (*e.g.,* residences, schools, religious uses, open space, etc.) wherever possible.

As outlined in Appendix D7, “Noise and Vibration Supplemental Information,” at existing structures within 25 feet of vibration-intensive construction activity, vibration monitoring would be provided during construction to ensure that Peak Particle Velocity levels do not exceed the

acceptable thresholds. A summary of anticipated LRT Build Alternative noise construction impacts, and associated mitigation measures are provided in Table D-15.

Table D-15. Summary of LRT Build Alternative Vibration Impacts and Mitigation Measures

Construction Impact	LRT Build Alternative Mitigation
LRT Build Alternative construction activities will include tunneling, construction of the Project alignment, and construction of Project stations, and other ancillary or supporting Project infrastructure that would result in construction related vibration impacts.	▪ Project final design and construction plans will develop a Blast Management Plan detailing blasting sequences, operations, safety protocol, mitigation, and monitoring efforts. ▪ Project final design and construction plans related to tunneling will develop vibration criteria and monitoring plan for vibration impacts to existing structures within 25-feet of construction activities. Coordinate with UB to avoid blasting proximate to Allen Hall during use of the performance space in that building. ▪ Coordinate work operation to coincide with time periods that would least affect neighboring residences and businesses. Normal work hours would be scheduled per municipal requirements. ▪ Restrict the use of impact and drilling equipment including caisson drilling, jackhammers, hoe rams, core drills, direct push soil probes (e.g., Geoprobe), pavement breakers, pneumatic tools, and rock drills when reasonable. ▪ Direct Contractor to transport construction equipment and vehicles carrying rock, concrete, or other materials along designated routes that would cause the least disturbance to vibration-sensitive receptors when reasonable.

Vibration Resulting from the Construction of the BRT Build Alternative

Construction of the BRT Build Alternative would include station construction and construction of a light maintenance/storage facility. Like the LRT Build Alternative, on-site equipment at the construction staging areas could result in construction-related vibration in the surrounding areas. In addition, construction-related vehicles (*e.g.,* delivery trucks, dump trucks, worker vehicles) traveling to and from the construction work areas could also result in vibration along the truck routes.

STATION AND LIGHT MAINTENANCE AND STORAGE FACILITY CONSTRUCTION

During construction of the proposed stations and light maintenance/storage facility, caisson drilling—the most vibration-inducing construction activity proposed—would occur within the construction work areas and could produce high levels of vibration. This vibration could be perceptible at distances of up to 63 feet and would exceed the threshold for human annoyance from vibration, although it would not result in damage to any buildings. At residences within 63 feet of caisson drilling areas, vibration may be perceptible during drilling but would still not have the potential to result in damage. Due to the limited duration of perceptible vibration resulting from caisson drilling, and because it would not result in vibration at a level that could result in damage, vibration from construction would not rise to the level of a significant adverse impact at residences within 63 feet of caisson drilling areas. At other receptors farther from the station construction work areas, vibration levels would be lower and would also not constitute adverse vibration impacts.

CONSTRUCTION TRUCK ROUTES

For the BRT Build Alternative, construction trucks would typically utilize major roadways (*e.g.,* Main Street, Niagara Falls Boulevard, John James Audubon Parkway) to access construction work areas. Construction-related vehicles (*e.g.,* delivery trucks, dump trucks, worker vehicles)

do not generally result in vibration levels that could damage buildings or annoy people and consequently do not typically result in adverse construction vibration impacts. However, heavily loaded trucks along truck routes could produce perceptible vibration levels. At residences greater than 63 feet from truck routes, vibration levels resulting from heavily loaded truck traffic would be neither perceptible nor have the potential to result in damage; consequently, these residences would not experience a vibration impact due to construction. At residences within 63 feet of truck routes, vibration may be perceptible during heavily loaded truck pass-by events but would still not have the potential to result in damage. Due to the limited duration of perceptible vibration resulting from heavily loaded truck traffic, and because it would not result in vibration at a level that could result in damage, vibration from construction would not rise to the level of a significant adverse impact at residences within 63 feet of truck routes

CONSTRUCTION VIBRATION IMPACT MITIGATION

Vibration from construction could result in slight exceedances of the FTA ground-borne vibration thresholds during the most vibration-intensive construction activities. While there is potential for vibration and ground-borne noise impacts at the nearest receptors, the calculated vibration levels for the BRT Build Alternative are below the threshold for damage to extremely fragile/susceptible structures provided by the FTA Guidance Manual. Due to the short duration of construction activities causing vibration and the small magnitude of potential exceedances, vibration from construction of stations would not constitute significant vibration impacts.

Most construction-related vibration would be generated by loaded trucks along routes to and from the construction work areas. Trucks would be routed to avoid passing by noise-sensitive land uses (*e.g.,* residences, schools, religious uses, open space, etc.) wherever possible. A summary of anticipated LRT Build Alternative noise construction impacts, and associated mitigation measures are provided in Table D-16.

Table D-16. Summary of BRT Build Alternative Vibration Impacts and Mitigation Measures

Construction Impact	BRT Build Alternative Mitigation
BRT Build Alternative construction activities will include construction of the Project alignment, and construction of Project stations, and other ancillary or supporting Project infrastructure that would result in construction related vibration impacts.	▪ Project final design and construction plans will develop vibration criteria and monitoring plan for vibration impacts to existing structures within 25-feet of construction activities. ▪ Coordinate work operation to coincide with time periods that would least affect neighboring residences and businesses. Normal work hours would be scheduled per municipal requirements ▪ Restrict the use of impact and drilling equipment including caisson drilling, jackhammers, hoe rams, core drills, direct push soil probes (e.g., Geoprobe), pavement breakers, pneumatic tools, and rock drills when reasonable. ▪ Direct Contractor to transport construction equipment and vehicles carrying rock, concrete, or other materials along designated routes that would cause the least disturbance to vibration-sensitive receptors when reasonable.

D.3.14 Air Quality

Emissions from on-site construction equipment, on-road construction-related vehicles, diverted traffic during construction, and dust-generating construction activities during the construction of

the Project have the potential to affect air quality. Recognizing the potential air quality impacts of construction activities, Metro has identified construction mitigation commitments, which include not only its standard specifications but also measures identified specifically for this Project based on its proximity to sensitive land uses. These measures are shown in Table D-17.

Fugitive dust and engine exhaust emissions from equipment associated with the construction of the Project would occur during site preparation activities such as grading, installing curbs, or grubbing and removal of vegetation to prepare a site for construction. Impacts during construction would be primarily associated with emissions from on-road and non-road vehicles. The equipment producing these emissions could include haul trucks, concrete trucks, front-end loaders, excavators, cranes, drill rigs, compressors, flatbed trucks, and generators. Short-term exposure (i.e., 1-hour averaging period) to nitrogen dioxide (NO2) can worsen the effect of allergens in allergic asthmatics and can contribute to atmospheric discoloration. Long-term exposure (i.e., annual averaging period) can lead to increased respiratory symptoms and medication use in asthmatics, emergency room visits for asthma in children, hospitalization for respiratory and cardiovascular disease, and premature mortality. The Environmental Protection Agency has guidelines for controlling fugitive dust (by BMPs), diesel particulate emissions (by exhaust emission controls and use of low-sulfur fuels), and GHG emissions (by limiting equipment operations such as excessive idling and by using alternative fuels).

Construction activities can also result in traffic disruption, rerouting, and temporary shutdown of traffic. Traffic disruption, such as detours or decreased roadway capacity, can lead to increased traffic congestion, thereby increasing motor vehicle exhaust emissions on nearby roadways, and resulting in elevated localized pollutant concentrations. A summary of anticipated LRT Build Alternative and BRT Build Alternative construction air quality impacts and associated mitigation measures are provided in Table D-17.

Table D-17. Summary of Air Quality Impacts and Mitigation Measures

Construction Impact	LRT Build Alternative Mitigation	BRT Build Alternative Mitigation
Construction of underground (LRT Build Alternative only) and at-grade alignment configurations, proposed stations, storage and light maintenance facility, and supporting systems and infrastructure. Traffic disruption rerouting, and temporary shutdown of traffic as a result of construction activities.	▪ Direct Contractor to protect sensitive receptors including hospitals, schools, daycare facilities, building fresh air or ventilation intakes, elderly housing, and convalescent facilities from impacts of diesel exhaust fumes. As practical and feasible, the Contractor will: – Use Tier IV rated construction equipment – Ensure that diesel powered engines are located away from building air conditioners and windows. – Minimize exposure of sensitive receptors in close proximity (50') to diesel exhaust, in terms of both concentration and time. – Limit idling time for diesel powered equipment to three consecutive minutes for delivery and dump trucks	▪ Direct Contractor to protect sensitive receptors including hospitals, schools, daycare facilities, building fresh air or ventilation intakes, elderly housing, and convalescent facilities from impacts of diesel exhaust fumes. As practical and feasible, the Contractor will: – Use Tier IV rated construction equipment – Ensure that diesel powered engines are located away from building air conditioners and windows. – Minimize exposure of sensitive receptors in close proximity (50') to diesel exhaust, in terms of both concentration and time. – Limit idling time for diesel powered equipment to three consecutive minutes for delivery and dump trucks

Construction Impact	LRT Build Alternative Mitigation	BRT Build Alternative Mitigation
	and all other diesel-powered equipment with limited exceptions. ▪ Before construction and as site preparations are being made, direct Contractor to complete the following activities as warranted to minimize fugitive dust emissions: – Minimize land disturbance – Use watering trucks to minimize dust – Cover trucks when hauling dirt – Stabilize the surface of dirt piles if they are not removed immediately – Use windbreaks to prevent accidental dust pollution – Limit vehicular paths and stabilize temporary roads – Pave all unpaved construction roads and parking areas to road grade for a minimum length of 50 feet from where such roads and parking areas exit the construction site, to prevent dirt from washing onto paved roadways ▪ During construction, the Contractor will perform the following to minimize fugitive dust emissions: – Implement an OSHA-compliant Health and Safety Plan (HASP) for each construction site or a HASP for the entire Project – Cover trucks when transferring materials – Use watering trucks or dust suppressants such as calcium chloride on unpaved traveled paths – Minimize unnecessary vehicular and machinery activities and enforce onsite speed limits – Minimize dirt track-out by washing or cleaning trucks before leaving the construction site. An alternative to this strategy is to pave a few hundred feet of the exit road just before entering the public road ▪ After construction, the Contractor will perform the following to minimize fugitive dust emissions: – Revegetate any disturbed land that is not used – Remove unused material – Remove dirt piles – Revegetate all vehicular paths created during construction to avoid future off-road vehicular activities ▪ Direct Contractor to use solar powered digital signs, including arrow panels and portable variable message signs when reasonable.	and all other diesel-powered equipment with limited exceptions. ▪ Before construction and as site preparations are being made, direct Contractor to complete the following activities as warranted to minimize fugitive dust emissions: – Minimize land disturbance – Use watering trucks to minimize dust – Cover trucks when hauling dirt – Stabilize the surface of dirt piles if they are not removed immediately – Use windbreaks to prevent accidental dust pollution – Limit vehicular paths and stabilize temporary roads – Pave all unpaved construction roads and parking areas to road grade for a minimum length of 50 feet from where such roads and parking areas exit the construction site, to prevent dirt from washing onto paved roadways ▪ During construction, the Contractor will perform the following to minimize fugitive dust emissions: – Implement an OSHA-compliant Health and Safety Plan (HASP) for each construction site or a HASP for the entire Project – Cover trucks when transferring materials – Use watering trucks or dust suppressants such as calcium chloride on unpaved traveled paths – Minimize unnecessary vehicular and machinery activities and enforce onsite speed limits – Minimize dirt track-out by washing or cleaning trucks before leaving the construction site. An alternative to this strategy is to pave a few hundred feet of the exit road just before entering the public road ▪ After construction, the Contractor will perform the following to minimize fugitive dust emissions: – Revegetate any disturbed land that is not used – Remove unused material – Remove dirt piles – Revegetate all vehicular paths created during construction to avoid future off-road vehicular activities ▪ Direct Contractor to use solar powered digital signs, including arrow panels and portable variable message signs when reasonable.

Construction Impact	LRT Build Alternative Mitigation	BRT Build Alternative Mitigation
	▪ Implement an ambient air quality monitoring program during construction that will be overseen by Metro. The program would identify the locations and durations of ambient air quality monitoring and protocols to address any exceedances of National Ambient Air Quality Standards should they be observed. ▪ Develop and execute a CTMP. ▪ Establish aggressive completion and/or milestone dates to minimize construction durations. ▪ Refine the construction staging plan to reduce the need for street closures and detours. ▪ Implement capacity and safety enhancements early in construction phase to reduce the impacts of later phases of the Project. ▪ Direct Contractor to shuttle construction workers from remote parking sites to construction areas, when reasonable.	▪ Implement an ambient air quality monitoring program during construction that will be overseen by Metro. The program would identify the locations and durations of ambient air quality monitoring and protocols to address any exceedances of National Ambient Air Quality Standards should they be observed. ▪ Develop and execute a CTMP. ▪ Establish aggressive completion and/or milestone dates to minimize construction durations. ▪ Refine the construction staging plan to reduce the need for street closures and detours. ▪ Implement capacity and safety enhancements early in construction phase to reduce the impacts of later phases of the Project. ▪ Direct Contractor to shuttle construction workers from remote parking sites to construction areas, when reasonable.

D.3.15 Energy

Energy would be used for the production of the track, busway, and station components (including steel, cement, copper, and glass). Energy would also be used for the operation of construction equipment. Energy use by construction equipment would be localized and temporary. Construction of the Project would not have an impact on energy consumption in the Project area. Because the Project would not have an impact on regional energy consumption, no mitigation measures are proposed.

D.3.16 Hazardous Materials

Hazardous and contaminated material impacts during construction of the Project would typically result from the removal and transportation of material from the site or the discovery of previously unidentified materials during construction. To mitigate potential impacts, contract requirements will be consistent with federal, state, and local laws.

Materials necessary for construction that would be transported to the site would typically consist of native or manufactured materials. Manufactured materials would typically include concrete, metal components, reinforcing steel, fencing, or similar elements that would not contain hazardous or contaminated materials. Native materials incorporated into the construction would typically consist of borrow material or select material for use in embankments and mechanically stabilized retaining-wall type applications. As a precautionary measure, the contractor would be required to submit the sources and the appropriate testing for approval, in accordance with 6 NYCRR Part 360 series, which would prevent hazardous or contaminated materials from being incorporated into construction operations.

Phase II ESA Field Investigations in Advance of Construction

If Phase II ESA field investigations are required, such work would be performed during final design and in advance of Project construction when the disturbance areas are known. If the Phase II ESA field investigations identify contamination that may affect the Project, remediation will take place during the construction phase.

The presence of soil or groundwater contamination, or the existence of hazardous materials within existing or proposed rights-of-way, can adversely affect a transportation project's cost and schedule. Early identification of potential contamination sites provides valuable information for an alternative's design, right-of-way acquisition, and construction plans.

As the Project moves into final design, the anticipated site-specific construction impacts will be reviewed against the information found in the Phase I ESA report to allow for the preparation of a Detailed Site Investigation (*i.e.*, Phase II ESA)[5] and Soil Management Plan[6] for the Project, as needed.

A Phase II ESA generally involves intrusive investigations and sampling at a site identified as an environmental concern through the Phase I ESA. A Phase II ESA would be performed to determine the presence or absence of contamination or underground storage tanks, assist with developing remediation cost estimates, and select and develop procedures for protecting on-site workers and the adjacent public during remediation work.

The scope of the environmental investigation would include drilling investigations conducted with a direct-push "hydraulic" or rotary drilling rig to collect soil samples for retrieval and examination. Soil samples would be collected and analyzed using both Target Compound List and Target Analyte List parameters for volatile organic compounds, semi-volatile organic compounds, pesticides, herbicides, polychlorinated biphenyls, and metals including mercury, cyanide, and hexavalent chromium. If any of the results indicate that a soil sample has the potential to be hazardous, the sample would be further analyzed under Toxicity Characteristic Leaching Procedure methodology (EPA method 1311)[7] for the parameter(s) in question. This additional Toxicity Characteristic Leaching Procedure analysis would determine whether the sample meets the definition of a RCRA hazardous waste. The results of these field studies would provide information to develop environmental remediation cost estimates and to determine budgetary allowances that should be set aside for construction.

To identify how contamination discovered in the field would be addressed, the contractor would be required to prepare a site-wide Soil Management Plan prior to the start of work. The plan

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5 Detailed Site Investigation (a.k.a., Phase II ESA) - A Phase II Environmental Site Assessment is the second stage of a phased contaminated land assessment.

6 Soil Management Plan – A soil management plan addresses excavation, handling, and disposal of contaminated soil. This is also known as a Contaminated Material Handling Plan and can be found under Section 205 - Contaminated Soil in NYSDOT's Standard Specifications

7 Toxicity Characteristic Leaching Procedure (TCLP) methodology (EPA SW-846 method 1311) (*https://www.epa.gov/hw-sw846/sw-846-test-method-1311-toxicity-characteristic-leaching-procedure*).

would outline procedures to be followed any time evidence of contamination, or potential contamination, is suspected or identified. Once evidence of contamination is identified by the contractor in the field, an environmental monitor hired by the contractor would be on call to assist with the screening and management of soils that show signs of contamination (*i.e.*, strange or noxious odors, unnatural colors or sheen, odors characteristic of petroleum or solvent contamination, or elevated volatile vapor readings as measured by field screening instruments). These measures would assist with the protection of on-site workers, collection of any necessary samples, and segregation of contaminated from non-contaminated soil. Ambient air would be monitored by the contractor's environmental monitor for the protection of on-site workers, and soil screening would be performed through visual observations and use of a photoionization detector or similar instrument. The environmental monitor would follow the procedures described in a Field Organic Vapor Monitoring Plan[8] prepared by the contractor.

During site remediation work, there would be potential for an increase in business, residential, and local worker exposures to the materials being removed (*e.g.*, contaminated water and soil, the removal of identified petroleum bulk storage tanks and their associated products, etc.). A project Health and Safety Plan[9] would be required to be developed by the contractor that would identify the various known environmental remediation activities, as well as procedures to be followed in the event of an unidentified discovery. The plan would include the following:

- Preparation of a job hazard analysis of each identified task.
- Assistance with identifying procedures to protect on-site workers and the adjacent public.
- Description of the real-time monitoring of environmental field conditions and the collection of any necessary samples for laboratory analysis.
- Details regarding the procedures and regulations to be followed for the segregation, transport, and disposal of contaminated materials.

Elevated volatile vapor readings would be expected only near the active work zone and would be mitigated by using respiratory and other personal protective equipment, with equipment levels adjusted based on field measurements. In addition, perimeter work zone monitoring for volatile vapors and particulates would be conducted at downwind and upwind locations to verify that exposures are limited to adequately trained and protected personnel in the exclusion work zone. If elevated readings are recorded at the work zone limits, modifications—including the implementation of engineering controls, adjustment of the exclusion zone boundary, or temporary stoppage of work—would be employed.

However, not all contaminated sites exhibit signs of contamination, such as petroleum odors, unnatural colors or sheen, or elevated volatile vapor readings as measured by field screening

[8] Field Organic Vapor Monitoring Plan specifications can be found under Section 205 - Contaminated Soil in NYSDOT's Standard Specifications.

[9] A document which is site specific and includes all identified hazards, safe work procedures to mitigate, reduce & control the hazards identified in a project.

instruments. During construction, the contractor would closely review and characterize soils excavated from industrial and commercial sites identified as having the potential for contamination in order to coordinate their proper management and disposal (per 6 NYCRR Part 375 and 6 NYCRR Parts 360-369). The establishment and use of an excavated soil laydown yard(s) would be a necessary component of the Soil Management Plan to provide a means to stockpile and test soils suspected of contamination generated during construction of the LRT Build Alternative and the BRT Build Alternative. Materials associated with historical industrial property uses would be tested before releasing soils to the contractor as unclassified excavation.

Contaminated soils would be managed in areas identified for material stockpiles or directly loaded for transport to an approved landfill. Stockpiled soils would be placed on impervious pavement or polyethylene sheeting and covered with sheeting or an equivalent material, then properly weighted to prevent contaminated runoff from precipitation and the release of odors. Any soils stored in roll-off containers awaiting transport would be completely covered and secured with waterproof tarpaulins. During transport, contaminated soils would be covered to control dust emissions. Covering the materials during stockpile and transport would mitigate potential public exposure to dust and contamination.

Mitigation of hazardous waste and contaminated materials would result in the removal and proper disposal of contaminated materials that are excavated during construction and contamination identified within the right-of-way.

Hazardous Materials as a Result of Property Acquisition

As described in Section 4.1, "Potential Property Acquisitions and Displacements," the Project would be constructed in areas where there is insufficient right-of-way width. Therefore, implementing the Project could require acquiring property and, in some cases, could displace commercial and residential uses. Asbestos-Containing Materials (ACM) surveys for buildings that could be acquired for the Project have not yet been completed. During final design, an assessment of ACM will be completed.

All ACM surveys would be completed in accordance with the protocols established by the EPA and as required by NYSDOL ICR 56. Detailed ACM surveys would be prepared for the affected buildings as Metro finalizes purchase of each property. The inspections of each structure would be performed either under an agreement negotiated by Metro with the property owner during final design or after Metro finalizes purchase of the property. Properties owned by Metro can be inspected at any time.

Should the ACM survey reveal the presence of ACM, all removals would require special handling and disposal in accordance with NYSDOL ICR 56. During construction/demolition, ACM would be removed and transported to a licensed handling facility in accordance with Federal and State regulations.

Hazardous or Contaminated Materials Cleanup

The potential for encountering future contamination associated with sites affected by the LRT Build Alternative and the BRT Build Alternative would be reduced by cleanup actions conducted during construction. Operationally, maintenance and cleanup of any future releases would be performed in accordance with applicable State and Federal laws and standards.

With respect to potential ACM within the Project Corridor, NYSDOL ICR 56 requires suspect ACM that would be affected or disturbed by construction work to be sampled by a NYSDOL-certified inspector. This work would be initiated during preliminary and final design and negotiation of access and right-of-way agreements.

As noted in Section 4.16, "Hazardous and Contaminated Materials," based on preliminary site investigations, several locations could contain contaminated and hazardous materials requiring removal and remediation. For these operations, the contractor would be required to properly remove, contain, and transport the materials in accordance with the applicable regulations including 40 CFR 260-282, 300-355, and 6 NYCRR Part 370 Series. In addition, the contractor would be required to clean its vehicles to prevent off-site contamination.

Hazardous or Contaminated Materials as a result of Construction Operations

Construction operations that could discharge hazardous or contaminated materials would require on-site management and control measures so that contamination would not occur. These construction operations would include demolishing existing buildings that could contain materials such as lead or asbestos. The contractor would be responsible for removing, remediating, and disposing of any lead or asbestos contaminated materials encountered during construction activities in accordance with 40 CFR Part 61, sub-part M and Part 763, 29 CFR 1910.1001, and 12 NYCRR Part 56.

Accidental spills from equipment would be another source of potentially hazardous or contaminated materials during construction. These types of spills typically occur because of mechanical failure of the equipment, during refueling operations, or during maintenance and repair of the equipment. The contractor would be responsible for removing, remediating, and disposing of any accidental spills during construction in accordance with 6 NYCRR Parts 610-614.

The excavation of previously unidentified hazardous or contaminated materials during construction would be another potential source of impacts. An Unanticipated Contamination Discoveries Plan will be prepared to identify how contamination and potential contamination can be identified. Procedures for safely handling this potential circumstance would be included in the contract specifications, which would require conformance to the appropriate safety and environmental controls, including the containment and remediation of any potential contaminated materials. Environmental investigations could minimize the potential for encountering previously unknown contaminated materials.

Hazardous or Contaminated Materials Construction Impacts and Mitigation Measures

A summary of anticipated LRT Build Alternative and BRT Build Alternative construction impacts related hazardous or contaminated materials impacts and associated mitigation measures are provided in Table D-18.

Table D-18. Summary of Hazardous or Contaminated Materials Impacts and Mitigation Measures

Construction Impact	LRT Build Alternative Mitigation	BRT Build Alternative Mitigation
Construction activities that result in transport, removal and remediation, accidental spills, and discovery of previously unidentified hazardous or contaminated materials.	▪ Require the development of a detailed Site Investigation (*i.e.*, Phase II ESA)[10] and Soil Management Plan[11]. ▪ Direct Contractor to develop a Field Organic Vapor Monitoring Plan[12]. ▪ Direct Contractor to develop a Project Health and Safety Plan. ▪ Direct Contractor to submit native construction materials for the appropriate testing in accordance with 6 NYCRR Part 360 series. ▪ For the removal and remediation of contaminated sites, the Contractor will be required to properly remove, contain, and transport the materials in accordance with the applicable regulations defined in 40 CFR 260-282, 300-355, and 6 NYCRR Part 370 Series. In addition, the contractor would be required to clean its vehicles to prevent off-site contamination. ▪ Require the Contractor to manage discharge of hazardous or contaminated materials or accidental spills during construction according to 40 CFR Part 61, sub-part M and Part 763, 29 CFR 1910.1001, and 12 NYCRR Part 56 and 6 NYCRR Parts 610-614 regulations. ▪ During final design and before start of construction activities an Unanticipated Contamination Discoveries Plan will be developed.	▪ Require the development of a detailed Site Investigation (*i.e.*, Phase II ESA)[13] and Soil Management Plan[14]. ▪ Direct Contractor to develop a Field Organic Vapor Monitoring Plan[15]. ▪ Direct Contractor to develop a Project Health and Safety Plan. ▪ Direct Contractor to submit native construction materials for the appropriate testing in accordance with 6 NYCRR Part 360 series. ▪ For the removal and remediation of contaminated sites, the Contractor will be required to properly remove, contain, and transport the materials in accordance with the applicable regulations defined in 40 CFR 260-282, 300-355, and 6 NYCRR Part 370 Series. In addition, the contractor would be required to clean its vehicles to prevent off-site contamination. ▪ Require the Contractor to manage discharge of hazardous or contaminated materials or accidental spills during construction according to 40 CFR Part 61, sub-part M and Part 763, 29 CFR 1910.1001, and 12 NYCRR Part 56 and 6 NYCRR Parts 610-614 regulations. ▪ During final design and before start of construction activities an Unanticipated Contamination Discoveries Plan will be developed.

[10] Detailed Site Investigation (a.k.a., Phase II ESA) - A Phase II Environmental Site Assessment is the second stage of a phased contaminated land assessment.

[11] Soil Management Plan – A soil management plan addresses excavation, handling, and disposal of contaminated soil. This is also known as a Contaminated Material Handling Plan and can be found under Section 205 - Contaminated Soil in NYSDOT's Standard Specifications

[12] Field Organic Vapor Monitoring Plan specifications can be found under Section 205 - Contaminated Soil in NYSDOT's Standard Specifications.

[13] Detailed Site Investigation (a.k.a., Phase II ESA) - A Phase II Environmental Site Assessment is the second stage of a phased contaminated land assessment.

[14] Soil Management Plan – A soil management plan addresses excavation, handling, and disposal of contaminated soil. This is also known as a Contaminated Material Handling Plan and can be found under Section 205 - Contaminated Soil in NYSDOT's Standard Specifications

[15] Field Organic Vapor Monitoring Plan specifications can be found under Section 205 - Contaminated Soil in NYSDOT's Standard Specifications.

Utilities

The Project would conflict with and impact the following existing utilities as described in Section 4.17, "Utilities:"

- Electrical power utilities (underground and above ground, including poles)
- Telecommunications, including telephone, fiber, and cable (underground and above ground)
- Water and sewer mains
- Natural gas utilities
- Oil pipelines
- UB steam lines
- Traffic signals and communications

Construction equipment typically required for relocating utilities would include excavators, backhoes, trenchers, boring machines, trucks, cranes, generators, and compressors. Utility relocations in existing streets would require the demolition of pavement, sidewalks, and curbs where open trench construction would be employed. This work would require sawing or jack hammering, and concrete or asphalt construction methods. Jack-and-bore and tunneling methods would reduce the amount of demolition required and would typically be employed at major intersections and perpendicular crossings. The design of utility adjustments and relocations would be developed as part of the final construction plans. Prepared during the preliminary and final design, relocations would be addressed in the traffic control plans through lane closures or temporary road closures.

Utility conflicts mitigation techniques would be addressed typically via in-kind replacement. Overhead utilities could be relocated underground or to "utility corridors," which could be located between the back-of-curb and the outside right-of-way. Opportunity to collaborate with utility providers who have been considering utility upgrades to their systems will be defined.

To minimize scheduling conflicts and coordination issues during construction, the utility relocations would occur before major construction activities begin. This advance utility relocation would facilitate the subsequent construction and minimize delays required to resolve utility conflicts. A summary of anticipated LRT Build Alternative and BRT Build Alternative construction impacts related utilities and associated mitigation measures are provided in Table D-19.

Table D-19. Summary of Utility Impacts and Mitigation Measures

Construction Impact	LRT Build Alternative Mitigation	BRT Build Alternative Mitigation
Construction activities that result in the relocation or replacement of existing utilities.	▪ Develop a utility relocation plan during final design and require contractor to advance utility relocation or replacement before construction. ▪ Require Contractor to replace utilities in-kind if not improved from existing conditions, as warranted.	▪ Develop a utility relocation plan during final design and require contractor to advance utility relocation or replacement before construction. ▪ Require Contractor to replace utilities in-kind if not improved from existing conditions, as warranted.