Section 4.8
Geology, Soils, and Farmlands

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Acronyms and Abbreviations

BRT ..... Bus Rapid Transit
CY ..... Cubic Yards
EIS ..... Environmental Impact Statement
FPPA ..... Farmland Protection Policy Act
LRT ..... Light Rail Transit
Metro ..... Niagara Frontier Transit Metro System, Inc.
NRCS ..... Natural Resources Conservation Service
Project ..... Buffalo-Amherst-Tonawanda Corridor Transit Expansion
SMMP ..... Soil and Materials Management
UB ..... University at Buffalo

4. Environmental Consequences

4.8 GEOLOGY, SOILS, AND FARMLANDS

This section describes the potential environmental effects of the LRT Build Alternative and BRT Build Alternative on geology, soils, and farmlands. Appendix G1, "Detailed Geology, Soils, and Farmlands Supplemental Information" describes existing geology and soils and farmland prevalence within the study area. Impacts on geology and soils are primarily associated with temporary construction activities, which are discussed in Section 4.17, "Construction Effects." Table 4.8-1 summarizes the geology, soils, and farmland impact findings related to the Build Alternatives. No geology or soil impacts would occur as part of the No Build Alternative.

Table 4.8-1. Geology, Soils, and Farmlands - Impacts Summary

Resource	Geology		Soils and Farmlands	
	Permanent Effect	Mitigation	Permanent Effect	Mitigation
No Build Alternative	No impacts	No mitigation warranted	No impacts	No mitigation required

Resource	Geology		Soils and Farmlands	
	Permanent Effect	Mitigation	Permanent Effect	Mitigation
LRT Build Alternative	Impacts resulting from construction of the tunnels on UB South Campus and the underground segment at Maple Road and Sweet Home Road	Direct Contractor to execute sequential excavation method protocols for tunnel excavation and controlled blasting as defined by the final construction plans, including development of a monitoring program/mitigation plan. Direct Contractor to properly treat, manage, and dewater groundwater encountered during deep excavation activities 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.	Impacts would not be adverse	Direct Contractor to properly treat and manage contaminated soils in accordance with 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.

Resource	Geology		Soils and Farmlands	
	Permanent Effect	Mitigation	Permanent Effect	Mitigation
BRT Build Alternative	Impacts would not be adverse	No mitigation warranted	Impacts would not be adverse	Direct Contractor to properly treat and manage contaminated soils in accordance with 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.

4.8.1 No Build Alternative

No geology or soil impacts would occur as part of the No Build Alternative.

4.8.2 Build Alternatives

4.8.2.1 Geology

The construction of both the LRT Build Alternative and BRT Build Alternative would require excavation of earth material. Surface construction of at-grade portions of both Build Alternatives would displace excavated soil deposits up to five feet (detailed further in Section 4.17 "Construction Effects"). A geological investigation conducted in 2022 and 2023 (see Appendix G3 of this Draft EIS) did not identify any fills within their samples that qualifies as contaminated fill. However, given the urban nature of the Project corridor, there is the potential

for contaminated infill material. The excavated material from tunneling would be managed in accordance with a site-specific soil and materials management plan (SMMP).

From University Station, the LRT Build Alternative would extend underground for 0.8 miles under Kenmore Avenue and Niagara Falls Boulevard to the portal location. Construction of the underground portion of the LRT Build Alternative, running from the existing University Station, under Main Street and Kenmore Avenue would involve construction of two 16-foot-wide tunnels using 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. Drill-and-blast tunneling involves a systematic process of boring and explosive demolition that enables the efficient creation of tunnels. Specifically, the method involves drilling, where holes are meticulously drilled into the rock using advanced machinery tailored to the specific rock's hardness and composition, followed by blasting, where the holes are filled with explosives and detonated in a controlled manner. Cut and cover is the oldest method of tunnelling and involves the digging of a trench, construction of a tunnel, and then returning the surface to its original state. Approximately 193,000 cubic yards (CY) of material would be excavated to construct the tunnels for the LRT Build Alternative. All excavated material from tunneling would be managed in accordance with SMMP.

The vertical alignment of the SEM tunnels was selected to minimize placement of the tunnels in 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 30% design. In addition, potential settlement impacts and development of settlement mitigation plans will be further assessed during preliminary and final design.

Controlling groundwater is a significant consideration during the construction of cut and cover tunnels. The implementation of proper techniques can minimize the impact of potential settlement and the effect of ground water drawdown on the adjoining structures and facilities. These measures are assessed during the design phase and are implemented during construction and could include dewatering, watertight support of excavation system, permeation, jet grouting, and ground freezing.

Tunnel grouting and lining are also important methods in tunnel construction to ensure safety and stability. In general, grouting is used to prevent groundwater leakage and increase rock mass strength. It involves injecting a chemical agent or cement mass into the tunnel to fill cavities and achieve intimate contact between the geology and the tunnel liner. Lining refers to the tunnel structure that encloses the excavated area. It can be a single or double shell, and its design affects water tightness and ground pressure transfer. Grouting can be used to mitigate excessive deformation of tunnel linings in soft soils.

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.

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 likely be required during construction to account for shallow groundwater table and weather 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.

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.

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 Build Alternative 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.

Operation of both the LRT Build Alternative and BRT Build Alternative would be primarily on or within the existing transportation right-of-way and use industry standard construction practices and follow required safety measures. As a result, neither Build Alternative would result in permanent adverse impacts on soil resources; however, the LRT Alternative does involve geologic impacts resulting from construction of the tunnels on UB South Campus and the underground segment at Maple Road and Sweet Home Road. At this time, impacts associated with tunnel construction and operation (i.e., settlement, dewatering, and hydrogen sulfide) have not been assessed but will be included in the preliminary and final design. Specifically, Project design will incorporate features that would minimize ground settlement, groundwater impacts, and the potential to damage structures or infrastructure or expose people to risk of injury. Project impacts are detailed further in Section 4.17, "Construction Effects."

4.8.2.2 Soils and Farmlands

The LRT Build Alternative and BRT Build Alternative would be located primarily on or within existing transportation use areas. Soil types present within the Project's area of disturbance are presented in Table 4.8-2, along with their farmland classification. The Project area of disturbance is defined as the areas where the Project alignment would be located, and the area immediately adjacent required for construction of the Project. The Project would expand beyond the current transportation right-of-way in some locations where there are soils mapped as prime farmland and farmland of statewide importance. However, the Project study area is classified as urbanized area and therefore, the Farmland Protection Policy Act (FPPA) does not apply.

None of the properties that would be acquired under the LRT Build Alternative and BRT Build Alternative are currently used for farming, and the Build Alternatives would not result in any effects on active farmland. Therefore, Article 25-AA of New York State's Agricultural and Markets Law does not apply.

In order to minimize and mitigate impacts to soils during construction, a Dust Control Plan that includes pro-active measures to prevent discharge of dust into the atmosphere will be developed. In areas not subject to traffic, products and materials including vegetative cover, mulch, and spray adhesives will be applied on soil surfaces to prevent airborne migration of soil particles. In areas subject to traffic, products and materials including water sprinkling, polymer additives, barriers, windbreaks, and wheel washing will be implemented. In addition, sediment and erosion controls and stormwater maintenance facilities will be developed in accordance with the 2010 Western New York Stormwater Coalition Stormwater Management Plan as well as all applicable state and federal permit requirements.

The construction of the LRT Build Alternative and BRT Build Alternative and related construction activities are anticipated to have temporary impacts to soil. Section 4.17 "Construction Effects," defines these temporary construction-related impacts and required mitigation measures.

Table 4.8-2. Soils Located Within the Project Area of Disturbance

Class	Soil Name	Acres within the Area of Disturbance (LRT Build Alternative)	Acres within the Area of Disturbance (BRT Build Alternative)	Farmland Classification
CfB	Cayuga silt loam	6.47	6.47	All areas are prime farmland
CgB	Cazenovia silt loam	0	0	All areas are prime farmland
Ch	Cheektowaga fine sandy loam	0.71	0.71	Farmland of statewide importance
CoA	Churchville silt loam	3.29	3.32	Prime farmland if drained
CrA	Claverack loamy fine sand	0.16	0.16	All areas are prime farmland
CrB	Claverack loamy fine sand	0.99	0.99	All areas are prime farmland
CuB	Colonie loamy fine sand	0.60	0.60	All areas are prime farmland
Cv	Cosad loamy fine sand	11.21	11.21	Prime farmland if drained
ElA	Elnora loamy fine sand	0	0	All areas are prime farmland
ElB	Elnora loamy fine sand	0	0	All areas are prime farmland
FaB	Farmington channery loam	0	0	All areas are prime farmland
Ge	Getzville silt loam	0	0	Farmland of statewide importance
In	Ilion silt loam	0.53	0.54	Farmland of statewide importance
La	Lakemont silt loam	1.90	1.61	Farmland of statewide importance
Lb	Lakemont mucky silt loam	0	0	Farmland of statewide importance
LmA	Lima loam	0	0	All areas are prime farmland
Mh	Minoa very fine sandy loam	0	0	Prime farmland if drained
Ne	Newstead loam	0	0	Prime farmland if drained
Od	Odessa silt loam	5.27	5.77	Prime farmland if drained
OvA	Ovid silt loam	0	0	Prime farmland if drained
SaA	Schoharie silt loam	4.30	4.36	All areas are prime farmland
SaB	Schoharie silt loam	0.47	0.47	All areas are prime farmland
Sw	Swormville clay loam	0	0	Prime farmland if drained
Ud	Urban land	7.98	7.98	Not prime farmland
Uh	Urban land- Churchville complex	1.90	1.90	Not prime farmland
Ut	Urban land–Odessa complex	6.56	6.56	Not prime farmland
Uu	Urban land-Schoharie complex	0.23	0.23	Not prime farmland
Ux	Urban land-Wassaic complex	0	0	Not prime farmland
W	Water	0.28	0.28	Not prime farmland
WaA	Wassaic silt loam	0	0	All areas are prime farmland
WaB	Wassaic silt loam	0	0	All areas are prime farmland

Source: NRCS Web Soil Survey, Erie County, New York, Version 21, August 29, 2021. *https://websoilsurvey.sc.egov.usda.gov/app/WebSoilSurvey.aspx*

4.8.3 Potential Mitigation Strategies

The LRT Build Alternative will include incorporating a number of design measures into the final design, to avoid, minimize, or mitigate impacts to and from geologic or soil conditions, which Metro will implement during construction.

- Excavated material from tunneling would be managed in accordance with SMMP and any contaminated soils encountered during construction will be properly treated and managed in accordance to state and federal regulations.
- Localized dewatering will be required during construction to account for weather and localized conditions. Groundwater inflow resulting from tunnel construction will be mitigated with sumps for localized groundwater inflow. In addition, tunnel lining will be designed to control water inflow. Impacts due to groundwater inflows, such as recharge rate or anticipated inflow volume, will be addressed during preliminary and final design.

  Dewatering requirements and mitigation for both construction and operation of the tunnels has not been fully assessed at this time but will be included in the preliminary and final designs. In addition, potential settlement impacts and development of settlement mitigation plans as well as the need for tunnel grouting and/or lining will be further assessed during preliminary and final design.
- The presence of sulfide gas will be investigated during the preliminary and final design. If the investigation confirms the existence of sulfide gas, appropriate excavation methods and techniques will be implemented to mitigate potential impacts.
- To mitigate vibration impacts generated during excavation or other construction activities, Metro will implement a vibration monitoring program.
- Metro will implement soil erosion control measures where there is earth disturbance or pavement would be removed during construction to prevent adverse impacts to erodible soils. Construction will be performed in accordance with standards and specifications for selection, design, and implementation of erosion and sediment control practices contained in the latest version of New York State Guidelines for Urban Erosion and Sediment Control.

The BRT Build Alternative would not result in adverse impacts to geologic conditions. To minimize impacts to soil conditions, Metro will implement erosion control measures where pavement would be removed during construction to prevent adverse impacts to erodible soils. Construction will be performed in accordance with standards and specifications for selection, design, and implementation of erosion and sediment control practices contained in the latest version of New York State Guidelines for Urban Erosion and Sediment Control.