Appendix A-5: Appendix Chapter 5: Physical and Environmental Analysis

Appendix A-5: Appendix Chapter 5: Physical and Environmental Analysis is a companion document to the Supplemental Final Environmental Impact Statement containing Chapter 5 (Physical and Environmental Analysis). Metropolitan Council and the United States Department of Transportation - Federal Transit Administration are committed to ensuring that information is available in appropriate alternative formats to meet the requirements of persons who have a disability. If you require an alternative version of this file, please contact FTAWebAccessibility@dot.gov.

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A-5. Appendix Chapter 5: Physical and Environmental Analysis

Appendix A-5 presents information about the regulatory context and methodology used to evaluate long-term and construction impacts and defines study areas for each physical and environmental resource to supplement the analysis presented in Chapter 5. Topics covered include utilities; geology, soils, and topography; hazardous materials; water quality and stormwater; air quality and GHG emissions; and energy. For information about floodplains, wetlands, noise, vibration, and biological environment, refer to the respective technical reports.

A study area represents a geographic area used to identify resources and varies based on the resource being evaluated. The basis for each study area begins with the potential area of disturbance, which has been defined as the estimated area where construction would occur for the Project at this stage of design. In some cases, the study area extends beyond the potential area of disturbance to understand the potential extent of impacts on adjacent resources (for example, a wetland or waterway may extend beyond the potential area of disturbance). The study area considered for each area of analysis in this appendix is summarized in Table A5-1. Greater detail is provided in each section of this appendix.

Table A5-1 Defined Study Areas for the Physical and Environmental Analysis

Resource Evaluated	Study Area Definition	Basis for Study Area
Utilities	Within or adjacent to the LOD	Captures utilities within the LOD and adjacent utilities that could be affected
Floodplains	Within or adjacent to the LOD	Captures floodplain impacts to upstream and downstream waters directly adjacent to the LOD
Wetlands and Other Aquatic Resources	Within or adjacent to the LOD	The distance captures the wetlands that are within and directly adjacent to the Project Alignment
Geology, Soils, and Topography	Within and adjacent to the LOD	Estimated area where construction would occur for the Project
Hazardous Materials Contamination	500–550 feet on either side of the Project Alignment	ASTM standards (E1527-21 and 42 USC § 9601(35)(B)), as modified by MnDOT for transportation corridors
Noise and Vibration	Within 350 feet of the Project Alignment	Based on the screening distances provided in Chapters 4 and 9 of the FTA *Transit Noise and Vibration Impact Assessment Manual* (2018)
Biological Environment	Within ¼ mile of the LOD	The distance captures the habitat that is directly adjacent to the Project Alignment and the wildlife that could be affected by the Project
Water Quality and Stormwater	1 mile on either side of the Project Alignment for impaired waters; within the LOD for stormwater	NPDES requirements for identifying impaired waters within or sensitive resources within 1 mile of a project
Air Quality and GHG Emissions	All roadway segments adjacent to and crossing the Project Alignment including the OMF	Established in cooperation with MPCA
Energy	Anticipated changes in travel patterns and bus operations resulting from the Project	Total energy consumption of the Project measured in Btu (industry standard)

5.1 Utilities

The following section provides additional details about the regulatory context, methodology, and study area used to evaluate impacts on utilities resulting from the Project.

The Council's design of the Project will include an evaluation of potential utility conflicts and a determination of which utilities could be affected by the Project.

This section includes general information about existing public and private utilities. Major utility owners that service the study area have been contacted for existing utility information. It is expected that utility information will continue to be updated as the design is refined. This section is not intended to identify every utility that provides service in the study area, but it does address those that could be affected by the Project.

5.1.1 Regulatory Context and Methodology

The following sections provide context and summarize the methodology used to examine potential utility impacts from the Project.

5.1.1.1 Legal and Regulatory Context

The following is a representative summary of the laws, regulations, and guidelines that are associated with utility relocation and accommodation.

Federal

The following federal laws and guidelines are associated with utility relocation and accommodation:

- 23 USC §§ 123 and 109(l)(1)
- FTA's Project and Construction Management Guidelines (2016), Appendix F: Utility Relocation Agreements

State

The following State laws, regulations, and guidelines are associated with utility relocation and accommodation:

- MnDOT Policy OP002: Utility Accommodation on Highway Right of Way.
- MnDOT Utility Accommodation and Coordination Manual.
- Minnesota State Constitution Article 1, Section 13, addresses just compensation associated with private property that is taken, destroyed, or damaged for public use.
- Minn. Stat. 161.20, Subdivision 1, addresses the general powers of the commissioner to carry out the provisions of Article 14, Section 2, of the Minnesota State Constitution regarding the public highway system. Subdivision 2 addresses the commissioner's power regarding acquisition of property.
- Minn. Stat. 161.45 addresses utilities within highway rights-of-way that require relocation. This section describes rulemaking authority and utility owner interests when real property is conveyed.
- Minn. Stat. 161.46 addresses reimbursement of utility owners for the relocation of facilities. The section includes definitions and reimbursement requirements and describes provisions associated with a lump-sum settlement, acquisition of substitute property in which to relocate a utility, and relocation work by the State.
- Minn. Stat. ch. 216B addresses utilities that are located within right-of-way that is owned by cities. These utilities might be subject to an individual franchise agreement that provides the terms for which the utility companies may operate in the public right-of-way.
- Minn. Stat. 216D.04 addresses the Department of Public Safety's notice, plan, and locating requirements for excavation projects involving underground facilities.
- Minn. Stat. 222.37, Subdivision 2, addresses pipeline relocations.
- Minnesota Rules 8810.3100 to 8810.3600 address the utility permit process, standards for work conducted under permit, aerial lines, and underground lines.

- Minnesota Rules 4720.5100 to 4720.5590 sets standards for wellhead protection planning, which is administered by MDH's Well Management Program.

5.1.1.2 Methodology

The information provided in this Supplemental Final EIS focuses on identifying major potential utility conflicts and identifying mitigation activities that could address those conflicts. The process of inventorying existing utilities in the study area using information provided by the utility owners (identified below), field investigations, and from Gopher State One Call will continue throughout design development.

Utilities in the study area include public potable water, public wastewater and public/private stormwater collection and distribution facilities, private wells and Wellhead Protection Areas, private electric transmission and distribution lines, public/private telecommunications copper and fiber-optic data (hardware and conduit) lines and facilities, and private energy (fuel) transmission and distribution lines.

Information about sanitary sewer, storm sewer, and water mains (geographic information system [GIS] database files and engineering drawings) was compared to the Project Alignment to identify conflicts for the following public utility owners:

- City of Minneapolis
- City of Robbinsdale
- City of Crystal
- City of Brooklyn Park
- Hennepin County
- MCES
- MnDOT
- BNSF (formerly known as Burlington Northern Santa Fe Railway)

As of this Supplemental Final EIS, limited information has been obtained from private utility owners; ongoing identification of private utilities should continue through design development. Private utility owners anticipated within the study area are expected to include the following:

- Arvig
- AT&T Transmission
- CenterPoint Energy
- CenturyLink
- Comcast
- Enventis
- Integra Telecom Holdings
- NuStar Energy
- Rogers Telecom
- Sprint
- TDS Metrocom
- TTM Operating Corporation
- TW Telecom
- Verizon (MCI)
- Windstream
- Xcel Energy
- XO Communications
- Zayo

5.1.2 Study Area and Affected Environment

The study area for utilities is defined as the area within and directly adjacent to the LOD for the Project. The LOD are defined as the estimated area where construction would occur for the Project at this stage of design.

Several public and private utilities are present in the study area. The general locations of several of these utilities in relation to the Project are shown in Figure A5-1, Figure A5-2, and Figure A5-3 by cities.

Figure A5-1 Locations of Major Utilities in the City of Brooklyn Park

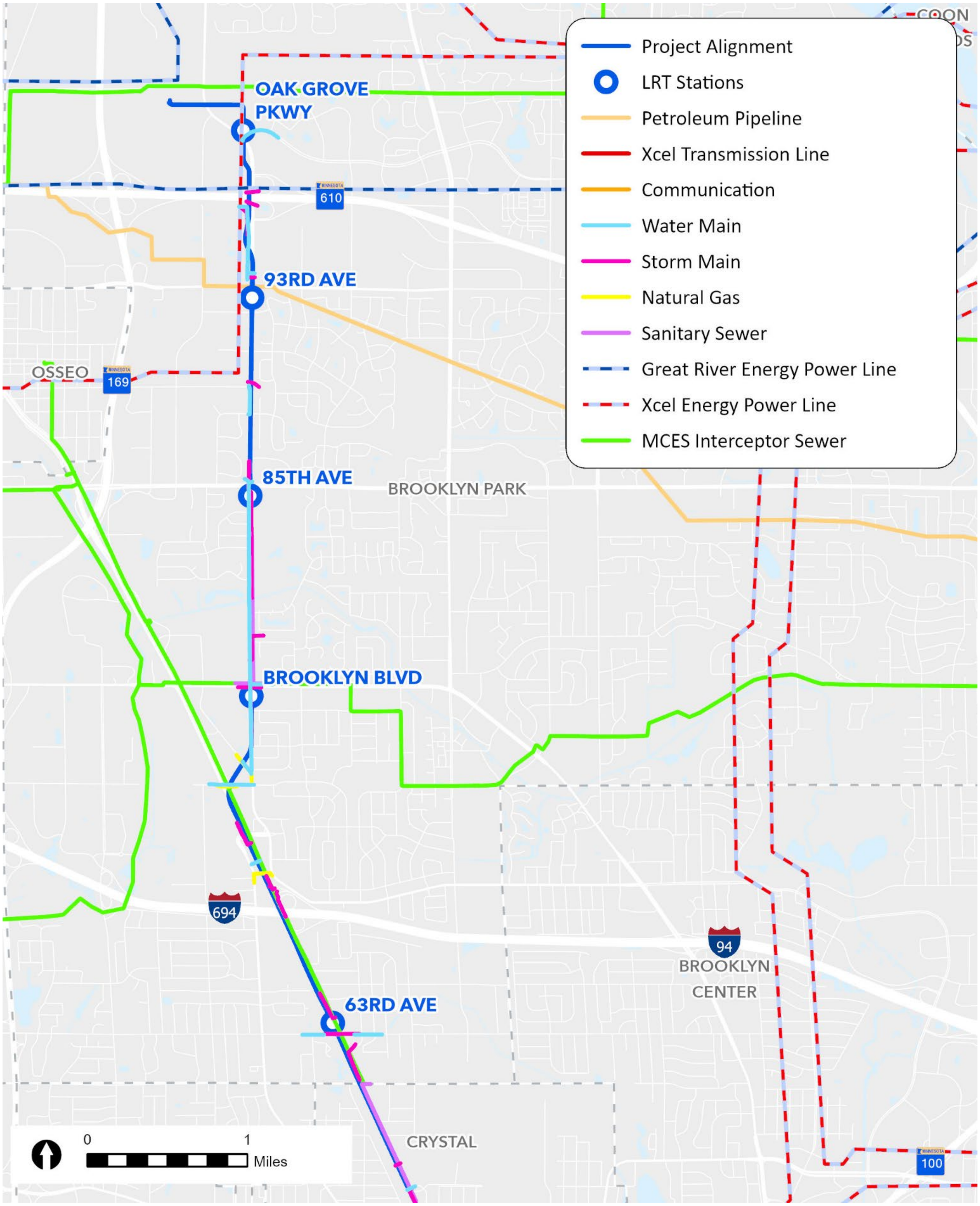
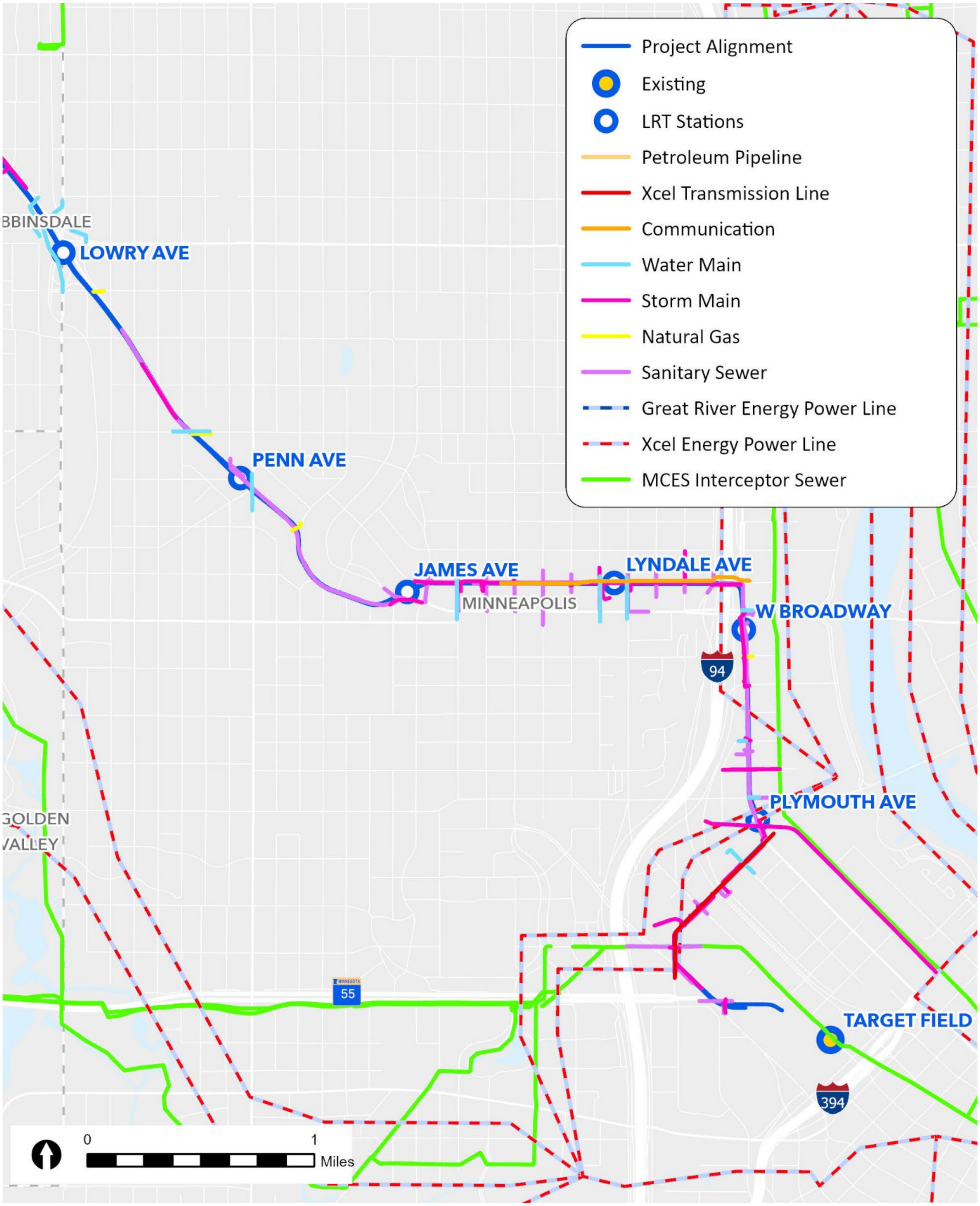


Figure A5-2 Locations of Major Utilities in the Cities of Brooklyn Park, Crystal, and Robbinsdale

Figure A5-3 Locations of Major Utilities in the City of Minneapolis



5.1.2.1 Existing Water Service

Existing water service in the study area is provided, maintained, and owned by the following entities:

- Joint Water Commission [ii]
- City of Brooklyn Park
- City of Crystal
- City of Robbinsdale
- City of Minneapolis

Water mains in the study area typically range from 6 to 16 inches in diameter. Larger mains (with a diameter of 20 inches or larger) crossing or running parallel to the project are shown in Table A5-2. At some locations, water mains with a 20-inch diameter or larger cross or run parallel to the study area.

Table A5-2 Significant Water Mains in Study Area

Water Main Description	City
24-inch-diameter water main on W Broadway Ave (CR 103) at 89th Ave N and Maplebrook Pkwy	Brooklyn Park
24-inch-diameter water main on W Broadway Ave south of 85th Ave N, parallel to the roadway	Brooklyn Park
20-inch-diameter water main on 63rd Ave N crossing CR 81	Brooklyn Park
16-inch-diameter water main on W Broadway Ave (CR 103) at Oak Grove Pkwy	Brooklyn Park
12-inch-diameter water main on W Broadway Ave (CR 103) crossing the alignment twice near 94th Ave N	Brooklyn Park
18-inch-diameter water main on W Broadway Ave (CR 103) at Brooklyn Blvd	Brooklyn Park
12-inch-diameter water main on W Broadway Ave (CR 103) at 75th Ave N and along W Broadway Ave	Brooklyn Park
24-inch-diameter water main crossing CR 81 on the south side of CR 9	Robbinsdale
48-inch-diameter steel pipe water main north of Theodore Wirth Pkwy crossing under the Lowry Ave bridge	Robbinsdale/Minneapolis
24-inch-diameter water main on Penn Ave from north of W Broadway Ave to south of W Broadway Ave	Minneapolis
36-inch-diameter water main on Aldrich Ave from N 21st Ave to 11th Ave N	Minneapolis

Twenty-eight private wells[iii] are located within the study area. These wells are identified in Table A5-3 and Figure A5-4. Portions of the study area are also located in Drinking Water Supply Management Areas and Wellhead Protection Areas, as shown in Figure A5-5.[iv] Per the federal Homeland Security Act of 2002, the locations of wells that supply public water systems cannot be mapped. Sealed and abandoned wells are included in the following table.

Table A5-3 Known Private Wells in Study Area

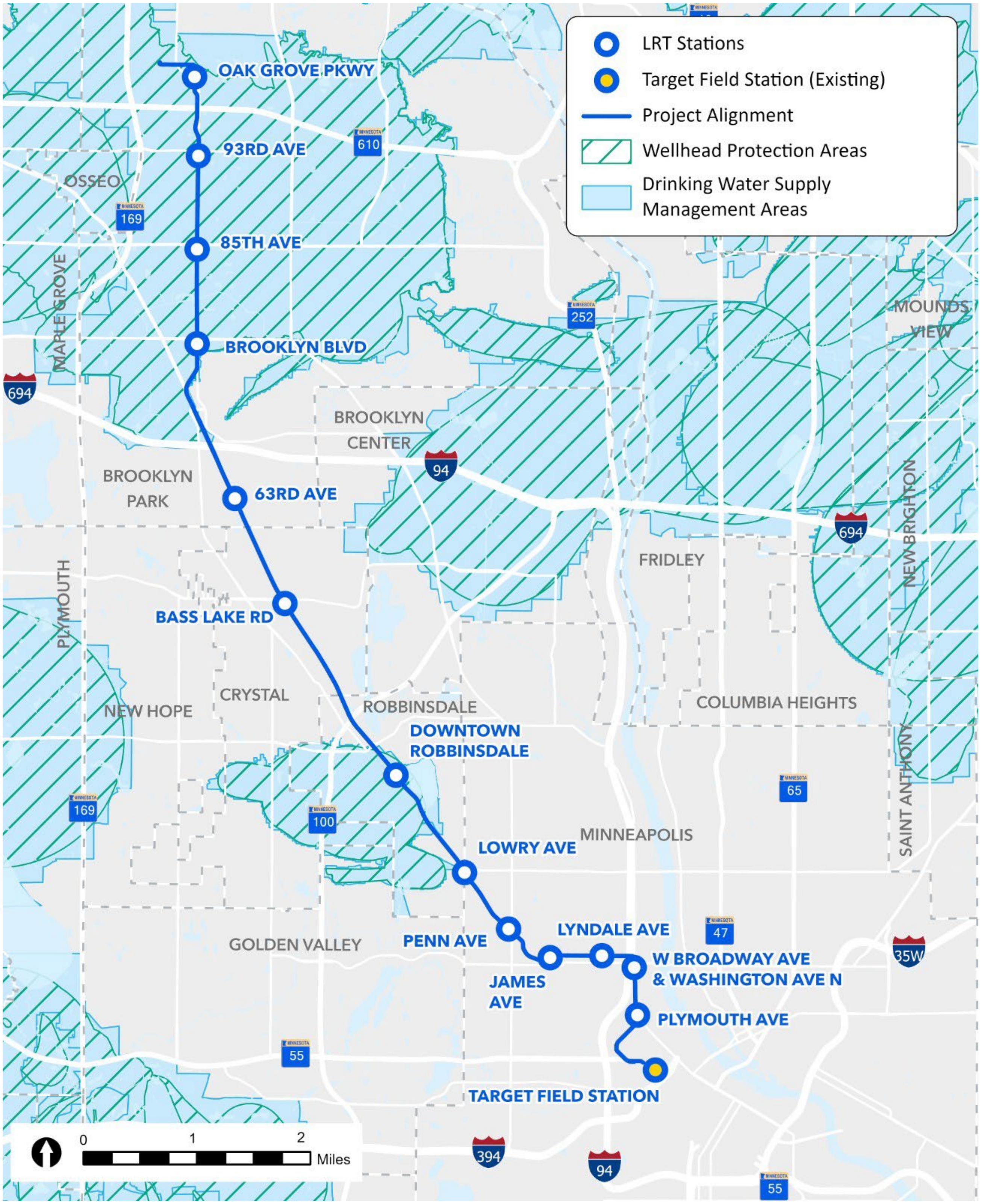
Minnesota Unique Well Number	Address	Well Type [a]	City
155091	8832 Broadway W, Brooklyn Park, MN	Domestic	Brooklyn Park
415896	8249 101st Ave N, Brooklyn Park, MN	Domestic	Brooklyn Park
450320	10225 Winnetka Ave N, Brooklyn Park, MN	Domestic	Brooklyn Park
255193	Brooklyn Park, MN	Irrigation	Brooklyn Park
203310	7005 63rd Ave N, Brooklyn Park, MN	Commercial	Brooklyn Park
203309	6300 Lakeland Ave, Brooklyn Park, MN	Domestic	Brooklyn Park
203570	4823 Lakeland Ave N, Crystal, MN	Domestic	Crystal
1000004807	SE Corner of 56th Ave N and CR 81 (in right-of-way)	Unknown	Crystal
203509	5800 Lakeland Ave N, Crystal, MN	Unknown	Crystal
203499	5636 Lakeland Ave, Crystal, MN	Abandoned/Sealed	Crystal
203500	6221 56th Ave N, Crystal, MN	Commercial	Crystal
501663	6000 Bass Lake Rd, Crystal, MN	Monitoring Well	Crystal
501664	6000 Bass Lake Rd, Crystal, MN	Monitoring Well	Crystal
190276	5602 Lakeland Ave, Crystal, MN	Monitoring Well	Crystal
190275	5602 Lakeland Ave, Crystal, MN	Monitoring Well	Crystal
190274	5602 Lakeland Ave, Crystal, MN	Monitoring Well	Crystal
W0007314	5465 Lakeland Ave N, Crystal, MN	Unknown	Crystal
1000004668	5548 Lakeland Ave, Crystal, MN	Domestic	Crystal
560426	Lakeview Terr, Robbinsdale, MN	Monitoring Well	Robbinsdale
241275	Minneapolis, MN	Air Conditioning	Minneapolis
200270	Minneapolis, MN	Industrial	Minneapolis
771132	2220 W Broadway Ave, Minneapolis, MN	Monitoring Well	Minneapolis
503774	1120 W Broadway Ave, Minneapolis, MN	Monitoring Well	Minneapolis
709101	1120 W Broadway Ave, Minneapolis, MN	Recovery Well	Minneapolis
709102	1120 W Broadway Ave, Minneapolis, MN	Recovery Well	Minneapolis
709103	1120 W Broadway Ave, Minneapolis, MN	Recovery Well	Minneapolis
503775	1120 W Broadway Ave, Minneapolis, MN	Monitoring Well	Minneapolis
329085	715 N 21st Ave, Minneapolis, MN (in right-of-way)	Abandoned/Sealed	Minneapolis

Source: Minnesota Geological Survey, Minnesota Well Index, 2024.

Figure A5-4 Private Well Locations

Source: Minnesota Geological Survey, County Wells Index, 2024.

Figure A5-5 Drinking Water Supply Management Areas and Wellhead Protection Areas



Source: Minnesota Department of Health, *Wellhead Protection Areas* (St. Paul: Minnesota Department of Health, 2019), https://gisdata.mn.gov/dataset/water-wellhead-protection-areas.

5.1.2.2 Existing Sanitary and Storm Sewer Service

Sanitary and storm sewer services are owned and maintained by the public-works divisions of the areas in which they are located, including:

- Cities of Minneapolis, Robbinsdale, Crystal, and Brooklyn Park
- Hennepin County
- MCES

Several publicly owned sanitary and storm sewer services run parallel to and intersect with the Project Alignment. The sanitary sewers range from 8 to 86 inches in diameter, and storm sewers range from 9 to 144 inches in diameter, all varying in depth. An MCES interceptor sewer is also located in the study area.

Table A5-4 lists the significant sanitary sewer and MCES interceptor sewers in the study area. Significant storm sewers in the study area are provided in Table A5-5. Significant, for the purposes of this table, are assumed to be a partial list of utilities that require more time, planning, coordination, and design than utilities that are part of typical street reconstruction project. This would also include utilities with large diameters, casing pipe, large service areas, or utilities that may be in direct conflict with the proposed alignment.

Table A5-4 Sanitary and MCES Interceptor Sewers in Study Area

Sanitary and MCES Interceptor Sewer Description	City
54-inch-diameter MCES interceptor sewer located on the south side of 101st Ave N, running parallel to the roadway	Brooklyn Park
Sanitary sewer lines are located on the east side of W Broadway Ave, south of 83rd Ave N, parallel to the roadway	Brooklyn Park
48-inch-diameter MCES interceptor sewer crosses W Broadway Ave at Brooklyn Blvd	Brooklyn Park
21-inch-diameter sanitary line crossing CR 81 at 63rd Ave N	Brooklyn Park
30-inch-diameter sanitary sewer line crossing CR 81 at Corvallis Ave	Crystal
18- to 33-inch-diameter clay sanitary line running parallel along CR 81 from Lowry Ave to N 26th Ave generally located under the northbound lane	Minneapolis
60-inch diameter sanitary sewer line crossing at 5th St	Minneapolis
15-inch-diameter clay to 36-inch-diameter brick sanitary line running parallel along CR 81 from 26th Ave N to Lyndale Ave N generally under the northbound lane	Minneapolis
42-inch diameter sanitary sewer line running parallel at 10th Ave N and Oak Lake	Minneapolis
An 86-inch-diameter brick sanitary sewer running under 8th Ave N at the intersection of 7th St	Minneapolis

Table A5-5 Significant Storm Sewers in Study Area

Storm Sewer Description	City
48-inch-diameter reinforced concrete pipe (RCP) crosses CR 81 south of W Broadway Ave	Brooklyn Park
36-inch-diameter RCP crosses CR 81 at 63rd Ave N	Brooklyn Park
44-inch-diameter arch pipe crosses CR 81 just north of the Cities of Crystal and Brooklyn Park border	Brooklyn Park
30/36-inch-diameter storm sewer on W Broadway Ave (CR 103) from 75th Ave N to Brooklyn Blvd	Brooklyn Park
42-inch-diameter storm sewer at Bottineau Blvd and 63rd Ave N	Brooklyn Park
36-inch-diameter (West)/60-inch-diameter (East) storm sewer at W Broadway Ave (CR 103) and Brooklyn Blvd	Brooklyn Park

Storm Sewer Description	City
42-inch-diameter storm sewer crossing the alignment south of 78th Ave N, then running along W Broadway Ave (CR 103) between 78th and 79th Ave	Brooklyn Park
24-inch-diameter storm sewer on W Broadway Ave (CR 103) at College Park Dr	Brooklyn Park
60-inch-diameter storm sewer on W Broadway Ave (CR 103) from south of 85th Ave N to Shingle Creek	Brooklyn Park
54-inch-diameter storm sewer south of W Broadway Ave (CR 103) and 85th Ave N	Brooklyn Park
60-inch-diameter storm sewer on W Broadway Ave (CR 103) at 89th Ave N	Brooklyn Park
30-inch-diameter storm sewer on W Broadway Ave (CR 103) at 93rd Ave N	Brooklyn Park
24-inch-diameter storm sewer running along W Broadway Ave (CR 103) and crossing the alignment	Brooklyn Park
30-inch-diameter storm sewer on W Broadway Ave (CR 103) south of MN 610	Brooklyn Park
42-inch-diameter storm sewer on W Broadway Ave (CR 103) north of MN 610	Brooklyn Park
36-inch-diameter arch pipe crosses CR 81 just north of Crystal Airport Rd	Crystal
36-inch-diameter RCP running parallel to CR 81 south of Airport Rd running in the median between northbound and southbound lanes crossing the northbound lane at Airport Rd	Crystal
36-inch-diameter RCP crossing CR 81 at CR 10	Crystal
36-inch-diameter RCP running parallel to CR 81 under the northbound lane at Wilshire Blvd	Crystal
72-inch-diameter storm crossing CR 81 just south of Wilshire Blvd, the storm sewer then runs parallel west of the CR 81 bridge over BNSF to Corvallis Pond south of BNSF	Crystal
36-inch-diameter RCP running parallel to CR 81 under the southbound lane from Corvallis Ave to 50th Ave N	Crystal
66-inch-diameter RCP crossing CR 81 north of 40th Ave N running parallel to northbound CR 81 to south of Robbins Landing Frontage Rd	Robbinsdale
48-inch-diameter RCP crossing CR 81 south of Lakeview Terrace Park	Robbinsdale
48-inch-diameter RCP running parallel to CR 81 from Crystal Lake to Lakeview Pond	Robbinsdale
54-inch-diameter RCP crossing CR 81 south of Lakeview Pond	Robbinsdale
60-inch-diameter RCP running parallel to CR 81 from Lakeview Pond to Crystal Lake	Robbinsdale
42-inch-diameter RCP running parallel to CR 81 from 35th Ave N pond to northbound Lowry Ave ramp	Robbinsdale
33-inch-diameter RCP running parallel to CR 81 from N 29th Ave to Queen Ave running in approximately the center of the roadway	Minneapolis
48-inch-diameter RCP running parallel to CR 81 under the northbound lane from Queen Ave to McNair Ave, crossing CR 81 at McNair Ave	Minneapolis
39-inch-diameter storm pipe running parallel to N 21st Ave from Bryant Ave to Aldrich Ave at approximately the center of the roadway	Minneapolis
42-inch-diameter storm pipe running parallel to N 21st Ave from Aldrich Ave to Lyndale Ave N at approximately the center of the roadway	Minneapolis
36-inch-diameter RCP running parallel to CR 81 from James Ave to just west of Girard Ave at approximately the center of the roadway	Minneapolis
48-inch-diameter RCP running parallel to CR 81 from just west of Girard Ave to Dupont Ave under the northbound lanes and from Dupont Ave to Lyndale Ave N under the southbound lanes	Minneapolis

Storm Sewer Description	City
144-inch-diameter brick/cast in place concrete (Old Bassett Creek Tunnel) crossing on N 10th Ave between N 5th St and 8th Ave	Minneapolis

5.1.2.3 Existing Electric and Gas Lines

Xcel Energy provides electrical service in the study area using overhead and underground distribution power lines. Xcel Energy and Great River Energy have electric transmission lines that intersect and run parallel to the Project Alignment. Table A5-6 provides a preliminary list of the overhead power lines that are in or adjacent to the LOD.

CenterPoint Energy owns several underground gas line utilities in the study area; many of these lines are part of the Belt Line, which supplies natural gas to distribution lines. The Council conducted an initial review of these lines using utility maps that were provided by CenterPoint Energy. A 12-inch-diameter gas line runs beneath Jolly Lane to the east of CR 81, and another 12-inch-diameter gas line runs from east to west beneath 73rd Ave N as it crosses the BNSF right-of-way. A 24-inch-diameter gas line, which is part of the Belt Line, crosses under CR 81 about 1,200 feet north of I-94. A 12-inch-diameter gas line runs beneath CR 9 crossing at CR 81. A 12-inch-diameter gas line crosses CR 81 at 30th Ave N.

A 20-inch-diameter gas line, which is part of the Belt Line, is located south of Golden Valley Rd. A 24-inch-diameter gas line runs parallel to Queen Ave, crossing under Olson Memorial Hwy. A 16-inch-diameter gas line, which is part of the Belt Line, runs from north to south and crosses Olson Memorial Hwy just west of I-94. The Belt Line also crosses the existing BNSF right-of-way near Golden Valley Rd and north of I-94. Additional information has been requested and will be incorporated with a future revision.

One 8-inch-diameter steel petroleum pipeline is in the study area. It crosses W Broadway Ave just north of 93rd Ave N, and then crosses 93rd Ave N northeast of W Broadway Ave. This pipeline, which is owned by NuStar Energy, distributes refined petroleum. Table A5-6 summarizes overhead power lines in the study area. Utilities identified are preliminary findings and will continue to be updated as the Project advances and additional utility information becomes available.

Table A5-6 Overhead Power Lines in Study Area

Utility Owner	Type	Overhead Power Line Description	City
Xcel Energy	Distribution	South side of 101st Ave N	Brooklyn Park
Great River Energy	Transmission	North side of TH 610, running parallel to TH 610 and crossing over the CR 103/TH 610 interchange	Brooklyn Park
Xcel Energy	Distribution	CR 103: west side north of Winnetka Ave N, east side north of TH 610 to Winnetka Ave N, west side from CR 8 to north of TH 610	Brooklyn Park
Xcel Energy	Distribution	North side of 93rd Ave N (CR 30)	Brooklyn Park
Xcel Energy	Transmission	West side of W Broadway Ave (CR 103), north of 89th Ave N	Brooklyn Park
Xcel Energy	Distribution	CR 81: west side from Bass Lake Rd to 60th Ave N, east side from 60th Ave N to 65th Ave N, west side from 65th Ave N to 73rd Ave N	Crystal
Xcel Energy	Distribution	CR 81: west side from 51st Ave N to CPKC	Crystal
Xcel Energy	Transmission	North side of TH 100, running parallel to TH 100 and crossing over CR 81 on the north side of the TH 100/ CR 81 interchange	Robbinsdale

5.1.2.4 Existing Long-Distance Communication Service

An existing fiber-optic cable connecting North Memorial Hospital and Maple Grove Hospital runs on the west side of CR 81, between CR 81 and the BNSF right-of-way.

5.2 Floodplains

Refer to the *Water Resources Technical Report* published with this Supplemental Final EIS for additional details about the regulatory context, methodology, and study area used to evaluate floodplain impacts resulting from the Project.

5.3 Wetlands and Other Aquatic Resources

Refer to the *Water Resources Technical Report* published with this Supplemental Final EIS for additional details about the regulatory context, methodology, and study area used to evaluate impacts to wetlands and other aquatic resources resulting from the Project.

5.4 Geology, Soils, and Topography

The following section provides additional details about the regulatory context, methodology, and study area used to evaluate impacts on geology, soils, and topography resulting from the Project.

5.4.1 Regulatory Context and Methodology

In Minnesota, geologic resources are rarely regulated, with the exceptions of groundwater dewatering and mining activities. A permit from DNR is required to dewater in excess of 1 million gallons per year or 10,000 gallons per day.

The discharge from dewatering is regulated under the NPDES permit that is required for construction activities. If the water is contaminated, an individual NPDES permit must be obtained from MPCA, or the groundwater can be discharged to the sanitary sewer system if approved by MCES.

The geologic resources listed in this section are not isolated and can affect or be affected by other water resources discussed in Section 5.9.

The Council consulted the Geologic Atlas of Hennepin County[1] and the Minnesota Geospatial Commons for information regarding surface geology, bedrock geology, and groundwater resources.

5.4.2 Study Area and Affected Environment

The study area for geology, soils, and topography is defined as the area within and adjacent to the LOD of the Project. The following sections describe the geology, soils, and topography in the study area.

5.4.2.1 Geology

The unconsolidated sediments in the study area were deposited primarily by glacial ice and meltwater during the last glaciation (Wisconsinan Stage). Sediments along most of the study area can be attributed to the advancement and retreat of the Superior lobe, the Grantsburg sublobe of the Des Moines lobe, and meltwater from these lobes. The underlying sandstone and carbonate bedrock are deeply cut with a branched network of valleys carved out by meltwater streams that drain toward master streams, such as the modern-day Mississippi River. Middle- and upper-terrace deposits of sand, gravelly sand, and loamy sand dominate much of the study area. Small areas of sandy to loamy till from the Des Moines lobe and Grantsburg sublobe are also present.

Lakes and wetlands throughout the region formed in low-lying areas created by the presence of underlying bedrock valleys or because of ice block melting as the glaciers were breaking up and retreating.

Karst features such as springs, caverns, and sinkholes are typically found in areas where carbonate bedrock is overlain by a thin cover of glacial material. Areas designated as active karst (less than 50 feet of soil/sediment covering bedrock) have been mapped along the Project Alignment between the Lowry Ave Station and W Broadway

Ave Business District Station area, and at Target Field Station (Figure A5-6). No field-verified karst features have been mapped in the study area, but two springs are located approximately 1.25 miles southeast of Target Field Station.

The Hennepin County Bedrock Collapse Hazard Project[2] is a 2-year study that the Hennepin County Emergency Management division contracted Freshwater and Midwest Geological Consultants to identify where bedrock collapse could lead to sinkholes within the county. Bedrock collapse is a natural hazard in Hennepin County that occurs most commonly in the form of sinkholes. Sinkholes are a result of natural or human undermining of unconsolidated sediment that overlies bedrock. The Atlas identified three areas of concern for bedrock collapse within the county based on historical geologic assessments, well records, sewer records, and reports from the public. The areas of concern included the Channel Rock Disturbed Area along West River Rd from Lake St to Minnehaha Park (4 miles south of the study area), Dickman Park (1 mile northeast of the study area), and the Minneapolis-St. Paul International Airport (6.5 miles southeast of the study area). No known sinkholes are located within the study area.

5.4.2.2 Soils

Soil types vary in the study area. Soil data were obtained from the United States Department of Agriculture Natural Resources Conservation Service Web Soil Survey online map.[3]

The majority of the study area, located on previously developed land, includes soils that have been highly disturbed. The major soil types within the LOD for the Project are identified in Table A5-7.

Table A5-7 Major Soil Types within the LOD for the Project

Soil Type	Individual Soil Complexes	Details
Poorly drained to excessively drained soils	▪ Anoka and Zimmerman loam ▪ Verndale sandy loam ▪ Forada sandy loam ▪ Duelm loamy sand ▪ Isan-Isan loam sand ▪ Southhaven loam ▪ Soderville loamy fine sand ▪ Hubbard loamy sand ▪ Hamel, overwash-hamel complex	Loam, sandy loams, loamy sands, and loamy fine sands. Poorly drained soils are associated with the wetlands and floodplain areas in the study area.
Somewhat poorly drained to excessively drained soils	▪ Urban Land: Duelm complex ▪ Urban Land: Dorset complex ▪ Urban Land: Hubbard complex, Mississippi River Valley ▪ Urban Land: Lester complex ▪ Urban Land: Moon complex ▪ Urban Land: Dundas complex ▪ Urban Land: Udipsamments, cut and fill, complex ▪ Urban Land: Udorthents, cut and fill land, complex ▪ Urban Land: Udorthents, wet substratum, complex	Soils that are considered highly disturbed by human activity.
Poorly drained soils	▪ Udorthents, wet substratum ▪ Udorthents, cut and fill land	Soils located in filled areas that were previously marshes, stream terraces, or moraines.
Very poorly drained soils	▪ Seelyeville and Markey soils, depressional	Soils located in depressions on stream terraces.

Certain areas in the study area contained soils, referenced herein as "poor soils," that are rated as having low strength and high compressibility potential. These soils are susceptible to large, non-uniform settlement when moisture is present, and vary based on rock fragment content, organic matter content, soil texture, and existing bulk density.[4] Such soils are often described as peats, mucks, organic clays, soft clays, and swamp deposits. The largest area of poor soils identified in the study area is concentrated at the location of the Oak Grove Pkwy Station (Figure A5-7).

Figure A5-6 Active Karst Areas

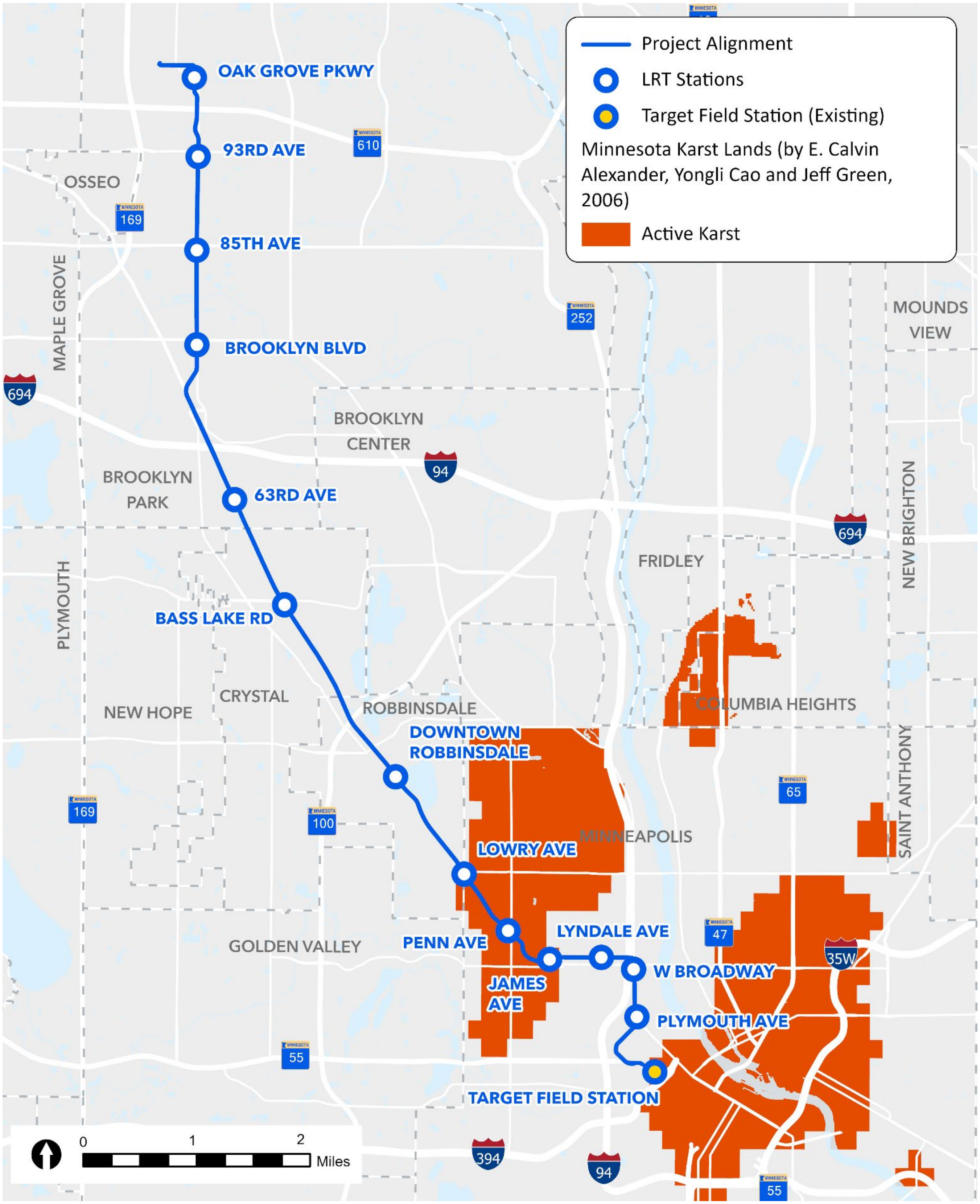
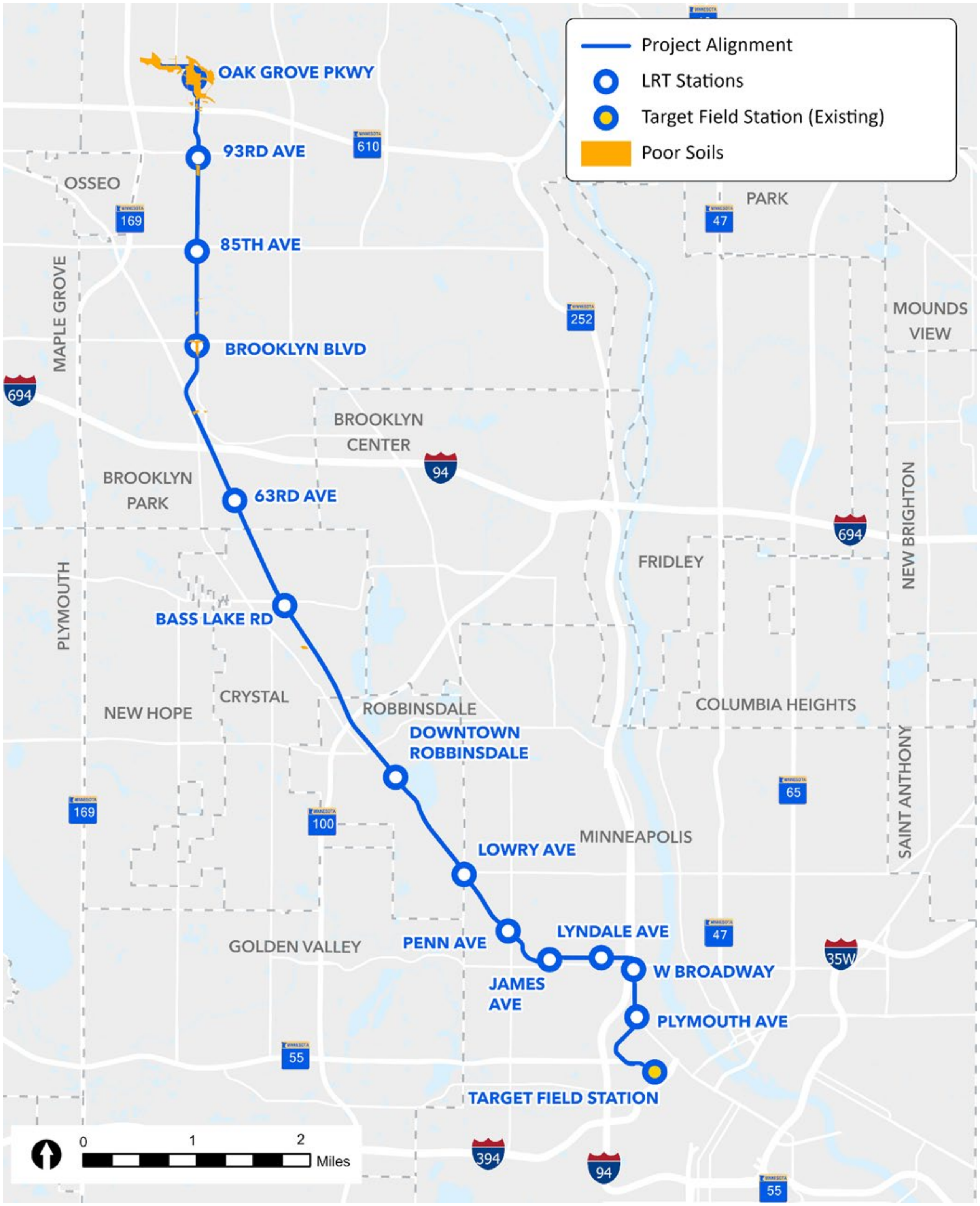


Figure A5-7 Poor Soils Near the Project



Sources: University of Minnesota, Department of Geology and Geophysics; DNR Ecological and Water Resources Division.

5.4.2.3 Topography

The general topography of the study area consists of gently rolling hills. Land surface elevation ranges from 806 to 944 feet amsl throughout the study area based on light detection and ranging (LiDAR) data (a remote sensing method that uses light in the form of a pulsed laser to measure variable distances to the Earth) received from DNR (2019). The general grade along the Project Alignment decreases to the north. Low-lying areas in the study area, relative to the surrounding land, were noted in the vicinity of wetlands, water bodies, and natural areas that abut the Project Alignment in the City of Robbinsdale.

5.5 Hazardous Materials Contamination

The following section provides additional details about the regulatory context, methodology, and study area used to evaluate impacts on hazardous materials contamination resulting from the Project.

5.5.1 Regulatory Context and Methodology

MPCA oversees regulations pertaining to contaminated soil, groundwater, and waste cleanup plan approvals; petroleum underground storage tank (UST) registration and removal; and NPDES permitting. MDH regulates asbestos abatement. Activities that encounter contaminated materials must follow State requirements for safe handling and disposal under the purview of MPCA and MDH. MDA oversees sites with wood treatment, chemical, herbicide, and pesticide contamination.

No single comprehensive source of information is available that identifies known or potential sources of environmental contamination. Therefore, to identify and evaluate properties that potentially contain hazardous or regulated materials (such as petroleum products) or other sources of contamination, the Council completed a Modified Phase I ESA in conformance with EPA, All Appropriate Inquiry, and ASTM E1527-21, as modified by the MnDOT Office of Environmental Stewardship (OES) guidelines for completion of Phase I ESAs. A Modified Phase I ESA (March 2023) and Updated Modified Phase I ESA (December 2023) were both prepared for the Project. [5]

A Modified Phase I ESA is an accepted industry practice for transportation projects and consists of the following key components for evaluating properties for the likelihood of contamination: (1) site reconnaissance, (2) records review, (3) historical review, and (4) interviews with representatives from local government. The Modified Phase I ESA is a qualitative review that evaluates the risk of encountering contamination during construction based on the key components listed above for properties along the Project Alignment. It does not measure the severity of any potential hazardous materials found on site.

Risk ranking categories used to evaluate potentially contaminated properties are listed in Table A5-8. The summary ranking list is not inclusive of every property use. Site rankings may be adjusted based on evidence collected and professional judgment. All sites within the study area were evaluated and received a ranking of “high,” “medium,” or “low” for environmental risk. Properties that do not qualify as high, medium, or low ranked sites are considered unlikely for contamination and ranked “de minimis.”

To evaluate the potential for contamination or confirm the presence of contamination of sites identified from the Phase I ESAs, a Phase II ESA was completed. The Phase II ESA scope of work included 124 Geoprobe borings, 6 test pits, field screening, and collection and chemical analysis of soil and groundwater samples sited near medium and high ranking sites. [6]

Table A5-8 Modified Phase I ESA Risk Ranking Categories

Environmental Risk Ranking Category	Description
High	All active and inactive Voluntary Investigation and Cleanup sites, all active and inactive Minnesota Environmental Response and Liability Act/Superfund sites, all active and inactive dump sites, all active leak sites, all dry cleaners (with on-site or unknown chemical processing), all bulk chemical/petroleum facilities, all active agricultural release sites, railroad facilities (fueling, yards, or maintenance), clandestine chemical/drug laboratories, all historical industrial sites with likely chemical use (printing, photography, blacksmithing, plating, dentistry) on the premises, and perfluorocarbon potential source areas.
Medium	All closed leak sites, all sites with USTs or aboveground storage tanks, machine shops, all sites with historical vehicle repair activities, all bulk grain/feed storage, all historical lumber yards, all closed agricultural release sites, historical USTs in roadway, graveyards, and all sites with detections of non-petroleum chemicals. A site-specific data sheet was not prepared for medium-risk sites with a small spill or a small spill and hazardous-waste generator as the ranking rationale per the Project scope. Additionally, small, closed leaks on residential sites or leaks identified outside of the Project Alignment buffer were not fully summarized (per the Project scope) because of the low potential impact to Project Alignment and future construction.
Low	Hazardous waste generators; railroad lines; current lumber yards; golf courses; and possibly some farmsteads, residences, or commercial properties with poor housekeeping practices.

MnDOT modifications to the ASTM 1527-21 Phase I ESA standard for transportation corridors include these risk ranking categories, and the modifications have been accepted by MPCA for its regulatory programs that apply to contaminated- and regulated-materials management.

5.5.2 Study Area and Affected Environment

The study area for hazardous materials contamination includes potentially contaminated properties or regulated material facilities within 500 feet of the Project Alignment and the OMF but is expanded to 550 feet in the City of Minneapolis based on the higher density of environmental risk sites. The analysis was organized by the city boundaries for the Cities of Brooklyn Park, Crystal, Robbinsdale, and Minneapolis.

Potentially contaminated properties are often found in previously developed industrial and commercial areas. These types of land uses are common throughout the study area, increasing the potential to encounter contaminated soils, groundwater, and materials based on prior use and development along the Project Alignment.

5.6 Noise

Refer to the *Noise and Vibration Technical Report* published with this Supplemental Final EIS for additional details about the regulatory context, methodology, and study area used to evaluate noise impacts resulting from the Project.

5.7 Vibration

Refer to the *Noise and Vibration Technical Report* published with this Supplemental Final EIS for additional details about the regulatory context, methodology, and study area used to evaluate vibration impacts resulting from the Project.

5.8 Biological Environment

Refer to the *Biological Environment Technical Report* published with this Supplemental Final EIS for additional details about the regulatory context, methodology, and study area used to evaluate impacts on the biological environment resulting from the Project.

5.9 Water Quality and Stormwater

The following section provides additional details about the regulatory context, methodology, and study area used to evaluate impacts on water quality and stormwater resulting from the Project. Refer to Appendix A-5 *Preliminary Engineering Water Resources Design Report*[7] published with this Supplemental Final EIS for additional information regarding the study area, regulatory context, and design methodology.

5.9.1 Regulatory Context and Methodology

Stormwater impacts are evaluated by quantifying changes to impervious surfaces because of implementing a project. Impervious surfaces include road and parking lot pavements, sidewalks, rooftops, and other hard surfaces that are impenetrable to water, which can significantly deter stormwater infiltration and reduce groundwater and surface water recharge. Runoff associated with rainfall and snowmelt discharges from impervious surfaces, accumulating pollutants before entering downstream water bodies.

For this analysis, to account for the worst-case scenario in calculating impacts, the Council assumed that LRT guideway segments that include ballasted track are impervious. Track ballast consists of crushed and compacted stone used to support the track and facilitate drainage. However, the stormwater runoff calculations developed for the Project assume that the ballast is slightly less impervious than asphalt or concrete pavement because it can store more rainfall in the spaces between the crushed stones. The Council would need to continue coordination with the regulating WMOs and cities to determine whether ballasted track is considered an impervious or pervious surface for regulatory purposes because the definition of impervious surface and classification of track ballast can vary according to each organization’s policy.

Regulatory and permitting authority for stormwater management falls to municipalities, MPCA, and WMOs. Each WMO is governed by a joint powers agreement among WMOs and the member communities whose jurisdictions are located within the boundaries of the WMO. Regulations are subject to change over time, and the Project would be subject to the regulations that are in effect when the Project design is submitted for approval by the permitting authorities. The stormwater management system for the Project Alignment was designed to meet the most stringent requirements for that segment. In all cases except for the OMF and park-and-ride structures, the WMO rules were the most stringent requirements.

Several agencies in the study area regulate stormwater management within their jurisdictional boundaries. Table A5-9 documents specific stormwater requirements of each of the following agencies with jurisdiction in the study area: BCWMC, SCWMC, WMWMC, MWMO, MPCA, Hennepin County, MnDOT, and the Cities of Brooklyn Park, Crystal, Robbinsdale, and Minneapolis.

Table A5-9 Regulatory Matrix of Stormwater Requirements

Organization, Commission, or City	Rate Control	Water Quality	Volume Control
BCWMC	Maintain or reduce peak flow rates for the 2-, 10-, and 100-year, 24-hour storm event.	Water quality criteria are achieved if a project meets compliance with MWMO's volume control requirements.	For a linear project, capture and retain 1.1 inches of stormwater runoff from net new impervious surfaces. If infeasible, proceed according to the objectives listed below: ■ 0.55 inch of runoff and remove 75% total phosphorus (TP) on an average annual basis ■ Capture maximum amount of runoff practicable; remove 60% TP on an average annual basis ■ 1.1 inches of runoff provided at off-site location
SCWMC/ WMWMC	Maintain or reduce peak flow rates for the 2-, 10-, and 100-year, 24-hour storm event, and the 100-year, 10-day critical storm event.	Water quality criteria are achieved if a project meets compliance with SCWMC/WMWMC's volume control requirements. If volume control is infeasible, maintain or reduce the discharge of TP and total suspended solids (TSS).	Provide abstraction equal to the larger of: ■ 1 inch times the new impervious surface created by a project ■ 0.5 inch times the new and fully reconstructed impervious surface
MWMO[a]	Must meet the rate control requirements of member municipalities.	Water quality criteria are achieved if a project meets compliance with MWMO's volume control requirements.	Capture and retain the larger of: ■ 1.1 inches times the new impervious surface created by a project ■ 0.55 inch times the new and fully reconstructed impervious surface ■ Flexible treatment options are available if volume reduction cannot be achieved
MPCA	Sedimentation basins (if applicable) must be designed to discharge the water quality volume at no more than 5.66 cubic feet per second per acre of surface area of the basin.	Water quality volume of 1 inch of runoff must be retained on site. If infiltration is infeasible, other stormwater management methods must be implemented to treat water quality volume.	Capture and retain 1 inch times the new impervious surfaces created by a project.

Organization, Commission, or City	Rate Control	Water Quality	Volume Control
Hennepin County	Must meet the rate control requirements of member municipalities.	Water quality criteria are achieved if a project meets compliance with Hennepin County's volume control requirements. If volume control is infeasible, maximize the treatment of the water quality volume.	Capture and retain the larger of: ■ 1 inch times the new impervious surface created by a project ■ 0.5 inch times the new and fully reconstructed impervious surface
MnDOT	N/A	Water quality criteria are achieved if a project meets compliance with MnDOT's volume control requirements. If volume control is infeasible, maximize the treatment of the water quality volume.	Capture and retain the larger of: ■ 1 inch times the new impervious surface created by a project ■ 0.5 inch times the new and fully reconstructed impervious surface
City of Brooklyn Park	Must meet SCWMC and MPCA standards (see above).	■ Must meet SCWMC standards (see above). ■ There should be a net reduction in annual TP and TSS discharges.	■ Must meet SCWMC standards (see above). ■ For the redevelopment (linear) portions, 1 inch of runoff across new impervious surfaces should be retained. ■ For the new development (i.e., park-and-ride) portions, 1 inch of runoff should be retained from all impervious surfaces.
City of Crystal	Maintain or reduce stormwater runoff peak flow rates as compared with the existing conditions for the 2-, 10-, and 100-year, 24-hour storm events.	If stormwater detention facilities are constructed, design according to MPCA publication "Protecting Water Quality in Urban Areas," the Minnesota Stormwater Manual, and the City of Crystal Unified Development Code.	Must meet SCWMC standards (see above).
City of Robbinsdale	Must meet SCWMC and BCWMC standards (see above).	Must meet SCWMC and BCWMC standards (see above).	Must meet SCWMC and BCWMC standards (see above).

Organization, Commission, or City	Rate Control	Water Quality	Volume Control
City of Minneapolis	Maintain or reduce stormwater runoff peak flow rates as compared with the existing conditions for the 2-, 10-, and 100-year, 24-hour storm event.	Remove 70% TSS from a 1.25-inch storm event. Additional TP removal to various extents based on location, as described in the City of Minneapolis Stormwater and Sanitary Sewer Guide.	Capture and retain the larger of: ■ 1.1 inches times the new impervious surface created by a project ■ 0.55 inch times the new and fully reconstructed impervious surface

[a] MWMO does not review or permit design plans and relies on member municipalities to enforce stormwater ordinances and performance standards.

5.9.2 Study Area and Affected Environment

The study area for stormwater is defined as the LOD for the Project Alignment and the receiving waters within and immediately adjacent to the Project Alignment. The study area includes impaired waters that are located within 1 mile on either side of the Project Alignment and that would receive stormwater discharge from the Project Alignment as per State regulation and as shown in Table A5-10 and Figure A5-8.

The study area is generally urbanized; highly altered compared to natural conditions; and characterized primarily by commercial, industrial, and residential development. Table A5-10 provides specific information on the impairment and total maximum daily load (TMDL) status of water bodies in the study area.

Most of the study area has no formal stormwater treatment to meet current water quality regulatory requirements. Stormwater typically flows directly into surrounding vegetated ditches or storm sewer systems. Vegetated ditches can provide water quality benefits such as sediment stabilization and pollutant filtration. The vegetated ditches generally discharge to existing wetlands and drainageways, which ultimately drain to nearby surface waters, some of which are impaired. Stormwater that is collected in storm sewer systems is typically conveyed directly to receiving waters, frequently with little or no water quality treatment or flow rate attenuation.

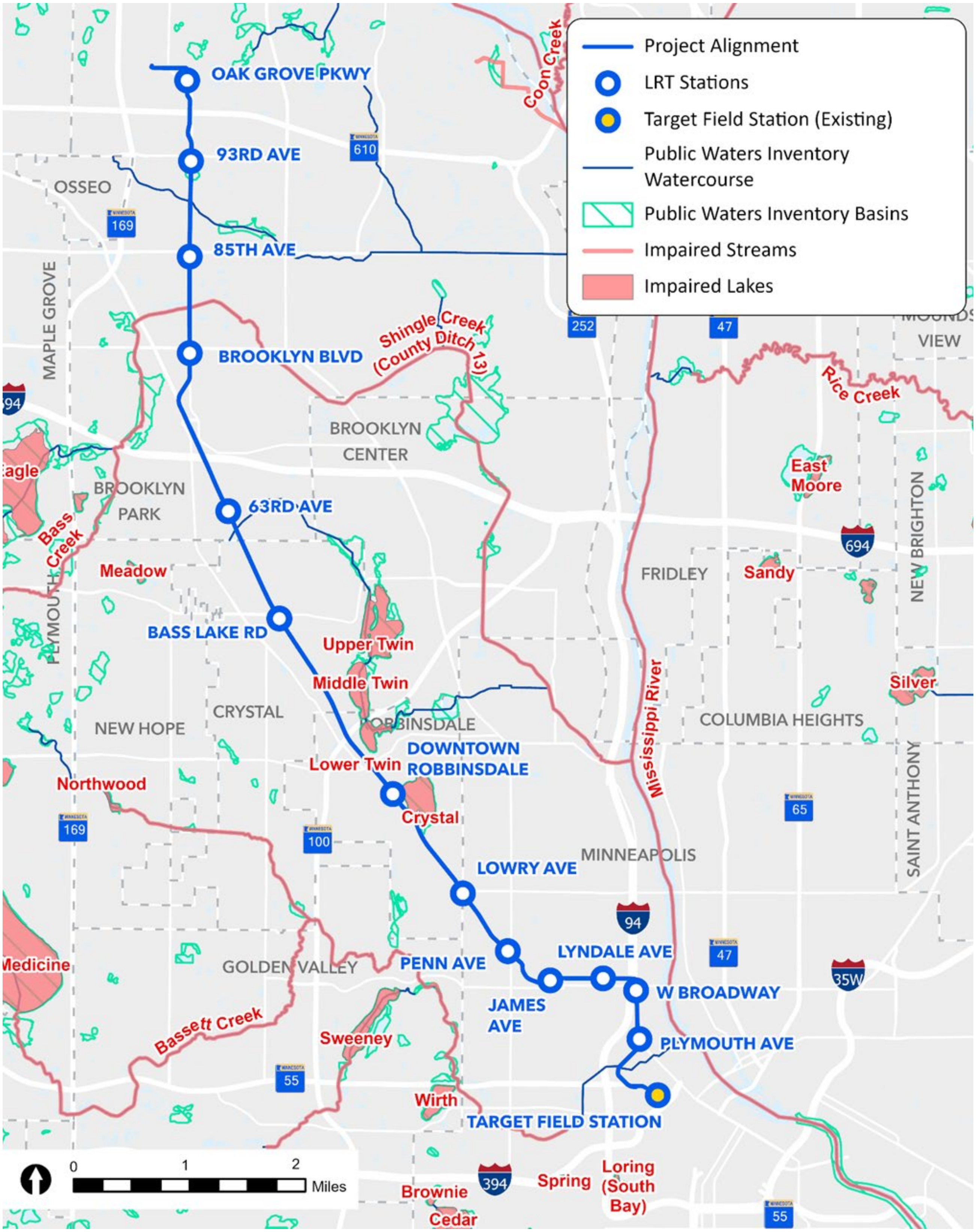
Existing stormwater management features are located near the Project Alignment and may receive stormwater from the storm sewer systems. The existing stormwater management features provide detention and/or water quality treatment before discharging to storm sewer systems or receiving waters.

Table A5-10 Downstream Impaired Waters within 1 Mile of the Project Alignment

Impaired Receiving Water	Impairments	TMDL Status
Shingle Creek	Benthic macroinvertebrates bioassessments; chloride; dissolved oxygen; fish bioassessments; E. coli	*Shingle and Bass Creeks Biota and Dissolved Oxygen TMDL Implementation Plan* (2012); *Shingle Creek Chloride TMDL Report* (2006); plan required for fish bioassessments
Upper Twin Lake	Fish bioassessments; mercury in fish tissue; polychlorinated biphenyls (PCBs) in fish tissue; perfluorooctane sulfonic acid (PFOS) in fish tissue; nutrients	*Twin and Ryan Lakes TMDL Implementation Plan* (2007); plan required for PCBs in fish tissue, PFOS in fish tissue, and fish bioassessments
Middle Twin Lake	Fish bioassessments; mercury in fish tissue; PCBs in fish tissue; PFOS in fish tissue; nutrients	*Twin and Ryan Lakes TMDL Implementation Plan* (2007); plan required for PCBs in fish tissue, PFOS in fish tissue, and fish bioassessments
Lower Twin Lake	Fish bioassessments; mercury in fish tissue; PCBs in fish tissue; PFOS in fish tissue	*Twin and Ryan Lakes TMDL Implementation Plan* (2007); plan required for PCBs in fish tissue, PFOS in fish tissue, and fish bioassessments
Crystal Lake	Nutrients; PFOS in fish tissue	*Crystal Lake Nutrient TMDL Implementation Plan* (2009); plan required for PFOS in fish tissue
Bassett Creek	Benthic macroinvertebrate bioassessments; chloride; fish bioassessments; fecal coliform	*Upper Mississippi River Bacteria TMDL Study and Protection Plan* (2014); plan required for benthic macroinvertebrate bioassessments and fish bioassessments
Mississippi River	Mercury in fish tissue; PCBs in fish tissue; nutrients; fecal coliform	*Upper Mississippi River Bacteria TMDL Study and Protection Plan* (2014); plan required for PCBs in fish tissue and fecal coliform

Source: MPCA 2023. TMDL projects; available online at https://www.pca.state.mn.us/business-with-us/total-maximum-daily-load-tmdl-projects.

Figure A5-8 Impaired Waters



Source: Minnesota Pollution Control Agency, *Impaired Waterbodies, Minnesota, 2022* (St. Paul: Minnesota Pollution Control Agency, 2022), https://gisdata.mn.gov/dataset/env-impaired-water-2022.

5.10 Air Quality and Greenhouse Gas Emissions

The following section provides additional details about the regulatory context, methodology, and study area used to evaluate impacts on air quality and GHGs emissions from the Project.

Motorized vehicles affect air quality by emitting airborne pollutants. Changes in traffic volumes, travel patterns, and roadway locations affect air quality by changing the number of vehicles and the congestion levels in a given area.

This section describes the existing air quality in the study area and analyzes the air quality impacts of the No-Build Alternative and Project on criteria pollutants—a group of common air pollutants regulated by EPA based on information on their health and/or environmental effects—and on GHGs.

5.10.1 Regulatory Context and Methodology

Air quality is evaluated as part of the NEPA review process for large projects receiving federal funding or approvals. This is done in accordance with the federal CAA of 1970 and the CAAA of 1977 and 1990. EPA regulates air quality and delegates this authority to the State, and MPCA monitors air quality and regulates emissions of air pollutants.

Air quality impacts are defined as an exceedance of established regulatory thresholds for certain pollutants. The criteria pollutants identified by EPA are ozone, particulate matter (PM), CO, nitrogen dioxides, lead, and sulfur dioxide. The Council assessed the air quality impacts of the Project by comparing the projected pollutant concentrations with the No-Build Alternative and Project to the NAAQS.

EPA designates geographic areas based on measurements of criteria pollutant concentrations compared to the NAAQS. An attainment designation means that concentrations in the area are below the NAAQS, a nonattainment designation means that concentrations in the area are exceeding the NAAQS, and maintenance areas are areas that have been redesignated within the prior 20 years from nonattainment to attainment.

No areas in Minnesota are designated as nonattainment for criteria pollutants. A 20-year maintenance period for CO ended in November 2019. Project-level CO hotspot is no longer required. The other criteria pollutants—nitrogen dioxides, sulfur dioxide, ozone, and lead—are not substantial concerns given the nature of the Project and study area; therefore, they have not been analyzed for this Supplemental Final EIS.

In addition to the criteria air pollutants, EPA regulates air toxics. Seven compounds with significant contributions from mobile sources are identified by EPA as MSATs: acrolein, acetaldehyde, benzene, 1,3-butadiene, diesel particulate matter plus diesel exhaust organic gases (diesel PM), formaldehyde, ethylbenzene, naphthalene, and polycyclic organic matter. As agreed to by FTA, the Council has applied the FHWA guidance for assessing MSAT effects for transportation projects in the NEPA process to this Project.

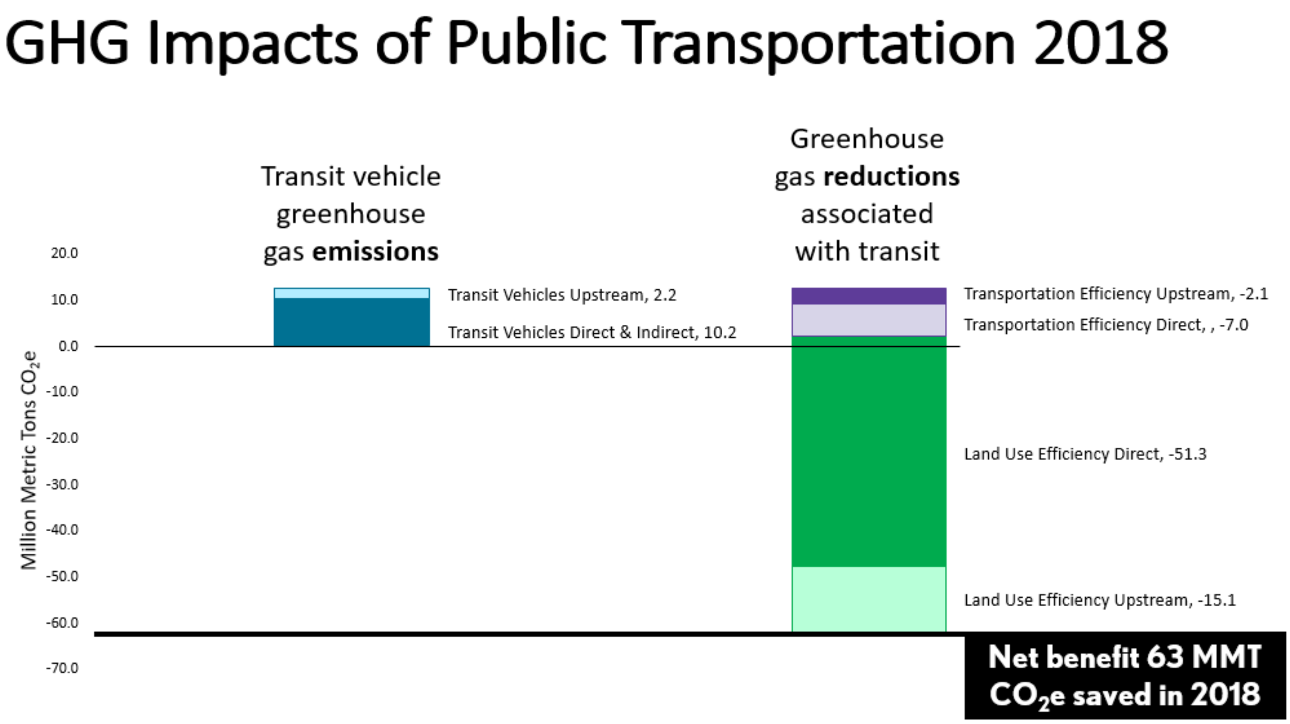
GREENHOUSE GASES

Transportation is the largest contributor to GHG emissions in the state of Minnesota, accounting for approximately 25 percent of the state's GHG emissions.[8] Despite being a major contributor to GHG emissions, transportation can deliver strategies to reduce GHG emissions through mode shift, increased public transit usage, and decarbonization of vehicles. This Project is an example of one such strategy—it would provide additional public transportation service and contribute to the VMT reductions outlined in the latest Statewide Multimodal Transportation Plan, Minnesota GO.[9] This plan aims to decrease overall annual GHG emissions from the transportation sector by 80 percent by 2040 and to reduce statewide VMT-per-capita by 14 percent at the same 2040 horizon.

The Transit Cooperative Research Program Research Report 226, "An Update on Public Transportation's Impacts on Greenhouse Gas Emissions,"[10] shows that the benefit of public transportation vastly outweighs any emissions generated by transit systems, as shown in Figure A5-9. While there are direct GHG emissions from fleet operations as well as upstream emissions for fleet operations to be considered, and agencies must manage their impacts in a drive to sustainability, the system-wide efficiency gains from utilization of public transit systems provide a net benefit CO_2e

savings. Transportation efficiency refers to transit passengers who avoid taking taxis or ride-hailing services; land use efficiency refers to shorter and fewer trips thanks to better land use patterns. In 2018, the national net benefit CO_2e savings was 63 million metric tons, which is equivalent to the annual GHG emissions output of 16 coal power plants.

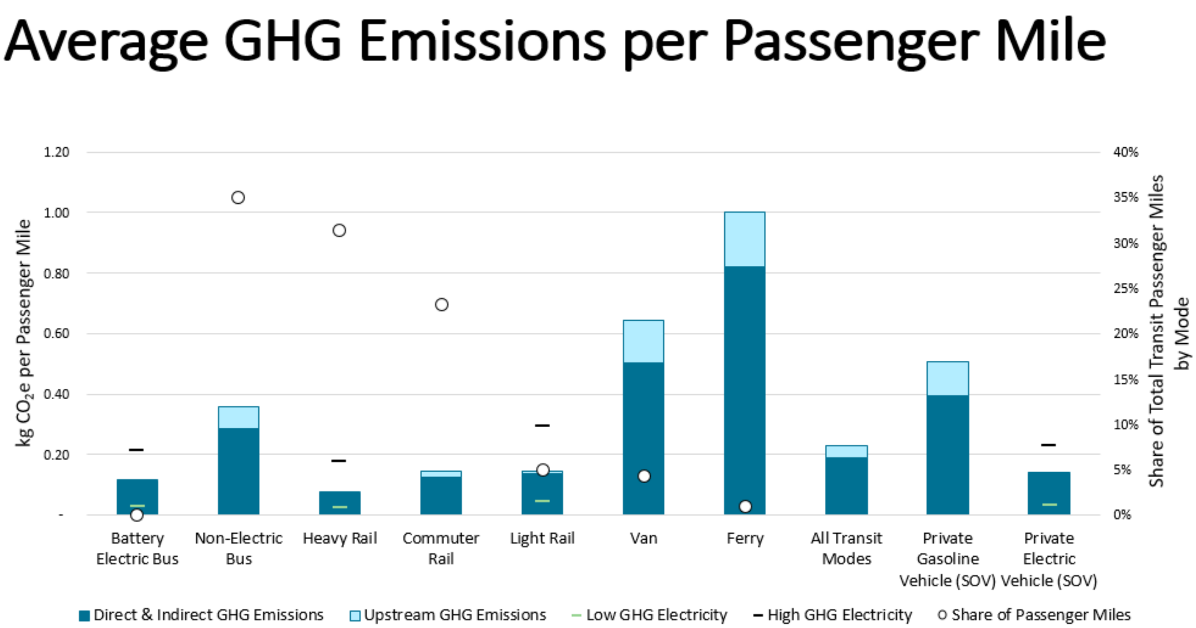
Figure A5-9 Greenhouse Gas Impacts of Public Transportation



Source: Transit Cooperative Research Program, Research Report 226, *An Update on Public Transportation's Impacts on Greenhouse Gas Emissions* (Washington, D.C.: Transit Cooperative Research Program, 2021), https://nap.nationalacademies.org/read/26103/chapter/1.

Transit systems continue to get cleaner year over year; in 2018, the emissions generated per passenger mile by public transportation were 26 percent lower than in 2005. An analysis of average GHG emissions per passenger mile (Figure A5-10) shows that for LRT, emissions are significantly lower than for non-electric bus or single-occupancy gasoline vehicles. A typical trip on public transit emits 55 percent fewer GHG emissions than driving or ride-hailing alone.

Figure A5-10 Average Greenhouse Gas Emissions per Passenger Mile



SOV is single occupancy vehicle. Average private vehicle occupancy for commute trips is 1.18 passengers, for all trips 1.67 passengers (NHTS).

Source: Transit Cooperative Research Program, Research Report 226, *An Update on Public Transportation's Impacts on Greenhouse Gas Emissions* (Washington, D.C.: Transit Cooperative Research Program, 2021), https://nap.nationalacademies.org/read/26103/chapter/1.

For this Project specifically, GHG emissions were calculated by multiplying the VMT of each type of vehicle by the CO_2 emission factors taken from the New and Small Starts Evaluation and Rating Process Final Policy Guidance[11] based on projected CO_2e emission factors for the planning horizon for the Project (2045).

Figure A5-11 illustrates the reduction in carbon intensity of the electrical grid between 2005 and 2018 using EPA's eGRID emission factor database. Through the continued decarbonization of the power grid, these emissions estimates are forecast to be reduced, approaching the zero-carbon target year of 2050.

AIR QUALITY CONFORMITY

The 1990 CAAA require that SIPs demonstrate how states with nonattainment and maintenance areas would meet federal air quality standards.

EPA issued final rules on transportation conformity (42 USC §§ 7401-7671q), which describe the methods in which transportation projects must comply with the SIP. The final rules require that transportation projects must be part of a conforming LRTP and 4-year TIP. The Project is part of the 2040 transitway system shown in the Council's *2040 TPP*, adopted on January 14, 2015, and is included in the latest version (2016–2019) of the TIP (September 23, 2015). The *2040 TPP* was found to be in conformity by FHWA and FTA on March 13, 2015.

The *2040 TPP* supports expanding transit services as a means of improving regional air quality. Chapter 4, Transportation Finance, of the *2040 TPP* describes federal funding policies that lead to coordinated investments in transportation infrastructure to mitigate congestion and improve air quality through fewer VMT in private cars. Appendix E, Additional Air Quality Information, of the *2040 TPP*[12] demonstrates that the *2040 TPP* conforms to the requirements of the CAA. In summary, the Project improvements are consistent with the Council's goal of improving regional air quality.

On November 8, 2010, EPA approved a request for a limited maintenance plan for the Twin Cities maintenance area. Under a limited maintenance plan, EPA has determined that there is no requirement to estimate projected emissions over the maintenance period and that “emissions budgets in limited maintenance plan areas may be treated as essentially not constraining for the length of the initial maintenance period because it is unreasonable to expect that such an area will experience so much growth in that period that a violation of the CO NAAQS would result.”[13]

Therefore, no regional modeling analysis for the LRTP and TIP is required. However, federally and state-funded projects are still subject to isolated intersection-level, or “hot-spot,” analysis requirements. The limited maintenance plan adopted in 2010 determined that the level of CO emissions and resulting ambient concentrations in the Twin Cities maintenance area will continue to demonstrate attainment of the CO NAAQS, so the Council did not perform regional emissions modeling as part of the evaluation for this Supplemental Final EIS. However, the Council did perform a hot-spot screening assessment, as required, which is summarized below.

Hot-Spot Screening for Carbon Monoxide

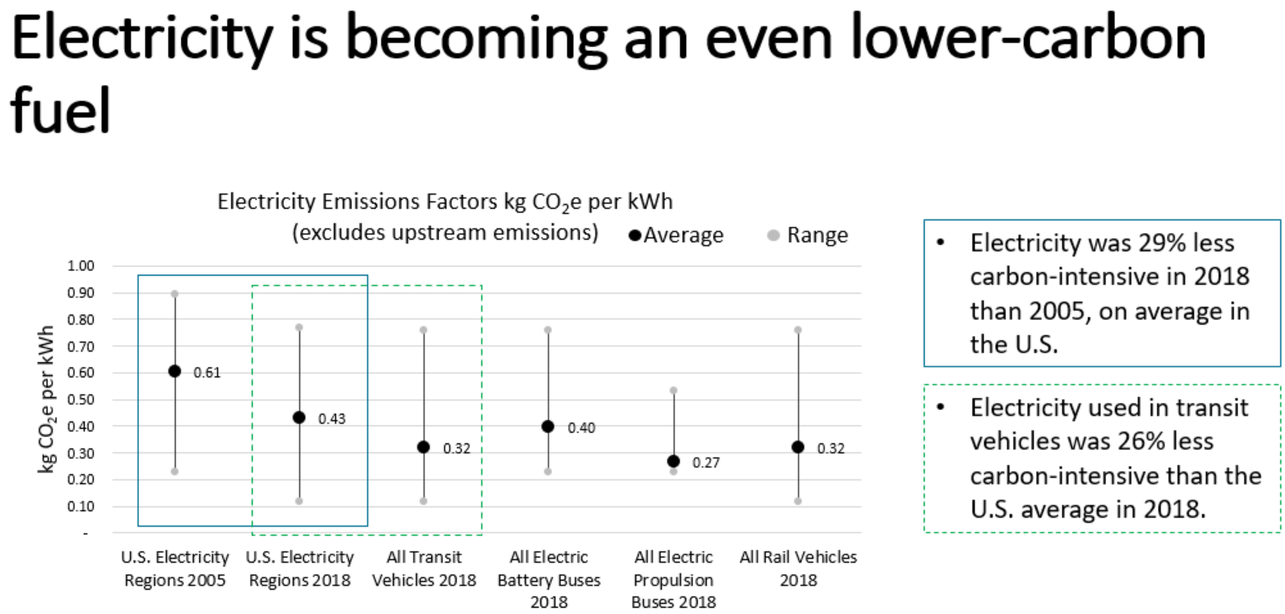
CO is assessed by evaluating the worst-operating (hot-spot) intersections in the study area. In 2010, EPA approved a screening method developed by MnDOT to determine which intersections need hot-spot analysis. The hot-spot screening method uses a traffic volume threshold of 82,300 entering vehicles per day (vpd) for signalized intersections affected by a project. If an affected intersection exceeds this threshold in the design year, or if a project affects 1 out of 10 specific intersections in the Twin Cities metropolitan area, a quantitative CO hot-spot analysis is required. If an affected intersection is not 1 of the listed 10, and if the total traffic through the intersection is less than the 82,300 vpd benchmark, the intersection screens out of quantitative analysis and is not considered a threat to the area’s attaining the NAAQS.

The signalized intersections that would be affected by the Project are not among the 10 listed intersections in the approved MnDOT hot-spot screening procedure. To determine whether any intersections would exceed the 82,300 vpd benchmark, the Council obtained the traffic projections for the year 2040 vpd for the busiest intersections along the Project Alignment for comparison. These numbers are based on the 2040 forecasts in the Hennepin County transportation plan. The intersections with the highest total traffic volumes for each intersection are listed here:

- W Broadway Ave and Brooklyn Blvd: 37,600 vpd
- CR 81 and Bass Lake Rd: 46,600 vpd
- Broadway Ave and Washington Ave: 37,800 vpd
- CR 81 and 42nd Ave: 36,700 vpd
- CR 81 and TH 100 southbound ramp: 37,900 vpd
- CR 81 and Bass Lake Rd: 51,100 vpd

None of the above-listed intersections would meet or exceed the screening threshold of 82,300 vpd in 2040. Given that the screening criteria indicate no potential for CO hot-spots that could approach or exceed the NAAQS, quantitative hot-spot analysis is not required for transportation conformity purposes.

Figure A5-11 Electricity Emissions Factors (kg CO_2e per kWh)



Source: Transit Cooperative Research Program, Research Report 226, *An Update on Public Transportation's Impacts on Greenhouse Gas Emissions* (Washington, D.C.: Transit Cooperative Research Program, 2021), https://nap.nationalacademies.org/read/26103/chapter/1.

MOBILE-SOURCE AIR TOXICS

Controlling air toxic emissions became a national priority with the passage of the CAAA of 1990, when Congress mandated that EPA regulate 188 air toxics, also known as hazardous air pollutants. EPA has assessed this list in its latest rule on the Control of Hazardous Air Pollutants from Mobile Sources (Federal Register, Vol. 72, No. 37, page 8430, February 26, 2007) and identified a group of 93 compounds emitted from mobile sources that are listed in its Integrated Risk Information System.[14]

In addition, EPA identified nine compounds discussed in Section 5.10.1 with significant contributions from mobile sources that are among the national- and regional-scale cancer risk drivers from its 2011 National Air Toxics Assessment.[15] These air toxic cancer-risk drivers are a concern for the study area, which has historically been subject to levels of air toxics at a level much higher than the statewide average.12

Historically, air toxics emissions have come from a multitude of sources in this area; this Project aims to reduce vehicle emissions that can contribute to the issue. With a focus on transit usage and overall emission reductions, localized air quality impacts and related human-health outcomes can be improved.

FHWA provides guidance on evaluating MSATs for highway projects as part of the NEPA process, which FTA is applying to the Project. This guidance specifies a tiered approach for MSAT evaluation:

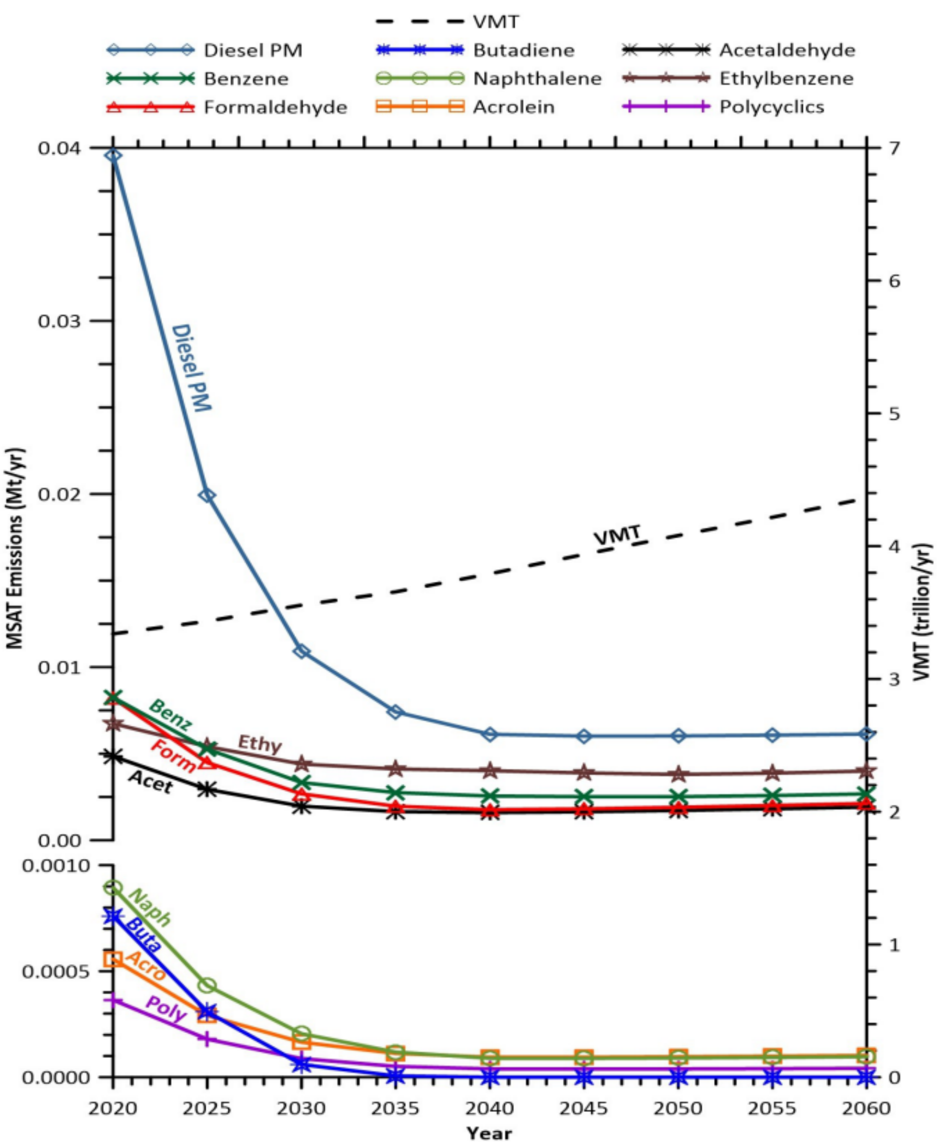
- No analysis is required for projects with no meaningful MSAT effects. These are projects qualifying as a categorical exclusion under 23 USC §§ 109 and 139, that are exempt under the CAA conformity rule, or that would have no meaningful impacts on traffic volumes or vehicle mix.
- Qualitative analysis is prescribed for projects with low potential MSAT effects. Most projects fall into this category if they do not meet the criteria for the other two categories.
- Quantitative analysis is required for major highway-capacity projects on facilities with more than 140,000 to 150,000 vpd or for intermodal freight terminal projects with high levels of diesel PM.

This qualitative evaluation of MSAT impacts for the Project was performed according to the FHWA guidance. This is appropriate based on the scope of improvements contemplated as part of this Project, particularly modifications to roads and intersections through the study area. FHWA guidance states that the qualitative assessment should compare, in narrative form, the expected effects of the Project on traffic volumes, vehicle mix, or routing of traffic and the associated changes in MSATs for the No-Build Alternative and Project, based on traffic volumes, vehicle mix, and speed. The assessment should also discuss national trend data projecting substantial overall reductions in emissions because of stricter engine and fuel regulations issued by EPA.

Summary of MSAT Information

The 2007 EPA rule further requires controls that would dramatically decrease MSAT emissions through cleaner fuels and cleaner engines. According to FHWA analysis using EPA's MOVES3, even if vehicle activity emissions (i.e., VMT) were to increase by 31 percent from 2020 to 2060 as forecasted, a reduction of 76 percent in the total annual emissions for the priority MSAT is projected from 2020–2060, as shown in Figure A5-13.

Figure A5-13 FHWA Projected National MSAT Emission Trends 2020–2060 for Vehicles Operating on Roadways



Source: U.S. Department of Transportation, *Updated Interim Guidance on Mobile Source Air Toxic Analysis in NEPA Documents- EPA MOVES3 model run conducted by FHWA, March 2021*. (USDOT 2023) https://www.fhwa.dot.gov/environment/air_quality/air_toxics/policy_and_guidance/msat/index.cfm.

Air toxics analysis is a continuing area of research. Although much work has been done to assess the overall health risk of air toxics, many questions remain unanswered. In particular, the tools and techniques for assessing project-specific health outcomes because of lifetime MSAT exposure remain limited. These limitations impede the ability to evaluate how the potential health risks posed by MSAT exposure should be factored into project-level decision-making within the context of NEPA.

Information is incomplete or unavailable to credibly predict project-specific health impacts that could occur because of changes in MSAT emissions associated with a proposed set of transportation alternatives. FHWA, EPA, the Health Effects Institute, and others have funded and conducted research studies to try to more clearly define potential risks from MSAT emissions associated with transportation projects. However, technical tools are not available to predict project-specific health impacts of MSAT emissions. In compliance with 42 USC §§ 4321-4347, FHWA has provided a discussion demonstrating that scientific techniques, tools, and data are not sufficient to accurately estimate human-health impacts that could result from a transportation project in a way that would be useful to decision-makers.

5.10.2 Study Area and Affected Environment

The study area for evaluating air quality effects from the Project was established in cooperation with MPCA. The analysis performed includes consideration of CO and MSATs. The evaluation of these pollutants is typically considered in the immediate Project area where traffic volumes, travel patterns, and roadway locations could affect air quality. Therefore, the study area for air quality includes all roadway segments adjacent to and crossing the Project Alignment.

In addition to traffic-related emissions, there would be minor amounts of emissions from an OMF to be located near the northern end of the Project Alignment. Therefore, the study area for air quality also includes the OMF.

Air quality is evaluated based on impacts on humans in the affected environment. Humans experience air quality impacts by breathing unsafe concentrations of airborne pollutants. Exposure to CO and MSATs emitted from motor vehicles, the pollutants of primary focus for this Project, can occur in homes, businesses, and recreation facilities located adjacent to affected roadway segments or on pedestrian facilities along Project-area roads.

5.11 Energy

The following section provides additional details about the regulatory context, methodology, and study area used to evaluate changes in regional energy consumption resulting from the Project.

5.11.1 Regulatory Context and Methodology

The analysis results are reported in Btu per mile as calculated from the VMT reported for each option by the Twin Cities Regional Travel Demand Model. A Btu is a commonly used unit of energy that represents the amount of heat energy needed to raise the temperature of 1 pint of water by 1 degree Fahrenheit. Energy consumption factors are based on estimates of average energy consumption rates.

The energy impact of the Project was determined by comparing the total energy consumption of the Project to that of the No-Build Alternative. The amount of energy used per mile by each mode of transportation is presented in Table A5-11. The light-duty vehicle emission factor is calculated based on the weighted average vehicle miles of cars, personal trucks, and motorcycles. By multiplying these energy-use factors by the total miles traveled, annual energy use can be estimated.

Table A5-11 Energy Consumption Factors

Travel Mode	Factor (Btu/Vehicle Mile)
Light-Duty Vehicle	5,066
Cars	4,292
Personal Trucks	5,845
Motorcycle	2,844

Source: U.S. Department of Energy, Transportation Energy Data Book: Edition 40, Oak Ridge National Laboratory, 2022, https://tedb.ornl.gov/.

An important note on the energy consumption analysis is that these values do not indicate the methods by which the energy was generated. There are large benefits in switching transportation mode type because the buses and heavy-duty and passenger vehicles rely on direct fossil-fuel combustion, while the LRT option relies on electricity (as a mixture of indirect fossil-fuel combustion and renewable energy sources). Electric LRT provides a shorter pathway to decarbonization through rapid capability to incorporate renewable power sources in the next few decades.

As discussed in the air quality analysis, decarbonization of the power grid would create an even more significant benefit for electrified mobility modes, the most readily available of which is LRT. Figure A5-11 in Section 5.1 illustrates the reduction in carbon intensity of the electrical grid between 2005 and 2018 using EPA's eGRID emission factor database. Through the continued decarbonization of the power grid, these emissions estimates are forecast to reduce, approaching the zero-carbon target year of 2050.

5.11.2 Study Area and Affected Environment

The study area for energy includes the seven-county Twin Cities Metropolitan Area, with an emphasis on anticipated changes in travel patterns and bus operations associated with the Project. The focus is on direct energy use; that is, the energy consumed through the operation of vehicles including automobiles, buses, and trucks.

The land use in the study area is primarily urban with undeveloped land at the north end. Development along the Project Alignment includes residential, business, industrial, institutional, park, and transportation uses. Existing land uses along the Project Alignment are identified and described in Chapter 4, Section 4.1 of this Supplemental Final EIS.

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[1] Geologic Atlas of Hennepin County (Minnesota Geological Survey 1989).

[2] Freshwater. 2021. *Hennepin County Bedrock Collapse Project: July 2021*. https://freshwater.org/wp-content/uploads/2021/10/Hennepin-County-Report.pdf.

[3] United States Department of Agriculture. 2019. Web Soil Survey. Accessed February 28, 2023. https://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm.

[4] United States Department of Agriculture 2019.

[5] Metropolitan Council. 2023. Modified Phase I Environmental Site Assessment, METRO Blue Line Extension, prepared by SEH (March 2023) and Updated Modified Phase I Environmental Site Assessment, METRO Blue Line Extension, prepared by Braun Intertec (December 2023).

[6] Metropolitan Council. 2024. Phase II Environmental Site Assessment, METRO Blue Line Extension. Prepared by Braun Intertec (date).

[7] Metropolitan Council. 2024. *Preliminary Engineering Water Resources Design Report,* Prepared by SRF Consulting Group. May 2024, Revision No. R01-00.

[8] Minnesota Pollution Control Agency (MPCA), *Greenhouse gas emissions in Minnesota 2005–2020* (Minneapolis, Minnesota: Minnesota Pollution Control Agency, 2022) https://www.pca.state.mn.us/sites/default/files/lraq-2sy23.pdf.

[9] Minnesota Department of Transportation (MnDOT), *Statewide Multimodal Transportation Plan* (Minneapolis, Minnesota: MnDOT, 2022) https://minnesotago.org/learn-about-plans/statewide-multimodal-transportation-plan.

[10] Transit Cooperative Research Program, *Research Report 226: An Update on Public Transportation's Impacts on Greenhouse Gas Emissions* (Washington, D.C.: Transit Cooperative Research Program, 2021) https://doi.org/10.17226/26103.
[11] Federal Transit Administration, *New and Small Starts Evaluation and Rating Process Final Policy Guidance* (New Jersey: FTA 2013) https://trid.trb.org/view/1267353.
[12] Metropolitan Council. Thrive MSP 2040 Transportation Policy Plan (TPP) 2040 TPP Appendix E (Minneapolis Minnesota, 2020) https://metrocouncil.org/Transportation/Planning-2/Key-Transportation-Planning-Documents/Transportation-Policy-Plan/2040.aspx.
[13] Environmental Protection Agency, *Limited Maintenance Plan Option for Nonclassifiable CO Nonattainment Areas* (EPA 1995) https://www.epa.gov/sites/default/files/2016-06/documents/1995lmp-co.pdf.
[14] Environmental Protection Agency, Integrated Risk Information System, (EPA, 2023), https://www.epa.gov/iris.
[15] Environmental Protection Agency, *1999 National-Scale Air Toxics Assessment* (EPA,1999) https://archive.epa.gov/airtoxics/nata1999/web/html/index.html.