Feasibility Report

2026 Spring Creek Road Reconstruction and Mill Towns State Trail Improvements

BMI Project No. 24X134891000
City Project No. STRT2026-A84

January 2025

Submitted by:
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Certification

Feasibility Report

For

2026 Spring Creek Road Reconstruction and Mill Towns State Trail Improvements

City of Northfield
Northfield, Minnesota
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PROFESSIONAL ENGINEER
I hereby certify that this plan, specification, or report was prepared by me or under my direct supervision, and that I am a duly Licensed Professional Engineer under the laws of the State of Minnesota.

Signature: ______________________________
Typed or Printed Name: Jason A. Malecha, P.E.
Date: XX/XX/XXXX License Number: 57151

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Appendix

I. INTRODUCTION

The Northfield City Council ordered the preparation of a feasibility report for the 2026 Spring Creek Road Reconstruction and Mill Towns State Trail Improvements project at its July 9th meeting in 2024. The 2026 Spring Creek Road Reconstruction and Mill Towns State Trail Improvements project will include complete street reconstruction, including both rural and urban sections, trail construction, watermain improvements, storm sewer improvements, and stormwater BMPs. See ***Figure 1*** in ***Appendix A*** for a proposed location map of the project area.

This report reviews the existing conditions in the project area and discusses the proposed improvements associated with the project. The report also provides preliminary cost estimates for the proposed improvements with financing for the project coming from a combination of Municipal State Aid, City franchise fees, and the City's storm water, sanitary sewer, and watermain utility funds.

One neighborhood meeting was held during the project development process providing property owners and the public with an opportunity to provide feedback on the proposed improvements. Additional information was available to the public on the project website. Feedback received from the neighborhood meeting was considered in the development of this report. A summary of the public feedback from the open house meeting is included in ***Appendix D***.

If the City decides to proceed with the proposed improvements described in this report, it is anticipated that construction would begin in 2026 as shown in the detailed project schedule included in this report.

II. BACKGROUND

The City of Northfield's Capital Improvement Plan (CIP) identifies Spring Creek Road Reconstruction and Mill Towns State Trail Improvements project for construction in the year 2026. The City's Pedestrian, Bike, and Trail System Plan identifies the planned Mill Towns State Trail along Spring Creek Road and identifies gaps in the City's trail and sidewalk network to be addresses as part of this project and adjacent future projects. This feasibility study will aid in identifying necessary infrastructure improvements and help define costs within the project area. The Spring Creek Road Corridor is an important collector on the east side of the City that connects County State-Aid Highway 28 and County Road 81 on the south. This route serves the agricultural community and will be an important connection for the growth area to the Southeast as that land gets annexed into the city in the future for new development. Fostering a connected City is important, so this report will examine how to facilitate those connections.

III. EXISTING CONDITIONS

A. Streets

Spring Creek Road was originally constructed as a gravel road with varying levels of maintenance being completed since then and segments of the road being reconstructed over various years. Paved surfacing extends approximately 300 feet north of Huron Court at which point the roadway surface becomes gravel. Spring Creek Road remains gravel until approximately 100 feet south of the Spring Creek box culvert where it changes back to a paved surface extending to the north extents of the project area at Woodley Street. The project area is largely comprised of a rural section roadway with the exception being a small amount of concrete curb and gutter located near the intersection with Woodley Street. The road sections include varying widths throughout. The project corridor abuts residential parcels, agricultural land, and some City owned parcels. No sidewalks or trails exist along the corridor.

The pavement is aged and exhibits signs of wear and distress to varying degrees and is generally in poor condition with significant transverse cracking, longitudinal cracking, alligator-type cracking, potholes, and rutting. The gravel surfacing also shows signs of deterioration including potholing and rutting.

The boulevards along the project corridor generally include turf type grasses and are graded to drain away from the roadway and into adjacent ditches. The boulevards contain a significant presence of varying diameter trees and brush. There are also power poles as well as other buried private utilities in various locations throughout the corridor right-of-way.

Soil borings and a geotechnical evaluation were completed throughout the project area by American Engineering Testing (AET) and the report is included in ***Appendix E***. The existing rural section ranges from about 4 inches of crushed limestone to about 1 foot of sand with gravel. Borings within the existing bituminous pavement areas to the north and south ends of the project limits were drilled just off the pavement and encountered 2 feet of sand with gravel and clayey sand. Sandstone bedrock was encountered at borings B-2, B-3, B-4, and B-6 at depths ranging from 5 feet to 9.5 feet, which may be above possible utility depths. Generally, the portion of bedrock encountered should be rippable, however hard bedrock may be encountered. Groundwater was observed within boring B-5, the boring nearest to the box culvert, and given the location of the observation above apparent bedrock residual material, it appears likely to represent a perched condition.

An Arborist Report was completed by TreeBiz LLC to evaluate the condition of the existing trees within the existing right-of-way and to provide recommendations for removal, protection and trimming as a part of the proposed construction. This report can be found in ***Appendix C***. Removals will follow the guidelines of the City's Emerald Ash Borer Management Plan which calls for trees to be removed that are under 13" in diameter, all trees with fair or worse rating condition, and trees less than 19" not deemed in great or excellent shape. Removals due to construction impacts will also be identified throughout preliminary and final design.

B. Sanitary Sewer

There are no sanitary sewer mains along Spring Creek Road, but an existing trunk sewer line does cross Spring Creek Road just north of the Spring Creek box culvert. This trunk line is constructed of 24-inch PVC pipe and precast concrete structures and was installed in 1997. A sanitary sewer stub was installed to the east when Bridge 66J81 was replaced over the creek.

C. Water Main

12 inch DIP water main extends north of Huron Court approximately 200 feet and was installed between 2015 and 2019. 12-inch DIP water main also extends south from Woodley Street to Sumac Lane and was installed in the 1990's. A 24-inch steel casing was installed under Bridge 66J81 for watermain to be installed with this project.

D. Storm Sewer

City records indicate that the Spring Creek Road corridor has minimal storm sewer infrastructure due to its rural design, where drainage primarily occurs through ditches directing water toward Spring Creek. Existing storm sewer in the area consists mainly of culverts that facilitate flow at roadway, driveway and field access crossings. Additionally, dual box culverts allow Spring Creek to pass beneath the road.

IV. PROPOSED IMPROVEMENTS

A. Streets

The section of Spring Creek Road from approximately 100 feet north of Huron Court to approximately 150 feet south of the Spring Creek box culvert will be reconstructed remaining a rural section with a bituminous pavement width of 34 feet, accounting for an 11-foot travel lane and a 6-foot paved shoulder in each direction. Side slopes will be graded to match existing grades or to construct a ditch section as required for drainage. Typical sections for the rural portion of Spring Creek Road can be seen in ***Figure 2*** and ***Figure 3*** in ***Appendix A***.

Spring Creek Road from approximately 150 feet south of the Spring Creek box culvert to Woodley Street East will be reconstructed to be an urban roadway section measuring 26-feet from face of curb to face of curb, which includes an 11-foot drive lane with a 2-foot curb reaction in each direction. The roadway is proposed to be narrowed to 26 feet to promote slower traffic speeds and reduce the pedestrian crossing distance where the Mill Towns State Trail crossed Spring Creek Road. North of Sumac Lane the east side of the road will bump out to accommodate an 8-foot parking lane. Typical sections for the urban section of Spring Creek Road can be seen in ***Figure 4*** of ***Appendix A***.

The proposed pavement section for Spring Creek Road consists of the following:

- 4" Bituminous Wearing Course
- 9" Class 5 Aggregate Base
- 12" Select Granular Borrow
- Geotextile Fabric

Segment C of the Mill Towns State Trail extends through the project corridor. Just north of the project corridor midpoint, the Mill Towns State Trail begins running adjacent to the west side of Spring Creek Road until it reaches the existing box culvert. At the box culvert, the trail crosses the roadway to the east side where it continues north until it reaches Woodley Street. The section of the trail north of Woodley Street will be completed as part of a different City project and the portion of the trail that connects to the south trail limits within our project will be completed in as part of the City's 2026 Mill and Overlay project along Jefferson Parkway. Concrete sidewalk is proposed to be constructed from the trail crossing location to Woodley Street along the west side of Spring Creek Road, connecting the trail and Sumac Lane to existing sidewalk along the south side of Woodley Street. Sidewalk was considered along the entire west side of Spring Creek Road from Huron Court to Woodley

Street but was omitted due to the lack on sidewalk on the west side on Spring Creek Road from Huron Court to the south. Through public input and observation of residents walking on Spring Creek Road a sidewalk on the west side of the corridor would be recommended due to the high speed of the roadway. However, back in 2018 when the first segment was improved, a sidewalk on the west side was cost prohibitive due to necessary retaining wall construction.

Intersection Improvements are proposed at three intersections within the reconstruction areas. The first is a mid-block crossing located near the Spring Creek box culvert and includes an enhanced pedestrian crossing for the Mill Towns State Trail. Pedestrian ramps, a Rectangular Rapid Flashing Beacon (RRFB), and crosswalk pavement markings will be implemented to increase pedestrian safety at this crossing. The second is the intersection of Spring Creek Road and Sumac Lane. Planned improvements for this intersection include standard 20-foot curb radii, pedestrian ramps, and crosswalk pavement markings. The third intersection with proposed pedestrian improvements is the intersection of Spring Creek Road and Woodley Street. Improvements are only proposed for the south quadrants of this intersection, as the north quadrants are included in a separate City project planned in 2027. Improvements at this intersection include pedestrian ramps and crosswalk pavement markings. An RRFB will be considered during final design for the north/south crossing of Woodley Street. Intersection improvements can be seen in ***Figure 7*** found in ***Appendix A*** of this report.

A Traffic Safety and Stop Analysis was completed for the intersection of Spring Creek Road and Woodley Street as part of this project. The five-year crash history, sight lines, and speed data were all reviewed at this intersection and an analysis of the potential change from a Two-Way Stop control to an All-Way Stop control was performed. The crash data revealed that no crashes were observed in the past five years at this intersection, indicating overall acceptable conditions. Roadway geometrics, power poles, utility boxes, and multiple bushes and trees on the NE and NW corners create poor sight lines for southbound traffic from Spring Creek Road entering Woodley Street. Speed data indicates that traffic speeds in both directions along Woodley Street exceed the posted 35-mph speed limit. Ultimately, the intersection of Spring Creek Road and Woodley Street does not meet the criteria for All-Way Stop Warrants based on traffic volumes and crashed history. Improvements to this intersection are still in development with City and County staff. The Traffic Safety and Stop Analysis can be found in ***Appendix F*** of this report.

As with most street and utility reconstruction projects, tree impacts are impossible to avoid. Many trees require removal to accommodate sidewalk and trail installation, due to their proximity to underground utilities, or due to necessary grading that would significantly impact the tree's root system. Additionally, reconstruction projects are an opportune time to remove trees that may be in poor health or that may be of a specific species, such as Ash trees, that are susceptible to disease and could be problematic soon. ***Table 1*** quantifies the number of trees removed that are over 3 inches in diameter at breast height and the reason for their removal. Some tree removals may need to be evaluated in the field during construction to determine if removal of the tree is necessary.

Table 1 – Proposed Tree Impacts	
Reason For Removal	**# Trees**
Sidewalk/Trail/Grading Related Removal	38
Health Related Removal	12
Ash Tree Removal	1
Total Tree Removal	51

B. Sanitary Sewer

No sanitary sewer improvements are planned as part of this project. Any existing sanitary structures falling within the project limits will have new castings and adjustment rings installed but structures and pipes will remain in their existing conditions.

C. Water Main

12-inch DIP water main will connect approximately 150 feet north of Huron Court and will extend north connecting to existing water main near Sumac Lane. An existing steel casing located at the creek crossing, installed as part of the past box culvert project, will be utilized to allow the water main pipe to cross the creek limiting disturbance. Hydrants will be installed along Spring Creek Road with a maximum spacing of 500 feet and gate valves will also be installed with a maximum spacing of 1000 feet. This new section of water main will allow for a looped system which benefits water quality and pressure within the system.

D. Storm Sewer

In the section of Spring Creek Road proposed to remain a rural road design, the existing drainage ditch system will remain in place and the proposed storm sewer improvements will include replacement of the existing culverts. In the area proposed to be constructed as an urban street section, additional storm sewer will be required to collect the stormwater. Storm sewer pipe and structures will be installed in a layout to meet drainage requirements. The proposed storm sewer layout will be analyzed for hydraulic performance during final design to determine final pipe sizing and catch basin locations.

Overall, the proposed design will maintain existing drainage patterns with the exception that runoff flowing directly onto the roadway will now be captured. The storm sewer system will adhere to city guidelines, ensuring a minimum pipe size of 15 inches and pipe capacity sufficient for a 10-year storm event. The pipe capacities and inlet spread will also meet state aid standards. It is the intent of the City to meet the requirements of water quality and rate control for this project.

In addition to upgrading the storm sewer infrastructure, stormwater management improvements will be designed to meet city and Municipal Separate Storm Sewer System (MS4) requirements for treatment volume and pollutant removal. A stormwater basin on the southeast side of Spring Creek is proposed to meet these requirements. Further analysis during the final design phase will refine the stormwater management BMP sizing, layout, and functionality.

See ***Figure 8*** in ***Appendix A*** for the proposed utilities layout.

V. STAKEHOLDER COORDINATION

A. Private Utilities

A private utility informational meeting will be held with private utility companies that have facilities within the project area to understand the presence of existing overhead or underground facilities and plans for infrastructure upgrades or relocations during the final design phase of the project. While reviewing the proposed project layouts, overhead utility poles may conflict with the Mill Towns State Trail to be installed along the east side of Spring Creek Road and require relocation as part of the project. These locations will be evaluated in detail during final design. Existing street lighting can be found at the intersections of Spring Creek Road and Huron Court, Sumac Lane, and Woodley Street. The locations of these poles will also be evaluated during final design and if required, the relocation of poles with streetlights will be coordinated with the corresponding private utility companies to ensure proper placement to light the project facilities.

B. Public Involvement

A neighborhood meeting was held with the adjacent property owners on October 10, 2024. Large scale layouts and the overall project scope were presented in addition to information being posted to the project website. Overall, feedback from residents was positive regarding the need for street reconstruction and trail construction. Discussions were had regarding the sidewalk and trail construction and how they would alleviate the issue of pedestrians frequently walking on the street along this section of Spring Creek Road. Several discussions were also had regarding the desire to impose a four way stop at the intersection of Spring Creek Road and Woodley Street, with traffic speed on Woodley Street and sight line issues being cited as the main concerns.

Resident feedback was welcomed and recorded and is included in ***Appendix D*** of this report.

VI. RIGHT-OF-WAY, EASEMENTS, AND PERMITS

The roadway corridor will extend outside of existing right-of-way within a City owned parcel. No easement or right-of-way acquisition is anticipated for this area. The roadway corridor also extends outside of existing right-of-way at the southeast corner of the intersection of Spring Creek Road and Woodley Street. Right-of-way acquisition is anticipated in this quadrant of the intersection to facilitate construction of the trail and pedestrian facilities. Temporary construction easements are likely needed for grading throughout the project corridor and will be further evaluated during final design. Permanent easement will be required for the storm water treatment basin located southeast of the creek crossing. Right-of-way and easement needs are shown on ***Figure 9*** in ***Appendix A***.

A preliminary list of anticipated permits for construction of the improvements include:

- Minnesota Pollution Control Agency (NPDES Construction Stormwater Permit)
- Minnesota Department of Health (Public Watermain Plan Review)
- Rice County (Work in ROW Permit)
    - Work within Woodley Street E ROW

VII. ESTIMATED COSTS AND FUNDING

A detailed estimate of probable construction costs has been prepared for the improvements described in this report and is included in Appendix B. All costs are based on anticipated unit prices for the 2026 construction season and include a 20% contingency and 20% overhead for legal, engineering, administrative, and finance costs. ***Table 2*** below shows a summary of the estimated project costs for the recommended base project improvements.

These cost estimates are based upon public construction cost information. Since the project team has no control over the cost of labor, materials, competitive bidding process, weather conditions, and other factors affecting the cost of construction, all cost estimates are opinions for general information of the client and no warranty or guarantee as to the accuracy of construction cost estimates is made. It is recommended that costs for project financing should be based upon actual, competitive bid prices with reasonable contingencies.

Table 2 – Estimated Project Costs

Proposed Improvements	Total Project Costs
Street	$ 1,659,598.00
Trail/Walk	$ 89,292.00
Storm	$ 172,802.00
Sanitary	$ 1,924.00
Water	$ 487,153.00
Total Project Costs	$ 2,410,769.00

Funding for the project will be covered by local funds from the city and Municipal State Aid funds. The costs will be split between Municipal State aid funds, city franchise fees, and the City's storm sewer utility fund, sanitary sewer utility fund, and watermain utility fund. The proposed funding summary is based on preliminary estimated project costs for the recommended improvements. A summary of the funding breakdown for the base project is presented in ***Table 3*** below.

Table 3 – Project Funding Sources

Funding Source	Estimated Funding
Municipal State Aid	$ 1,896,092.00
City Franchise Fees	$ 25,600.00
City Utility Fund – Sanitary Sewer	$ 1,924.00
City Utility Fund - Watermain	$ 487,153.00
Total Funding	$ 2,410,769.00

VIII. PROJECT SCHEDULE

The proposed project schedule is shown below but is subject to change:

Neighborhood Meeting #1 ……………………………………………………………………………. October 10, 2024

Council Meeting to Discuss Draft Feasibility Report ……………………………………….…… January 21, 2025

Accept Feasibility & Authorize Preparation of Plans and Specifications* ……..……… February 4, 2025

Right-of-Way/Easement Acquisition ……………………………………………….…………… February – July 2025

Neighborhood Meeting #2 ……………………………………………………………………………… December 10, 2025

Approve Final Plans & Specifications and Order Advertisement for Bids* ……………. January 6, 2026

Bid Opening …… February 5, 2026

Accept Bids and Award Contract* ………………………………………………………………… February 17, 2026

Construction Begins …………………………………………………………………………………………….……. May 2026

Construction Substantial Completion ………………………………………………………………….. October 2026

* Denotes City Council Meeting

IX. CONCLUSION

This report has been prepared to investigate the components of the 2026 Spring Creek Road Reconstruction and Mill Towns State Trail Improvements project as necessary to construct the included roadways as safe and effective multimodal corridors. This report identified the recommended improvements to the infrastructure, provided estimated costs of the recommended improvements, and identified applicable funding to finance the improvements.

From an engineering standpoint, this project, as proposed, is feasible, cost effective, and necessary and it can best be accomplished by letting competitive bids for the work. It is recommended that the work be done under one contract to complete the work in an orderly and efficient manner. The City and its financial advisor will have to determine the economic feasibility of the proposed improvements.

Appendix A: Figures

NORTHFIELD MINNESOTA

2026 SPRING CREEK ROAD RECONSTRUCTION & MTT IMPROVEMENTS

CITY OF NORTHFIELD

FIGURE 1: PROJECT LOCATION

JANUARY 2025

BOLTON & MENK

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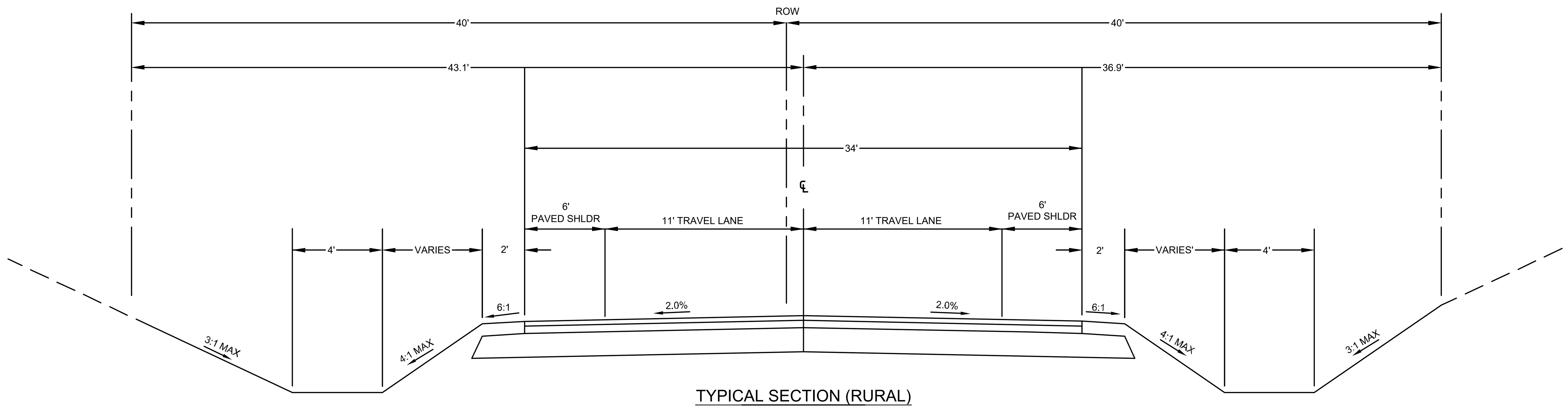
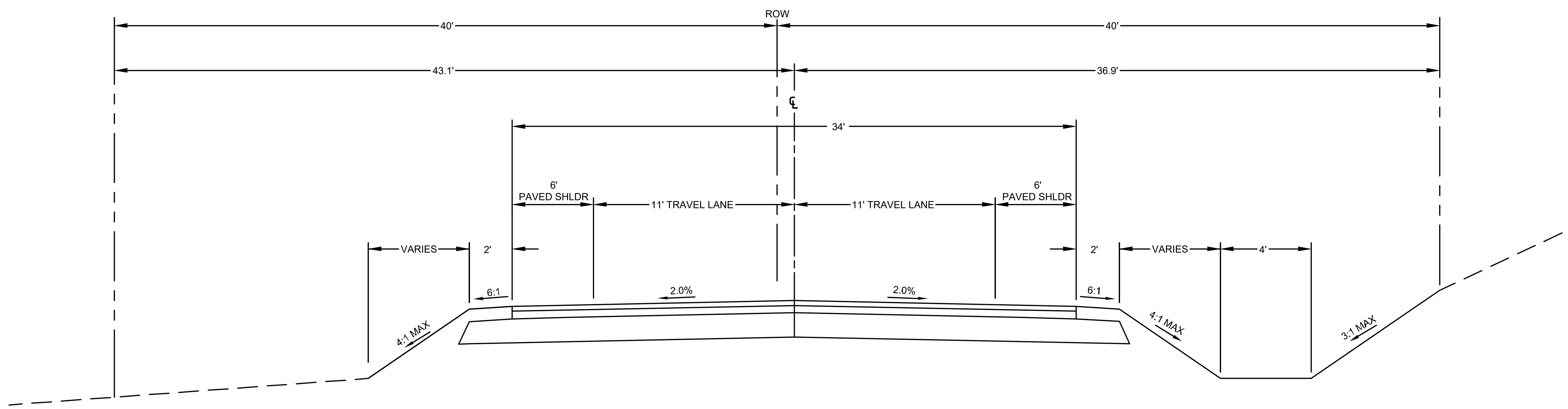
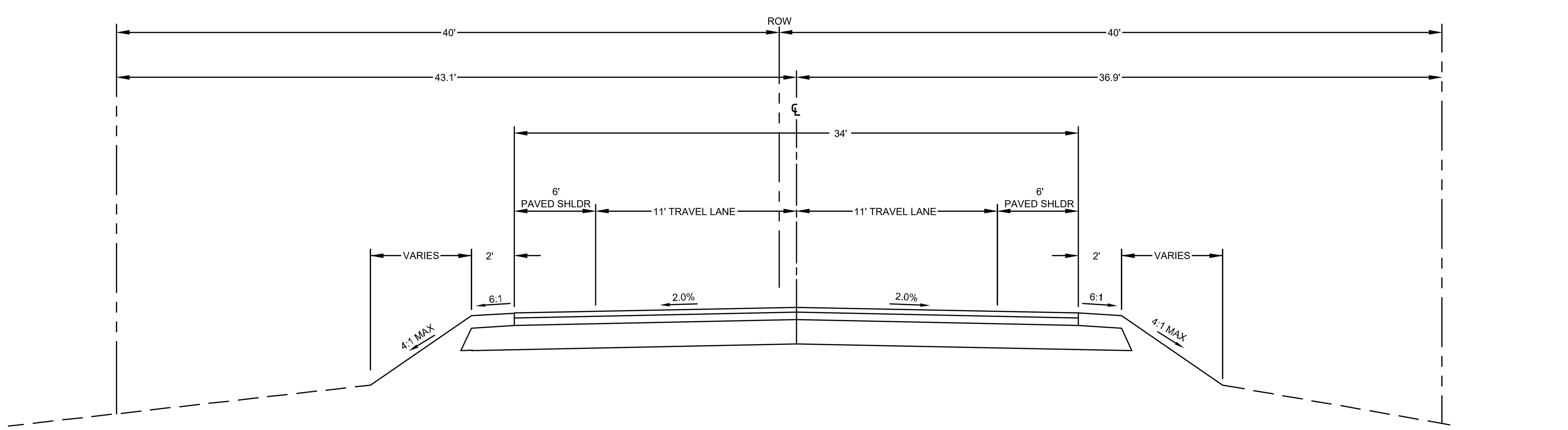


TYPICAL SECTION (RURAL)
(N.T.S.)
STA 56+20 TO STA 56+35



TYPICAL SECTION (RURAL)
(N.T.S.)
STA 52+00 TO STA 56+20
STA 58+56 TO STA 65+25



TYPICAL SECTION (RURAL)
(N.T.S.)
STA 57+02 TO STA 58+56

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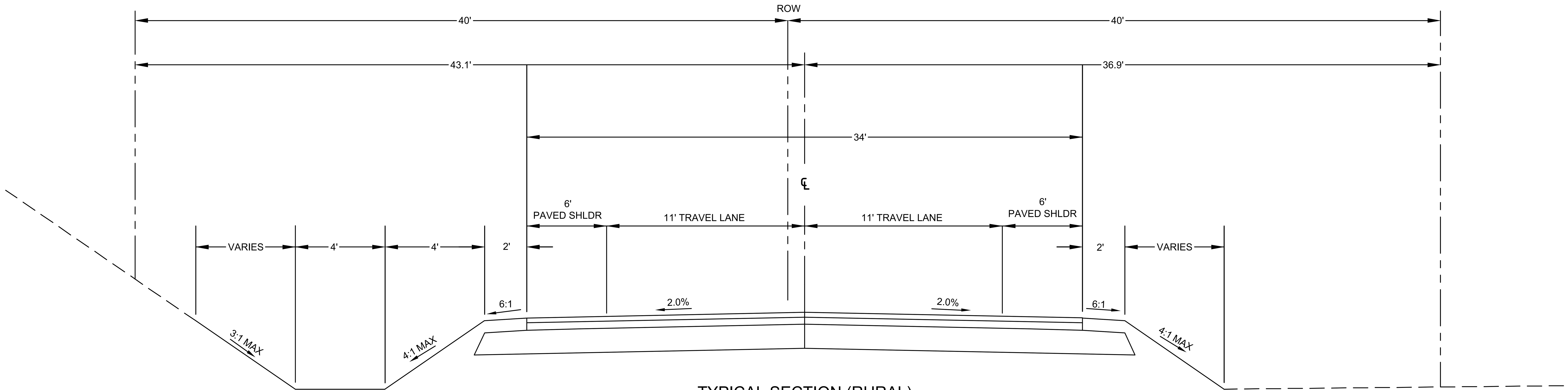
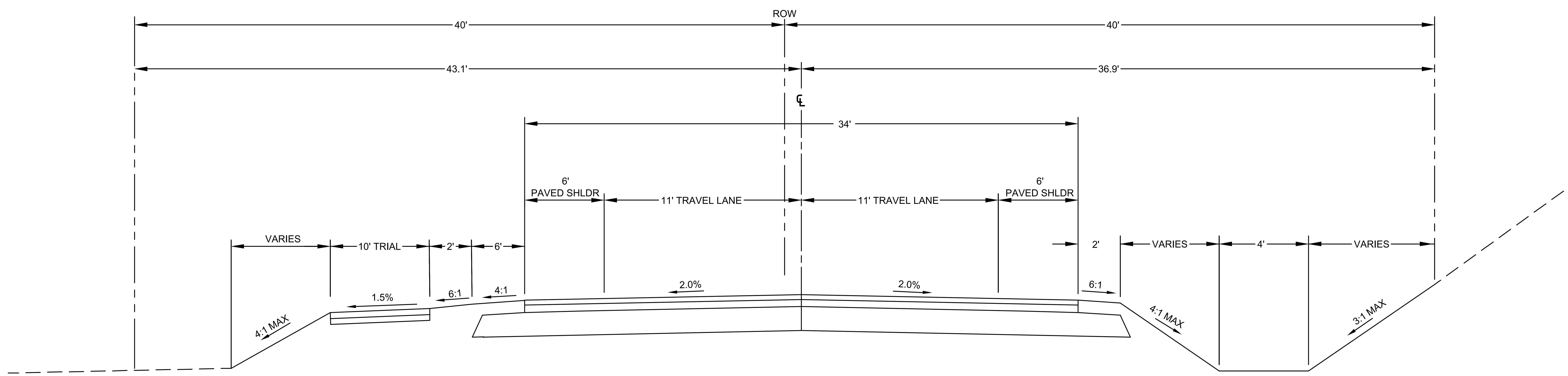


TYPICAL SECTION (RURAL)

(N.T.S.)
STA 56+35 TO STA 57+02



TYPICAL SECTION (RURAL)

(N.T.S.)
STA 65+25 TO STA 68+13

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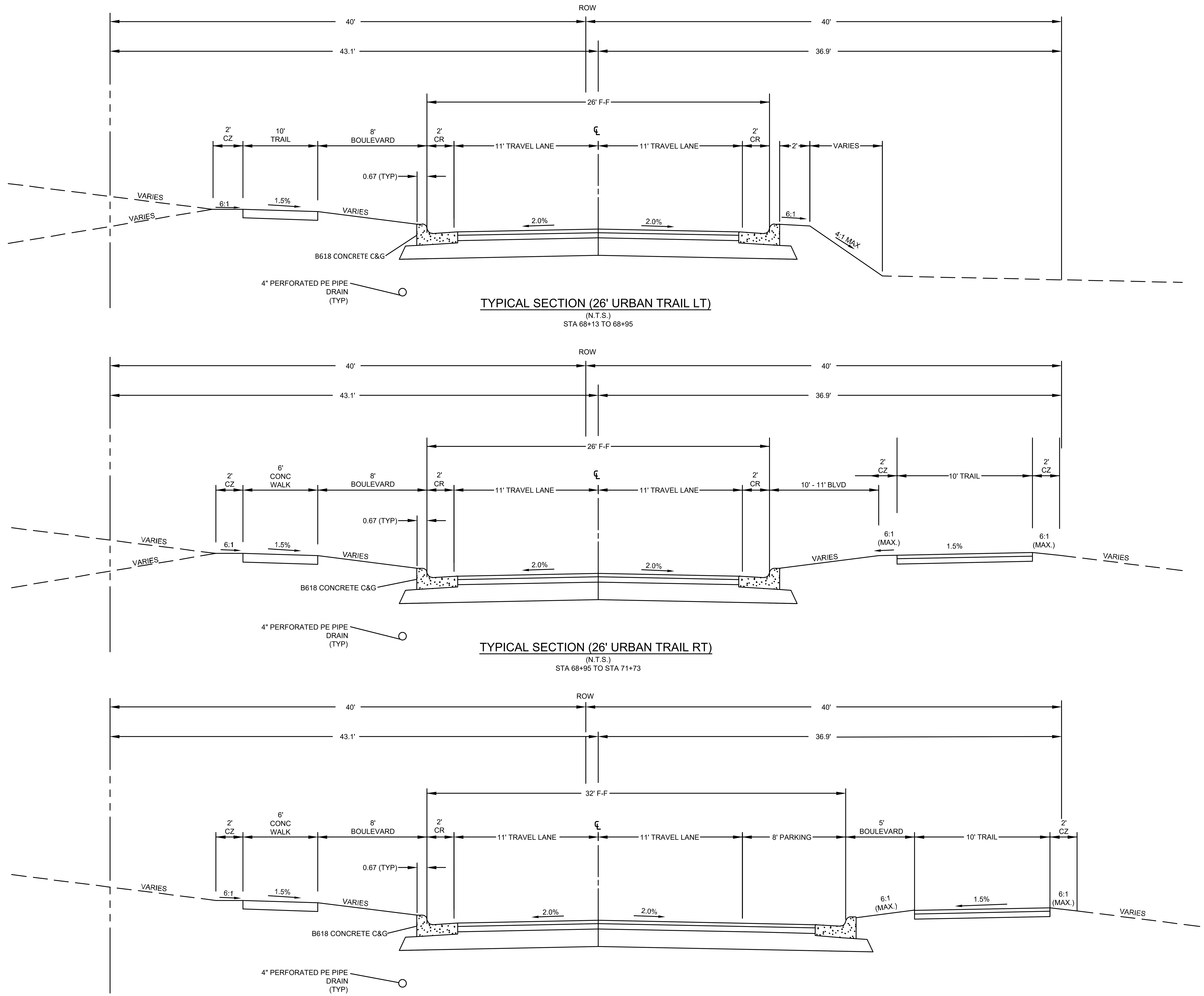

TYPICAL SECTION (26' URBAN TRAIL LT)
(N.T.S.)
STA 68+13 TO 68+95

TYPICAL SECTION (26' URBAN TRAIL RT)
(N.T.S.)
STA 68+95 TO STA 71+73

TYPICAL SECTION (32' URBAN WITH PARKING & TRAIL RT)
(N.T.S.)
STA 71+73 TO STA 74+53

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2026 SPRING CREEK ROAD RECONSTRUCTION & MTT IMPROVEMENTS

CITY OF NORTHFIELD

FIGURE 5: PROPOSED STREET IMPROVEMENTS

JANUARY 2025

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NORTHFIELD MINNESOTA

2026 SPRING CREEK ROAD RECONSTRUCTION & MTT IMPROVEMENTS

CITY OF NORTHFIELD

FIGURE 6: TREE IMPACTS

JANUARY 2025

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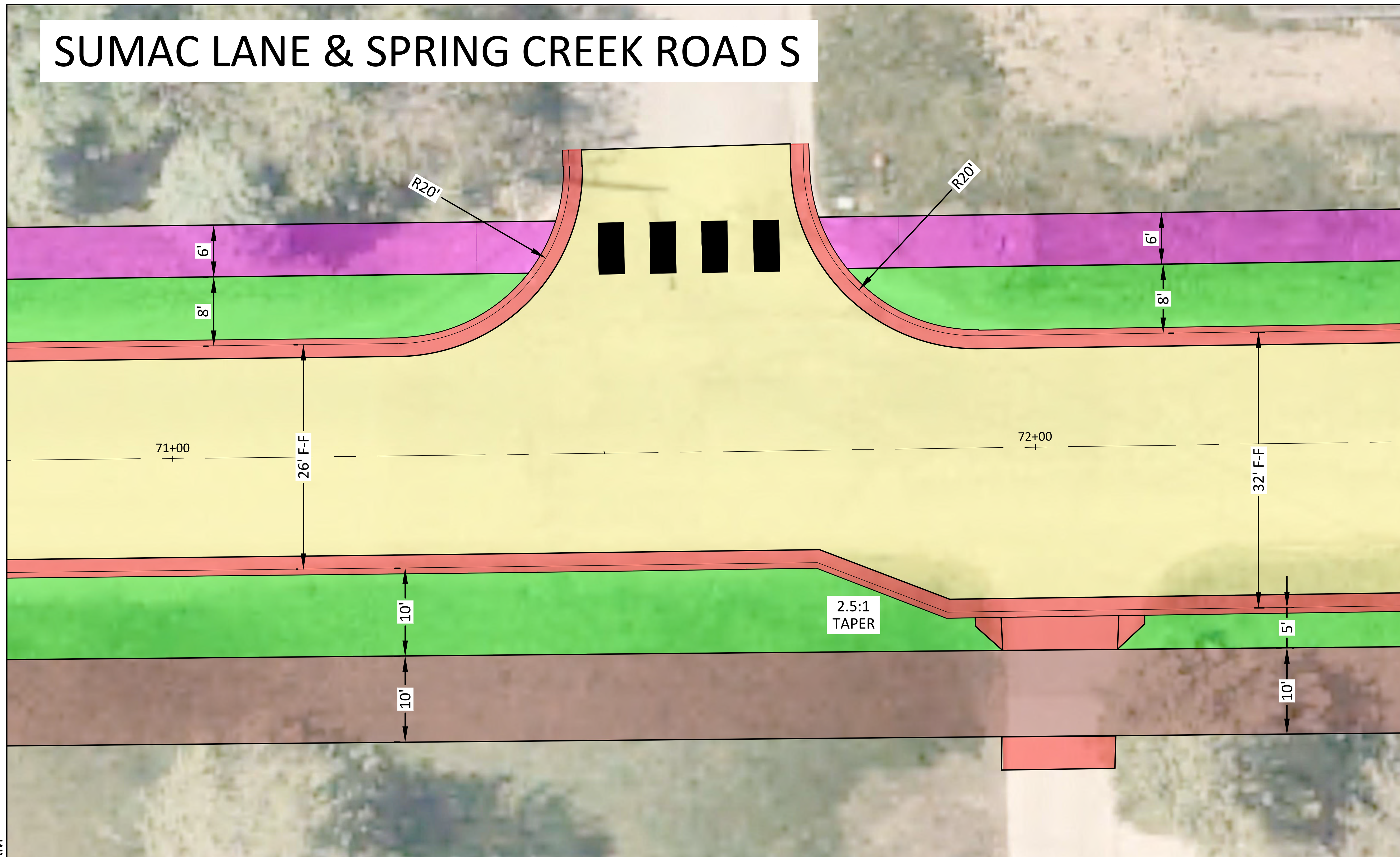
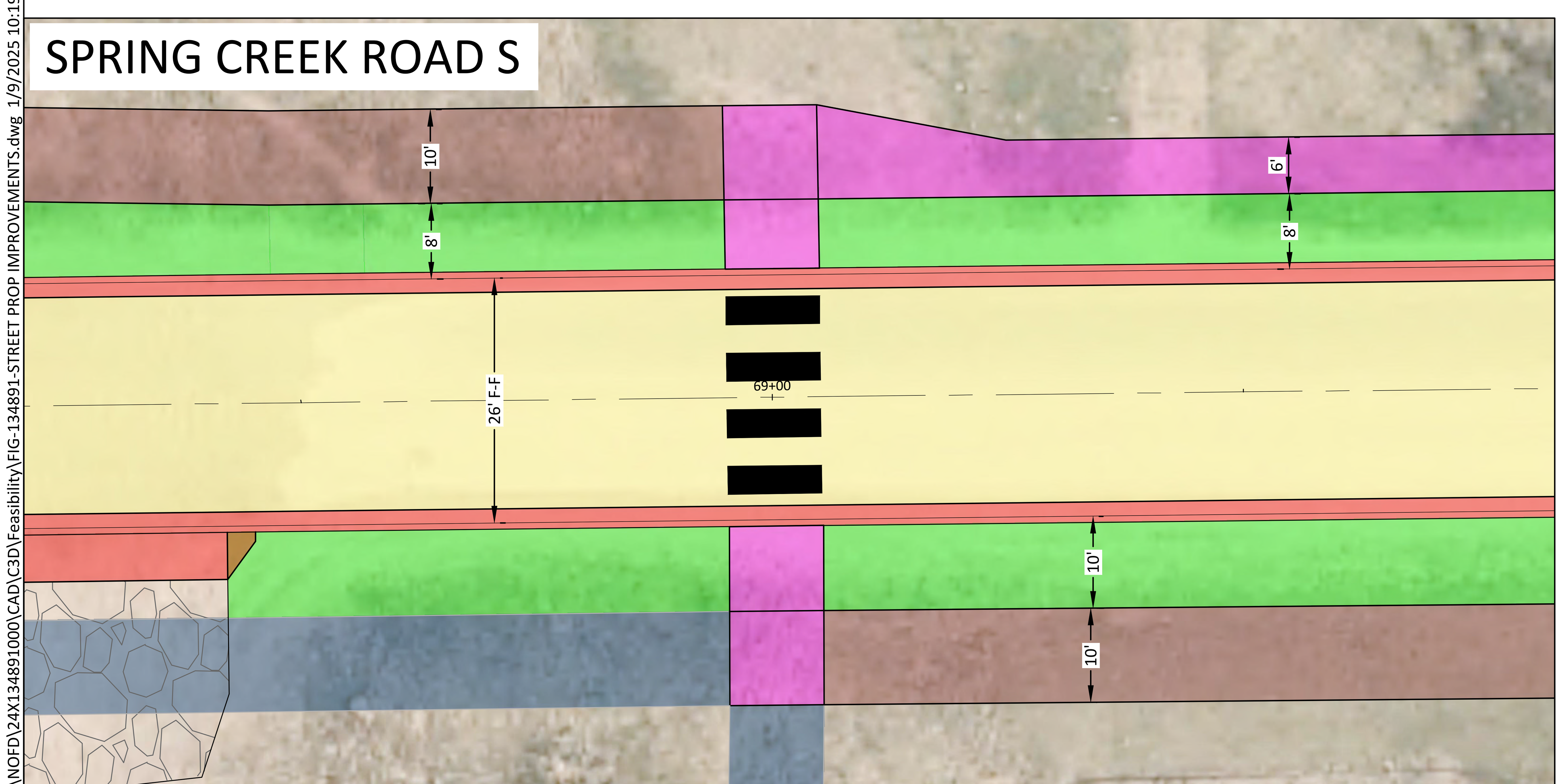
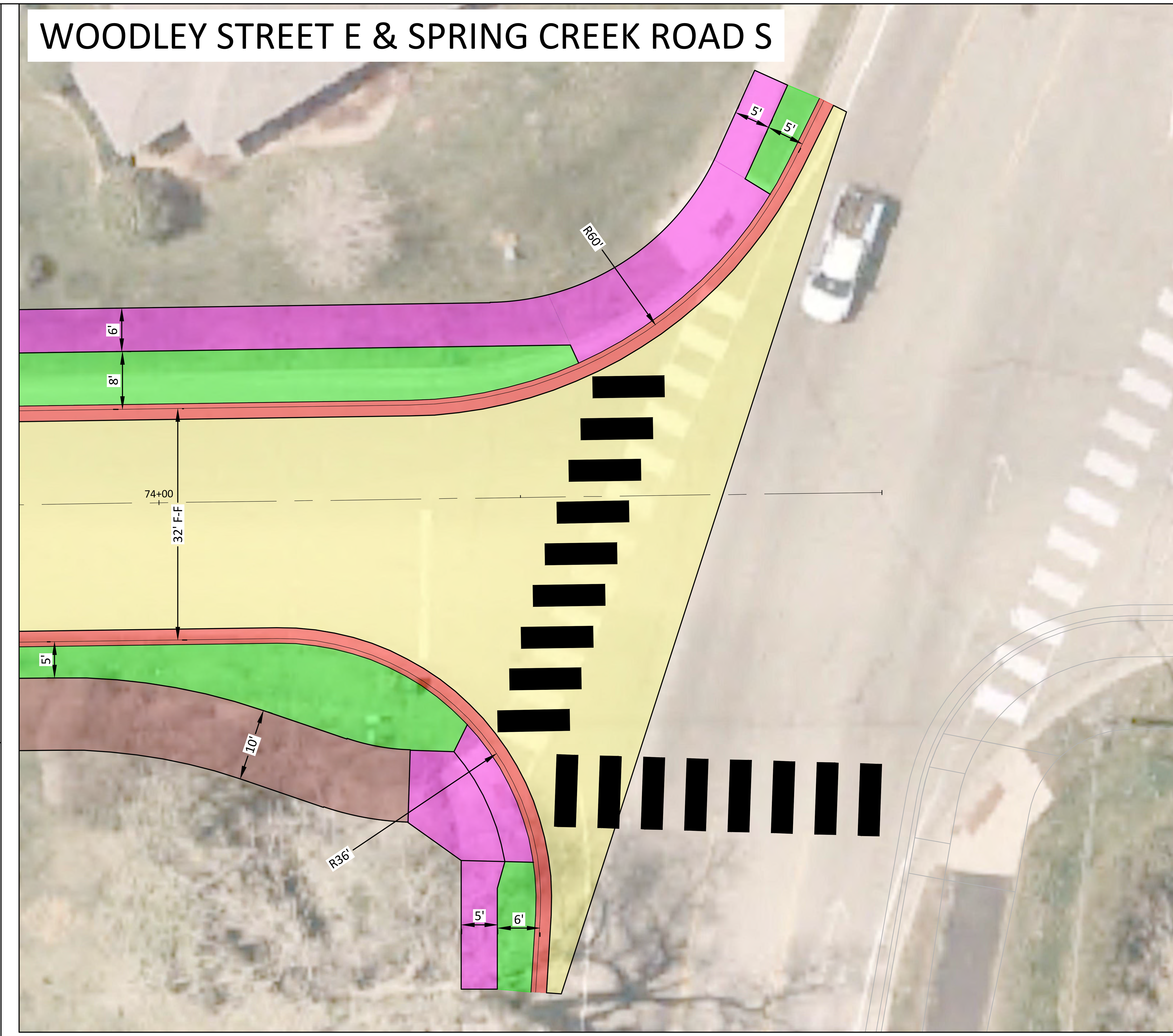
H:\NOFD\24X134891000\CAD\C3D\Feasibility\FIG-134891-STREET AREA TREE IMPACTS.dwg 1/9/2025 10:17:47 AM

FIGURE 7: INTERSECTION IMPROVEMENTS







HORZ. SCALE 0 10 20 FEET

LEGEND

- BITUMINOUS PAVEMENT
- CONCRETE PAVEMENT & B618 CURB & GUTTER
- CONCRETE SIDEWALK
- FUTURE BITUMINOUS TRAIL
- BITUMINOUS TRAIL
- TURF
- PEDESTRIAN CROSS WALK BLOCKS

NORTHFIELD MINNESOTA

2026 SPRING CREEK ROAD RECONSTRUCTION & MTT IMPROVEMENTS

CITY OF NORTHFIELD

FIGURE 8: UTILITY IMPROVEMENTS

JANUARY 2025

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H:\NOFD\24X134891000\CAD\C3D\Feasibility\FIG-134891-ROW & EASE IMPACTS.dwg 1/9/2025 10:17:17 AM

Appendix B: Preliminary Cost Estimate

PRELIMINARY ENGINEER'S ESTIMATE

2026 SPRING CREEK ROAD RECONSTRUCTION AND MILL TOWNS STATE TRAIL IMPROVEMENTS

CITY OF NORTHFIELD, MINNESOTA

CITY PROJECT NO. STRT2026-A84

BMI PROJECT NO. 24X.134891.000

NORTHFIELD MINNESOTA — BOLTON & MENK — Real People. Real Solutions.

ITEM NO.	SPEC. REF	DESCRIPTION	NOTES	UNIT	CITY OF NORTHFIELD					STATE AID			TOTAL ESTIMATED QUANTITY	ESTIMATED UNIT PRICE	ESTIMATED TOTAL PRICE
					STREET	TRAIL/WALK	STORM	SANITARY	WATER	STREET	TRAIL/WALK	STORM			
1	2021.501	MOBILIZATION		LUMP SUM	0.00	0.00	0.00	0.00	0.20	0.69	0.04	0.07	1.00	$93,000.00	$ 93,000.00
2	2101.502	CLEARING		EACH	0	0	0	0	0	51	0	0	51	$700.00	$ 35,700.00
3	2101.502	GRUBBING		EACH	0	0	0	0	0	51	0	0	51	$250.00	$ 12,750.00
4	2104.502	REMOVE PIPE APRON		EACH	0	0	0	0	0	0	0	15	15	$400.00	$ 6,000.00
5	2104.502	REMOVE CASTING		EACH	0	0	0	1	0	0	0	0	1	$125.00	$ 125.00
6	2104.502	REMOVE GATE VALVE & BOX		EACH	0	0	0	0	1	0	0	0	1	$250.00	$ 250.00
7	2104.502	REMOVE DRAINAGE STRUCTURE		EACH	0	0	0	0	0	0	0	1	1	$650.00	$ 650.00
8	2104.502	REMOVE SIGN		EACH	0	0	0	0	0	7	0	0	7	$60.00	$ 420.00
9	2104.502	SALVAGE MAILBOX SUPPORT		EACH	0	0	0	0	0	5	0	0	5	$250.00	$ 1,250.00
10	2104.503	SAWING CONCRETE PAVEMENT (FULL DEPTH)		LIN FT	0	0	0	0	0	10	0	0	10	$5.00	$ 50.00
11	2104.503	SAWING BITUMINOUS PAVEMENT (FULL DEPTH)		LIN FT	0	0	0	0	0	191	0	0	191	$3.00	$ 573.00
12	2104.503	REMOVE WATERMAIN		LIN FT	0	0	0	0	139	0	0	0	139	$15.00	$ 2,085.00
13	2104.503	REMOVE SEWER PIPE (STORM)		LIN FT	0	0	0	0	0	0	0	368	368	$15.00	$ 5,520.00
14	2104.503	REMOVE CURB & GUTTER		LIN FT	0	0	0	0	0	308	0	0	308	$5.00	$ 1,540.00
15	2104.504	REMOVE CONCRETE DRIVEWAY PAVEMENT		SQ YD	0	0	0	0	0	12	0	0	12	$10.00	$ 120.00
16	2104.504	REMOVE BITUMINOUS DRIVEWAY PAVEMENT		SQ YD	0	0	0	0	0	110	0	0	110	$7.00	$ 770.00
17	2104.504	REMOVE BITUMINOUS PAVEMENT		SQ YD	0	0	0	0	0	2100	0	0	2100	$4.00	$ 8,400.00
18	2104.518	REMOVE CONCRETE WALK		SQ FT	0	0	0	0	0	0	400	0	400	$2.00	$ 800.00
19	2106.507	EXCAVATION - ROCK	(EV)	CU YD	0	0	0	0	172	0	0	0	172	$70.00	$ 12,040.00
20	2106.507	EXCAVATION - COMMON	(EV)(P)	CU YD	0	0	0	0	0	5784	0	0	5784	$24.00	$ 138,816.00
21	2106.507	EXCAVATION - SUBGRADE	(EV)	CU YD	0	0	0	0	0	314	0	0	314	$15.00	$ 4,710.00
22	2106.507	SELECT GRANULAR EMBANKMENT	(CV)(P)	CU YD	0	0	0	0	0	3137	0	0	3137	$32.00	$ 100,384.00
23	2106.507	COMMON EMBANKMENT	(CV)(P)	CU YD	0	0	0	0	0	2854	0	0	2854	$12.00	$ 34,248.00
24	2106.507	STABILIZING AGGREGATE	(CV)	CU YD	0	0	0	0	0	314	0	0	314	$34.00	$ 10,676.00
25	2108.504	GEOTEXTILE FABRIC TYPE 5	(P)	SQ YD	0	0	0	0	0	8963	0	0	8963	$2.00	$ 17,926.00
26	2118.509	AGGREGATE SURFACING CLASS 2		TON	0	0	0	0	0	32	0	0	32	$45.00	$ 1,440.00
27	2123.510	COMMON LABORERS		HOUR	0	0	0	0	0	50	0	0	50	$105.00	$ 5,250.00
28	2123.510	DOZER		HOUR	0	0	0	0	0	25	0	0	25	$210.00	$ 5,250.00
29	2123.510	3.0 CU YD FRONT END LOADER		HOUR	0	0	0	0	0	25	0	0	25	$200.00	$ 5,000.00
30	2123.610	CRAWLER MOUNTED BACKHOE		HOUR	0	0	0	0	0	25	0	0	25	$290.00	$ 7,250.00
31	2123.610	STREET SWEEPER (WITH PICKUP BROOM)		HOUR	0	0	0	0	0	75	0	0	75	$165.00	$ 12,375.00
32	2211.507	AGGREGATE BASE (CV) CLASS 5	(CV)(P)	CU YD	0	0	0	0	0	2241	0	0	2241	$40.00	$ 89,640.00
33	2357.506	BITUMINOUS MATERIAL FOR TACK COAT		GAL	0	0	0	0	0	597	0	0	597	$2.00	$ 1,194.00
34	2360.504	TYPE SP 9.5 WEARING COURSE MIXTURE (2,B) 3.0" THICK		SQ YD	0	0	0	0	0	1208	0	0	1208	$32.00	$ 38,656.00
35	2360.509	TYPE SP 9.5 WEARING COURSE MIXTURE (3,C)		TON	0	0	0	0	0	1876	0	0	1876	$90.00	$ 168,840.00
36	2501.502	15" RC PIPE APRON		EACH	0	0	0	0	0	0	0	8	8	$1,400.00	$ 11,200.00
37	2501.502	18" RC PIPE APRON		EACH	0	0	0	0	0	0	0	1	1	$1,600.00	$ 1,600.00
38	2502.503	4" PERF TP PIPE DRAIN		LIN FT	0	0	0	0	0	1330	0	0	1330	$13.00	$ 17,290.00
39	2502.602	4" PVC PIPE DRAIN CLEANOUT		EACH	0	0	0	0	0	11	0	0	11	$275.00	$ 3,025.00
40	2503.503	15" RC PIPE SEWER CLASS V		LIN FT	0	0	0	0	0	0	0	560	560	$70.00	$ 39,200.00
41	2503.503	18" RC PIPE SEWER CLASS III		LIN FT	0	0	0	0	0	0	0	68	68	$75.00	$ 5,100.00
42	2504.602	CONNECT TO EXISTING WATERMAIN		EACH	0	0	0	0	3	0	0	0	3	$2,500.00	$ 7,500.00
43	2504.602	HYDRANT		EACH	0	0	0	0	3	0	0	0	3	$7,200.00	$ 21,600.00
44	2504.602	ADJUST GATE VALVE & BOX		EACH	0	0	0	0	4	0	0	0	4	$750.00	$ 3,000.00
45	2504.602	6" GATE VALVE & BOX		EACH	0	0	0	0	3	0	0	0	3	$3,200.00	$ 9,600.00
46	2504.602	12" GATE VALVE & BOX		EACH	0	0	0	0	3	0	0	0	3	$4,600.00	$ 13,800.00
47	2504.603	6" WATERMAIN DUCTILE IRON CL 52		LIN FT	0	0	0	0	30	0	0	0	30	$93.00	$ 2,790.00
48	2504.603	12" WATERMAIN DUCTILE IRON CL 52		LIN FT	0	0	0	0	2027	0	0	0	2027	$110.00	$ 222,970.00
49	2504.604	4" POLYSTYRENE INSULATION		SQ YD	0	0	0	0	100	0	0	0	100	$40.00	$ 4,000.00
50	2504.608	DUCTILE IRON FITTINGS		LB	0	0	0	0	738	0	0	0	738	$15.00	$ 11,070.00
51	2506.502	CASTING ASSEMBLY (STORM)		EACH	0	0	0	0	0	0	0	7	7	$1,200.00	$ 8,400.00
52	2506.502	CASTING ASSEMBLY (SANITARY)		EACH	0	0	0	1	0	0	0	0	1	$1,200.00	$ 1,200.00
53	2506.503	CONSTRUCT DRAINAGE STRUCTURE DESIGN SPECIAL (2'X3' CB)		LIN FT	0	0	0	0	0	0	0	15	15	$500.00	$ 7,500.00
54	2506.503	CONSTRUCT DRAINAGE STRUCTURE DESIGN 48-4022		LIN FT	0	0	0	0	0	0	0	12.1	12	$600.00	$ 7,260.00
55	2506.602	CONSTRUCT DRAINAGE STRUCTURE DESIGN SPECIAL 1 (SAFL BAFFLE W/ SUMP)		EACH	0	0	0	0	0	0	0	1	1	$10,000.00	$ 10,000.00
56	2511.507	RANDOM RIPRAP CLASS III		CU YD	0	0	0	0	0	0	0	79	79	$100.00	$ 7,900.00
57	2521.518	4" CONCRETE WALK		SQ FT	0	0	0	0	0	0	3375	0	3375	$8.00	$ 27,000.00
58	2521.518	4" CONCRETE WALK SPECIAL (POETRY)		SQ FT	0	0	0	0	0	0	144	0	144	$10.00	$ 1,440.00
59	2521.518	6" CONCRETE WALK		SQ FT	0	0	0	0	0	0	1023	0	1023	$16.00	$ 16,368.00
60	2521.602	DRILL & GROUT REINF BAR (EPOXY COATED)		EACH	0	0	0	0	0	0	67	0	67	$16.00	$ 1,072.00
61	2531.503	CONCRETE CURB & GUTTER DESIGN B618		LIN FT	0	0	0	0	0	1371	0	0	1371	$24.00	$ 32,904.00
62	2531.504	6" CONCRETE DRIVEWAY PAVEMENT		SQ YD	0	0	0	0	0	126	0	0	126	$85.00	$ 10,710.00
63	2531.618	TRUNCATED DOMES		SQ FT	0	0	0	0	0	0	176	0	176	$56.00	$ 9,856.00
64	2540.602	INSTALL MAILBOX SUPPORT		EACH	0	0	0	0	0	5	0	0	5	$300.00	$ 1,500.00
65	2540.621	LANDSCAPING RESTORATION ALLOWANCE		DOL	0	0	0	0	0	10000	0	0	10000	$1.00	$ 10,000.00
66	2563.601	TRAFFIC CONTROL		LUMP SUM	0.00	0.00	0.00	0.00	0.20	0.69	0.04	0.07	1.00	$31,000.00	$ 31,000.00
67	2564.518	SIGN PANELS TYPE C		SQ FT	0	0	0	0	0	47	0	0	47	$60.00	$ 2,820.00
68	2564.518	SIGN PANELS TYPE D		SQ FT	0	0	0	0	0	7	0	0	7	$145.00	$ 1,015.00
69	2565.616	PEDESTRIAN CROSSWALK FLASHER SYSTEM		SYSTEM	0	0	0	0	0	1	0	0	1	$21,000.00	$ 21,000.00
70	2571.502	DECIDUOUS TREE 2.5" CAL B&B		EACH	0	0	0	0	0	102	0	0	102	$775.00	$ 79,050.00
71	2572.602	TREE PRUNING		HOUR	0	0	0	0	0	20	0	0	20	$300.00	$ 6,000.00
72	2573.501	STABILIZED CONSTRUCTION EXIT		LUMP SUM	0	0	0	0	0	1	0	0	1	$4,000.00	$ 4,000.00
73	2573.502	STORM DRAIN INLET PROTECTION		EACH	0	0	0	0	0	11	0	0	11	$210.00	$ 2,310.00
74	2573.503	SILT FENCE, TYPE MS		LIN FT	0	0	0	0	0	1139	0	0	1139	$3.00	$ 3,417.00
75	2573.503	FLOTATION SILT CURTAIN TYPE MOVING WATER		LIN FT	0	0	0	0	0	35	0	0	35	$25.00	$ 875.00
76	2573.503	SEDIMENT CONTROL LOG TYPE WOOD FIBER		LIN FT	0	0	0	0	0	1139	0	0	1139	$4.00	$ 4,556.00
77	2574.507	COMMON TOPSOIL BORROW	(LV)	CU YD	0	0	0	0	0	1700	0	0	1700	$25.00	$ 42,500.00
78	2575.504	SODDING TYPE LAWN		SQ YD	0	0	0	0	0	1467	0	0	1467	$11.00	$ 16,137.00
79	2575.504	ROLLED EROSION PREVENTION CATEGORY 30 AND SEED MIXTURE 25-151		SQ YD	0	0	0	0	0	8673	0	0	8673	$4.00	$ 34,692.00
80	2575.504	ROLLED EROSION PREVENTION CATEGORY 20 AND SEED MIXTURE 33-262		SQ YD	0	0	0	0	0	292	0	0	292	$3.00	$ 876.00
81	2575.523	RAPID STABILIZATION METHOD 3		MGAL	0	0	0	0	0	14	0	0	14	$900.00	$ 12,600.00
82	2582.503	4" SOLID LINE MULTI-COMPONENT		LIN FT	0	0	0	0	0	4556	0	0	4556	$2.00	$ 9,112.00
83	2582.503	24" SOLID LINE MULTI-COMPONENT		LIN FT	0	0	0	0	0	26	0	0	26	$15.00	$ 390.00
84	2582.503	4" DOUBLE SOLID LINE MULTI-COMPONENT		LIN FT	0	0	0	0	0	2278	0	0	2278	$3.00	$ 6,834.00
85	2582.518	CROSSWALK MULTI-COMPONENT (WHITE)		SQ FT	0	0	0	0	0	582	0	0	582	$16.00	$ 9,312.00
86	2582.518	CROSSWALK PREFORM THERMOPLASTIC GROUND IN (GREEN W/ WHITE)		SQ FT	0	0	0	0	0	121	0	0	121	$30.00	$ 3,630.00

PRELIMINARY ENGINEER'S ESTIMATE

2026 SPRING CREEK ROAD RECONSTRUCTION AND MILL TOWNS STATE TRAIL IMPROVEMENTS

CITY OF NORTHFIELD, MINNESOTA

CITY PROJECT NO. STRT2026-A84

BMI PROJECT NO. 24X.134891.000

ITEM NO.	SPEC. REF	DESCRIPTION	NOTES	UNIT	CITY OF NORTHFIELD					STATE AID			TOTAL ESTIMATED QUANTITY	ESTIMATED UNIT PRICE	ESTIMATED TOTAL PRICE
					STREET	TRAIL/WALK	STORM	SANITARY	WATER	STREET	TRAIL/WALK	STORM			
SCHEDULE "A" ESTIMATED CONSTRUCTION SUBTOTAL					$ -	$ -	$ -	$ 1,325.00	$ 335,505.00	$ 1,125,343.00	$ 61,496.00	$ 119,010.00			$ 1,642,679.00
20% CONSTRUCTION CONTINGENCY					$ -	$ -	$ -	$ 265.00	$ 67,101.00	$ 225,069.00	$ 12,299.00	$ 23,802.00			$ 328,536.00
SCHEDULE "A" ESTIMATED CONSTRUCTION TOTAL					$ -	$ -	$ -	$ 1,590.00	$ 402,606.00	$ 1,350,412.00	$ 73,795.00	$ 142,812.00			$ 1,971,215.00
CITY ART ALLOWANCE (1%)					$ -	$ -	$ -	$ 13.00	$ 3,355.00	$ 11,253.00	$ 615.00	$ 1,190.00			$ 16,426.00
ESTIMATED CONSTRUCTION TOTAL W/ ART ALLOWANCE					$ -	$ -	$ -	$ 1,603.00	$ 405,961.00	$ 1,361,665.00	$ 74,410.00	$ 144,002.00			$ 1,987,641.00
20% INDIRECT COSTS					$ -	$ -	$ -	$ 321.00	$ 81,192.00	$ 272,333.00	$ 14,882.00	$ 28,800.00			$ 397,528.00
ESTIMATED PROJECT SUBTOTAL					$ -	$ -	$ -	$ 1,924.00	$ 487,153.00	$ 1,633,998.00	$ 89,292.00	$ 172,802.00			$ 2,385,169.00
ESTIMATED EASEMENT AND ROW ACQUISITION COSTS					$ 25,600.00	$ -	$ -	$ -	$ -	$ -	$ -	$ -			$ 25,600.00
ESTIMATED PROJECT TOTAL					$ 25,600.00	$ -	$ -	$ 1,924.00	$ 487,153.00	$ 1,633,998.00	$ 89,292.00	$ 172,802.00			$ 2,410,769.00

Appendix C: Arborist Report

Tree Inventory and Assessment
Spring Creek Road Reconstruction and Mill Towns Trail Improvements
Northfield, Minnesota

Introduction

As part of proposed Spring Creek Street Road Reconstruction and Mill Towns Trail Improvements project, an inventory and report detailing the species, size, location and condition of trees within or immediately adjacent to the existing road right of way from the intersection of Huron Court north to the intersection with Woodley Street was requested. This report discusses the findings of the tree inventory and makes some general recommendations that may relate to the care and fate of these trees moving forward. Field work associated with the tree inventory was performed in summer of 2024.

Methods

All data recorded in the field were input into an ESRI shapefile and submitted to Bolton & Menk for inclusion in project plans and for planning information.

Live trees within the ROW 3 inches in diameter or greater were included in the inventory. Right of Way (ROW) trees adjacent to private property were included when the diameter was one-half inch or greater. Dead trees in the ROW were included.

Tree diameter was measured at 4.5 feet above grade (DBH). Where trees have multiple stems, the diameter recorded is the total diameter of all stems. Location of each tree was determined using sub-meter GNSS equipment and converted into the Rice County Coordinate System.

Condition of each tree was assessed and assigned a number using a scale from 0 – 9. The best quality trees were given the highest number, trees of low quality were given a low number with zero being a dead tree. Trees in good condition are those that appear vigorous and free of significant defects (cavities, decay, large dead or broken branches, cracks, etc.). Trees of low (poor or very poor) quality may have large wounds, significant decay, insect damage or very poor form. Trees in fair condition (rated 4 or 5) may have, for example, an odd form, slight lean, one or two large dead branches, but appear healthy and are expected to survive for many years barring any significant negative impacts.

Findings

A total of 67 trees greater than 3 inches in diameter were found and the data associated with those trees are detailed in tabular form. These 67 trees represent 19 different species and range in size from 3 inches DBH to 47 inches (a cottonwood on or near the line between 10017 Hall Avenue and the east Hall Avenue ROW). Three ash trees were found. They appear to be either free of emerald ash borer infestation or show no signs of infestation at time of inspection.

Many different species make up the 67 trees found; 18 species in total. Five species account for about 61% of all trees (41 out of 67): Siberian elm, Austrian pine, boxelder, juniper and blue spruce, in that order.

Discussion

The presence of 19 unique species is an indication of a significant amount of tree diversity within the project area. However, 67 trees constitute a small population and many species are not abundant as they are represented by very few trees; in many instances less than five individuals. Nine species are represented by a single individual. This significant species diversity coupled with low representation is due in part to the fact that many trees at the north end of the project area are not present due to natural regeneration but rather have been planted by people at some point in time. The Austrian pine and spruce trees are examples of trees not native to the project area. How many of these trees were planted by humans and how many occur naturally may not be relevant but the fact that so many species appear to be thriving gives an indication of soils well suited to a variety of trees.

The most common species present is the Siberian elm. Dutch elm disease (DED) is present in the immediate area and has likely killed many American elms in the neighborhood and this may explain why none were found.

Average condition of the 67 trees is 5.64. The most common condition was 7, accounting for over 35 percent. Five trees are dead. Some have been dead long enough that positive species identification isn't possible. Factors that prevent a tree from receiving the highest rating (9) include: decay, thin canopy, disease, wounds, decay, etc.

A few of the tree species here are considered by some to be "low quality" or undesirable. These include Siberian elm and boxelder. Siberian elm is a non-native tree that can spread aggressively. Boxelder is a fast-growing, native tree that few people like but has a role as one of the first trees to become established after a disturbance like land clearing or fire. Regardless of the perception of the casual or professional observer, desirability was not a factor in assessing condition.

At the time of this report, future improvements to Spring Creek Road and the adjacent connection to the Mills Town Trail have not been finalized. This makes projections for the fate of individual trees or groups of trees virtually impossible to predict. Removal of dead trees could occur at any time, preferably before other work commences to ensure the safety of workers and the public. Trees at the north end of Spring Creek Road and adjacent to homes near the road connection with Woodley Street may have their roots impacted by grading and other construction activities, specifically, trees 3-20. Significant grade change (six or more inches of cut or fill) within a large portion of a tree's root area may have a lasting negative impact on tree health and survival.

Recommendations

1. Since the soils here appear to be ideal for growing trees it will be important to protect it throughout the construction process by keeping as much of the native soil on site as

possible, limiting compaction wherever possible and assuring no change to soil chemistry due to chemical spills or concrete washout.

2. Prune saved trees to limit the risk from falling branches once the project is over. Preventive pruning should be considered for saved trees that have branches that conflict with or could be damaged by large and/or equipment like backhoes close to construction like those adjacent to or within 1212 Sumac Lane.

3. Despite the existing species diversity, there remain many opportunities to increase the number of some of the under-represented species. These include: bur oak, sugar maple, basswood and black cherry. Trees not now present but should be considered are: red oak, bicolor oak, white oak, northern pin oak, bitternut hickory, Kentucky coffeetree, river birch, disease resistant hybrid elms, and honeylocust. The first five of these should be considered first. Smaller trees for consideration include serviceberry, redbud (non-native), ironwood, musclewood (hornbeam), hawthorn, and witch hazel. Trees not mentioned above may also make good selections but should be used judiciously. The use of too many non-native trees could considerably change the rural ambience of this stretch of road.

4. Replacement tree spacing recommendations is difficult at this time since it is not known how many trees might be removed or where new planting spaces may be created by this project. Many communities use a spacing of 30-40 feet between trees on linear projects. This is a good rule of thumb for larger trees like oaks or basswood. Smaller trees could be planted closer together, perhaps as close as 20 feet.

Prepared by:
Stephen Nicholson CF
TreeBiz LLC

Species Count

Species	Number
Elm, Siberian	12
Pine, Austrian	9
Boxelder	8
Juniper	6
Spruce, blue	6
Cottonwood	5
Arborvitae	5
Walnut	3
Ash, green	2
Unknown	2
Pine, white	1
Pine, Red	1
Hackberry	1
Aspen	1
Ash, black	1
Cherry	1
Cherry, black	1
Spruce, white	1
Nannyberry	1
Total	67

Condition Count

Condition	Count
0	6
2	2
3	1
4	8
5	6
6	12
7	24
8	3
9	5

Tree List

Tree #	Species	DBH	Condition	Stems	Notes
1	Cottonwood	47.0	7	1	
2	Ash, green	6.0	7	1	
3	Arborvitae	0.5	9	1	
4	Arborvitae	0.5	9	1	
5	Arborvitae	0.5	9	1	
6	Arborvitae	0.5	9	1	
7	Arborvitae	0.5	9	1	
8	Spruce, white	19.0	7	1	
9	Ash, black	2.0	7	1	
10	Cherry	0.5	7	1	
11	Spruce, blue	13.0	6	1	
12	Spruce, blue	10.5	6	1	
13	Spruce, blue	10.5	4	1	
14	Spruce, blue	11.5	5	1	
15	Spruce, blue	13.5	6	1	
16	Spruce, blue	15.0	6	1	
17	Juniper	18.0	6	1	
18	Nannyberry	5.0	7	8	
19	Pine, red	0.5	7	1	
20	Pine, white	0.5	8	1	
21	Elm, Siberian	11.0	4	1	
22	Elm, Siberian	13.0	2	1	dieback
23	Pine, Austrian	14.0	6	1	
24	Elm, Siberian	9.0	7	1	
25	Pine, Austrian	16.0	5	1	
26	Pine, Austrian	8.0	4	1	
27	Walnut	11.5	8	1	
28	Boxelder	10.5	7	1	
29	Elm, Siberian	10.0	0	1	
30	Boxelder	12.0	6	1	
31	Boxelder	13.5	4	1	
33	Elm, Siberian	9.5	4	1	
34	Unknown	9.5	0	1	
35	Unknown	17.0	0	1	
36	Elm, Siberian	8.5	6	1	
37	Elm, Siberian	15.0	6	2	
38	Elm, Siberian	10.5	5	1	
39	Elm, Siberian	27.0	6	2	
40	Pine, Austrian	8.0	7	1	
41	Hackberry	7.5	7	1	
42	Elm, Siberian	17.0	0	1	
43	Pine, Austrian	7.0	7	1	
44	Juniper	13.0	7	1	
45	Pine, Austrian	10.0	6	1	
46	Pine, Austrian	11.0	7	1	

47	Juniper	14.0	7	1	
48	Elm, Siberian	10.5	7	1	
49	Pine, Austrian	9.5	7	1	
50	Ash, green	6.0	5	1	
51	Aspen	6.5	0	1	
52	Cherry, black	12.5	7	1	
53	Juniper	8.0	7	1	
54	Juniper	7.5	7	1	
55	Juniper	16.0	7	1	
56	Elm, Siberian	18.0	4	5	
57	Walnut	6.5	7	1	
58	Walnut	6.5	8	1	
59	Boxelder	25.5	4	2	
60	Boxelder	7.5	4	1	
61	Boxelder	12.0	2	1	decay
62	Boxelder	12.5	3	1	decay
63	Boxelder	10.0	5	1	
64	Cottonwood	16.0	7	1	
65	Cottonwood	26.0	7	1	
66	Cottonwood	26.0	0	1	
67	Cottonwood	21.0	5	1	

Appendix D: Open House Feedback

BOLTON & MENK

Real People. Real Solutions.

Comments

Name: [redacted]

Address: [redacted]

Email/Phone: [redacted]

Comments: I am advocating for a 4 way stop sign at the intersection of Spring Creek and Woodley

BOLTON & MENK

Real People. Real Solutions.

Comments

Name: [redacted]

Address: [redacted]

Email/Phone [redacted]

Comments: Any plans for the South part of HHLC?

Real People. Real Solutions.

Comments

Name: [redacted]

Address: [redacted]

[redacted]

Email/Phone: [redacted]

[redacted]

Comments: Please make sure there are 4 stops Signs @ WSE/SCR intersection. Thanks

Appendix E: Geotechnical Report

REPORT OF GEOTECHNICAL EXPLORATION

2026 Spring Creek Road Reconstruction
and Mill Towns Trail Improvements
Northfield, Minnesota

DRAFT

AET Project No. P-0034269

Date:
October 23, 2024

Prepared for:
Bolton & Menk, Inc.
12224 Nicollet Ave
Burnsville, MN 55337

Geotechnical • Materials
Forensic • Environmental
Building Technology
Petrography/Chemistry

American Engineering Testing
550 Cleveland Avenue North
St. Paul, MN 55114-1804
TeamAET.com • 800.972.6364

October 23, 2024

Bolton & Menk, Inc.
12224 Nicollet Ave
Burnsville, MN 55337

Attn: Jason Malecha, PE

RE: Report of Geotechnical Exploration
2026 Spring Creek Road Reconstruction and Mill Towns Trail Improvements
Northfield, Minnesota
AET Project No. P-0034269

Dear Mr. Malecha:

American Engineering Testing, Inc. (AET) is pleased to present the results of our subsurface exploration program and geotechnical engineering review for the 2026 Spring Creek Road Reconstruction and Mill Towns Trail Improvements in Northfield, Minnesota. These services were performed according to our proposal to you dated May 31, 2024.

We are submitting an electronic copy (PDF) of the report to you. Please contact me if you have any questions about the report. I can also be contacted to arrange construction observation and testing services.

Sincerely,
American Engineering Testing, Inc.

DRAFT

Neil G. Lund, PE (MN)
Senior Engineer
nlund@teamAET.com
612-369-3163

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SIGNATURE PAGE

Prepared for:

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I hereby certify that this plan, specification, or report was prepared by me or under my direct supervision and that I am a duly Licensed Professional Engineer under Minnesota Statute Section 326.02 to 326.15

Name: Neil G. Lund, PE

Date: October 23, 2024 License #: 46212

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1.0 INTRODUCTION

The City of Northfield (City) 2026 Spring Creek Road Reconstruction and Mill Towns Trail Improvements will include reconstruction of Spring Creek Rd between Huron Ct and Woodley St. Additionally, it will construct a new segment of Mill Towns Trail, connecting a current segment of trail with the north end of this project.

To assist with planning and design, Bolton & Menk, Inc. (BMI) authorized American Engineering Testing, Inc. (AET) to conduct a subsurface exploration program at the site, conduct soil laboratory testing, and perform a geotechnical engineering review for the project. This report presents the results of the above services and provides our engineering recommendations based on this data.

2.0 SCOPE OF SERVICES

AET's services were performed according to our revised proposal to BMI dated May 31, 2024. The authorized scope included the following:

- GPS staking and arranging to clear the exploration locations of underground utilities.
- Performing six (6) standard penetration test (SPT) borings to depths of 10 feet within the Spring Creek Rd alignment.
- Performing four (4) hand auger borings (HAB) to about 3 feet deep along the trail alignment.
- Backfilling and/or patching the boreholes per Minnesota Department of Health (MDH) requirements.
- Providing the traffic control necessary to complete the above work.
- Soil laboratory testing.
- Geotechnical engineering review based on the data collected and preparation of this report.

These services were intended for geotechnical purposes only. The scope was not intended to explore for the presence or extent of environmental contamination in the soil or groundwater.

3.0 PROJECT INFORMATION

Spring Creek Rd is currently a mostly unpaved roadway with a rural cross-section. The reconstruction will result in a bituminous pavement and an upgraded cross-section that will be a mix of rural and urban. Utility upgrades will include areas with new storm sewer and watermain. Total project length is about 2,370 feet.

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The new Mill Towns Trail alignment will begin on the west side of Spring Creek Rd near a trail segment to be constructed through Spring Creek Park as part of another project. The trail will run on the west side until crossing to the east side just south of Sumac Ln and continuing to the north project terminus.

We were not provided with proposed utility depths; based on typical street construction, we assumed storm sewer and watermain would be placed at about 5 and 8 feet deep, respectively.

Topography of the corridor is rolling, with elevations mostly dropping from south to north. The most recent MnDOT traffic count (2023) showed an annual average daily traffic (AADT) of 585.

The above stated information represents our understanding of the proposed construction. This information is an integral part of our engineering review. It is important that you contact us if there are changes from our project description so that we can evaluate whether modifications to our recommendations are appropriate.

4.0 SUBSURFACE EXPLORATION AND TESTING

4.1 Field Exploration Program

The subsurface exploration program conducted for the project consisted of six SPT borings in the roadway and four HAB along proposed trail alignments, which we performed in August 2024. AET selected the boring locations and boring depths.

The boring locations are shown on the Boring Location Maps in Appendix A. The locations were collected by AET personnel using GPS equipment with sub-meter accuracy. Please note that the elevations provide relative consistency for presenting geotechnical data and they do not represent the precision of a licensed land surveyor.

The logs of the borings and details of the methods used appear in Appendix A. The logs contain information concerning soil layering, soil classification, geologic origins, and moisture condition. The coordinates, elevations, and road names are provided on the boring logs in the appendix.

4.2 Laboratory Testing

The laboratory test program included water content tests. The test results appear on the individual boring logs in Appendix A, adjacent to the samples upon which they were performed. The gradation test results are on the data sheets following the logs. The soils were visually-manually classified by the Unified Soil Classification System (USCS) and the American Association of State Highway and Transportation Officials (AASHTO) system.

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5.0 SITE CONDITIONS

5.1 Pavement Section and Topsoil

At the boring locations, we observed a pavement section consisting of various aggregate surfacing materials. The thicknesses encountered varied from about 4 inches of crushed limestone material to about 1 foot of sand with gravel. Borings B-1 and B-6, which were in recently paved sections near each end of Spring Creek Rd, were drilled off the pavement and encountered 2 feet of sand with gravel and clayey sand, respectively.

Apparent topsoil measured in HAB-1 to HAB-4 ranged from 3 to 15 inches thick and included mostly dark brown sandy lean clay with trace roots.

5.2 Subsurface Soils/Geology

Our experience and geologic resources indicate the project area suggest mixed underlying soils including glacial till, alluvium/glacial outwash, and local shallow bedrock.

Our soil borings generally encountered apparent fill soils overlying coarse alluvium or bedrock. The fill depths ranged from about 4 1/2 to 9 feet and consisted mostly lean clay, sandy lean clay (A-6) or clayey sand (A-2-6 and A-6). Similar soils were present in the hand auger borings, which terminated at 2 to 3 feet deep. A small amount of the fill appeared to be slightly organic.

Coarse alluvial soils encountered in B-1, B-5 and B-6 included very loose to very dense sand with silt and variable gravel (A-3 and A-2-4).

We encountered apparent weathered St. Peter formation sandstone bedrock in B-2, B-3, B-4, with a wide range of elevations from about 954.9 to 987.4 feet, corresponding to depths of 5 to 9 1/2 feet. We met hammer and/or auger refusal in B-2. Boring B-6 also penetrated bedrock, beginning with Shakopee formation dolostone at 7 feet deep (elevation 949.2), and terminating by hammer refusal in a sandstone layer at 9 feet below the ground surface (elevation 947.2).

5.3 Groundwater

We observed the boreholes for the presence of groundwater after the boring termination depth was reached. Groundwater was observed at the time of our exploration Boring B-5 at a depth of 8 feet; given the location of the observation above apparent bedrock residual material, it appears likely it represented a perched condition.

Longer-term monitoring of water levels using temporary piezometers will provide more accurate water level measurement; however, this was not part of our scope of services. Groundwater

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levels fluctuate due to varying seasonal and annual rainfall and snow melt amounts, as well as other factors. A discussion of the water level measurement methods is presented in Appendix A.

5.4 Subgrade Soil Properties

The soils encountered within the critical subgrade zone, which includes the top 3 feet of subgrade, were variable and consisted of mostly A-6 clayey soils (lean clay, lean clay with sand, and sandy lean clay), with some A-1-b and A-3 sands and sands with silt.

We judge the A-6 soils to have at least moderate frost susceptibility, slow drainage characteristics, and low strength and stability characteristics regarding pavement support. The stability of the onsite clayey soils can become rather low when these soils become wet.

We judge the A-1-b silty sands to have low to moderate frost susceptibility, moderately fast drainage characteristics, and moderately high strength and stability characteristics regarding pavement support. We judge the A-3 sands with silt to have low frost susceptibility, fast drainage characteristics, and moderately high strength and stability characteristics regarding pavement support.

6.0 UTILITY RECOMMENDATIONS

6.1 Utility Excavation

We assume the storm sewer will generally be placed at a depth of 5 feet and watermain will be placed at a depth of 8 feet.

Groundwater was observed in Boring B-5 at a depth of 8 feet. Although likely perched in isolation, this condition may be encountered elsewhere where bedrock is present. The trench bottoms should be properly dewatered to reduce the potential for soils disturbance and to allow for proper bedding and utility placement. Local dewatering procedures will likely be sufficient to remove water from within excavations in the clayey soils. Dewatering means and methods are the responsibility of the contractor and should be designed such that the drawdown does not influence neighboring buildings, pavements, or utilities.

We assume utilities will generally be excavated using open cut methods with excavations sloped or supported by portable trench box. We note that our soil borings encountered bedrock in some locations above possible invert depths for the utilities. Generally, the portion of the bedrock which could be sampled with SPT methods in our borings should be rippable, such as the sandstone encountered. However, hard bedrock, weathered bedrock, and limestone slabs may be

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encountered in excavations at this site, such as where we met auger refusal. These materials will make excavating procedures more difficult than normal, and rock excavation could be required. The means and methods of rock excavation should be the responsibility of the contractor. Prior to bedrock removal, we recommend performing preconstruction condition surveys (PCCS) of existing structures within 500 feet of the site.

6.2 Utility Support

Based on the soils encountered at boring locations, it is our opinion that the soils exposed in the proposed excavations are suitable for utility support. However, any oversized materials, such as cobbles and boulders, should be removed as needed to reduce point loads on the pipes.

Where soils with significant gravel content are encountered, we recommend providing a 4- to 6-inch-thick layer of Granular Bedding (MnDOT Spec. 3149.2F) directly beneath the pipe, per the pipe manufacturer's recommendations. The bedding should be shaped to conform to the bottom of the pipe to minimize point or imbalanced loads on the pipe and provide uniform pipe support. If unstable soils are encountered and additional sub-cutting is necessary to provide pipe support, the excavation for pipe foundation improvement should be laterally oversized at the bottom a horizontal distance (from the outermost plan viewpoint of the pipe) at least equal to the vertical distance between the lowest bottom elevation of the pipe and the lowest excavation bottom elevation (i.e., 1V:1H lateral oversize). All new fill placed within the excavation below the spring-line should be well compacted sand and/or gravel material.

If highly unstable trench bottom soils are encountered or groundwater control is difficult, Coarse Aggregate Bedding (MnDOT Specification 3149.2.G.2) may be needed. This material should be completely enveloped with a geotextile separation fabric (MnDOT Spec. 3733, Type 5), which reduces the intrusion of fines into the rock void space.

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6.3 Backfill and Compaction

The onsite inorganic soils are suitable for reuse as utility backfill provided they can be properly moisture conditioned and compacted. The fill soils should be free of organic matter, rubble, debris, or gravel larger than 3 inches in the largest dimension. Utility trench backfill soils should match the adjacent subgrade soils when placed within 3 feet of grading grade.

Utility backfill soils should be placed in lift thicknesses appropriate to the compaction equipment being used and the soil being compacted. The compactor should be capable of compacting the entire lift thickness to the recommended compaction level. We recommend trench backfill placed within 3 feet of grading grade be compacted to a minimum of 100% of the Standard Proctor (ASTM D698) maximum dry unit weight. The remaining utility trench backfill below the upper

3 feet can have a minimum compaction level of 95% of the Standard Proctor maximum dry unit weight.

7.0 PAVEMENT RECOMMENDATIONS

7.1 Definitions

This report references the 2020 MnDOT Standard Specifications for Construction (MnDOT Spec.). The ensuing sections reference the following words, which are defined below:

Top of Subgrade is the surface of material immediately beneath a granular material layer meeting MnDOT Spec. 3149, which is usually placed as a sand subbase layer. If there is no granular material layer, then the top of subgrade is the grading grade.

Grading grade is the bottom of the aggregate base layer.

Granular Material should meet the requirements of MnDOT Specification 3149, including Table 3149.2-1, which requires 0% to 20% for the ratio of the percent passing the No. 200 sieve/1-inch sieve.

Select Grading Material is mineral soil, excluding organic soils (>5% organic material by weight), silt (soil containing 80 percent or more silt-sized particles), and marl (soil consisting of clay and lime or unconsolidated sedimentary rock).

Top of Subgrade is the surface of material immediately beneath a granular material layer meeting MnDOT Spec. 3149, which is usually placed as a sand subbase layer. If there is no granular material layer, then the top of subgrade is the grading grade.

7.2 Removals and Excavation

We recommend removing the existing paving materials. The materials base can be recycled and stockpiled for reuse as aggregate base. Any reclaimed material that will be placed as aggregate base should meet the gradation requirements of MnDOT Table 3138.2-6. Excavations should continue to allow the placement of the recommended pavement sections.

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7.3 Subgrade Preparation

The soils exposed following the excavation recommended in Section 7.2 should be prepared per MnDOT Spec. 2112, Subgrade Preparation. This includes scarification, mixing, moisture conditioning, and compaction of the upper 6 inches of the subgrade.

If unstable soils or soils which do not meet the requirements for Select Grading Material are encountered during subgrade preparation, we recommend removing these unsuitable materials and replacing them with Select Grading Material. Unstable soils typically have a water content exceeding the standard optimum water content as defined in ASTM D698 (Standard Proctor test). We caution that instability of soils beneath those being reworked and compacted may limit the ability to compact the upper soils; therefore, greater depths of subcutting and stability improvement may be needed.

7.4 Fill and Compaction

Fill soils used to re-attain pavement subgrade may consist of on-site, non-organic, debris-free soils, and they should be moisture conditioned for compaction. Imported fill soils should consist of Select Grading Material and should generally match the adjacent soils when placed within 3 feet of grading grade.

All new fill and reworked soils for pavement support should be placed and compacted per MnDOT Spec. 2106, including the moisture content and compaction requirements shown in MnDOT Tables 2106.3-1 and 2106.3-4, respectively. In ASTM terms, this specification requires soils placed within 3 feet of grading grade within the road core be compacted to a minimum of 100% of the standard maximum dry unit weight defined in ASTM D 698 (Standard Proctor test). A reduced minimum compaction level of 95% of the standard maximum dry unit weight can be used below the critical subgrade zone for non-granular materials (those which do not meet MnDOT Spec 3149.2B).

7.5 Subgrade Stability

The final subgrade should have proper stability within the critical subgrade zone. Where clayey soils are exposed, stability should be evaluated using the test roll procedure. Where unstable soils are found using the test roll process, these soils should be improved by means of scarification, drying, and recompaction; or by subcutting and replacement. If highly variable conditions are present (either stability-wise or soil type), a compaction subcut should be performed to provide a more consistent subgrade condition. We recommend the final soils remaining in place be capable of passing a test roll prior to placing the aggregate base.

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Where granular soils are exposed (i.e., sands to silty sands), we recommend applying surface compaction. This compaction should take place with a self-propelled vibratory roller compactor having a drum diameter of at least 3 feet. Overall stability should be evaluated during the compaction process (judged by an AET geotechnical/pavement engineer or their representative). Instability will likely be a result of wetter clayey/silty soils beneath the exposed sandy soils. The unstable soils should be improved by means of scarification, drying, and recompaction; or by subcutting and replacement.

7.6 Sand Subbase

The City of Northfield standard pavement section (Plate No. STR-5) includes a 6-inch-thick sand subbase layer to improve the subgrade support, frost, and drainage characteristics of the pavement system. We recommend the sand subbase consist of Select Granular Material (MnDOT Table 3149.2-1).

The sand subbase will generally overlie slower draining soil, such as clayey soils and fine-grained silty sands; therefore, subsurface drainage should be provided to minimize build-up of water within the sand subbase and aggregate base layers as recommended in the STR-5.

If there is a need to vary the thickness of the sand subbase, we recommend the thickness have longitudinal tapers along the roadway of 1V:20H or flatter. Where intersecting cross streets, we recommend a transverse taper of 1V:4H, with the sand subbase overlaying the adjacent soils.

7.7 Aggregate Base

Aggregate base placed for pavement support should meet the gradation and quality requirements for Class 5 per MnDOT Spec. 3138, modified as required by the City. Any millings or reclaimed material placed as aggregate base should meet the gradation requirements of MnDOT Table 3138.2-6. Aggregate base placement and compaction should be performed according to MnDOT Spec. 2211. All aggregate base material (including existing, imported, or reclaimed) should be tested for compaction using the Penetration Index Method per the requirements of MnDOT Table 2211.3-3.

After the aggregate base has been placed, compacted, and tested, it is the contractor's responsibility to maintain the base in a suitable condition for paving. If the subgrade or aggregate base materials become saturated or contaminated by clayey or silty soils after testing, it may be rendered unsuitable for paving due to softness and pumping. This action would require remedial action before pavement can be placed.

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7.8 Bituminous Pavement Design

Tables 7.8-1 and 7.8-2 below show the pavement sections for Spring Creek Rd and Mill Towns Trail, respectively, based on the City standards.

Table 7.8-1 – Bituminous Pavement Thickness Design STR-5 (Spring Creek Rd)

Pavement Course	MnDOT Material Type (Spec.)	Thickness
Bituminous Wear	SPWEA330C (PG 58H-34)	2"
Bituminous Wear	SPWEA330C (PG 58H-34)	2"
Aggregate Base	Class 5 Modified (3138)	9"
Subbase	Select Granular (3149)	6"
Geotextile Fabric	Type 5 (3733)	--

Table 7.8-2 – Bituminous Pavement Thickness Design STR-9 (Mill Towns Trail)

Pavement Course	MnDOT Material Type (Spec.)	Thickness
Bituminous Wear	SPWEB230B (PG 58S-28)	3"
Aggregate Base	Class 5 or 6 (3138)	8"

Please note that the pavement thickness designs recommended above are minimum thicknesses, not average thicknesses. They should be noted as such on the project plans and specifications.

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7.9 Bituminous Mixes

An A-gradation could be substituted in the wear course on the trail, which generally provides a finer pavement surface and tighter joints.

The use of recycled asphalt pavement (RAP) in the bituminous mix is a cost saving measure that is often suggested; however, there will be a higher probability of pavement thermal cracking when RAP is used. We recommend a maximum of 10% RAP in the upper wear course and a maximum of 20% RAP in the lower courses to reduce thermal cracking. If bituminous mixes are utilized other than those recommended, a lower percentage of RAP may be needed.

The bituminous mixtures should meet the most current MnDOT Spec. 2360 (Plant-Mixed Asphalt Pavement) requirements. Compaction of all bituminous mixtures should be by the Maximum Density Method per MnDOT Spec. 2360.3D.1.

7.10 Bituminous Pavement Comments

The bituminous pavement sections listed above are estimated to have a service life of 20 years. However, the Owner should not expect that the pavements will last 20 years without maintenance. Even if placed and compacted properly on stable subgrade conditions, bituminous pavements will likely experience cracking in 1 to 3 years, primarily due to temperature-related expansion and shrinkage. The designs given above assume that a regularly scheduled maintenance program consisting of patching cracks and repairing of locally distressed areas would be implemented.

8.0 CONSTRUCTION CONSIDERATIONS

8.1 Potential Difficulties

8.1.1 Runoff Water in Excavation

Water can be expected to collect in the excavation bottom during times of inclement weather or snow melt. To allow observation of the excavation bottom, to reduce the potential for soil disturbance, and to facilitate filling operations, we recommend water be removed from within the excavation during construction. Based on the soils encountered, we anticipate the groundwater can be handled with conventional sump pumping.

8.1.2 Disturbance of Soils

The on-site soils can be disturbed under construction traffic, especially if the soils are wet. If soils become disturbed, they should be subcut to the underlying undisturbed soils. The subcut soils can then be dried and recompacted back into place, or they should be removed and replaced with drier imported fill.

8.1.3 Cobbles and Boulders

The alluvial soils at this site can include cobbles and boulders. This may make excavating procedures somewhat more difficult than normal if they are encountered.

8.2 Excavation Backsloping

If excavation faces are not retained, the excavations should maintain maximum allowable slopes in accordance with *OSHA Regulations (Standards 29 CFR), Part 1926, Subpart P, "Excavations"* (can be found on www.osha.gov). Even with the required OSHA sloping, water seepage or surface runoff can potentially induce sideslope erosion or sloughing which could require slope maintenance.

8.3 Observation and Testing

The recommendations in this report are based on the subsurface conditions found at our test boring locations. Since the soil conditions can be expected to vary away from the soil boring locations, we recommend on-site observation by a geotechnical engineer/technician during

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construction to evaluate these potential changes. Soil density testing should also be performed on new fill placed to document that project specifications for compaction have been satisfied.

9.0 TEST STANDARDS

When we refer to an ASTM Standard in this report, we mean that our services were performed in general accordance with that standard. Compliance with any other standards referenced within the specified standard is neither inferred nor implied.

10.0 LIMITATIONS

Within the limitations of scope, budget, and schedule, we have endeavored to provide our services according to generally accepted geotechnical engineering practices at this time and location. Other than this, no warranty, express or implied, is intended.

Important information regarding risk management and proper use of this report is given in Appendix B entitled “Geotechnical Report Limitations and Guidelines for Use.”

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Appendix A

Geotechnical Field Exploration and Testing
Boring Log Notes
Unified Soil Classification System
AASHTO Soil Classification System
Boring Location Maps
Subsurface Boring Logs

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Appendix A
Geotechnical Field Exploration and Testing
Report No. P-0034269

A.1 FIELD EXPLORATION

The subsurface conditions at the site were explored by drilling and sampling 6 standard penetration test borings. The locations of the borings and cores appear on the Boring Location Maps, preceding the Pavement Core Logs and Subsurface Boring Logs in this appendix.

A.2 SAMPLING METHODS

A.2.1 Split-Spoon Samples (SS)

Standard penetration (split-spoon) samples were collected in general accordance with ASTM: D1586. The ASTM test method consists of driving a 2-inch O.D. split-barrel sampler into the in-situ soil with a 140-pound hammer dropped from a height of 30 inches. The sampler is driven a total of 18 inches into the soil. After an initial set of 6 inches, the number of hammer blows to drive the sampler the final 12 inches is known as the standard penetration resistance or N-value.

A.2.2 Disturbed Samples (DS)/Spin-up Samples (SU)

Sample types described as “DS” or “SU” on the boring logs are disturbed samples, which are taken from the flights of the auger. Because the auger disturbs the samples, possible soil layering and contact depths should be considered approximate.

A.2.3 Sampling Limitations

Unless actually observed in a sample, contacts between soil layers are estimated based on the spacing of samples and the action of drilling tools. Cobbles, boulders, and other large objects generally cannot be recovered from test borings, and they may be present in the ground even if they are not noted on the boring logs.

Determining the thickness of “topsoil” layers is usually limited, due to variations in topsoil definition, sample recovery, and other factors. Visual-manual description often relies on color for determination, and transitioning changes can account for significant variation in thickness judgment. Accordingly, the topsoil thickness presented on the logs should not be the sole basis for calculating topsoil stripping depths and volumes. If more accurate information is needed relating to thickness and topsoil quality definition, alternate methods of sample retrieval and testing should be employed.

A.3 CLASSIFICATION METHODS

Soil descriptions shown on the boring logs are based on the Unified Soil Classification System (USCS). The USCS is described in ASTM: D2487 and D2488. Where laboratory classification tests (sieve analysis or Atterberg Limits) have been performed, accurate classifications per ASTM: D2487 are possible. Otherwise, soil descriptions shown on the boring logs are visual-manual judgments. Charts are attached which provide information on the USCS, the descriptive terminology, and the symbols used on the boring logs.

Visual-manual judgment of the AASHTO Soil Group is also noted as a part of the soil description. A chart presenting details of the AASHTO Soil Classification System is also attached.

The boring logs include descriptions of apparent geology. The geologic depositional origin of each soil layer is interpreted primarily by observation of the soil samples, which can be limited. Observations of the surrounding topography, vegetation, and development can sometimes aid this judgment.

A.4 WATER LEVEL MEASUREMENTS

The groundwater level measurements are shown at the bottom of the boring logs. The following information appears under “Water Level Measurements” on the logs:

- Date and Time of measurement
- Sampled Depth: lowest depth of soil sampling at the time of measurement
- Casing Depth: depth to bottom of casing or hollow-stem auger at time of measurement
- Cave-in Depth: depth at which measuring tape stops in the borehole
- Water Level: depth in the borehole where free water is encountered
- Drilling Fluid Level: same as Water Level, except that the liquid in the borehole is drilling fluid

The true location of the water table at the boring locations may be different than the water levels measured in the boreholes. This is possible because there are several factors that can affect the water level measurements in the

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borehole. Some of these factors include: permeability of each soil layer in profile, presence of perched water, amount of time between water level readings, presence of drilling fluid, weather conditions, and use of borehole casing.

A.5 LABORATORY TEST METHODS

A.5.1 Water Content Tests

Conducted per AET Procedure 01-LAB-010, which is performed in general accordance with ASTM: D2216 and AASHTO: T265.

A.6 TEST STANDARD LIMITATIONS

Field and laboratory testing is done in general conformance with the described procedures. Compliance with any other standards referenced within the specified standard is neither inferred nor implied.

A.7 SAMPLE STORAGE

Unless notified to do otherwise, we routinely retain representative samples of the soils recovered from the borings and pavement cores for a period of 30 days.

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BORING LOG NOTES

DRILLING AND SAMPLING SYMBOLS

Symbol	Definition
AR:	Sample of material obtained from cuttings blown out the top of the borehole during air rotary procedure.
B, H, N:	Size of flush-joint casing
CAS:	Pipe casing, number indicates nominal diameter in inches
COT:	Clean-out tube
DC:	Drive casing; number indicates diameter in inches
DM:	Drilling mud or bentonite slurry
DR:	Driller (initials)
DS:	Disturbed sample from auger flights
DP:	Direct push drilling; a 2.125 inch OD outer casing with an inner 1½ inch ID plastic tube is driven continuously into the ground.
FA:	Flight auger; number indicates outside diameter in inches
HA:	Hand auger; number indicates outside diameter
HSA:	Hollow stem auger; number indicates inside diameter in inches
LG:	Field logger (initials)
MC:	Column used to describe moisture condition of samples and for the ground water level symbols
N (BPF):	Standard penetration resistance (N-value) in blows per foot (see notes)
NQ:	NQ wireline core barrel
PQ:	PQ wireline core barrel
RDA:	Rotary drilling with compressed air and roller or drag bit.
RDF:	Rotary drilling with drilling fluid and roller or drag bit
REC:	In split-spoon (see notes), direct push and thin-walled tube sampling, the recovered length (in inches) of sample. In rock coring, the length of core recovered (expressed as percent of the total core run). Zero indicates no sample recovered.
SS:	Standard split-spoon sampler (steel; 1.5" is inside diameter; 2" outside diameter); unless indicated otherwise
SU	Spin-up sample from hollow stem auger
TW:	Thin-walled tube; number indicates inside diameter in inches
WASH:	Sample of material obtained by screening returning rotary drilling fluid or by which has collected inside the borehole after "falling" through drilling fluid
WH:	Sampler advanced by static weight of drill rod and hammer
WR:	Sampler advanced by static weight of drill rod
94mm:	94 millimeter wireline core barrel
▼:	Water level directly measured in boring
▽:	Estimated water level based solely on sample appearance

TEST SYMBOLS

Symbol	Definition
CONS:	One-dimensional consolidation test
DEN:	Dry density, pcf
DST:	Direct shear test
E:	Pressuremeter Modulus, tsf
HYD:	Hydrometer analysis
LL:	Liquid Limit, %
LP:	Pressuremeter Limit Pressure, tsf
OC:	Organic Content, %
PERM:	Coefficient of permeability (K) test; F - Field; L - Laboratory
PL:	Plastic Limit, %
q_p:	Pocket Penetrometer strength, tsf (approximate)
q_c:	Static cone bearing pressure, tsf
q_u:	Unconfined compressive strength, psf
R:	Electrical Resistivity, ohm-cms
RQD:	Rock Quality Designation of Rock Core, in percent (aggregate length of core pieces 4" or more in length as a percent of total core run)
SA:	Sieve analysis
TRX:	Triaxial compression test
VSR:	Vane shear strength, remolded (field), psf
VSU:	Vane shear strength, undisturbed (field), psf
WC:	Water content, as percent of dry weight
%-200:	Percent of material finer than #200 sieve

STANDARD PENETRATION TEST NOTES

The standard penetration test consists of driving a split-spoon sampler with a drop hammer counting the number of blows applied in each of three 6" increments of penetration. If the sampler is driven less than 18" (usually in highly resistant material), permitted in ASTM: D1586, the blows for each complete 6" increment and for each partial increment is on the boring log. For partial increments, the number of blows is shown to the nearest 0.1' below the slash.

The length of sample recovered, as shown on the "REC" column, may be greater than the distance indicated in the N column. The disparity is because the N-value is recorded below the initial 6" set (unless partial penetration defined in ASTM: D1586 is encountered) whereas the length of sample recovered is for the entire sampler drive (which may even extend more than 18").

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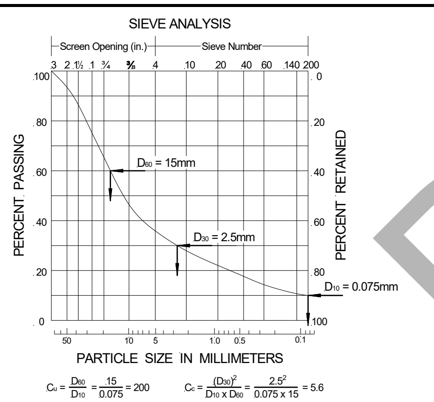
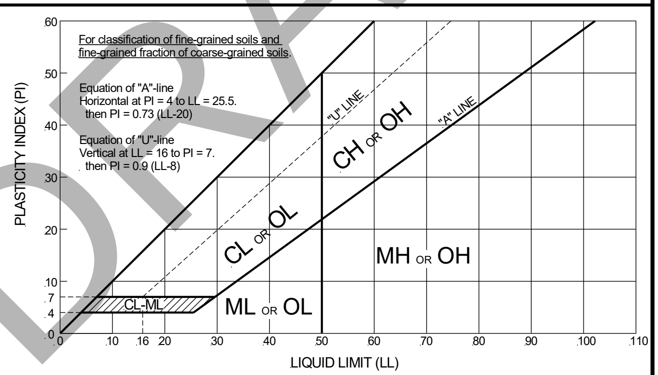
UNIFIED SOIL CLASSIFICATION SYSTEM
ASTM Designations: D 2487, D2488

AMERICAN ENGINEERING TESTING, INC.

Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests[A]				Soil Classification: Group Symbol	Soil Classification: Group Name[B]
Coarse-Grained Soils More than 50% retained on No. 200 sieve	Gravels More than 50% coarse fraction retained on No. 4 sieve	Clean Gravels Less than 5% fines[C]	$Cu \geq 4$ and $1 \leq Cc \leq 3$[E]	GW	Well graded gravel[F]
			$Cu < 4$ and/or $1 > Cc > 3$[E]	GP	Poorly graded gravel[F]
		Gravels with Fines more than 12% fines[C]	Fines classify as ML or MH	GM	Silty gravel[F.G.H]
			Fines classify as CL or CH	GC	Clayey gravel[F.G.H]
	Sands 50% or more of coarse fraction passes No. 4 sieve	Clean Sands Less than 5% fines[D]	$Cu \geq 6$ and $1 \leq Cc \leq 3$[E]	SW	Well-graded sand[I]
			$Cu < 6$ and/or $1 > Cc > 3$[E]	SP	Poorly-graded sand[I]
		Sands with Fines more than 12% fines[D]	Fines classify as ML or MH	SM	Silty sand[G.H.I]
			Fines classify as CL or CH	SC	Clayey sand[G.H.I]
Fine-Grained Soils 50% or more passes the No. 200 sieve (see Plasticity Chart below)	Silts and Clays Liquid limit less than 50	inorganic	PI>7 and plots on or above "A" line[J]	CL	Lean clay[K.L.M]
			PI<4 or plots below "A" line[J]	ML	Silt[K.L.M]
		organic	Liquid limit–oven dried / Liquid limit – not dried <0.75	OL	Organic clay[K.L.M.N] Organic silt[K.L.M.O]
	Silts and Clays Liquid limit 50 or more	inorganic	PI plots on or above "A" line	CH	Fat clay[K.L.M]
			PI plots below "A" line	MH	Elastic silt[K.L.M]
		organic	Liquid limit–oven dried / Liquid limit – not dried <0.75	OH	Organic clay[K.L.M.P] Organic silt[K.L.M.Q]
Highly organic soil			Primarily organic matter, dark in color, and organic in odor	PT	Peat[R]

DRAFT





Plasticity Chart

Notes

[A]Based on the material passing the 3-in (75-mm) sieve.

[B]If field sample contained cobbles or boulders, or both, add "with cobbles or boulders, or both" to group name.

[C]Gravels with 5 to 12% fines require dual symbols:
- GW-GM well-graded gravel with silt
- GW-GC well-graded gravel with clay
- GP-GM poorly graded gravel with silt
- GP-GC poorly graded gravel with clay

[D]Sands with 5 to 12% fines require dual symbols:
- SW-SM well-graded sand with silt
- SW-SC well-graded sand with clay
- SP-SM poorly graded sand with silt
- SP-SC poorly graded sand with clay

[E]$Cu = D_{60}/D_{10}$, $Cc = \frac{(D_{30})^2}{D_{10} \times D_{60}}$

[F]If soil contains ≥15% sand, add "with sand" to group name.

[G]If fines classify as CL-ML, use dual symbol GC-GM, or SC-SM.

[H]If fines are organic, add "with organic fines" to group name.

[I]If soil contains ≥15% gravel, add "with gravel" to group name.

[J]If Atterberg limits plot is hatched area, soil is a CL-ML silty clay.

[K]If soil contains 15 to 29% plus No. 200 add "with sand" or "with gravel", whichever is predominant.

[L]If soil contains ≥30% plus No. 200, predominantly sand, add "sandy" to group name.

[M]If soil contains ≥30% plus No. 200, predominantly gravel, add "gravelly" to group name.

[N]PI≥4 and plots on or above "A" line.

[O]PI<4 or plots below "A" line.

[P]PI plots on or above "A" line.

[Q]PI plots below "A" line.

[R]Fiber Content description shown below.

ADDITIONAL TERMINOLOGY NOTES USED BY AET FOR SOIL IDENTIFICATION AND DESCRIPTION

Grain Size

Term	Particle Size
Boulders	Over 12"
Cobbles	3" to 12"
Gravel	#4 sieve to 3"
Sand	#200 to #4 sieve
Fines (silt & clay)	Pass #200 sieve

Gravel Percentages

Term	Percent
A Little Gravel	3% - 14%
With Gravel	15% - 29%
Gravelly	30% - 50%

Consistency of Plastic Soils

Term	N-Value, BPF
Very Soft	less than 2
Soft	2 - 4
Firm	5 - 8
Stiff	9 - 15
Very Stiff	16 - 30
Hard	Greater than 30

Relative Density of Non-Plastic Soils

Term	N-Value, BPF
Very Loose	0 - 4
Loose	5 - 10
Medium Dense	11 - 30
Dense	31 - 50
Very Dense	Greater than 50

Moisture/Frost Condition (MC Column)

D (Dry):	Absence of moisture, dusty, dry to touch.
M (Moist):	Damp, although free water not visible. Soil may still have a high water content (over "optimum").
W (Wet/ Waterbearing):	Free water visible, intended to describe non-plastic soils. Waterbearing usually relates to sands and sand with silt.
F (Frozen):	Soil frozen

Layering Notes

Laminations:	Layers less than ½" thick of differing material or color.
Lenses:	Pockets or layers greater than ½" thick of differing material or color.

Peat Description

Term	Fiber Content (Visual Estimate)
Fibric Peat:	Greater than 67%
Hemic Peat:	33 – 67%
Sapric Peat:	Less than 33%

Organic Description (if no lab tests)

Soils are described as *organic*, if soil is not peat and is judged to have sufficient organic fines content to influence the Liquid Limit properties. *Slightly organic* used for borderline cases.

Root Inclusions

With roots:	Judged to have sufficient quantity of roots to influence the soil properties.
Trace roots:	Small roots present, but not judged to be in sufficient quantity to significantly affect soil properties.

AASHTO SOIL CLASSIFICATION SYSTEM

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS

Classification of Soils and Soil-Aggregate Mixtures

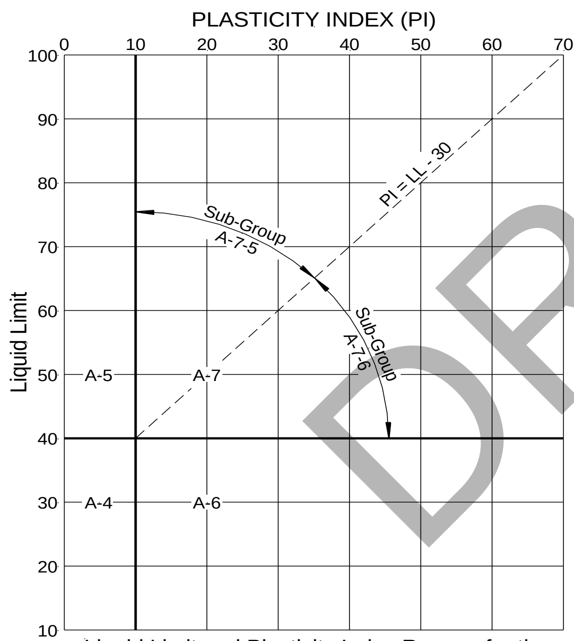
General Classification	Granular Materials (35% or less passing No. 200 sieve)							Silt-Clay Materials (More than 35% passing No. 200 sieve)			
Group Classification	A-1			A-2							A-7
	A-1-a	A-1-b	A-3	A-2-4	A-2-5	A-2-6	A-2-7	A-4	A-5	A-6	A-7-5 A-7-6
Sieve Analysis, Percent passing:											
No. 10 (2.00 mm)	50 max.	. . . .	. . . .	. . . .	. . . .	. . . .	. . . .	. . . .	. . . .	. . . .	. . . .
No. 40 (0.425 mm)	30 max.	50 max.	51 min.	. . . .	. . . .	. . . .	. . . .	. . . .	. . . .	. . . .	. . . .
No. 200 (0.075 mm)	15 max.	25 max.	10 max.	35 max.	35 max.	35 max.	35 max.	36 min.	36 min.	36 min.	36 min.
Characteristics of Fraction Passing No. 40 (0.425 mm)											
Liquid limit	. . . .		. . . .	40 max.	41 min.	40 max.	41 min.	40 max.	41 min.	40 max.	41 min.
Plasticity index	6 max.		N.P.	10 max.	10 max.	11 min.	11 min.	10 max.	10 max.	11 min.	11 min.
Usual Types of Significant Constituent Materials	Stone Fragments, Gravel and Sand		Fine Sand	Silty or Clayey Gravel and Sand				Silty Soils		Clayey Soils	
General Ratings as Subgrade	Excellent to Good							Fair to Poor			

The placing of A-3 before A-2 is necessary in the "left to right elimination process" and does not indicate superiority of A-3 over A-2.

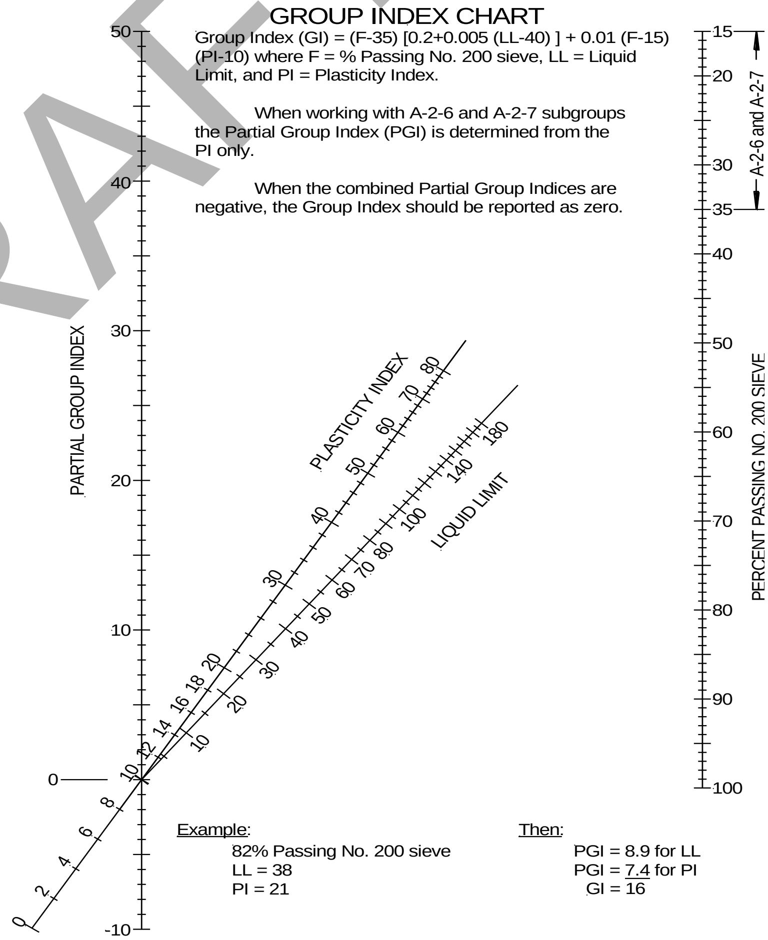
Plasticity index of A-7-5 subgroup is equal to or less than LL minus 30. Plasticity index of A-7-6 subgroup is greater than LL minus 30.

Group A-8 soils are organic clays or peat with organic content >5%.

DRAFT



Liquid Limit and Plasticity Index Ranges for the A-4, A-5, A-6 and A-7 Subgroups



Group Index (GI) = (F-35) [0.2+0.005 (LL-40)] + 0.01 (F-15) (PI-10) where F = % Passing No. 200 sieve, LL = Liquid Limit, and PI = Plasticity Index.

When working with A-2-6 and A-2-7 subgroups the Partial Group Index (PGI) is determined from the PI only.

When the combined Partial Group Indices are negative, the Group Index should be reported as zero.

Example:
82% Passing No. 200 sieve
LL = 38
PI = 21

Then:
PGI = 8.9 for LL
PGI = 7.4 for PI
GI = 16

Definitions of Gravel, Sand and Silt-Clay

The terms "gravel", "coarse sand", "fine sand" and "silt-clay", as determinable from the minimum test data required in this classification arrangement and as used in subsequent word descriptions are defined as follows:

GRAVEL - Material passing sieve with 3-in. square openings and retained on the No. 10 sieve.

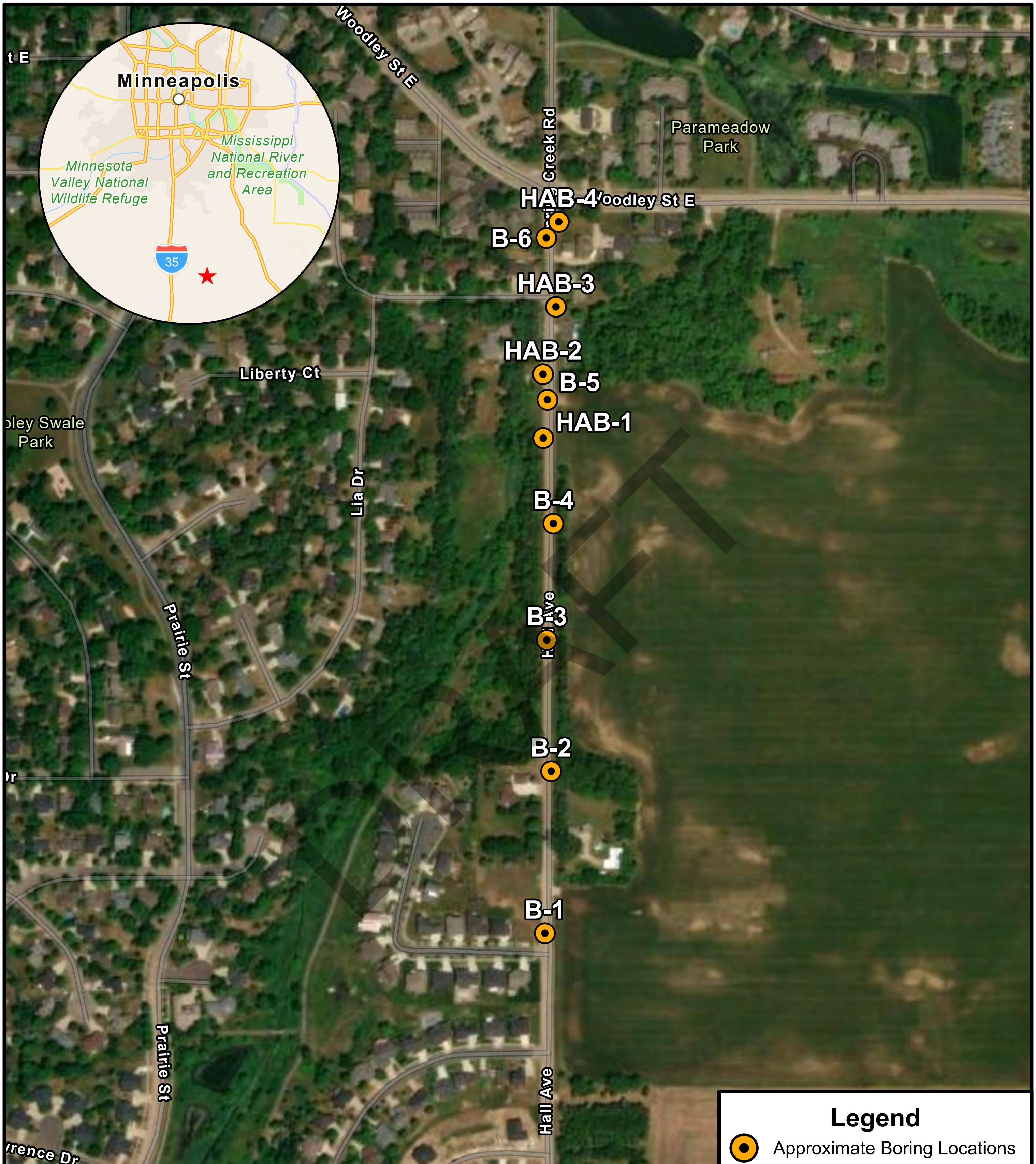
COARSE SAND - Material passing the No. 10 sieve and retained on the No. 40 sieve.

FINE SAND - Material passing the No. 40 sieve and retained on the No. 200 sieve.

COMBINED SILT AND CLAY - Material passing the No. 200 sieve

BOULDERS (retained on 3-in. sieve) should be excluded from the portion of the sample to which the classificaiton is applied, but the percentage of such material, if any, in the sample should be recorded.

The term "silty" is applied to fine material having plasticity index of 10 or less and the term "clayey" is applied to fine material having plasticity index of 11 or greater.



AMERICAN ENGINEERING TESTING

Map Reference:
MnGeo 2023

N

0 360 720

Feet

Figure 1

Boring Location Map

2026 Spring Creek Road Reconstruction
and Mill Towns Trail Improvements
Northfield, MN

Date: 8/16/24

AET Project No. P-0034269

AMERICAN ENGINEERING TESTING

SUBSURFACE BORING LOG

AET JOB NO: **P-0034269** LOG OF BORING NO. **B-1 (p. 1 of 1)**

PROJECT: **2026 Spring Creek Road Reconstruction and Mill Towns Trail Improvements; Northfield, MN**

Rice County LATITUDE: **44.44112729** LONGITUDE: **-93.14092424**

DEPTH IN FEET	MATERIAL DESCRIPTION (SURFACE ELEVATION: 998.7)	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	WC	DEN	LL	PL	%-#200
0–2	FILL, mostly sand with gravel, brown (A-1-b)	FILL	11	M	SS	16					
2–4.5	FILL, mostly lean clay with sand with gravel, dark brown (A-6)		8	M	SS	17	26				
4.5–7	FILL, mostly clayey sand, brown (A-2-6)		3	M	SS	18	10				
7–9.5	FILL, mostly clayey sand, a little gravel, brown (A-6)		6	M	SS	24	12				
9.5–11.5	SAND WITH SILT, fine grained, brown, moist, medium dense (SP-SM) (A-3)	COARSE ALLUVIUM	22	M	SS	9					
	END OF BORING										

DRAFT

DEPTH:	DRILLING METHOD	DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL	WATER LEVEL
0-9½'	**3.25" HSA**	**8/23/24**	**12:29**	**11.5**	**9.5**	**9.8**		**None**

BORING COMPLETED: **8/23/24**

DR: **JF** LG: **SG** Rig: **91C**

NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG

AET CORP W-CO NAME AND LAT-LONG P-0034269 NORTHFIELD 2026 SPRING CREEK ROAD AND MILL TOWN TRAIL.GPJ AET+CPT+WELL.GDT 10/23/24

SUBSURFACE BORING LOG

AET JOB NO: **P-0034269** LOG OF BORING NO. **B-2 (p. 1 of 1)**

PROJECT: **2026 Spring Creek Road Reconstruction and Mill Towns Trail Improvements; Northfield, MN**

Rice County LATITUDE: **44.44253623** LONGITUDE: **-93.14084832**

DEPTH IN FEET	MATERIAL DESCRIPTION (SURFACE ELEVATION: 992.4)	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	WC	DEN	LL	PL	%-#200
	FILL, mostly sand with gravel, pieces of bituminous, brown (A-1-b) (aggregate surface)	FILL									
1	FILL, mostly clayey sand, a little gravel, brown (A-6)		27	M	SS	14	10				
2											
3			5	M	SS	15	11				
4											
5	SEVERELY WEATHERED SANDSTONE (residual soil) [Textural Classification: Sand, fine grained, light brown, moist, medium dense (SP) (A-3)]	ST. PETER FORMATION	13	M	SS	15	17				
6											
	END OF BORING **REFUSAL OF AUGER**										

FIELD & LABORATORY TESTS: WC, DEN, LL, PL, %-#200

DRAFT

DEPTH:	DRILLING METHOD	DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL	WATER LEVEL
0-4½'	**3.25" HSA**	**8/23/24**	**11:52**	**6.5**	**4.5**	**6.5**		**None**

BORING COMPLETED: **8/23/24**

DR: **JF** LG: **SG** Rig: **91C**

NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG

AET CORP W-CO NAME AND LAT-LONG P-0034269 NORTHFIELD 2026 SPRING CREEK ROAD AND MILL TOWN TRAIL.GPJ AET+CPT+WELL.GDT 10/23/24

SUBSURFACE BORING LOG

AMERICAN ENGINEERING TESTING

AET JOB NO: **P-0034269** LOG OF BORING NO. **B-3 (p. 1 of 1)**

PROJECT: **2026 Spring Creek Road Reconstruction and Mill Towns Trail Improvements; Northfield, MN**

Rice County LATITUDE: **44.44367686** LONGITUDE: **-93.14090187**

SURFACE ELEVATION: **974.4**

DEPTH IN FEET	MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	WC	DEN	LL	PL	%-#200
0–⅓	4" Crushed limestone (aggregate surface)	FILL									
1	FILL, mostly clayey sand, dark brown (A-6)		24	M	SS	16	10				24
2–4	FILL, mostly silty sand, a little gravel, brown (A-1-b)		6	M	SS	7					
4.5–7	FILL, mostly clayey sand, trace roots, brown (A-2-6)		3	M	SS	17	17				
7–9.5	FILL, mostly sandy lean clay, brown (A-6)		7	M	SS	18	21				
9.5–11.5	SEVERELY WEATHERED SANDSTONE (residual soil) [Textural Classification: Sand, fine grained, light brown with mottling, moist, medium dense (SP) (A-3)]	ST. PETER FORMATION	16	M	SS	18					
	END OF BORING										

DRAFT

DEPTH:	DRILLING METHOD
0-9½'	**3.25" HSA**

WATER LEVEL MEASUREMENTS

DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL	WATER LEVEL
8/23/24	**11:14**	**11.5**	**9.5**	**11.5**		**None**

NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG

BORING COMPLETED: **8/23/24**

DR: **JF** LG: **SG** Rig: **91C**

AET CORP W-CO NAME AND LAT-LONG P-0034269 NORTHFIELD 2026 SPRING CREEK ROAD AND MILL TOWN TRAIL.GPJ AET+CPT+WELL.GDT 10/23/24

SUBSURFACE BORING LOG

AMERICAN ENGINEERING TESTING

AET JOB NO: **P-0034269** LOG OF BORING NO. **B-4 (p. 1 of 1)**

PROJECT: **2026 Spring Creek Road Reconstruction and Mill Towns Trail Improvements; Northfield, MN**

Rice County LATITUDE: **44.44468924** LONGITUDE: **-93.14082133**

SURFACE ELEVATION: **961.9**

DEPTH IN FEET	MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	WC	DEN	LL	PL	%-#200
0–0.3	4" Crushed limestone (aggregate surface)	FILL									
1	FILL, mostly silty sand, brown (A-2-4)		31	M	SS	17					
2–4	FILL, mostly slightly organic silty sand, trace roots, dark brown (A-2-4)		6	M	SS	16					
5–7	FILL, mostly sand with silt with gravel, brown (A-3)		4	M	SS	17					
7–9.5	SEVERELY WEATHERED SANDSTONE (residual soil) [Textural Classification: Silty sand, pieces of sandstone, fine to medium grained, light brown with mottling, moist, medium dense (SM) (A-2-4)]	ST. PETER FORMATION	12	M	SS	22					
9.5–11.5	SEVERELY WEATHERED SANDSTONE (residual soil) [Textural Classification: Silty sand, pieces of sandstone, fine to medium grained, brown, moist, very dense (SM) (A-2-4)]		77	M	SS						
	END OF BORING										

DRAFT

DEPTH: DRILLING METHOD	DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL	WATER LEVEL
0-9½' 3.25" HSA	**8/23/24**	**10:31**	**9.5**	**11.3**			**None**

BORING COMPLETED: **8/23/24**

DR: **JF** LG: **SG** Rig: **91C**

NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG

AET CORP W-CO NAME AND LAT-LONG P-0034269 NORTHFIELD 2026 SPRING CREEK ROAD AND MILL TOWN TRAIL.GPJ AET+CPT+WELL.GDT 10/23/24

SUBSURFACE BORING LOG

AET JOB NO: **P-0034269** LOG OF BORING NO. **B-5 (p. 1 of 1)**

PROJECT: **2026 Spring Creek Road Reconstruction and Mill Towns Trail Improvements; Northfield, MN**

Rice County LATITUDE: **44.44576589** LONGITUDE: **-93.14089361**

SURFACE ELEVATION: **948.0**

DEPTH IN FEET	MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	WC	DEN	LL	PL	%-#200
0–1	FILL, mostly sand with gravel, brown (A-1-b) (aggregate surface)	FILL									
1–2	FILL, mostly silty sand with gravel (A-1-b)		29	M	SS	18					
2–4.5	FILL, mostly gravelly clayey sand, dark brown (A-2-6)		19	M	SS	18	7				
4.5–8	FILL, mostly slightly organic silty sand, dark brown (A-2-4)		9	M	SS	20					
8–9.5	FILL, mostly sand with silt with gravel, pieces of limestone, brown (A-1-b)		10	M (water level symbol)	SS	20					
9.5–11.5	GRAVELLY SILTY SAND, pieces of limestone, fine to medium grained, brown, moist, very dense (SM) (A-2-4)	COARSE ALLUVIUM	73	M	SS	19					
	END OF BORING										

DRAFT

DEPTH:	DRILLING METHOD
0-9½'	**3.25" HSA**

BORING COMPLETED: **8/23/24**

DR: **JF** LG: **SG** Rig: **91C**

WATER LEVEL MEASUREMENTS

DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL	WATER LEVEL
8/23/24	**9:33**	**11.5**	**9.5**	**9.5**		**8.2**
8/23/24				**11.4**		**10.0**

NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG

AET CORP W-CO NAME AND LAT-LONG P-0034269 NORTHFIELD 2026 SPRING CREEK ROAD AND MILL TOWN TRAIL.GPJ AET+CPT+WELL.GDT 10/23/24

SUBSURFACE BORING LOG

AMERICAN ENGINEERING TESTING

AET JOB NO: **P-0034269** LOG OF BORING NO. **B-6 (p. 1 of 1)**

PROJECT: **2026 Spring Creek Road Reconstruction and Mill Towns Trail Improvements; Northfield, MN**

Rice County LATITUDE: **44.44717325** LONGITUDE: **-93.14090745**

SURFACE ELEVATION: **956.2**

DEPTH IN FEET	MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	WC	DEN	LL	PL	%-#200
0–2	FILL, mostly clayey sand, a little gravel, trace roots, dark brown (A-6)	FILL	5	M	SS	15	10				
2–4.5	FILL, mostly sandy lean clay, a little gravel, brown (A-6)		8	M	SS	18	19				
4.5–7	SAND WITH SILT, a little gravel, fine grained, light brown, moist, very loose (SP-SM) (A-3) (possible fill)	COARSE ALLUVIUM OR FILL	4	M	SS	18					
7–9	HIGHLY WEATHERED DOLOSTONE, Textural Classification: Silty sand with gravel, fine grained, light brown, moist, medium dense (SM) (A-2-4)	SHAKOPEE FORMATION	29	M	SS	24					
9	HIGHLY WEATHERED SANDSTONE, Textural Classification: Sand with silt, fine grained, light brown, moist, medium dense (SP-SM) (A-3)										

END OF BORING
REFUSAL OF AUGER

DRAFT

DEPTH:	DRILLING METHOD
0-9'	3.25" HSA

WATER LEVEL MEASUREMENTS

DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL	WATER LEVEL
9/13/24	10:00	9.0	7.0	9.0		None

BORING COMPLETED: **9/13/24**

DR: **SB** LG: **BC** Rig: **1C**

NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG

SUBSURFACE BORING LOG

AMERICAN ENGINEERING TESTING

AET JOB NO: **P-0034269** LOG OF BORING NO. **HA-1 (p. 1 of 1)**

PROJECT: **2026 Spring Creek Road Reconstruction and Mill Towns Trail Improvements; Northfield, MN**

Rice County LATITUDE: **44.44543239** LONGITUDE: **-93.14094482**

DEPTH IN FEET	MATERIAL DESCRIPTION (SURFACE ELEVATION: 948.6)	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	WC	DEN	LL	PL	%-#200
	FILL, mostly sandy lean clay with gravel, trace roots, dark brown (A-6) (topsoil)	FILL		M	DS		13				
1	FILL, mostly sandy lean clay, a little gravel, brown (A-6)			M	DS		14				
2	FILL, mixture of sandy lean clay and lean clay, a little gravel, dark brown and brown (A-6)			M	DS		15				
				M	DS		8				
				M	DS		10				
3	FILL, mostly gravelly clayey sand, light brown (A-2-6)										
	END OF BORING										

DRAFT

DEPTH:	DRILLING METHOD	WATER LEVEL MEASUREMENTS						
		DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL	WATER LEVEL
0-3'	**Hand Auger**	**8/22/24**	**10:50**	**3.0**	**0.0**	**3.0**		**None**

BORING COMPLETED: **8/22/24**

DR: **JF** LG: **SG** Rig: **HA**

NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG

AET CORP W-CO NAME AND LAT-LONG P-0034269 NORTHFIELD 2026 SPRING CREEK ROAD AND MILL TOWN TRAIL.GPJ AET+CPT+WELL.GDT 10/23/24

SUBSURFACE BORING LOG

AET JOB NO: **P-0034269** LOG OF BORING NO. **HA-2 (p. 1 of 1)**

PROJECT: **2026 Spring Creek Road Reconstruction and Mill Towns Trail Improvements; Northfield, MN**

Rice County LATITUDE: **44.44598809** LONGITUDE: **-93.14094742**

DEPTH IN FEET	MATERIAL DESCRIPTION SURFACE ELEVATION: 943.2	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	WC	DEN	LL	PL	%-#200
	FILL, mostly sandy lean clay, a little gravel, trace roots, dark brown (A-6) (topsoil)	FILL		M	DS		10				
1	FILL, mostly gravel with sand, brown (A-1-a)			M	DS						
2	FILL, mixture of silty sand and clayey sand, a little gravel, brown (A-2-4)			M	DS		14				
	END OF BORING										

DEPTH:	DRILLING METHOD	WATER LEVEL MEASUREMENTS						
		DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL	WATER LEVEL
0-2'	Hand Auger	8/22/24	9:50	2.0	0.0	2.0		None

BORING COMPLETED: **8/22/24**

DR: **JF** LG: **SG** Rig: **HA**

NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG

DRAFT

AET CORP W-CO NAME AND LAT-LONG P-0034269 NORTHFIELD 2026 SPRING CREEK ROAD AND MILL TOWN TRAIL.GPJ AET+CPT+WELL.GDT 10/23/24

SUBSURFACE BORING LOG

AMERICAN ENGINEERING TESTING

AET JOB NO: **P-0034269** LOG OF BORING NO. **HA-3 (p. 1 of 1)**

PROJECT: **2026 Spring Creek Road Reconstruction and Mill Towns Trail Improvements; Northfield, MN**

Rice County LATITUDE: **44.44657389** LONGITUDE: **-93.14078973**

DEPTH IN FEET	MATERIAL DESCRIPTION (SURFACE ELEVATION: 952.4)	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	WC	DEN	LL	PL	%-#200
	FILL, mostly sandy lean clay, a little gravel, trace roots, dark brown to brown (A-6) (topsoil)	FILL		M	DS		20				
1				M	DS						
	FILL, mostly gravelly silty sand, brown (A-2-4)										
2	FILL, mixture of sandy lean clay and lean clay, dark brown and brown (A-6)			M	DS		18				
	FILL, mostly sandy lean clay, brown (A-6)			M	DS		24				
3	**END OF BORING**										

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DEPTH:	DRILLING METHOD	DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL	WATER LEVEL
0-3'	**Hand Auger**	**8/22/24**	**9:29**	**3.0**	**0.0**	**3.0**		**None**

BORING COMPLETED: **8/22/24**

DR: **JF** LG: **SG** Rig: **HA**

NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG

AET CORP W-CO NAME AND LAT-LONG P-0034269 NORTHFIELD 2026 SPRING CREEK ROAD AND MILL TOWN TRAIL.GPJ AET+CPT+WELL.GDT 10/23/24

SUBSURFACE BORING LOG

AMERICAN ENGINEERING TESTING

AET JOB NO: **P-0034269** LOG OF BORING NO. **HA-4 (p. 1 of 1)**

PROJECT: **2026 Spring Creek Road Reconstruction and Mill Towns Trail Improvements; Northfield, MN**

Rice County LATITUDE: **44.44731333** LONGITUDE: **-93.14075504**

DEPTH IN FEET	MATERIAL DESCRIPTION (SURFACE ELEVATION: **953.7**)	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	WC	DEN	LL	PL	%-#200
1	FILL, mostly sandy lean clay, trace roots, dark brown (A-6) (topsoil)	FILL		M	DS		15				
2	FILL, mostly sandy lean clay with gravel, brown and dark brown (A-6)			M	DS		11				
				M	DS						
	FILL, mostly gravelly silty sand, brown (A-1-b)			M	DS		17				
3	FILL, mostly sand, a little gravel, brown (A-1-b)										
	FILL, mostly sandy lean clay, a little gravel, brown and dark brown (A-6)										
	END OF BORING										

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DEPTH:	DRILLING METHOD	DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL	WATER LEVEL
0-3'	**Hand Auger**	**8/22/24**	**9:05**	**3.0**	**0.0**	**3.0**		**None**

WATER LEVEL MEASUREMENTS

BORING COMPLETED: **8/22/24**

DR: **JF** LG: **SG** Rig: **HA**

NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG

AET CORP W-CO NAME AND LAT-LONG P-0034269 NORTHFIELD 2026 SPRING CREEK ROAD AND MILL TOWN TRAIL.GPJ AET+CPT+WELL.GDT 10/23/24

Appendix B

Geotechnical Report Limitations and Guidelines for Use

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Appendix B
Geotechnical Report Limitations and Guidelines for Use
Report No. P-0034269

B.1 REFERENCE

This appendix provides information to help you manage your risks relating to subsurface problems which are caused by construction delays, cost overruns, claims, and disputes. This information was developed and provided by GBA[1], of which we are a member firm.

B.2 RISK MANAGEMENT INFORMATION

B.2.1 Understand the Geotechnical Engineering Services Provided for this Report

Geotechnical engineering services typically include the planning, collection, interpretation, and analysis of exploratory data from widely spaced borings and/or test pits. Field data are combined with results from laboratory tests of soil and rock samples obtained from field exploration (if applicable), observations made during site reconnaissance, and historical information to form one or more models of the expected subsurface conditions beneath the site. Local geology and alterations of the site surface and subsurface by previous and proposed construction are also important considerations. Geotechnical engineers apply their engineering training, experience, and judgment to adapt the requirements of the prospective project to the subsurface model(s). Estimates are made of the subsurface conditions that will likely be exposed during construction as well as the expected performance of foundations and other structures being planned and/or affected by construction activities.

The culmination of these geotechnical engineering services is typically a geotechnical engineering report providing the data obtained, a discussion of the subsurface model(s), the engineering and geologic engineering assessments and analyses made, and the recommendations developed to satisfy the given requirements of the project. These reports may be titled investigations, explorations, studies, assessments, or evaluations. Regardless of the title used, the geotechnical engineering report is an engineering interpretation of the subsurface conditions within the context of the project and does not represent a close examination, systematic inquiry, or thorough investigation of all site and subsurface conditions.

B.2.2 Geotechnical Engineering Services are Performed for Specific Purposes, Persons, and Projects, and At Specific Times

Geotechnical engineers structure their services to meet the specific needs, goals, and risk management preferences of their clients. A geotechnical engineering study conducted for a given civil engineer will not likely meet the needs of a civil-works constructor or even a different civil engineer. Because each geotechnical engineering study is unique, each geotechnical engineering report is unique, prepared solely for the client.

Likewise, geotechnical engineering services are performed for a specific project and purpose. For example, it is unlikely that a geotechnical engineering study for a refrigerated warehouse will be the same as one prepared for a parking garage; and a few borings drilled during a preliminary study to evaluate site feasibility will not be adequate to develop geotechnical design recommendations for the project.

Do not rely on this report if your geotechnical engineer prepared it:

- for a different client;
- for a different project or purpose;
- for a different site (that may or may not include all or a portion of the original site); or
- before important events occurred at the site or adjacent to it; e.g., man-made events like construction or environmental remediation, or natural events like floods, droughts, earthquakes, or groundwater fluctuations.

Note, too, the reliability of a geotechnical-engineering report can be affected by the passage of time, because of factors like changed subsurface conditions; new or modified codes, standards, or regulations; or new techniques or tools. If you are the least bit uncertain about the continued reliability of this report, contact your geotechnical engineer before applying the recommendations in it. A minor amount of additional testing or analysis after the passage of time – if any is required at all – could prevent major problems.

1 Geoprofessional Business Association,15800 Crabbs Branch Way Suite 300, Rockville, MD 20850
Telephone: 301/565-2733: www.geoprofessional.org, 2019

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B.2.3 Read the Full Report

Costly problems have occurred because those relying on a geotechnical-engineering report did not read the report in its entirety. Do not rely on an executive summary. Do not read selective elements only. Read and refer to the report in full.

B.2.4 You Need to Inform Your Geotechnical Engineer About Change

Your geotechnical engineer considered unique, project-specific factors when developing the scope of study behind this report and developing the confirmation-dependent recommendations the report conveys. Typical changes that could erode the reliability of this report include those that affect:

- the site's size or shape;
- the elevation, configuration, location, orientation, function or weight of the proposed structure and the desired performance criteria;
- the composition of the design team; or
- project ownership.

As a general rule, always inform your geotechnical engineer of project or site changes – even minor ones – and request an assessment of their impact. The geotechnical engineer who prepared this report cannot accept responsibility or liability for problems that arise because the geotechnical engineer was not informed about developments the engineer otherwise would have considered.

B.2.5 Most of the "Findings" Related in This Report Are Professional Opinions

Before construction begins, geotechnical engineers explore a site's subsurface using various sampling and testing procedures. Geotechnical engineers can observe actual subsurface conditions only at those specific locations where sampling and testing is performed. The data derived from that sampling and testing were reviewed by your geotechnical engineer, who then applied professional judgement to form opinions about subsurface conditions throughout the site. Actual sitewide-subsurface conditions may differ – maybe significantly – from those indicated in this report. Confront that risk by retaining your geotechnical engineer to serve on the design team through project completion to obtain informed guidance quickly, whenever needed.

B.2.6 This Report's Recommendations Are Confirmation-Dependent

The recommendations included in this report – including any options or alternatives – are confirmation-dependent. In other words, they are not final, because the geotechnical engineer who developed them relied heavily on judgement and opinion to do so. Your geotechnical engineer can finalize the recommendations only after observing actual subsurface conditions exposed during construction. If through observation your geotechnical engineer confirms that the conditions assumed to exist actually do exist, the recommendations can be relied upon, assuming no other changes have occurred. The geotechnical engineer who prepared this report cannot assume responsibility or liability for confirmation-dependent recommendations if you fail to retain that engineer to perform construction observation.

B.2.7 This Report Could Be Misinterpreted

Other design professionals' misinterpretation of geotechnical engineering reports has resulted in costly problems. Confront that risk by having your geotechnical engineer serve as a continuing member of the design team, to:

- confer with other design-team members;
- help develop specifications;
- review pertinent elements of other design professionals' plans and specifications; and
- be available whenever geotechnical engineering guidance is needed.

You should also confront the risk of constructors misinterpreting this report. Do so by retaining your geotechnical engineer to participate in prebid and preconstruction conferences and to perform construction-phase observations.

B.2.8 Give Constructors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can shift unanticipated-subsurface-conditions liability to constructors by limiting the information they provide for bid preparation. To help prevent the costly, contentious problems this practice has caused, include the complete geotechnical engineering report, along with any attachments or appendices, with your contract documents, but be certain to note conspicuously that you've included the material for information purposes only. To avoid misunderstanding, you may also want to note that "informational purposes" means constructors have no right to rely on the interpretations, opinions, conclusions, or recommendations in the

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report. Be certain that constructors know they may learn about specific project requirements, including options selected from the report, only from the design drawings and specifications. Remind constructors that they may perform their own studies if they want to, and be sure to allow enough time to permit them to do so. Only then might you be in a position to give constructors the information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions. Conducting prebid and preconstruction conferences can also be valuable in this respect.

B.2.9 Read Responsibility Provisions Closely

Some client representatives, design professionals, and constructors do not realize that geotechnical engineering is far less exact than other engineering disciplines. This happens in part because soil and rock on project sites are typically heterogeneous and not manufactured materials with well-defined engineering properties like steel and concrete. That lack of understanding has nurtured unrealistic expectations that have resulted in disappointments, delays, cost overruns, claims, and disputes. To confront that risk, geotechnical engineers commonly include explanatory provisions in their reports. Sometimes labeled “limitations,” many of these provisions indicate where geotechnical engineers’ responsibilities begin and end, to help others recognize their own responsibilities and risks. Read these provisions closely. Ask questions. Your geotechnical engineer should respond fully and frankly.

B.2.10 Geoenvironmental Concerns Are Not Covered

The personnel, equipment, and techniques used to perform an environmental study – e.g., a “phase-one” or “phase-two” environmental site assessment – differ significantly from those used to perform a geotechnical engineering study. For that reason, a geotechnical engineering report does not usually provide environmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. Unanticipated subsurface environmental problems have led to project failures. If you have not obtained your own environmental information about the project site, ask your geotechnical consultant for a recommendation on how to find environmental risk-management guidance.

B.2.11 Obtain Professional Assistance to Deal with Moisture Infiltration and Mold

While your geotechnical engineer may have addressed groundwater, water infiltration, or similar issues in this report, the engineer’s services were not designed, conducted, or intended to prevent migration of moisture – including water vapor – from the soil through building slabs and walls and into the building interior, where it can cause mold growth and material-performance deficiencies. Accordingly, proper implementation of the geotechnical engineer’s recommendations will not of itself be sufficient to prevent moisture infiltration. Confront the risk of moisture infiltration by including building-envelope or mold specialists on the design team. Geotechnical engineers are not building-envelope or mold specialists.

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Appendix F: Traffic Safety and Stop Analysis

Real People. Real Solutions.

MEMORANDUM

Date: 11/13/2024

To: City of Northfield

From: Bryan T. Nemeth, P.E., PTOE

Subject: Woodley Street and Spring Creek Road
Traffic Safety and Warrant Analysis
City of Northfield, Minnesota
Project No.: 24X134891000

Introduction

The City of Northfield, Minnesota, has proposed improvements for Spring Creek Road including road reconstruction and the Mill Towns State Trail enhancements, which include upgrades of the street to a paved surface and the addition of sidewalk, trail, and utility infrastructure. The reconstruction area includes the southern leg of the intersection of County State Aid Highway (CSAH) 28/Woodley Street and Spring Creek Road. With this being a major intersection in the area and previous citizen input on safety concerns, there is a focus to identify and document safety issues and identify what improvements may increase traffic safety and provide acceptable operations. This memorandum includes an analysis of traffic safety and the traffic control needs of the intersection based on current conditions and outlines potential improvements for implementation.

Scope of Analysis

- **Traffic Safety:** Review five-year history of crashes at locations, analysis of sight lines at the stop - controlled intersection, and review of speed data to provide insights into safety trends and concerns.
- **Warrant Analysis:** Analyze a potential change from Two-Way Stop control to All-Way Stop control at the intersection.

Study Intersection

The intersection of Woodley Street and Spring Creek Road is controlled by stop signs on Spring Creek Road as a Two-Way Stop Controlled intersection. Woodley Street is a minor arterial with a posted speed limit of 35 mph, while Spring Creek Road is a local roadway with a posted speed limit of 30 mph on the north leg. The south leg of Spring Creek Road is not currently posted with a speed limit and the Speed Limit of 55 mph would be applicable in accordance with State Statute. Spring Creek Road is currently a gravel road approximately 150 feet south of Woodley Street and is once again a paved section approximately 2,000 feet south of Woodley Street. Woodley Street is a three-lane roadway (two-lane roadway that also features a two-way left turn lane) and Spring Creek Road is a two-lane roadway. The intersection is located on a horizontal curve of Woodley Street.

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Data Collection

Existing traffic turning movement counts including vehicles and pedestrians at the intersection were collected on Tuesday October 29, 2024. Traffic speed data was collected at two locations on October 30, 2024. Intersection turning movement data for the intersection is included in **Appendix A**.

Crash Review

Crashes available from the Minnesota Crash Mapping Analysis Tool (MnCMAT2) from 2019 to 2023 were reviewed to determine the types of crashes that have occurred at the intersection and to determine potential mitigation measures if needed. A crash rate higher than the critical crash rate (critical index > 1.0) indicates a need for mitigation to reduce crashes. A critical index less than 1 indicates that the intersection is operating within the normal range as compared to similar intersections statewide and there is not an immediate need for mitigation. The intersection has had no crashes in the last five years or the crashes may not have been recorded or reported to the city. **Table 1** shows the intersection crash rate.

Table 1: Crash Rate and Critical Index

Intersection	Traffic Control	All Severities				Fatal and Serious Injury Crashes (K+A Crashes)			
		Total Crashes	Crash Rate (per MEV)	Critical Crash Rate (per MEV)	Critical Index	K+A Crashes	K+A Crash Rate (per 100 MEV)	K+A Critical Crash Rate (per 100 MEV)	K+A Critical Index
Woodley Street and Spring Creek Road	Two-Way Stop	0	0.14	0.68	0.00	0	0.35	14.39	0.00

While the crash history indicates that the intersection is performing within the "normal" range, this does not indicate that safety improvements should not be incorporated into the project and additional conditions should be evaluated as there is likely to be an increase in vehicle, bicyclist, and pedestrian volume through the intersection due to the project enhancements.

Intersection Sight Distance Analysis (Sight Lines)

To identify potential sight-line obstructions for vehicles and pedestrians making movements from stop-controlled approaches, intersection sight distance analysis was completed at the stop-controlled intersections following guidance in the AASHTO *Policy on Geometric Design of Highways and Streets*. This analysis evaluated departure distances for the north-south stop-controlled approaches to Woodley Street assuming side street stop control. Woodley Street was evaluated with the speed limit of 35 mph.

This analysis was performed using two different assumptions:

- **Conservative analysis** – this assumes that a driver's eye is 14.5 feet from the edge of the major road traveled way which would be typical for motorists that are stopped behind an adjacent sidewalk.
    - Analysis results for the conservative analysis are summarized in **Table 2.**
- **Typical driving behavior** – this assumes that a driver's eye is 6.5 feet from the edge of the major road traveled way (i.e. pulling closer to Woodley St to evaluate sight lines as allowed by state law).
    - Analysis results for the typical driving behavior analysis are summarized in **Table 3.**

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Table 2: Sight Line Analysis – Assuming Driver's Eye is 14.5 feet from Edge of Woodley Street

Intersection	Approach	Movement	
		Left Turn	Right Turn
Woodley Street and Spring Creek Road	Northbound	Trees on SE Quadrant	No Obstructions
	Southbound	Roadway Curve	Roadway Curve

Table 3: Sight Line Analysis – Assuming Driver's Eye is 6.5 feet from Edge of Woodley Street

Intersection	Approach	Movement	
		Left Turn	Right Turn
Woodley Street and Spring Creek Road	Northbound	No Obstructions	No Obstructions
	Southbound	Roadway Curve	Roadway Curve

The sight line analysis for the intersection is attached in **Appendix B.**

The northbound approach has some minor sight line obstructions including trees and bushes on the SE corner under the conservative analysis but it is not considered to be a major concern since it can be remedied through the vehicle advancing forward of the stop sign but not impacting crossing traffic.

Due to the roadway geometrics with the horizontal curve, power poles, utility boxes, and multiple bushes and trees on the NE and NW corners of the intersection, the southbound traffic from Spring Creek Road entering Woodley Street has poor sight lines where motorists cannot advance adequately to provide clear sight lines without impacting Woodley Street traffic. Assuming the driver's eye at 6.5 feet from the edge of Woodley Street would still have sight-line issues, especially when looking west. While this has not currently caused crashes, with an anticipated increase in volume on Spring Creek Road, this may be a concern. Changing the intersection control to all-way stop or roundabout control may be considered as traffic control options given the sight line issues at the intersection if they cannot be rectified through geometric improvements.

Speed Data Review

Elevated traffic speeds can increase both crash potential and the likelihood that a crash will result in serious injuries, especially for pedestrians and bicyclists. To understand existing traffic speeds, speed data was collected at two separate locations in the study area. Speeds were collected both East and West of Woodley Street and Spring Creek Road along Woodley Street within the 35 mph zone. The collected data is summarized in **Table 4**.

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Table 4: Field-Collected Speed Data

Location	Median Speed	85th Percentile Speed	Posted Speed
West to Spring Creek Road	33 to 34 mph	37 to 39 mph	35 mph
East to Spring Creek Road	38 mph	43 mph	35 mph

*Multiple speeds listed above indicate different speed measurements in each direction

Speed data indicates that traffic speeds at both locations exceed the 35-mph posted speed limit. Ideally 85th percentile speeds would match the speed limit. If this is not achieved, the roadway features should be designed to the speeds wanted or the speed limit should be increased. The speed data indicates that speeds are higher than the speed limit and appropriate speed limit should be in the range of 40 mph.

This data also indicates that the sight line analysis may be further impacted with the higher speeds, with more obstructions with the higher speed. In recognition that the roadway should be designed to best indicate to motorists that the appropriate speed is 35 mph or less, options to reduce motorist speed would be recommended but given the current lane layout and features the only reasonable option may be reduce lane width and provide some minimal curb extensions. Improved street lighting would also be recommended to light up all four corners where pedestrians or bicyclists may be present.

Warrant Analysis

The traffic volumes and crash history were analyzed at the intersection for All-Way Stop. The data is used to determine if the intersection meets the all-way stop warrant from the Minnesota Manual on Uniform Traffic Control (MnMUTCD).

- Woodley Street and Spring Creek Road
    - Traffic Volumes do not currently meet the all-way stop warrant.
    - Crash history indicates that there have been no crashes at the intersection for the past five years.
    - All-way stop control warrant is not met based on crashes or volumes.

All-way stop warrant analysis for the intersection is provided in **Appendix C.**

- However, sight-line analysis indicates a potential need for measures to improve sight lines.
    - All-way stop control may be considered if other options are not feasible.
    - While an all-way stop in a rural area may be unexpected by motorists, an all-way stop in this area given the homes in the immediate vicinity would not be an unusual traffic control device in this transition from a rural land use to one that is urbanizing.

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Additional Considerations

- If the sight line considerations could largely be rectified for motor vehicles, the sight line issues are likely to continue to be present for pedestrians and bicyclists due to their lower speeds in crossing the intersection and the horizontal curve.
  - In consideration of the above and the potential for a significant increase in pedestrian and bicyclist volume, it is recommended that enhancements for non-motorized crossing movements be provided in accordance with Minnesota's Best Practices for Pedestrian and Bicycle Safety. This includes implementation of high visibility crosswalk markings, adequate nighttime lighting levels, crosswalk warning signs, advance stop for pedestrian signs and crosswalk warning signs, and given the measured speeds (if all-way stop not implemented) a pedestrian hybrid beacon. As current volumes do not justify a pedestrian hybrid beacon in accordance with the MnMUTCD, a rectangular hybrid beacon may be appropriate given the speed limit.
    - Measures to decrease speeds to the speed limit is highly encouraged.
- The implementation of all-way stop may be justified under the warrants in MnMUTCD when traffic volumes increase.
  - The roadway and trail improvements are anticipated to draw additional traffic to the intersection, resulting in an increase due to traffic diversion from other routes.
  - Continued development growth in the SE corner of the city would be anticipated in increase the volume of traffic using Spring Creek Road.
  - The trail and sidewalk improvements and connection of the Mill Towns State Trail will increase pedestrian and bicyclist traffic along Spring Creek Road.
- A roundabout would be an appropriate traffic control option given the roadway curvature and traffic volumes. A mini-roundabout would be appropriate, but a single-lane roundabout would also be acceptable, but not necessary given the speeds and volumes.

Conclusion

The crash review reveals that there have been no crashes observed in past five years at the intersection, indicating overall acceptable conditions.

The intersection of Woodley Street and Spring Creek Road does not meet the criteria for All-Way Stop Warrants based on traffic volumes or crash history. Sight-line analysis identified sight line issues for vehicles, bicyclists, and pedestrians, almost exclusive from the north leg (southbound approach) due to vegetative obstructions at the intersection and the roadway curvature. The speed study shows that speeds near the intersection along Woodley Street is higher than the posted speed limit, increasing the risk of crashes and indicating that sight lines are even longer.

Overall, the findings support the following proposed safety improvements to enhance accessibility and reduce risk for all users at the intersection of Spring Creek Road and CSAH 28/Woodley Street:

- Provide curb extensions and implement lane narrowing, if possible, to reduce traffic speeds.
- Increase intersection lighting to provide adequate nighttime lighting levels.
- Improve the pedestrian crossing planned for the east side of the intersection to include high visibility crosswalk markings, crosswalk warning signs, advance stop for pedestrian signs, and advance crosswalk warning signs.

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- Maintain the two-way stop control but adjust geometrics and trim or remove bushes and trees, to improve sight lines, especially on the NW and NE corners.
    - Implement a Rectangular Rapid Flashing Beacon (RRFB) for the pedestrian crossing if two-way stop control is maintained.
    - If the sight lines cannot be improved, implement all-way stop control or a mini-roundabout.
- Implement all-way stop or roundabout control when traffic volumes increase, if not implemented due to sight line issues.

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Appendix A – Turning Movement Counts

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Woodley St E & Spring Creek Rd S, Northfield, MN
Tuesday, October 29, 2024

Time	Southbound						Westbound						Northbound						Eastbound						VEHICLE TOTAL
	U Turns	Left Turns	Straight Through	Right Turns	Crosswalk Crossings	*Vehicle Approach Total*	U Turns	Left Turns	Straight Through	Right Turns	Crosswalk Crossings	*Vehicle Approach Total*	U Turns	Left Turns	Straight Through	Right Turns	Crosswalk Crossings	*Vehicle Approach Total*	U Turns	Left Turns	Straight Through	Right Turns	Crosswalk Crossings	*Vehicle Approach Total*	
12:00 AM	0	0	1	0	0	*1*	0	0	0	0	0	*0*	0	0	0	0	0	*0*	0	0	0	0	0	*0*	**1**
12:15 AM	0	0	0	0	0	*0*	0	0	0	0	0	*0*	0	0	0	0	0	*0*	0	0	0	0	0	*0*	**0**
12:30 AM	0	0	0	0	0	*0*	0	0	0	0	0	*0*	0	0	0	0	0	*0*	0	0	0	0	0	*0*	**0**
12:45 AM	0	0	0	0	0	*0*	0	0	0	0	0	*0*	0	0	0	0	0	*0*	0	0	0	0	0	*0*	**0**
Hourly Total	0	0	1	0	0	*1*	0	0	0	0	0	*0*	0	0	0	0	0	*0*	0	0	0	0	0	*0*	**1**
1:00 AM	0	0	0	0	0	*0*	0	0	0	0	0	*0*	0	0	0	0	0	*0*	0	0	1	0	0	*1*	**1**
1:15 AM	0	0	0	0	0	*0*	0	0	0	0	0	*0*	0	0	0	0	0	*0*	0	0	0	0	0	*0*	**0**
1:30 AM	0	0	0	0	0	*0*	0	0	0	0	0	*0*	0	0	0	0	0	*0*	0	0	1	0	0	*1*	**1**
1:45 AM	0	0	0	0	0	*0*	0	0	0	0	0	*0*	0	0	0	0	0	*0*	0	0	0	0	0	*0*	**0**
Hourly Total	0	0	0	0	0	*0*	0	0	0	0	0	*0*	0	0	0	0	0	*0*	0	0	2	0	0	*2*	**2**
2:00 AM	0	0	0	0	0	*0*	0	0	1	0	0	*1*	0	0	1	0	0	*1*	0	0	0	0	0	*0*	**2**
2:15 AM	0	0	0	0	0	*0*	0	0	0	0	0	*0*	0	0	0	0	0	*0*	0	0	1	0	0	*1*	**1**
2:30 AM	0	0	0	0	0	*0*	0	0	0	0	0	*0*	0	0	0	0	0	*0*	0	0	0	0	0	*0*	**0**
2:45 AM	0	0	0	0	0	*0*	0	0	0	0	0	*0*	0	0	0	0	0	*0*	0	0	1	0	0	*1*	**1**
Hourly Total	0	0	0	0	0	*0*	0	0	1	0	0	*1*	0	0	1	0	0	*1*	0	0	2	0	0	*2*	**4**
3:00 AM	0	0	2	0	0	*2*	0	0	0	0	0	*0*	0	1	0	0	0	*1*	0	0	2	0	0	*2*	**5**
3:15 AM	0	0	0	0	0	*0*	0	0	2	0	0	*2*	0	0	0	0	0	*0*	0	0	0	0	0	*0*	**2**
3:30 AM	0	0	0	0	0	*0*	0	0	1	0	0	*1*	0	0	0	0	0	*0*	0	0	1	0	0	*1*	**2**
3:45 AM	0	0	0	0	0	*0*	0	0	0	0	0	*0*	0	0	0	0	0	*0*	0	0	0	0	0	*0*	**0**
Hourly Total	0	0	2	0	0	*2*	0	0	3	0	0	*3*	0	1	0	0	0	*1*	0	0	3	0	0	*3*	**9**
4:00 AM	0	0	0	0	0	*0*	0	0	0	0	0	*0*	0	0	0	0	0	*0*	0	0	0	0	0	*0*	**0**
4:15 AM	0	0	0	0	0	*0*	0	1	1	0	0	*2*	0	0	0	0	0	*0*	0	0	0	0	0	*0*	**2**
4:30 AM	0	0	0	0	0	*0*	0	0	3	0	0	*3*	0	1	0	0	0	*1*	0	0	0	0	0	*0*	**4**
4:45 AM	0	0	0	0	0	*0*	0	0	1	0	0	*1*	0	0	1	0	0	*1*	0	1	0	0	0	*1*	**3**
Hourly Total	0	0	0	0	0	*0*	0	1	5	0	0	*6*	0	1	1	0	0	*2*	0	1	0	0	0	*1*	**9**
5:00 AM	0	0	1	0	0	*1*	0	1	2	1	0	*4*	0	0	0	0	0	*0*	0	0	0	0	0	*0*	**5**
5:15 AM	0	0	0	0	0	*0*	0	0	2	0	0	*2*	0	0	0	0	0	*0*	0	1	0	0	0	*1*	**3**
5:30 AM	0	0	0	0	0	*0*	0	0	4	0	0	*4*	0	0	1	0	0	*1*	0	0	1	0	0	*1*	**6**
5:45 AM	0	0	0	1	0	*1*	0	0	1	0	0	*1*	0	0	0	0	0	*0*	0	0	3	0	0	*3*	**5**
Hourly Total	0	0	1	1	0	*2*	0	1	9	1	0	*11*	0	0	1	0	0	*1*	0	1	4	0	0	*5*	**19**
6:00 AM	0	0	0	1	0	*1*	0	0	5	0	0	*5*	0	1	0	0	0	*1*	0	1	1	0	0	*2*	**9**
6:15 AM	0	0	0	1	0	*1*	0	1	3	0	0	*4*	0	1	0	0	0	*1*	0	0	0	0	0	*0*	**6**
6:30 AM	0	0	0	5	0	*5*	0	1	12	0	0	*13*	0	0	0	0	0	*0*	0	1	3	0	0	*4*	**22**
6:45 AM	0	0	1	3	0	*4*	0	2	10	0	1	*12*	0	2	0	0	0	*2*	0	2	2	1	0	*5*	**23**
Hourly Total	0	0	1	10	0	*11*	0	4	30	0	1	*34*	0	4	0	0	0	*4*	0	4	6	1	0	*11*	**60**
7:00 AM	0	0	0	0	0	*0*	0	0	14	0	0	*14*	0	1	5	1	0	*7*	0	2	0	0	0	*2*	**23**
7:15 AM	0	0	2	6	0	*8*	0	4	20	0	0	*24*	0	1	3	0	0	*4*	0	3	2	0	0	*5*	**41**
7:30 AM	0	0	3	6	1	*9*	0	11	23	0	0	*34*	0	3	2	1	0	*6*	0	2	7	2	0	*11*	**60**
7:45 AM	0	0	0	2	0	*2*	0	5	27	1	0	*33*	0	8	4	2	0	*14*	0	1	9	1	1	*11*	**60**
Hourly Total	0	0	5	14	1	*19*	0	20	84	1	0	*105*	0	13	14	4	0	*31*	0	8	18	3	1	*29*	**184**
8:00 AM	0	0	2	6	6	*8*	0	6	18	1	2	*25*	0	4	1	1	0	*6*	0	5	10	0	0	*15*	**54**
8:15 AM	0	2	1	4	1	*7*	0	2	15	1	0	*18*	0	1	3	0	0	*4*	0	1	6	2	0	*9*	**38**
8:30 AM	0	1	4	1	0	*6*	0	1	20	0	0	*21*	0	0	4	0	0	*4*	0	5	10	0	0	*15*	**46**
8:45 AM	0	0	0	6	2	*6*	0	2	17	0	1	*19*	0	1	2	0	0	*3*	0	1	9	0	0	*10*	**38**
Hourly Total	0	3	7	17	9	*27*	0	11	70	2	3	*83*	0	6	10	1	0	*17*	0	12	35	2	0	*49*	**176**
9:00 AM	0	0	0	5	0	*5*	0	1	9	0	0	*10*	0	1	2	1	1	*4*	0	2	9	0	1	*11*	**30**
9:15 AM	0	1	0	3	0	*4*	1	0	5	1	0	*7*	0	2	1	0	0	*3*	0	2	5	0	1	*7*	**21**
9:30 AM	0	1	1	2	0	*4*	0	0	8	0	0	*8*	0	5	3	1	0	*9*	0	3	7	0	0	*10*	**31**
9:45 AM	0	0	2	3	0	*5*	0	0	11	0	0	*11*	0	3	1	1	0	*5*	0	5	9	2	0	*16*	**37**
Hourly Total	0	2	3	13	0	*18*	1	1	33	1	0	*36*	0	11	7	3	1	*21*	0	12	30	2	2	*44*	**119**
10:00 AM	0	2	0	5	0	*7*	0	1	10	0	0	*11*	0	1	3	0	0	*4*	0	0	8	1	0	*9*	**31**
10:15 AM	0	0	1	2	0	*3*	0	0	13	0	0	*13*	0	0	2	0	0	*2*	0	3	7	0	0	*10*	**28**
10:30 AM	0	0	1	2	3	*3*	0	1	12	0	0	*13*	0	1	2	1	0	*4*	0	2	12	1	0	*15*	**35**
10:45 AM	0	0	2	4	1	*6*	0	0	13	0	0	*13*	0	4	2	0	0	*6*	0	5	10	0	0	*15*	**40**
Hourly Total	0	2	4	13	4	*19*	0	2	48	0	0	*50*	0	6	9	1	0	*16*	0	10	37	2	0	*49*	**134**
11:00 AM	0	0	2	3	2	*5*	0	0	13	0	0	*13*	0	0	2	1	0	*3*	0	3	16	2	0	*21*	**42**
11:15 AM	0	0	1	3	0	*4*	0	1	11	0	0	*12*	0	0	2	2	0	*4*	0	0	11	3	2	*14*	**34**
11:30 AM	0	0	3	3	1	*6*	0	0	16	0	0	*16*	0	3	0	2	0	*5*	0	6	16	3	0	*25*	**52**
11:45 AM	0	1	0	7	0	*8*	0	0	12	1	0	*13*	0	1	0	0	0	*1*	0	6	15	1	0	*22*	**44**
Hourly Total	0	1	6	16	3	*23*	0	1	52	1	0	*54*	0	4	4	5	0	*13*	0	15	58	9	2	*82*	**172**
12:00 PM	0	0	1	2	2	*3*	0	0	8	0	0	*8*	0	1	1	1	0	*3*	0	1	19	0	0	*20*	**34**
12:15 PM	0	0	1	6	2	*7*	0	1	8	0	0	*9*	0	1	1	0	0	*2*	0	4	10	5	0	*19*	**37**
12:30 PM	0	0	1	7	1	*8*	0	3	13	0	0	*16*	0	1	5	1	1	*7*	0	3	11	0	0	*14*	**45**
12:45 PM	0	0	0	2	1	*2*	0	0	15	1	0	*16*	0	1	1	4	0	*6*	1	1	15	1	0	*18*	**42**
Hourly Total	0	0	3	17	6	*20*	0	4	44	1	0	*49*	0	4	8	6	1	*18*	1	9	55	6	0	*71*	**158**
1:00 PM	0	0	4	2	0	*6*	0	1	13	0	0	*14*	0	0	0	0	0	*0*	0	3	15	2	1	*20*	**40**
1:15 PM	0	0	2	3	1	*5*	0	1	8	1	0	*10*	0	2	2	0	0	*4*	0	4	12	1	0	*17*	**36**
1:30 PM	0	0	3	3	2	*6*	0	0	11	0	0	*11*	0	1	0	3	0	*4*	0	1	9	1	0	*11*	**32**
1:45 PM	0	2	3	3	0	*8*	0	0	19	1	0	*20*	0	4	0	1	0	*5*	0	2	12	2	0	*16*	**49**
Hourly Total	0	2	12	11	3	*25*	0	2	51	2	0	*55*	0	7	2	4	0	*13*	0	10	48	6	1	*64*	**157**
2:00 PM	0	1	2	6	5	*9*	0	0	9	0	0	*9*	0	1	1	0	2	*2*	0	4	12	4	0	*20*	**40**
2:15 PM	0	0	1	7	4	*8*	0	0	20	0	0	*20*	0	3	0	1	0	*4*	0	1	23	0	0	*24*	**56**
2:30 PM	0	0	1	4	0	*5*	0	2	16	1	0	*19*	0	0	3	1	0	*4*	0	1	15	3	0	*19*	**47**
2:45 PM	0	0	2	0	0	*2*	0	3	11	0	0	*14*	0	3	9	4	0	*16*	0	2	18	3	0	*23*	**55**
Hourly Total	0	1	6	17	9	*24*	0	5	56	1	0	*62*	0	7	13	6	2	*26*	0	8	68	10	0	*86*	**198**
3:00 PM	0	0	3	7	1	*10*	0	1	13	0	0	*14*	0	2	1	5	2	*8*	0	7	24	2	0	*33*	**65**
3:15 PM	0	0	2	4	1	*6*	0	1	13	0	0	*14*	0	3	2	4	0	*9*	0	11	12	1	0	*24*	**53**
3:30 PM	0	1	3	2	18	*6*	0	3	15	1	0	*19*	0	0	5	3	0	*8*	0	6	22	2	0	*30*	**63**
3:45 PM	0	1	5	3	1	*9*	0	3	17	1	15	*21*	0	3	5	1	0	*9*	0	4	15	0	1	*19*	**58**
Hourly Total	0	2	13	16	21	*31*	0	8	58	2	15	*68*	0	8	13	13	2	*34*	0	28	73	5	1	*106*	**239**
4:00 PM	0	0	4	10	0	*14*	0	3	13	0	0	*16*	0	1	1	2	0	*4*	0	7	18	3	0	*28*	**62**
4:15 PM	0	0	4	7	0	*11*	0	3	10	0	0	*13*	0	5	3	1	1	*9*	0	5	26	3	1	*34*	**67**
4:30 PM	0	1	1	4	2	*6*	0	2	11	2	0	*15*	0	4	1	2	0	*7*	0	4	26	1	0	*31*	**59**
4:45 PM	0	0	5	6	0	*11*	0	1	13	1	0	*15*	0	3	4	3	1	*10*	0	6	16	3	0	*25*	**61**
Hourly Total	0	1	14	27	2	*42*	0	9	47	3	0	*59*	0	13	9	8	2	*30*	0	22	86	10	1	*118*	**249**
5:00 PM	0	2	2	4	2	*8*	0	4	21	0	0	*25*	0	1	3	2	0	*6*	0	5	18	5	0	*28*	**67**
5:15 PM	0	1	5	3	3	*9*	0	2	9	1	0	*12*	0	4	4	1	0	*9*	0	6	22	2	0	*30*	**60**
5:30 PM	0	1	3	9	1	*13*	0	1	9	0	0	*10*	0	9	1	1	0	*11*	0	4	16	2	0	*22*	**56**
5:45 PM	0	0	2	4	1	*6*	0	1	10	0	0	*11*	0	0	3	4	0	*7*	0	7	14	1	0	*22*	**46**
Hourly Total	0	4	12	20	7	*36*	0	8	49	1	0	*58*	0	14	11	8	0	*33*	0	22	70	10	0	*102*	**229**
6:00 PM	0	0	2	6	0	*8*	0	1	18	0	1	*19*	0	2	0	1	0	*3*	0	2	14	2	0	*18*	**48**
6:15 PM	0	0	4	7	0	*11*	0	2	10	0	0	*12*	0	1	2	2	0	*5*	0	3	18	1	1	*22*	**50**
6:30 PM	0	0	2	2	0	*4*	0	2	8	0	0	*10*	0	0	0	2	0	*2*	0	3	18	1	0	*22*	**38**

6:45 PM	0	1	2	2	0	*5*	0	0	9	0	0	*9*	0	1	3	1	0	*5*	0	2	20	3	0	*25*	**44**
Hourly Total	0	1	10	17	0	*28*	0	5	45	0	1	*50*	0	4	5	6	0	*15*	0	10	70	7	1	*87*	**180**
7:00 PM	0	1	1	3	0	*5*	0	2	9	1	0	*12*	0	2	0	2	0	*4*	0	2	10	0	0	*12*	**33**
7:15 PM	0	0	1	3	0	*4*	0	3	9	0	0	*12*	0	0	0	2	0	*2*	0	2	10	0	0	*12*	**30**
7:30 PM	0	0	0	1	0	*1*	0	0	4	0	0	*4*	0	0	2	1	0	*3*	0	4	12	4	0	*20*	**28**
7:45 PM	0	0	1	3	0	*4*	0	0	6	0	0	*6*	0	0	2	1	0	*3*	0	3	12	1	0	*16*	**29**
Hourly Total	0	1	3	10	0	*14*	0	5	28	1	0	*34*	0	2	4	6	0	*12*	0	11	44	5	0	*60*	**120**
8:00 PM	0	0	0	0	0	*0*	0	0	3	0	0	*3*	0	0	2	1	0	*3*	0	1	8	2	0	*11*	**17**
8:15 PM	0	0	1	0	0	*1*	0	0	4	0	0	*4*	0	0	0	1	0	*1*	0	3	8	0	0	*11*	**17**
8:30 PM	0	0	1	0	0	*1*	0	0	2	0	0	*2*	0	0	1	1	0	*2*	0	1	7	0	0	*8*	**13**
8:45 PM	0	0	0	1	0	*1*	0	0	1	0	0	*1*	0	0	0	1	0	*1*	0	2	12	0	0	*14*	**17**
Hourly Total	0	0	2	1	0	*3*	0	0	10	0	0	*10*	0	0	3	4	0	*7*	0	7	35	2	0	*44*	**64**
9:00 PM	0	0	0	0	0	*0*	0	0	0	0	0	*0*	0	0	1	1	0	*2*	0	2	6	1	0	*9*	**11**
9:15 PM	0	0	0	1	0	*1*	0	0	4	0	0	*4*	0	0	0	1	0	*1*	0	2	8	0	0	*10*	**16**
9:30 PM	0	0	2	0	0	*2*	0	1	2	0	0	*3*	0	0	0	0	0	*0*	0	1	3	0	0	*4*	**9**
9:45 PM	0	0	1	1	0	*2*	0	0	1	0	0	*1*	0	1	0	0	0	*1*	0	0	1	1	0	*2*	**6**
Hourly Total	0	0	3	2	0	*5*	0	1	7	0	0	*8*	0	1	1	2	0	*4*	0	5	18	2	0	*25*	**42**
10:00 PM	0	0	0	2	0	*2*	0	0	1	0	0	*1*	0	0	1	1	0	*2*	0	0	2	0	0	*2*	**7**
10:15 PM	0	0	1	0	0	*1*	0	0	1	0	0	*1*	0	0	0	1	0	*1*	0	0	2	0	0	*2*	**5**
10:30 PM	0	0	0	0	0	*0*	0	0	2	0	0	*2*	0	0	1	0	0	*1*	0	1	1	0	0	*2*	**5**
10:45 PM	0	0	0	0	0	*0*	0	0	0	0	0	*0*	0	0	0	0	0	*0*	0	0	2	0	0	*2*	**2**
Hourly Total	0	0	1	2	0	*3*	0	0	4	0	0	*4*	0	0	2	2	0	*4*	0	1	7	0	0	*8*	**19**
11:00 PM	0	0	0	0	0	*0*	0	0	1	0	0	*1*	0	0	0	0	0	*0*	0	0	0	0	0	*0*	**1**
11:15 PM	0	0	1	0	0	*1*	0	0	0	0	0	*0*	0	0	0	0	0	*0*	0	0	0	0	0	*0*	**1**
11:30 PM	0	0	0	0	0	*0*	0	0	1	0	0	*1*	0	0	0	0	0	*0*	0	1	0	0	0	*1*	**2**
11:45 PM	0	0	0	0	0	*0*	0	0	1	0	0	*1*	0	0	0	0	0	*0*	0	0	0	0	0	*0*	**1**
Hourly Total	0	0	1	0	0	*1*	0	0	3	0	0	*3*	0	0	0	0	0	*0*	0	1	0	0	0	*1*	**5**
DAILY TOTAL	**0**	**20**	**110**	**224**	**65**	***354***	**1**	**88**	**737**	**17**	**20**	***843***	**0**	**106**	**118**	**79**	**8**	***303***	**1**	**197**	**769**	**82**	**9**	***1049***	**2549**
Cars	0	20	107	222	58	*349*	1	85	725	16	19	*827*	0	104	113	78	8	*295*	0	195	761	80	7	*1036*	**2507**
Heavy Vehicles	0	0	3	2	7	*5*	0	3	12	1	1	*16*	0	2	5	1	0	*8*	1	2	8	2	2	*13*	**42**
Heavy Vehicle %	0.00%	0.00%	2.73%	0.89%	10.77%	*1.41%*	0.00%	3.41%	1.63%	5.88%	5.00%	*1.90%*	0.00%	1.89%	4.24%	1.27%	0.00%	*2.64%*	100.00%	1.02%	1.04%	2.44%	22.22%	*1.24%*	**1.65%**

Woodley St E & Spring Creek Rd S, Northfield, MN
Tuesday, October 29, 2024

AM Peak Hour

Time	Southbound						Westbound						Northbound						Eastbound						VEHICLE TOTAL
	U Turns	Left Turns	Straight Through	Right Turns	Crosswalk Crossings	*Vehicle Approach Total*	U Turns	Left Turns	Straight Through	Right Turns	Crosswalk Crossings	*Vehicle Approach Total*	U Turns	Left Turns	Straight Through	Right Turns	Crosswalk Crossings	*Vehicle Approach Total*	U Turns	Left Turns	Straight Through	Right Turns	Crosswalk Crossings	*Vehicle Approach Total*	
7:15 AM	0	0	2	6	0	*8*	0	4	20	0	0	*24*	0	1	3	0	0	*4*	0	3	2	0	0	*5*	**41**
7:30 AM	0	0	3	6	1	*9*	0	11	23	0	0	*34*	0	3	2	1	0	*6*	0	2	7	2	0	*11*	**60**
7:45 AM	0	0	0	2	0	*2*	0	5	27	1	0	*33*	0	8	4	2	0	*14*	0	1	9	1	1	*11*	**60**
8:00 AM	0	0	2	6	6	*8*	0	6	18	1	2	*25*	0	4	1	1	0	*6*	0	5	10	0	0	*15*	**54**
Peak Hour Total	0	0	7	20	7	*27*	0	26	88	2	2	*116*	0	16	10	4	0	*30*	0	11	28	3	1	*42*	**215**
PHF	0.000	0.000	0.583	0.833	0.292	*0.750*	0.000	0.591	0.815	0.500	0.250	*0.853*	0.000	0.500	0.625	0.500	0.000	*0.536*	0.000	0.550	0.700	0.375	0.250	*0.700*	**0.896**

PM Peak Hour

Time	Southbound						Westbound						Northbound						Eastbound						VEHICLE TOTAL
	U Turns	Left Turns	Straight Through	Right Turns	Crosswalk Crossings	*Vehicle Approach Total*	U Turns	Left Turns	Straight Through	Right Turns	Crosswalk Crossings	*Vehicle Approach Total*	U Turns	Left Turns	Straight Through	Right Turns	Crosswalk Crossings	*Vehicle Approach Total*	U Turns	Left Turns	Straight Through	Right Turns	Crosswalk Crossings	*Vehicle Approach Total*	
4:15 PM	0	0	4	7	0	*11*	0	3	10	0	0	*13*	0	5	3	1	1	*9*	0	5	26	3	1	*34*	**67**
4:30 PM	0	1	1	4	2	*6*	0	2	11	2	0	*15*	0	4	1	2	0	*7*	0	4	26	1	0	*31*	**59**
4:45 PM	0	0	5	6	0	*11*	0	1	13	1	0	*15*	0	3	4	3	1	*10*	0	6	16	3	0	*25*	**61**
5:00 PM	0	2	2	4	2	*8*	0	4	21	0	0	*25*	0	1	3	2	0	*6*	0	5	18	5	0	*28*	**67**
Peak Hour Total	0	3	12	21	4	*36*	0	10	55	3	0	*68*	0	13	11	8	2	*32*	0	20	86	12	1	*118*	**254**
PHF	0.000	0.375	0.600	0.750	0.500	*0.818*	0.000	0.625	0.655	0.375	0.000	*0.680*	0.000	0.650	0.688	0.667	0.500	*0.800*	0.000	0.833	0.827	0.600	0.250	*0.868*	**0.948**

Daily Volumes

Total Vehicles On Leg	686				
Vehicles Entering Intersection	354	Vehicles Exiting Intersection	332		
Southbound					
Cars	222	107	20	0	58
Heavy	2	3	0	0	7
Total	**224**	**110**	**20**	**0**	**65**

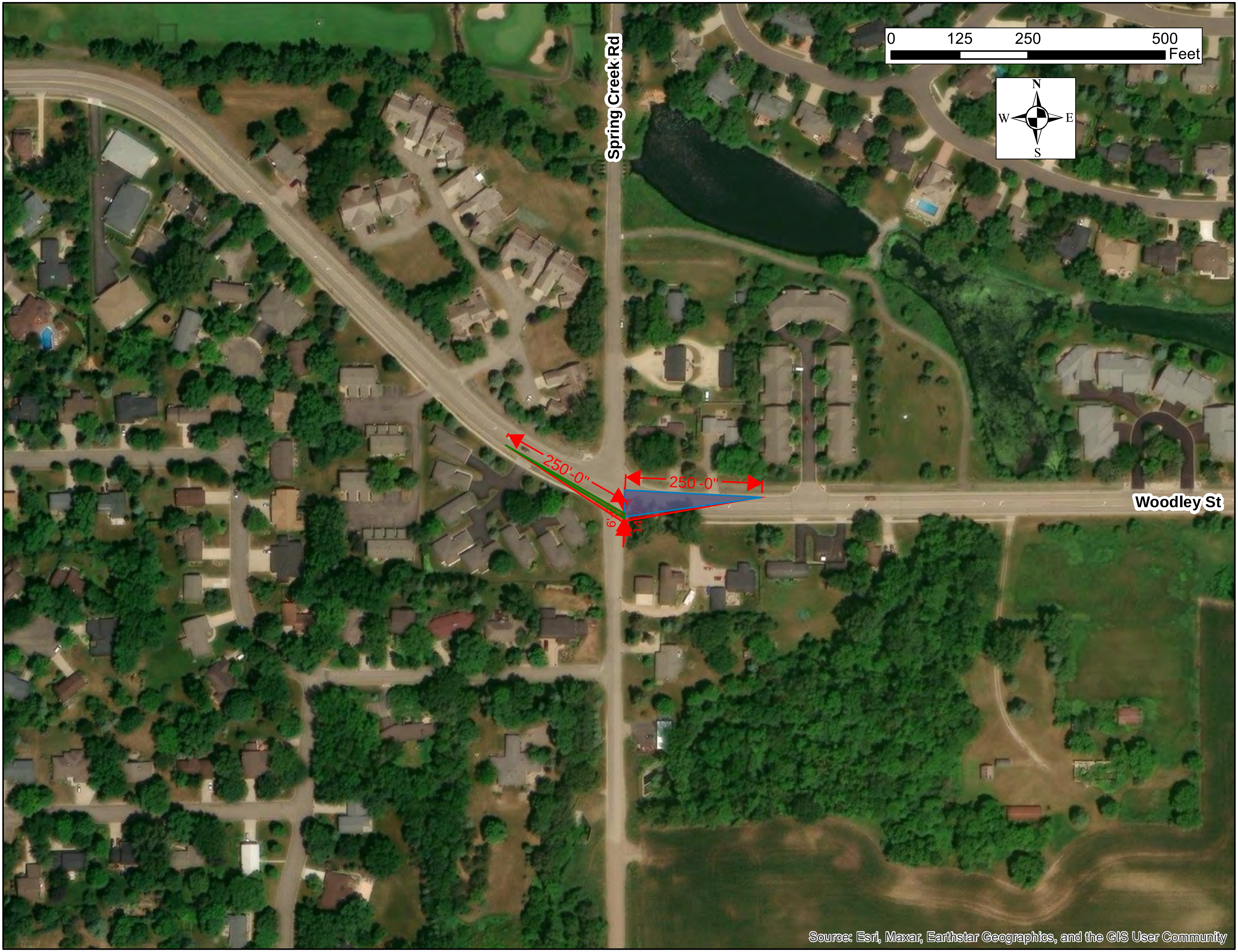
Total Vehicles on Leg	Vehicles Entering Intersection	Vehicles Exiting Intersection	Eastbound	Cars	Heavy	**Total**
2117	1049	1068		7	2	**9**
				0	1	**1**
				195	2	**197**
				761	8	**769**
				80	2	**82**

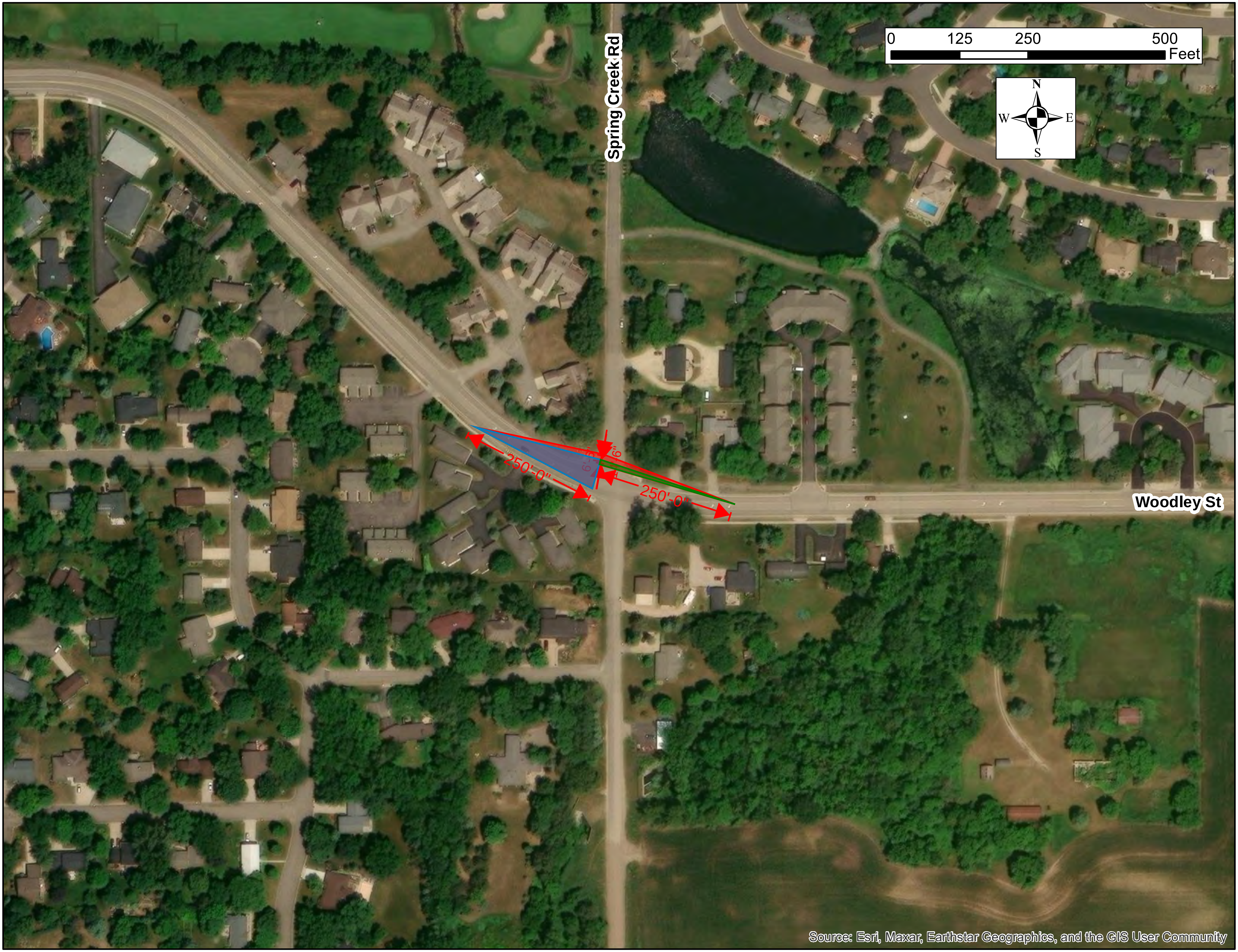
Cars	Heavy	**Total**	Westbound	Vehicles Entering Intersection	Vehicles Exiting Intersection	Total Vehicles on Leg
16	1	**17**		843	869	1712
725	12	**737**				
85	3	**88**				
1	0	**1**				
19	1	**20**				

Cars	8	0	104	113	78
Heavy	0	0	2	5	1
Total	**8**	**0**	**106**	**118**	**79**
Northbound					
Vehicles Entering Intersection	303	Vehicles Exiting Intersection	280		
Total Vehicles On Leg	583				

Appendix B – Sight Line Analysis

Bolton & Menk is an equal opportunity employer.


0
125
250
500
Feet
N
W
E
S
Spring Creek Rd
250'-0"
250'-0"
14'-6"
Woodley St
Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community



Spring Creek Rd
Woodley St
0 125 250 500
Feet
N
W
E
S
250'-0"
250'-0"
Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

Appendix C – Warrant Analysis

Bolton & Menk is an equal opportunity employer.

Traffic Signal Warrant Analysis

Woodley Street and Spring Creek Road **Multi-Way Stop Warrants**

Project Name	Spring Creek Road Reconstruction
Project/File #	24X134891000
Scenario	Existing Condition

Intersection Information			
Major Street (E/W Road)	Woodley Street E	Minor Street (N/S Road)	Spring Creek Rd S
Analyzed with	1 approach lane	Analyzed with	1 Approach Lane
Total Approach Volume	1891 vehicles	Total Approach Volume	657 vehicles
Total Ped/Bike Volume	29 crossings	Total Ped/Bike Volume	73 crossings
Right turn reduction of	0 percent applied	Right turn reduction of	0 percent applied

No high speed or isolated community reduction applied to the Multi-Way Stop Warrant thresholds.

Condition A - Traffic Signal Warrant	
Condition Satisfied?	**Not Satisfied**
Criteria*	Traffic Signal Warranted & Justified

* Multi-way stop control may be used as an interim measure that can be installed quickly to control traffic while arrangements are being made for the installation of the traffic control signal.

Condition B - Crash Experience	
Condition Satisfied?	**Not satisfied**
Required values reached for	less than 4 correctable crashes
Criteria - Crash Experience	5 or more correctable crashes in 12-month period

Condition C - Intersection Volume & Delay	
Condition Satisfied?	**Not Satisfied**
Required values reached for	0 hours & 45 sec. average delay/veh
Criteria - Major Street (veh/hr)	300 for any 8 hours of an average day
Criteria - Minor Street (total vol-veh, ped, & bikes/hr)	200 for the same 8 hours of an average day
Criteria - Delay (average sec/veh)	30 during the highest hour

Condition D - Combination Volume, Crash Experience, & Delay	
Condition Satisfied?	**Not Satisfied**
Required values reached for	0 hours, less than 4 crashes, & 45 sec. average delay/veh
Criteria - Major Street (veh/hr)	240 for any 8 hours of an average day
Criteria - Minor Street (total vol-veh, ped, & bikes/hr)	160 for the same 8 hours of an average day
Criteria - Crash Experience	4 or more correctable crashes in 12-month period
Criteria - Delay (average sec/veh)	24 during the highest hour