FEASIBILITY STUDY

FOR

DOWNTOWN RECONSTRUCTION, PHASE 2 PROJECT

CITY OF WACONIA, MN

AUGUST 2023

PREPARED BY:
BOLTON & MENK, INC.
2638 SHADOW LANE SUITE 200
CHASKA, MN 55318

BOLTON & MENK
Real People. Real Solutions.

2638 Shadow Lane
Suite 200
Chaska, MN 55318-1172

Ph: (952) 448-8838
Fax: (952) 448-8805
Bolton-Menk.com

August 15, 2023

City of Waconia
Attn: Shane Fineran
201 South Vine Street
Waconia, MN 55387

RE: Downtown Reconstruction, Phase 2 Project

Honorable Mayor and City Council Members:

Pursuant to your request we have prepared a Feasibility Study for project components to be included in the Downtown Reconstruction, Phase 2 Project. These components include the following:

- Street reconstruction, sidewalk reconstruction, sanitary sewer, watermain, and storm sewer replacements of Main Street from Olive Street to Spruce Street and of Elm Street, Pine Street and Spruce Street from Main Street to First Street.
- Constructing a new stormwater reuse system consisting of an underground storage chamber on Vine Street north of Main Street and associated drainage and distribution systems.

This report includes maps and drawings indicating the proposed improvements and a proposed method of financing and funding. I am available to discuss this report and this proposed project at your convenience.

Respectfully Submitted,
Bolton & Menk, Inc.

Jake S. Saulsbury

Jake S. Saulsbury, P.E.

Enclosure

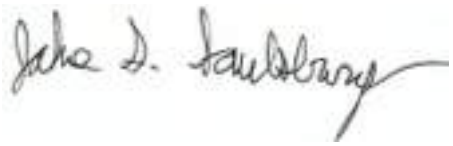
FEASIBILITY STUDY

FOR

DOWNTOWN RECONSTRUCTION, PHASE 2 PROJECT

CITY OF WACONIA, MINNESOTA

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.



Jake S. Saulsbury, P.E.

Date: August 15, 2023 Registration No. 42713

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FIGURES & TABLES

SUMMARY & CONCLUSIONS

A. STUDY SCOPE

It is proposed that improvements to the infrastructure be constructed or reconstructed to provide the public with a sustainable system of roads, utilities, and pedestrian facilities to augment the City with good water quality, greater connectivity among residents, safer traveling for vehicles and pedestrians, and a healthier quality of life. This study investigates the feasibility of the proposed improvements, provides related project cost estimates, and recommends a proposed method for financing and funding the project. The location of these improvements is shown on Figure No. 1.1 and consists of the following project components:

1. Reconstruction of Main Street (from South Olive Street to South Spruce Street), South Elm Street, South Pine Street, South Spruce Street (from Main Street to First Street), and the parking lot in the southwest corner of Elm Street and First Street:
    - Removal and reconstruction of the entire 80-foot road right-of-way of Main Street and the entire 66-foot road right-of-way of Elm Street, Pine Street, and Spruce Street.
    - Reconstruction of Main Street and Elm Street to the City's truck route section.
    - Reconstruction of Pine Street and Spruce Street to City's residential section.
    - Replacement of the sanitary sewer system, including service laterals.
    - Replacement, upsizing, and expansion of the water system, including replacement of hydrants, gate valves, and services.
    - Replacement and expansion of the existing storm sewer system, including the addition of stormwater treatment.
    - Reconstruction of the existing sidewalks along Main Street, Elm Street, and Pine Street.
    - Construction of a stormwater reuse system on Vine Street with distribution mains located along Main Street, Elm Street, Pine Street, and Spruce Street.

The City Council requested two alternatives to be reviewed for Main Street between Elm Street and Pine Street. The contents of this Feasibility Study and the widths of the roadway, parking areas, and sidewalks contained herein reflect the City Council's direction.

B. Estimated Costs, Funding, and Financing

Estimated project costs for each of the project components are provided in Appendix A. The project costs are summarized as follows:

1.)	Option A Street Reconstruction	$4,242,600
2.)	Option B Street Reconstruction	$4,225,800
3.)	Parking Lot Reconstruction	$299,800
4.)	Utility Reconstruction	$1,325,000
5.)	Storm Water Reuse System	$2,703,700

Option A Total Project Cost - **$8,571,100**

Option B Total Project Cost - **$8,554,300**

The proposed method of financing for the Downtown Reconstruction, Phase 2 Project is through the sale of a combined bond consisting of a Chapter 429 General Obligation Bond, a Chapter 115 Sanitary Sewer Revenue Bond, and a Chapter 444 Water and Storm Water Revenue Bond. The Chapter 429 Bond would be used for the street/storm sewer reconstruction. The Chapter 115 Bond would be used for the sanitary sewer reconstruction. The Chapter 444 Bond would be used for the watermain reconstruction and miscellaneous drainage improvements. PIR Capital Improvement cash would be used for the sidewalk improvements. This proposed method will be discussed further with the Finance Director and the City's Financial Consultant.

C. Overall Feasibility and Cost Effectiveness

All improvements addressed within this report are feasible from a technical standpoint. This study addresses issues with failing or non-existent infrastructure including street pavement, storm sewer, watermain, sanitary sewer, storm water reuse, and sidewalk facilities. The improvements are necessary to provide safe and adequate infrastructure and represent cost effective solutions for doing so. Detailed cost estimates for all project components have been completed and are located in Appendix A.

SECTION 1 - INTRODUCTION

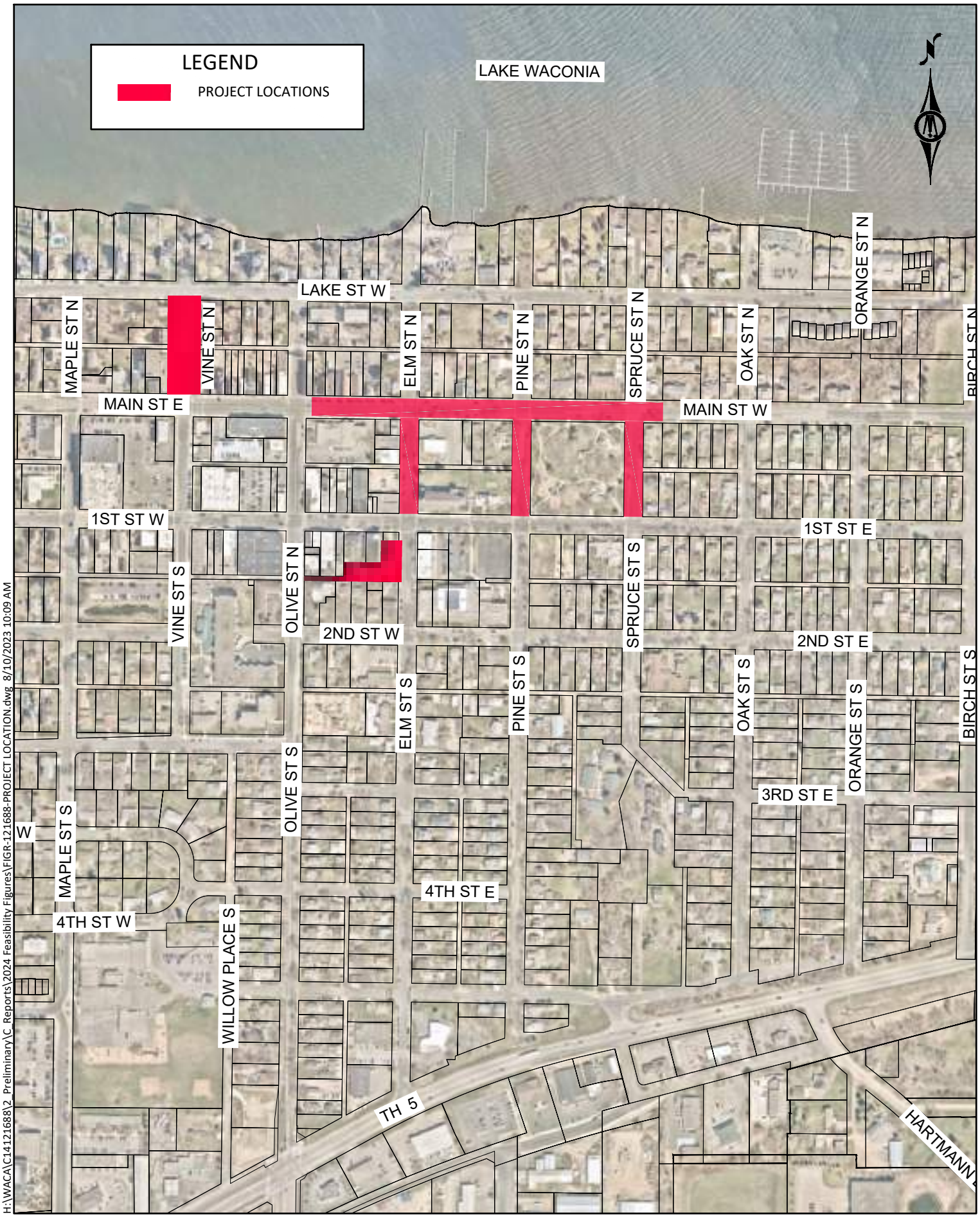
A. IMPETUS

The impetus for this report is a request from the City of Waconia to evaluate the feasibility of planned improvements for the upcoming year. Figure No. 1.1 shows the proposed project location for the Downtown Reconstruction, Phase 2 Project.

B. REPORT ORGANIZATION

To address the various projects in an orderly manner, this report is organized into four (4) sections, shown below:

- Section 1 - Introduction
- Section 2 - Street and Utility Reconstruction
- Section 3 - Stormwater Reuse Improvements
- Section 4 - Financing / Funding



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SECTION 2 - STREET AND UTILITY RECONSTRUCTION

A. STREET IMPROVEMENTS

Figure No. 2.1 indicates the two proposed options for Main Street between Elm Street and Pine Street and the proposed improvements on Pine Street and Spruce Street. The street improvements include removal of the existing road sections on each of the highlighted roads and rebuilding them to current city standards, including replacement of existing curb and gutter sections. Options the City Council requested to be reviewed are outlined below:

1. Main Street (Olive Street to Elm Street)

   The proposed street section for Main Street from Olive Street to Elm Street consists of a 62-foot-wide street with curb and gutter, matching the adjacent street section to the west that was reconstructed as part of the Phase 1 project. The proposed sidewalk on Main Street between Olive Street and Elm Street would be 9-feet wide on both sides of the roadway. The 9-foot sidewalk would increase the sidewalk width by approximately 1-foot on each side. Parking on Main Street between Olive Street and Elm Street would remain 60-degree parking on the north side of the road and parallel parking on the south side. The parking stall count would remain approximately the same as existing on this block of Main Street.

2. Main Street (Elm Street to Pine Street) - Option A

   The proposed street section for Option A consists of a 62-foot-wide street with curb and gutter increasing the street width by approximately 8 feet. The 8 feet of increased street width would come from widening both the north and south sides of the roadway by 4 feet. Increasing the street width allows for 60-degree angled parking on the north side of Main Street which gains 8 parking stalls over the existing condition. Parking on the south side of Main Street would remain parallel parking. Option A would also increase the sidewalk width from 5 feet to 9 feet on both sides of Main Street.

3. Main Street (Elm Street to Pine Street) - Option B

   The proposed street section for Option B consists of a 62-foot-wide street with curb and gutter through the commercial section of the block and 52-foot-wide street with curb and gutter through the residential section of the block. This option would increase the street width by approximately 8 feet through the commercial section of the block. The increase in street width would be approximately 4 feet on both the north and south sides of the road. Parking on the commercial section of the block would be 60-degree angled parking on the north side of the road and parallel on the south side. The parking on the north side of the road would switch to parallel parking through the residential section of the block. The south side of the road would remain parallel parking throughout the entire block. Option B's parking arrangement would result in an increase of 4 parking stalls over the existing condition. Option B would increase the sidewalk width to 9 feet in the commercial section of the block and taper into a 6-foot sidewalk with an 8-foot grass boulevard in the residential section of the block.

4. Main Street (Pine Street to Spruce Street)

   The proposed street section for Main Street from Pine Street to Spruce Street consists of a 52-foot-wide street with curb and gutter. This results in no width change. Parking on the north and south sides of the road would remain parallel parking. The sidewalk on the north side of the road is proposed to be widened to 6 feet and to have a 4-foot grass boulevard.

5. Elm Street

   The proposed street section for Elm Street consists of a 52-foot-wide street with curb and gutter, which matches the existing street width. Elm Street is proposed to have 7-foot sidewalks on both the east and west sides of the roadway. The parking arrangement on Elm Street would consist of 19-foot, 60-degree angled parking on the west side of the street and 9-foot parallel parking on the east side. With this parking layout there would be 12-foot drive lanes and approximately the same number of parking stalls as the existing condition.

6. Pine Street

   The proposed street section for Pine Street consists of a 45-foot-wide street with curb and gutter, which matches the existing street width. Pine Street is proposed to have a 6-foot-wide sidewalk with a 3-foot grass boulevard on the west side of the roadway. The existing sidewalk on the east side of the roadway in City Square Park will be left as is, except for the reconstruction of the pedestrian ramps at the intersections. Parking on Pine Street will remain parallel parking, and the parking stall count shall remain similar to the existing condition.

7. Spruce Street

   The proposed street section for Spruce Street also consists of a 45-foot-wide street with curb and gutter, decreasing the street width by less than 1-foot. Spruce Street is not proposed to have any sidewalk on the east side of the roadway. The existing sidewalk on the west side of the roadway in City Square Park will be left as is, except for the reconstruction of the pedestrian ramps at the intersections. Parking on Spruce Street will remain parallel parking, and the parking stall count shall remain similar to the existing condition.

8. Off Site Park Lot Improvements

   With this project the City reviewed and evaluated the possibility of additional parking areas close to the downtown area. Figure No. 2.3 illustrates one of the potential locations near the intersection of Elm Street and First Street. This site would require coordination with the property owner and reserving some parking stalls for tenants. With the preliminary layout shown in Figure No 2.3 it would create a paved and striped lot with 30 to 35 parking stalls in the downtown area. The parking lot would be constructed with a typical section of 2 lifts of bituminous pavement (4.5”) and an aggregate base depth of 9.0”.

Construction of a standard truck route section includes three lifts of bituminous pavement (6.5”), aggregate base (12.0”), and select granular borrow (12.0”) underlain by geotextile fabric. The typical residential street section includes 2 lifts of bituminous pavement (4.5”), aggregate base (8.0”), and select granular borrow (12.0”). Both street sections are constructed on top of a compacted subgrade and both also contain draintile behind the curb. The typical section for the City standard truck route and residential section are

shown on Figure No. 2.2. The results of the soils investigation indicate poor soils could be encountered near the middle of the block on Pine Street. To provide a suitable subgrade, a layer of stabilizing aggregate will likely be needed in these areas. The 12" of select granular borrow and these additional materials are considered extra section items and are therefore not considered to be assessable.

The staging for construction will generally fall into three or four construction stages. These stages will be determined determine the final design phase of the project to help keep adequate parking, pedestrian access, and business access available at all times. The stages will be continually changing as the work progresses from utilities to street construction and will be adjusted as necessary.

B. STORM SEWER IMPROVEMENTS

The existing storm sewer systems on Main Street and Elm Street will be removed and reconstructed as shown on Figure No. 2.4. New storm sewer is proposed to be constructed on Spruce Street for future connection with storm sewer on First Street. The existing drainage patterns will primarily be maintained.

Additional stormwater treatment will be required in order to meet the Carver County Watershed Management Organization's rules. Due to the limited amount of green space in the right-of-way, underground treatment options will be evaluated during the final design phase of the project.

The total estimated cost for the proposed street and storm sewer reconstruction improvements is $3,744,600. Of this amount, $564,000 is considered assessable. Itemized cost estimates are provided in Appendix A of this report. Financing and funding for the entire project is discussed in Section 4.

C. SIDEWALK IMPROVEMENTS

The proposed sidewalk reconstruction locations and alternates are also shown on Figure No. 2.1. The two proposed options for the Main Street sidewalk are for the block between Elm Street and Pine Street. The current sidewalk on Main Street from Elm Street to Pine Street will be reconstructed and the width of sidewalk/boulevard will vary depending on which street width is selected. The current sidewalk along both sides of Main Street from Olive Street to Elm Street are proposed to be reconstructed to a width of 9-feet. Elm Street sidewalk is proposed to be reconstructed in the same location to a width of 7-feet

depending on building locations. The current 5-foot sidewalk on Pine Street is proposed to be reconstructed to a width of 6 feet with a 3-foot boulevard. The current sidewalk on the north side of Main Street from Pine Street to Spruce Street is proposed to be reconstructed to a width of 6 feet with a 4-foot boulevard. All existing and proposed pedestrian ramps will be constructed to Americans with Disabilities Act (ADA) standards to provide adequate access to all users.

The total estimated cost of the sidewalk improvements is $498,000 which is not considered an assessable cost. An itemized cost is provided in Appendix A of this report. Financing and funding for the entire project is discussed in Section 4.

D. SANITARY SEWER IMPROVEMENTS

The sanitary sewer improvements consist of reconstruction of sewer main, manholes, and sewer services on Main Street and Elm Street as shown on Figure No. 2.5. The sewer reconstruction consists of replacing the old and deteriorated, clay sewer system with an 8-inch PVC sewer main and with sewer services from the main to the property line. Sanitary manholes will be reconstructed, and new sewer will be stubbed out of the intersections and connected to the existing pipes north and east of the Main Street and Spruce Street intersection.

The total estimated cost for all of the sanitary sewer improvements is $411,500. Of this amount, $181,100 is considered assessable. Itemized cost estimates are provided in Appendix A. Financing and funding is discussed in Section 4.

E. WATERMAIN IMPROVEMENTS

Figure No. 2.6 indicates the proposed watermain improvements. The existing watermain consists of 4-inch main on Elm Street and 6-in main on Main Street. The existing system is aging and is susceptible to breakages and leaks. Breakages and leaks result in high maintenance and repair costs, service disruptions, and saturation of the street subgrade. Therefore, the proposed improvements include removing and replacing the entire watermain system within the street right-of-way and upsizing to an 8-inch main. Replacement includes the mainline, gate valves, hydrants, and services. The watermain reconstruction will stop short of the intersection of Elm Street and First Street in order to not impact that intersection. The proposed work includes adding watermain on Spruce Street between Main Street and First Street to create a loop. This loop will improve water quality and will assist with operations by allowing for smaller isolation zones in the

downtown area. The watermain looping is considered an extra item and is therefore not considered assessable. The new watermain will be stubbed out to the north and the east of the Main Street and Spruce Street intersection and connected to the existing pipes so the intersection will not need to be reconstructed again with future adjacent projects.

Water services along Main Street and Elm Street will be constructed into the buildings that are adjacent to the road. This will involve connecting inside the buildings and extra work to bore through the foundation walls and make any necessary adjustments to interior connections. Curb stops will be constructed within the city right-of-way for future operation and maintenance needs as standard practice.

The proposed pipe material is polyvinyl chloride pipe (PVC). This pipe is more resistant to corrosion from the in-place clay soils. Previous geotechnical evaluations on adjacent projects included soil resistivity testing to determine how corrosive the in-place soils are. These tests resulted in resistivity values showing the in-place soil to be moderately corrosive. To protect the watermain against corrosion, the following steps will be taken during construction:

- All hydrants and gate valves will be manufactured and secured utilizing stainless steel bolts.
- All fittings will be coated with fusion bonded epoxy.
- All ductile iron pipe, fittings, valves, valve boxes, and hydrant risers will be wrapped in polyethylene encasement material and provided with cathodic protection.

The total estimated cost for all of the watermain improvements is $913,400. Of this amount, $351,900 is considered assessable. Itemized cost estimates are provided in Appendix A. Financing and funding is discussed in Section 4.

Figure 2.1: Street & Sidewalk Reconstruction

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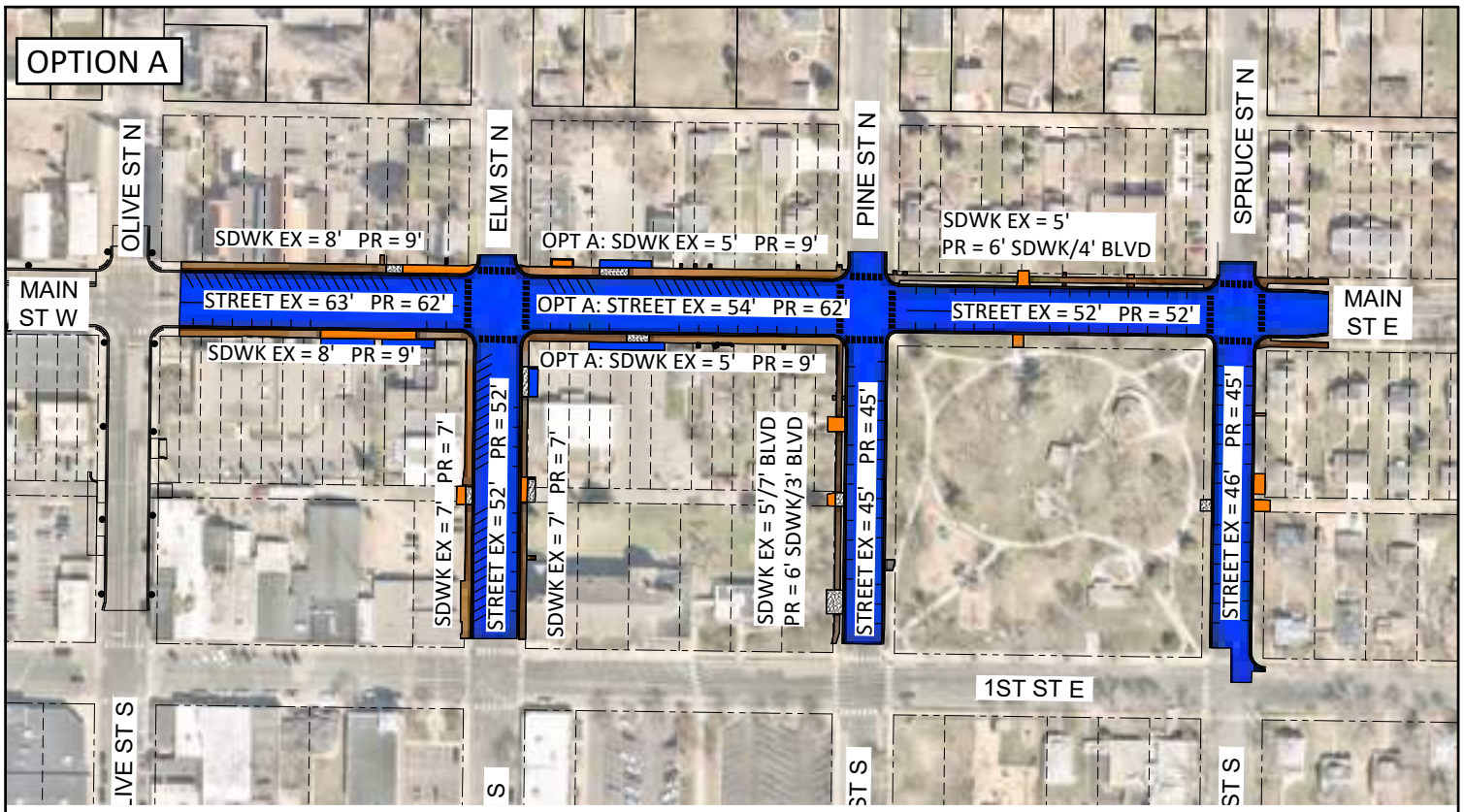
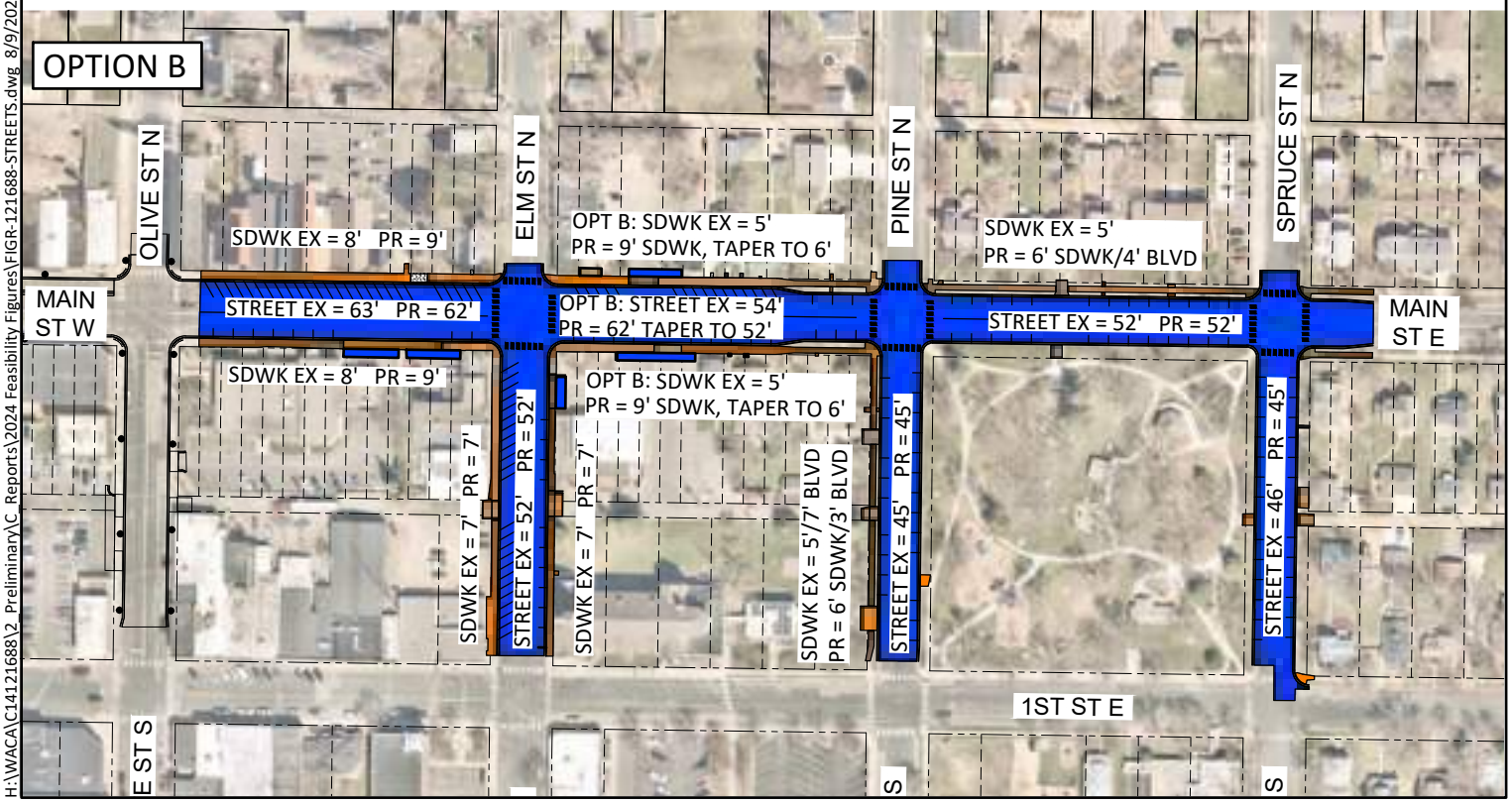
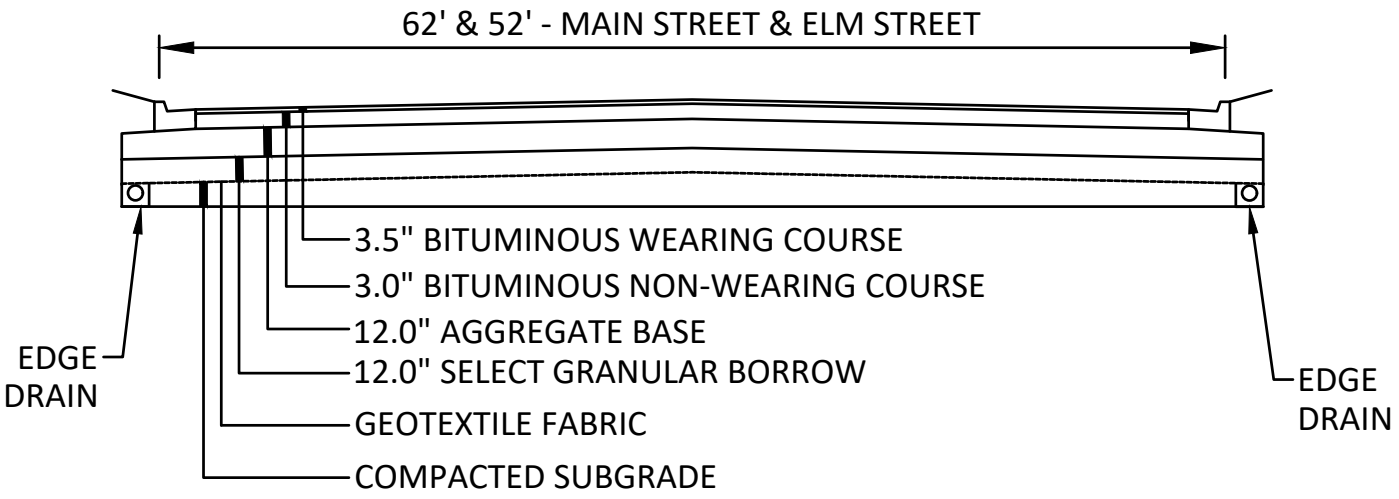


LEGEND

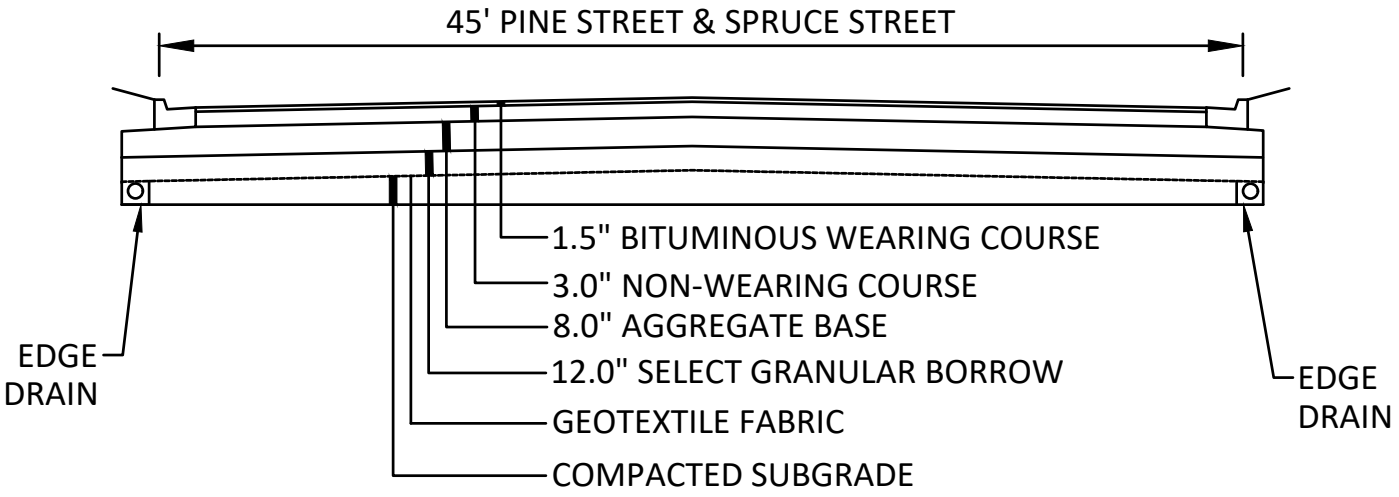
- PROPOSED STREET RECONSTRUCTION
- PROPOSED SIDEWALK RECONSTRUCTION



STREET SECTION (TRUCK SECTION)
NOT TO SCALE



STREET SECTION (RESIDENTIAL SECTION)
NOT TO SCALE



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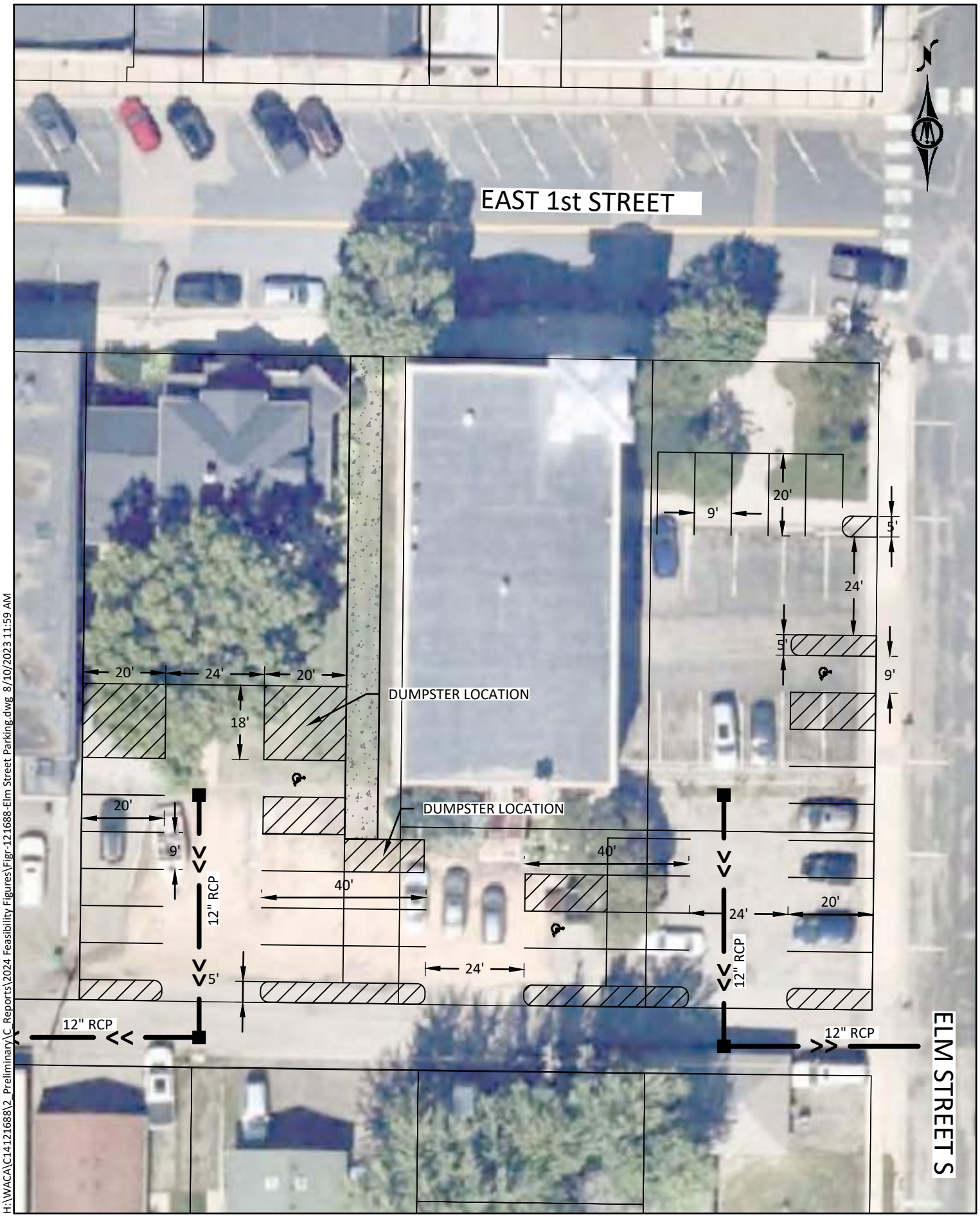

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Downtown Reconstruction-Phase 2

City of Waconia

Figure 2.4: Storm Sewer Reconstruction

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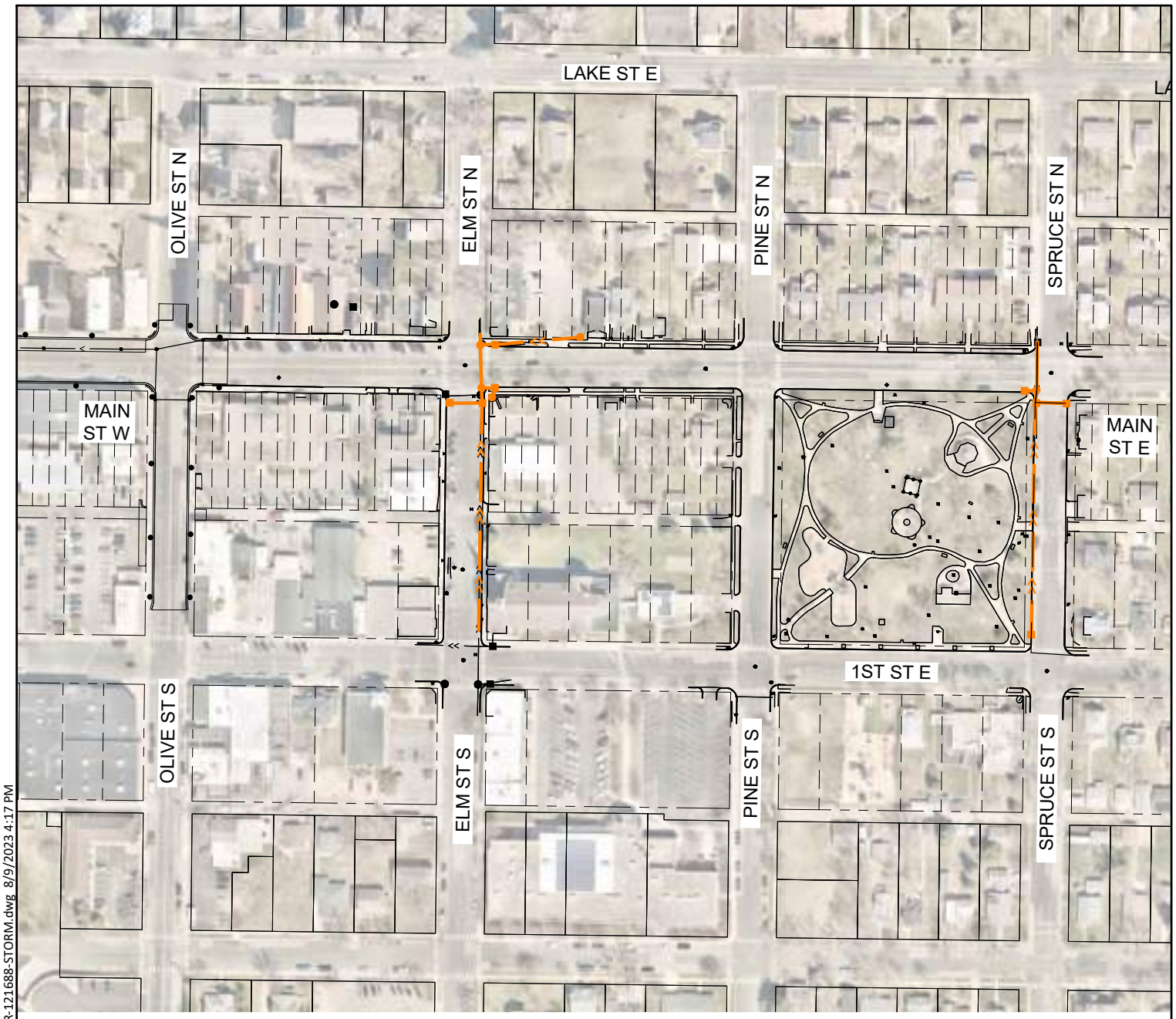

LEGEND

EXISTING STORM SEWER

CONSTRUCT STORM SEWER

CONSTRUCT MANHOLE

CONSTRUCT CATCH BASIN

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Downtown Reconstruction-Phase 2

City of Waconia

Figure 2.5: Sanitary Sewer Reconstruction

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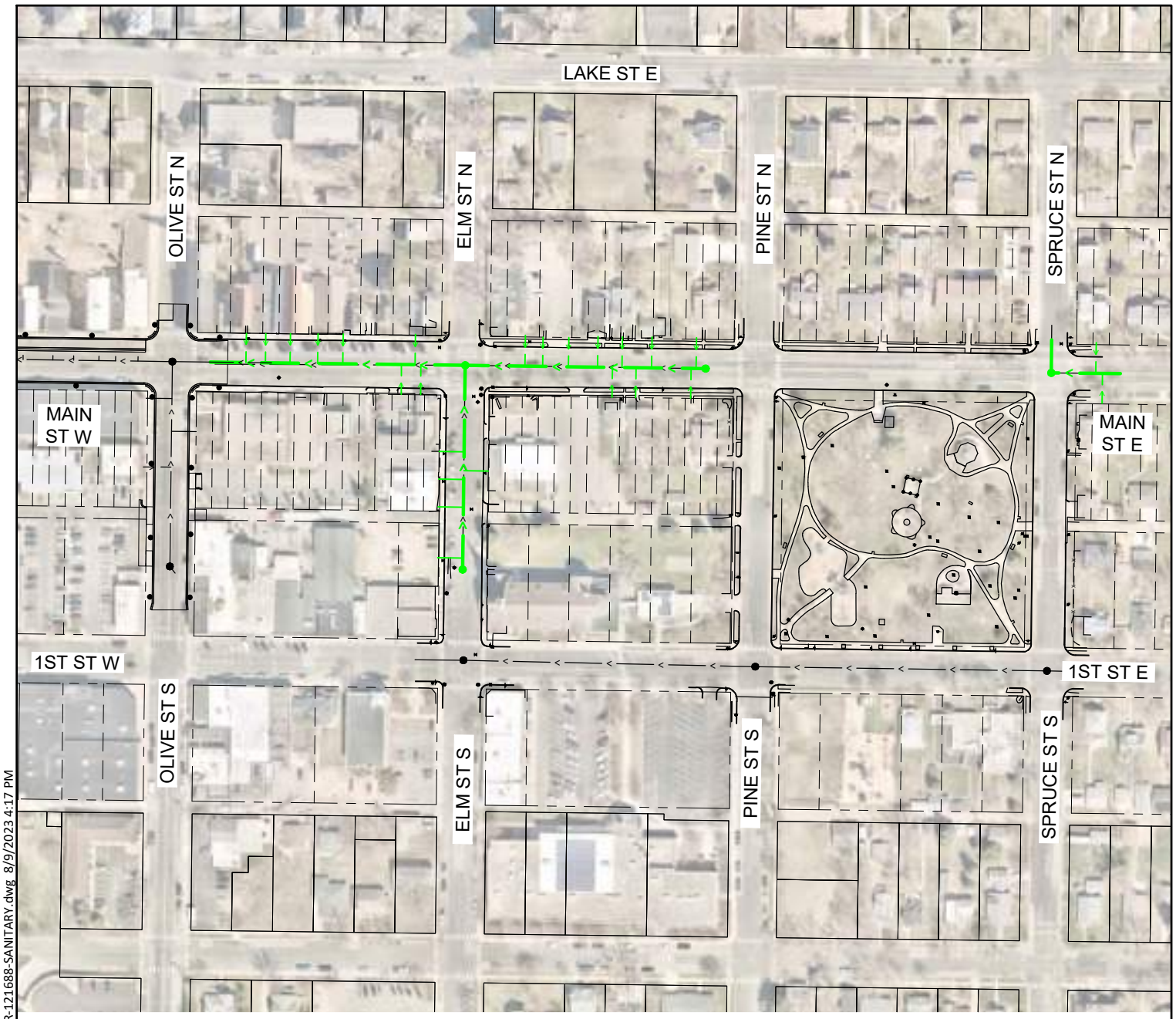

LEGEND

- EXISTING SANITARY SEWER
- REPLACE SANITARY SEWER
- REPLACE SANITARY SEWER SERVICE
- REPLACE SANITARY SERVICE
- REPLACE MANHOLE

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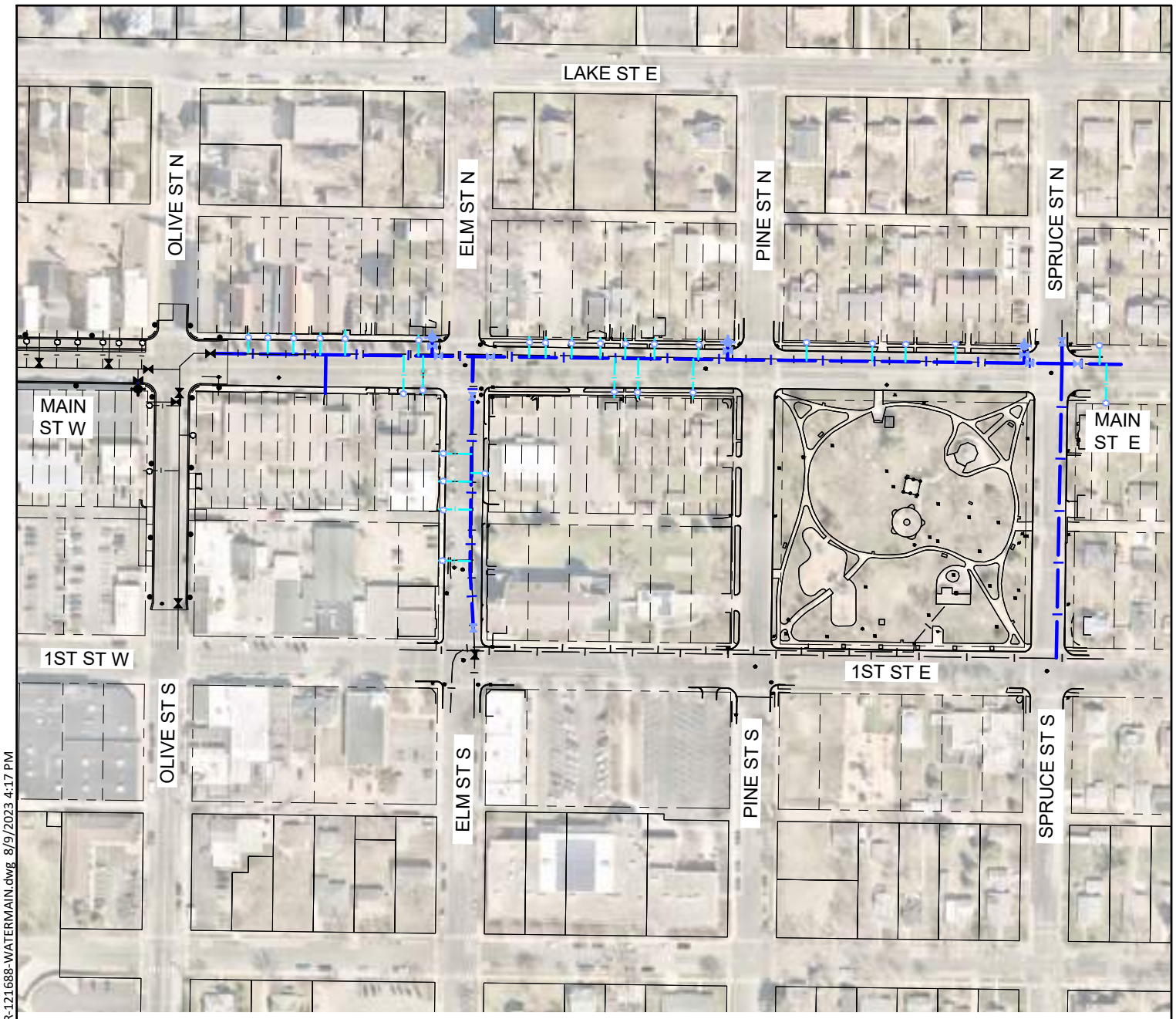

LEGEND

- EXISTING WATERMAIN
- REPLACE WATERMAIN
- REPLACE WATER SERVICE
- HYDRANTS AND VALVES

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SECTION 3 - STORMWATER REUSE IMPROVEMENTS

A. STORMWATER REUSE SYSTEM

Figure No. 2.7 and 2.8 indicate the proposed improvements to the stormwater reuse system.

The purpose of this proposed reuse system is to reduce the volume of stormwater runoff allowed to discharge untreated to Lake Waconia while also reducing the volume of potable water currently being utilized for irrigation. This will be done by capturing runoff from a 13.5-acre drainage area, that consists of 12.8 acres of impervious surface, and storing it in an underground chamber system to be utilized for irrigation in green spaces such as the Downtown Area, the City Park, and the townhomes on the old county road corridor. The stored water will receive UV (ultraviolet) treatment prior to being utilized for irrigation. UV treatment will be used over chlorination as there is no detention time required which allows for a smaller storage tank and a more cost-effective system. The main areas to be irrigated with the reuse water will have a large amount of human contact so the storm water will need to be treated to a level of 2.2 Most Probable Number(MPN)/100ml.

The storage tank is proposed to be located on Vine Street just south of the alley between Main Street and Lake Street. The holding tank is proposed to be half under Vine Street and half on the property in the northeast corner of Main Street and Vine Street (Parcel ID: 750503740). The City is still in communication with the owner of the property to acquire the easement for the proposed location. The pumping and treatment building is proposed to be located in the northeast corner of the HEI parking lot (Parcel ID: 750503740) and have exterior dimensions of 36'x15'. The proposed storage tank would have a sump at the upstream end to catch sediment. This system will use a single pump system to pump the stored water from the underground system to the areas to be irrigated.

To connect the storage tank to the storm sewer system a 36" storm pipe will be placed from the Downtown Reconstruction, Phase 1 stub to the tank. The storage tank will have an overflow outlet on the north side that connects into the existing to storm system for when the tank is at capacity and there is still flow coming into the tank.

Lake Waconia is currently listed on the MPCA impaired waters list for mercury in fish tissue and fish bioassessment. This project will improve water quality for Lake Waconia.

The project will also provide a benefit to the aquifers utilized for the city's drinking water by reducing the usage of potable water for irrigation.

The total estimated cost for all of the reuse system is $2,703,700 which is not considered an assessable cost and does not include a potential cost for easement. An itemized cost estimate is provided in Appendix A. Financing and funding is discussed in Section 4.

Downtown Reconstruction-Phase 2

City of Waconia

Figure 2.7: Storm Water Reuse System

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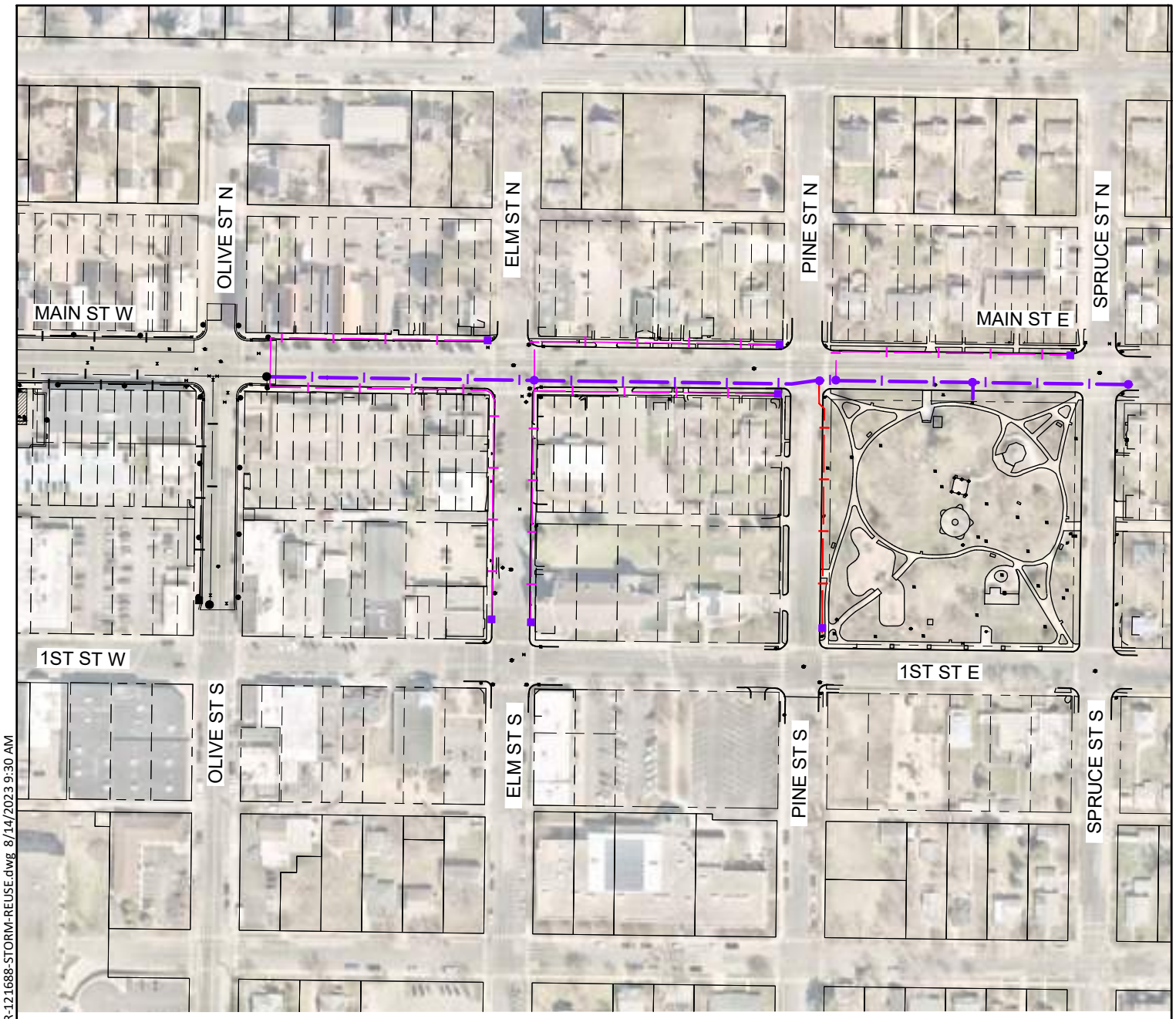

LEGEND

- 4" WATER REUSE PIPE
- 2" WATER REUSE PIPE
- 1" WATER REUSE PIPE
- ACCESS MANHOLE
- BLOWOFF IN CONCRETE MANHOLE
- EX 4" WATER REUSE PIPE (2023)
- EX 1" WATER REUSE PIPE (2023)

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Downtown Reconstruction-Phase 2

City of Waconia

Figure 2.8: Storm Water Reuse Treatment

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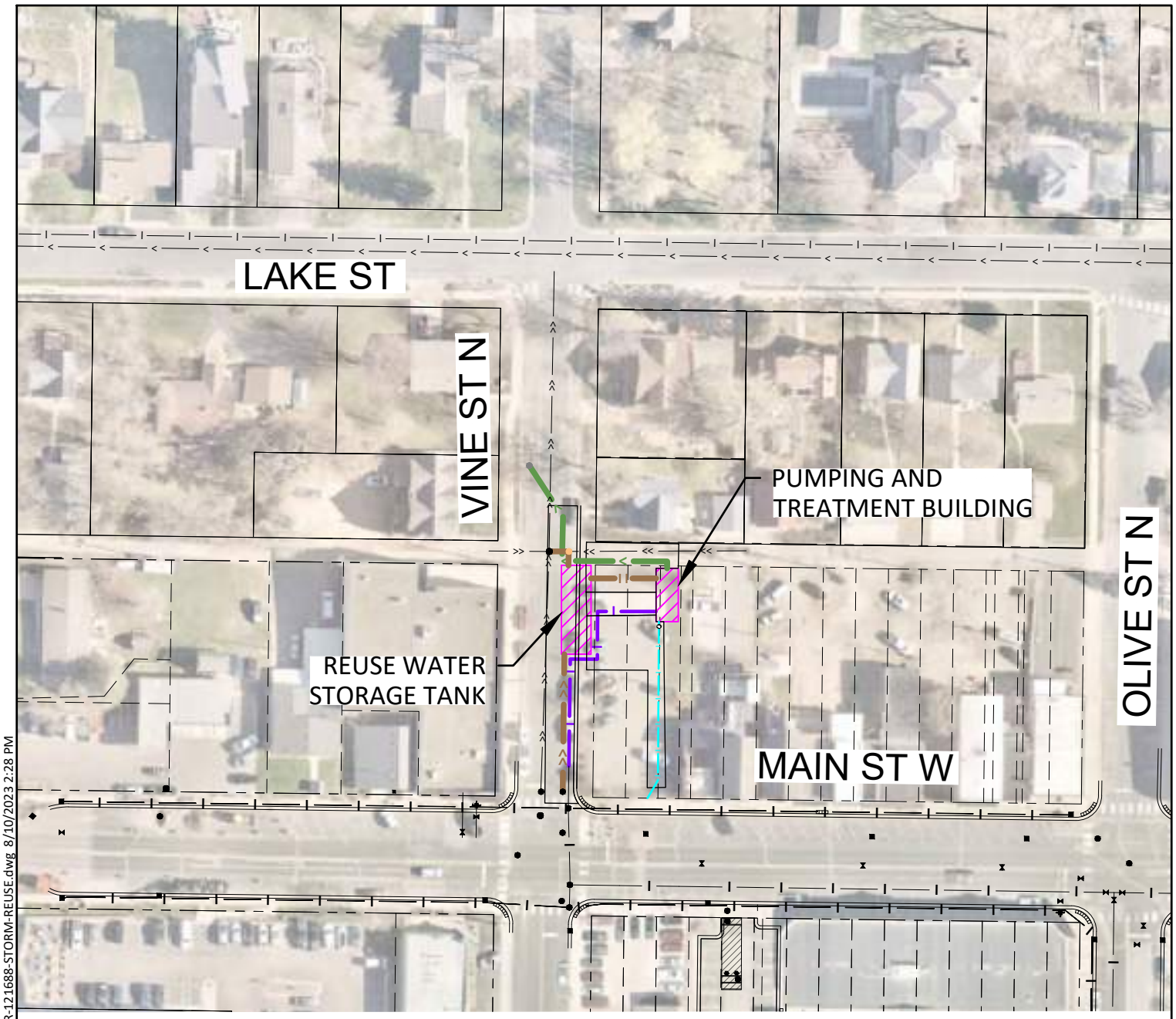

LEGEND

- 4" WATER REUSE PIPE
- 1" WATER SERVICE PIPE
- SANITARY SEWER PIPE
- STORM SEWER PIPE
- STORM STRUCTURE

N

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SECTION 4 - FINANCING / FUNDING

A. FINANCING

The proposed method of financing for the Downtown Reconstruction, Phase 2 Project is through the sale of a combined bond consisting of a Chapter 429 General Obligation Bond, a Chapter 115 Sanitary Sewer Revenue Bond, and a Chapter 444 Water and Storm Water Revenue Bond. The Chapter 429 Bond would be used for the street/storm sewer reconstruction. The Chapter 115 Bond would be used for the sanitary sewer reconstruction. The Chapter 444 Bond would be used for the watermain reconstruction and miscellaneous drainage improvements. PIR Capital Improvement cash would be used for the sidewalk improvements.

It is recommended that the City discuss financing options in more detail with their Financial Consultant. Combining the financing of this project with other possible planned improvements or planned equipment purchases should also be evaluated and discussed.

The total estimated project cost for Option A is $8,571,100, and if Option B is selected overall project costs would be reduced. The detailed cost estimates for individual project components are located in Appendix A. The estimates consist of the estimated construction cost based on recent construction bid prices, a 10% allowance for contingencies, and a 30% allowance for bidding, surveying, engineering, construction staking, construction administration, and inspection costs.

B. FUNDING

There are different funding sources proposed to be used to service the bond debt including: special assessments, new special debt levy, stormwater funds, sewer funds, water funds, and PIR funds. The City has funds available in the various fund accounts to service the debt. And if necessary, the City also has funds available in the general fund to service the debt.

The following sections provide a cost apportionment and funding source summary for the various project components.

Also, to date the following grant funds have been received or are being pursued:

- $10,000 2022 CCWMO Cost Share Grant (Approved)
- $50,000 2023 CCWMO Cost Share Grant (Approved)
- $75,000 2024 CCWMO Cost Share Grant (Pending)
- $200,000 2023 Watershed-Based Implementation Funding (Approved)
- $250,000 2024 Clean Water Fund Grant (Pending, Amount TBD)
- $300,000 MN Department of Health / Public Facilities Authority Lead Water Service Line Replacements (Pending, $10,000 per Found Lead Water Service)

C. STREET / STORM / SIDEWALK RECONSTRUCTION

The total project costs are apportioned as follows:

Item	Cost / FF	City Cost or Assessment	Recommended Funding Source
Sidewalk Construction Cost			
Sidewalk Construction Cost	$498,000	City	PIR Funds
Total Project Cost:	***$498,000***		
Street / Storm Reconstruction Costs			
Extra Section Depth / Width Cost	$2,169,100	City	New Special Debt Levy
Street / Storm Reconstruction Cost	$1,575,500		
Total Street / Storm Reconstruction Cost:	***$3,744,600***		
Assessment Calculations			
Standard Street Section Cost	$1,575,500		
City Contribution (50%)	$787,800	City	New Special Debt Levy
Assessable Eligible Portion (50%)	$787,800		
Total Front Footage	3,984.0		
Corner Lot Front Footage (Feet)	583.5		
Assessment Basis Front Footage (Feet)	3,400.50		
Assessable Cost Per Front Foot	$231.66		
Non-Assessable Front Footage (Feet)	965.7		
Non-Assessable Cost	$223,700	City	New Special Debt Levy
City Front Footage (Feet)	495.00		
City Front Footage Cost	$114,700		
Assessment Front Footage (Feet)	2,434.8		
Total Assessed Amount	$564,000	Assessment	Special Assessments
Total City Cost:	***$3,678,600***		
Total Assessed Amount:	***$564,000***		
Total Project Cost:	***$4,242,600***		

D. SANITARY SEWER

The sanitary sewer proposed for reconstruction services commercial and residential properties. Commercial and multi-family properties are converted to equivalent residential units (ERUs) based on water usage. Four properties exceed the normal water usage for a typical single-family home. These properties and their ERU calculations are as follows:

Property Owner	Property Address	Annual Water Usage (gal)	Daily Water Usage (gal)	Daily Usage / ERU (gal)	*ERUs
4Main LLC	4 Main Street E	63,385	484	275	1.5
First Natl Bank of Waconia	53 Main Street W	317,000	868	275	3.0
CQ Rental LLC	1 Main Street W	155,000	425	275	1.5
16 South Elm Street LLC	16 Elm Street S	301,000	825	275	3.0

* ERUs are rounded down to the nearest 0.5 units

On previous projects the portion of the sanitary sewer cost that was assessed consisted of 50 percent of the typical project sanitary sewer cost. Costs related to soil corrections, bypass pumping, and vibration monitoring are isolated as City costs and not included in the assessment calculations.

Based on the information and recommendations above, the total project costs for the sanitary sewer component of the proposed project are apportioned as follows:

Item	Cost / Units	City Cost or Assessment	Recommended Funding Source
Total Sanitary Sewer Project Costs			
Typical Sanitary Sewer Project Cost	$362,200		
City Contribution Cost	$49,300	City	Sewer Fund
Total Project Cost:	***$411,500***		
Assessment Calculations			
Assessment Eligible Portion	$362,200		
City Contribution (50%)	$181,100	City	Sewer Fund
Assessable Eligible Portion (50%)	$181,100		
Sanitary Sewer Units	27.0		
Assessment Per Unit	$6,708.87		
Assessable Units	27.0		
Non-Assessable Units	0		
Non-Assessable Cost	$0	City	Sewer Fund
Total Assessed Amount	$181,100	Assessment	Special Assessments
Total City Cost:	***$230,400***		
Total Assessed Amount:	***$181,100***		
Total Project Cost:	***$411,500***		

E. WATERMAIN

The watermain proposed for reconstruction services commercial and residential properties. Same as with the sanitary sewer, commercial and multi-family properties are converted to equivalent residential units (ERUs) based on water usage. Five properties exceed the normal water usage for a typical single-family home. These properties and their ERU calculations are as follows:

Property Owner	Property Address	Annual Water Usage (gal)	Daily Water Usage (gal)	Daily Usage / ERU (gal)	*ERUs
4Main LLC	4 Main Street E	63,385	484	275	1.5
The Mitchell Ranch LLP	140 Main Street E	404,000	1,107	275	4.0
First Natl Bank of Waconia	53 Main Street W	317,000	868	275	3.0
CQ Rental LLC	1 Main Street W	155,000	425	275	1.5
16 South Elm Street LLC	16 Elm Street S	301,000	825	275	3.0

* ERUs are rounded down to the nearest 0.5 units

On previous projects, the portion of the watermain cost that was assessed consisted of 50 percent of the standard water system cost. Costs related to soil corrections, looping, vibration monitoring, boring, and cathodic protection are isolated as City costs and not included in the assessment calculations.

The total project costs for this component of the proposed project are apportioned as follows:

Item	Cost / Units	City Cost or Assessment	Recommended Funding Source
Total Watermain Project Costs			
City Contribution Cost	$209,600	City	Water Fund
Standard Water System Costs	$703,800		
Total Project Cost:	***$913,400***		
Assessment Calculations			
Assessment Eligible Portion	$703,800		
City Contribution (50%)	$351,900	City	Water Fund
Assessable Eligible Portion (50%)	$351,900		
Watermain Units	34.0		
Assessment Per Unit	$10,349.25		
Assessable Units	34.0		
Non-Assessable Units	0		
Non-Assessable Cost	$0	City	Water Fund
Total Assessed Amount	$351,900	Assessment	Special Assessments
Total City Cost:	***$561,500***		
Total Assessed Amount:	***$351,900***		
Total Project Cost:	***$913,400***		

F. STORMWATER REUSE IMPROVEMENTS

The costs associated with the Stormwater Reuse improvements are non-assessable costs and are proposed to be funded with various City funds. The total estimated project cost is $2,703,700.

Itemized cost estimates are provided in Appendix A of this report.

G. OVERALL COST SUMMARY

In summary, a portion of the street and utility reconstruction work will be assessed to benefitting property owners and the remaining work is recommended to be paid by the City. The overall costs for all project components are summed as follows:

Item	Cost	Recommended Funding Source
Assessed Amount (Per Policy)	$1,097,000	Special Assessments
Street & Utility Reconstruction (City Cost)	$4,770,400	Combined Bond Funds & PIR Capital Improvement Funds
Stormwater Reuse Improvements	$2,703,700	Stormwater Funds & Grant Funds
Total Overall Project Cost:	***$8,571,100***	

Note – If street layout Option B is selected overall project costs would be reduced

H. ASSESSMENTS

The assessable portion of the street and utility reconstruction work is proposed to be assessed to the benefiting properties in accordance with current City policy as follows:

- Street Reconstruction - 50% Assessed on a Front Footage Basis of Standard City Residential Street
- Storm Sewer Reconstruction - 50% Assessed on a Front Footage Basis
- Sanitary Sewer Reconstruction - 50% Assessed on a Unit Basis
- Watermain Reconstruction - 50% Assessed on a Unit Basis

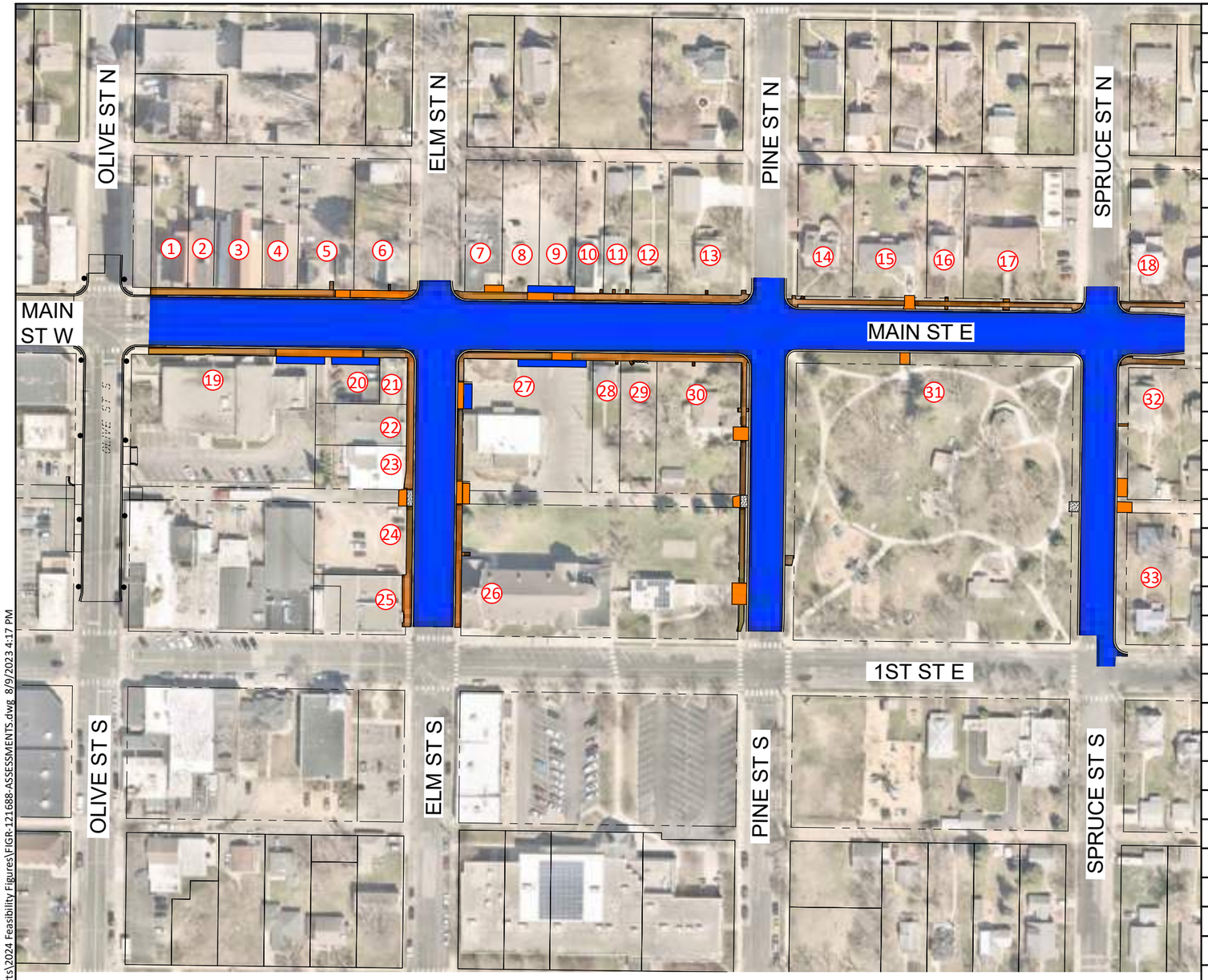
Some of the project components would not be assessed. These project components include the following:

- Extra Depth and Width of Street Reconstruction
- Sidewalk Reconstruction

- Stormwater Treatment
- Sanitary Sewer & Watermain Non-Standard Construction Items

The current estimated assessable percentage of the street and utility reconstruction project is 18.7%. The current estimated assessable percentage of the total project, including the reuse system is 12.8%. The minimum required assessable percentage for a Chapter 429 bond is 20.0%. Consistent with City policy and previous assessment projects, appraisals will be conducted to determine the special benefit amounts. The assessments will be capped at these amounts as determined by the appraisal process. This process is anticipated to considerably lower the assessments and reduce the assessable percentage of the project. Therefore, as discussed in the previous section, a combined bond approach is recommended in order meet all statutory requirements.

A copy of the current City assessment policy is included in Appendix B of this report for reference. To follow is an assessment area map (Figure 3.1), a preliminary assessment roll (Table 4.1) for the street reconstruction project area, and debt service and proposed funding sources (Tables 4.2).



Prop. No.	Property Address	Owner	PID
1	48 MAIN ST W	DAVIS R III & PEGGY C PHILIP	750503860
2	44 MAINST W	SHAPE IT UP FITNESS LLC	750503850
3	36 MAINST W	SS JENSEN PROPERTIES LLC	750503830
4	20 MAIN ST W	DANIEL R NEUBAUER TRUST	750503820
5	16 MAIN ST W	BETH ANN & JOSEPH SCHRUPP	750503813
6	4 MAIN ST W	ALLEN LUETH	750503812
7	4 MAIN ST E	4MAIN LLC	750503990
8	MAIN ST W	4MAIN LLC	750503980
9	MAIN ST W	4MAIN LLC	750503970
10	24 MAIN ST E	BRIDEN PROPERTIES LLC	750503960
11	32 MAIN ST E	SOLTIS PROPERTIES LLC	750503950
12	40 MAIN ST E	JUSTIN YOUNG & MARIAH KETCHER	750503940
13	52 MAIN ST E	JEFFREY & JILL SCHMITT	750503930
14	104 MAIN ST E	JOHN S & KRISTINE DVORAK	750504070
15	116 MAIN ST E	JAMES K & JANALEE KITE	750504060
16	128 MAIN ST E	TIMOTHY L & RHONDA K TESCH	750504050
17	140 MAIN ST E	THE MITCHELL RANCH LLP	750504040
18	200 MAIN ST E	THERESA L HAMER & PAMELA L LEACH	750504170
19	53 MAIN ST W	FIRST NATL BANK OF WACONIA	750502720
20	MAIN ST W	CQ RENTAL LLC	750502741
21	1 MAIN ST W	CQ RENTAL LLC	750502730
22	8 ELM ST S	APG REAL PROPERTIES LLC	750502740
23	16 ELM ST S	16 SOUTH ELM STREET LLC	750502750
24	26 ELM ST S	16 SOUTH ELM STREET LLC	750502630
25	40 ELM ST S	EMBARQ CORP	750502640
26	32 MAIN ST E	CHURCH OF ST JOSEPH	750503550
27	9 MAIN ST E	CHURCH OF ST JOSEPH	750502560
28	29 MAIN ST E	THE CHURCH OF SAINT JOSEPH OF WACONIA	750502570
29	37 MAIN ST E	STEVEN J YETZER	750502580
30	4 PINE ST S	ROSEMARY PETERSON	750502600
31	MAIN ST E	WACONIA CITY (PARK)	750502540
32	201 MAIN ST E	THOMAS J MATHWIG & ANDREA SICHENEDER	750502480
33	200 1ST ST E	MARTHA LAYBOURN	750502470

TABLE 4.1 - PRELIMINARY ASSESSMENT ROLL
DOWNTOWN RECONSTRUCTION, PHASE 2 PROJECT
8/15/2023

PROP. NO.	P.I.D.	OWNER	PROPERTY ADDRESS	OWNER ADDRESS		F/F	*STREET ASSESSMENT	WATERMAIN UNITS	WATERMAIN ASSESSMENT	SANITARY SEWER UNITS	SANITARY SEWER ASSESSMENT	TOTAL ASSESSMENT	**ANNUAL ASSESSMENT PAYMENT
1	750503860	DAVID R III & PEGGY C PHILP	48 MAIN STREET W	10720 NORTH SHORE RD	WACONIA, MN 55387	44.00	$10,193.15	1.0	$10,349.25	1.0	$6,708.87	$27,251.27	$3,615.37
2	750503850	SHAPE IT UP FITNESS LLC	44 MAIN STREET W	408 FIRST STREET W	WACONIA, MN 55387	33.40	$7,737.53	1.0	$10,349.25	1.0	$6,708.87	$24,795.65	$3,289.58
3	750503830	SS JENSEN PROPERTIES LLC	36 MAIN STREET W	36 MAIN STREET W	WACONIA, MN 55387	54.60	$12,648.77	1.0	$10,349.25	1.0	$6,708.87	$29,706.89	$3,941.15
4	750503820	DANIEL R NEUBAUER TRUST	20 MAIN STREET W	252 SUNSET BLVD	WACONIA, MN 55387-1227	44.00	$10,193.15	1.0	$10,349.25	1.0	$6,708.87	$27,251.27	$3,615.37
5	750503813	BETH ANN & JOSEPH R SCHRUPP	16 MAIN STREET W	16 MAIN STREET W	WACONIA, MN 55387-1020	62.00	$14,363.08	1.0	$10,349.25	1.0	$6,708.87	$31,421.19	$4,168.58
6	750503812	ALLEN LUETH	4 MAIN STREET W	10820 COUNTY ROAD 33	NORWOOD YOUNG AMERICA, MN 55397	35.00	$8,108.19	1.0	$10,349.25	1.0	$6,708.87	$25,166.31	$3,338.76
7	750503990	4MAIN LLC	4 MAIN STREET E	13911 RIDGEDALE DR STE 243	MINNETONKA, MN 55305	22.00	$5,096.58	1.5	$15,523.87	1.5	$10,063.31	$30,683.75	$4,070.74
8	750503980	4MAIN LLC	NA	13911 RIDGEDALE DR STE 243	MINNETONKA, MN 55305	44.00	$10,193.15	0.0	$0.00	0.0	$0.00	$10,193.15	$1,352.30
9	750503970	4MAIN LLC	NA	13911 RIDGEDALE DR STE 243	MINNETONKA, MN 55305	43.50	$10,077.32	0.0	$0.00	0.0	$0.00	$10,077.32	$1,336.94
10	750503960	BRIDEN PROPERTIES LLC	24 MAIN STREET E	35 WILLOW WOOD DR	EXCELSIOR, MN 55331	32.50	$7,529.03	1.0	$10,349.25	1.0	$6,708.87	$24,587.15	$3,261.92
11	750503950	SOLTIS PROPERTIES LLC	32 MAIN STREET E	32 MAIN STREET E	WACONIA, MN 55387-1113	34.00	$7,876.53	1.0	$10,349.25	1.0	$6,708.87	$24,934.64	$3,308.02
12	750503940	JUSTIN YOUNG & MARIAH KETCHER	40 MAIN STREET E	40 MAIN STREET E	WACONIA, MN 55387	44.00	$10,193.15	1.0	$10,349.25	1.0	$6,708.87	$27,251.27	$3,615.37
13	750503930	JEFFREY & JILL SCHMITT	52 MAIN STREET E	52 MAIN STREET E	WACONIA, MN 55387	44.00	$10,193.15	1.0	$10,349.25	1.0	$6,708.87	$27,251.27	$3,615.37
14	750504070	JOHN S & KRISTINE H DVORAK	104 MAIN STREET E	104 MAIN STREET E	WACONIA, MN 55387	33.00	$7,644.86	1.0	$10,349.25	0.0	$0.00	$17,994.11	$2,387.24
15	750504060	JAMES K & JANALEE R KITE	116 MAIN STREET E	116 MAIN STREET E	WACONIA, MN 55387-1115	88.00	$20,386.30	1.0	$10,349.25	0.0	$0.00	$30,735.55	$4,077.62
16	750504050	TIMOTHY L & RHONDA K TESCH	128 MAIN STREET E	128 MAIN STREET E	WACONIA, MN 55387-1115	44.00	$10,193.15	1.0	$10,349.25	0.0	$0.00	$20,542.40	$2,725.31
17	750504040	THE MITCHELL RANCH LLP	140 MAIN STREET E	BOX 174	CORTEZ, CO 81321-0174	66.00	$15,289.73	4.0	$41,396.99	0.0	$0.00	$56,686.71	$7,520.50
18	750504170	THERESA L HAMER & PAMELA J LEACH	200 MAIN STREET E	312 THIRD STREET W	JORDAN, MN 55352-1426	33.00	$7,644.86	1.0	$10,349.25	1.0	$6,708.87	$24,702.98	$3,277.29
19	750502720	FIRST NATL BANK OF WACONIA	53 MAIN STREET W	PO BOX 80615	INDIANAPOLIS, IN 46280	110.00	$25,482.88	3.0	$31,047.74	3.0	$20,126.61	$76,657.23	$10,169.94
20	750502741	CQ RENTAL LLC	NA	1570 OAKPOINTE DR	WACONIA, MN 55387-4522	54.00	$12,509.78	0.0	$0.00	0.0	$0.00	$12,509.78	$1,659.64
21	750502730	CQ RENTAL LLC	NA	1570 OAKPOINTE DR	WACONIA, MN 55387-4522	44.70	$10,355.31	1.5	$15,523.87	1.5	$10,063.31	$35,942.49	$4,768.41
22	750502740	APG REAL PROPERTIES LLC	8 ELM STREET S	39088 AIRPARK DR	EASTON, MD 21601-7000	49.60	$11,490.46	1.0	$10,349.25	1.0	$6,708.87	$28,548.58	$3,787.48
23	750502750	16 SOUTH ELM STREET LLC	16 ELM STREET S	9990 ORCHARD RD	COLOGNE, MN 55322-9083	52.00	$12,046.45	3.0	$31,047.74	3.0	$20,126.61	$63,220.81	$8,387.36
24	750502630	16 SOUTH ELM STREET LLC	26 ELM STREET S	9990 ORCHARD RD	COLOGNE, MN 55322	86.00	$19,922.98	0.0	$0.00	0.0	$0.00	$19,922.98	$2,643.14
25	750502640	EMBARQ CORP	40 ELM STREET S	1025 ELDORADO BLVD	BROOMFIELD, CO 80021	35.50	$8,224.02	0.0	$0.00	0.0	$0.00	$8,224.02	$1,091.06
26	750502550	CHURCH OF ST JOSEPH	32 FIRST STREET E	41 FIRST STREET E	WACONIA, MN 55387-1526	157.00	$36,371.02	0.0	$0.00	0.0	$0.00	$36,371.02	$4,825.26
27	750502560	CHURCH OF ST JOSEPH	9 MAIN STREET E	41 FIRST STREET E	WACONIA, MN 55387-1526	155.50	$36,023.52	1.0	$10,349.25	1.0	$6,708.87	$53,081.64	$7,042.22
28	750502570	THE CHURCH OF SAINT JOSEPH OF WAC	29 MAIN STREET E	41 FIRST STREET E	WACONIA, MN 55387	33.00	$7,644.86	1.0	$10,349.25	1.0	$6,708.87	$24,702.98	$3,277.29
29	750502580	STEVEN J YETZER	37 MAIN STREET E	PO BOX 51	WACONIA, MN 55387	43.00	$9,961.49	1.0	$10,349.25	1.0	$6,708.87	$27,019.61	$3,584.63
30	750502600	ROSEMARY PETERSON	4 PINE STREET S	4 PINE STREET S	WACONIA, MN 55387-1533	128.50	$29,768.63	1.0	$10,349.25	1.0	$6,708.87	$46,826.75	$6,212.40
31	750502540	WACONIA CITY	NA	201 VINE STREET S	WACONIA, MN 55387-1337	495.00	$114,672.95	0.0	$0.00	0.0	$0.00	$114,672.95	$15,213.40
32	750502480	THOMAS MATHWIG & A SICHENEDER	201 MAIN STREET E	201 MAIN STREET E	WACONIA, MN 55387-1119	111.50	$25,830.37	1.0	$10,349.25	1.0	$6,708.87	$42,888.49	$5,689.92
33	750502470	MARTHA LAYBOURN	200 FIRST STREET E	200 FIRST STREET E	WACONIA, MN 55387-1528	78.50	$18,185.51	1.0	$10,349.25	1.0	$6,708.87	$35,243.63	$4,675.69
						2,434.80							
					Totals:		$564,051.91	34.0	$351,874.38	27.0	$181,139.53	$1,097,065.82	$145,545.27

*Cost per FF = $231.66 (Original Calculation)

**Based on a 5.50% Interest Rate and a 10 Year Term.

TOTAL FRONT FOOTAGE:	3,984.00
CORNER LOT CREDIT:	583.50
ASSESSMENT BASIS FRONT FOOTAGE:	3,400.50
NON-ASSESSABLE FRONT FOOTAGE:	965.70
ASSESSMENT FRONT FOOTAGE:	2,434.80

TABLE 4.2
DEBT SERVICE & PROPOSED FUNDING SOURCES
FOR
DOWNTOWN RECONSTRUCTION, PHASE 2 PROJECT
8/15/2023

	TOTALS				DEBT SERVICE / FUNDING SOURCE							
PROPOSED PROJECTS	TOTAL PROJECT COST	TOTAL ASSESS. AMOUNT	TOTAL CITY COST	TOTAL ASSESS. %	TOTAL DEBT SERVICE	DEBT SVC ASSMT REVENUE	DEBT SVC GENERAL/ PIR FUND	DEBT SVC STM WTR FUND	DEBT SVC SEWER FUND	DEBT SVC WATER FUND	TOTAL REVENUE	RECOMMENDED FINANCING OPTION
STREET & UTILITY RECONSTRUCTION	$5,867,378	$1,097,000	$4,770,378	18.7%	$741,512	$138,638	$452,244	$50,552	$29,118	$70,962	$741,512	$8,600,000 Combined Bond
STORMWATER REUSE	$2,703,717	$0	$2,703,717	0.0%	$341,693	$0	$0	$341,693	$0	$0	$341,693	
TOTALS:	**$8,571,096**	**$1,097,000**	**$7,474,096**	**12.8%**	**$1,083,205**	**$138,638**	**$452,244**	**$392,244**	**$29,118**	**$70,962**	**$1,083,205**	

Notes:

1.) All Debt Service Projections are Based on a 10-Year Bond At 4.5%.

2.) Actual Assessment Revenue Debt Service Will Be Based On Interest Rate 1.0% Above Bonding Cost (=4.5% + 1.0% = 5.5%) With a 10-Year Term.

3.) Amounts Shown Do Not Include Any Grant Funds Which May Reduce the Required Payment Amounts.

APPENDIX A

ITEMIZED COST ESTIMATES

ESTIMATED PROJECT COST
FOR
Downtown Reconstruction Phase 2
8/15/2023

STREET RECONSTRUCTION (ASSESSABLE)

ITEM NO.	BID ITEM	UNIT	EST QTY	UNIT PRICE	TOTAL
1	MOBILIZATION	LUMP SUM	1	$56,000.00	$56,000.00
2	CLEAR & GRUB TREE	EACH	30	$650.00	$19,500.00
3	REMOVE CONCRETE CURB & GUTTER	LIN FT	4,392	$6.00	$26,352.00
4	REMOVE BITUMINOUS PAVEMENT	SQ YD	12,515	$4.00	$50,060.00
5	REMOVE CONCRETE DRIVEWAY/WALK	SQ FT	20,183	$3.00	$60,549.00
6	REMOVE BITUMINOUS DRIVEWAY	SQ FT	5,015	$1.75	$8,776.25
7	REMOVE PAVER DRIVEWAY	SQ FT	257	$5.00	$1,285.00
8	REMOVE DRAINAGE STRUCTURE	EACH	8	$750.00	$6,000.00
9	REMOVE DRAINAGE PIPE	LIN FT	639	$18.00	$11,502.00
10	COMMON EXCAVATION (EV)	CU YD	5,598	$27.00	$151,146.00
11	GEOTEXTILE FABRIC	SQ YD	9,607	$2.00	$19,214.00
12	AGGREGATE BASE CLASS 5 (CV) - 8" DEPTH	TON	4,524	$28.50	$128,934.00
13	CONCRETE CURB & GUTTER (B618)	LIN FT	4,537	$28.75	$130,438.75
14	BITUMINOUS NON-WEAR COURSE - 3.0" DEPTH	TON	1,390	$84.00	$116,760.00
15	BITUMINOUS WEAR COURSE - 1.5" DEPTH	TON	694	$107.00	$74,258.00
16	3" BITUMINOUS DRIVEWAY	SQ FT	4,748	$6.25	$29,675.00
17	6" CONCRETE DRIVEWAY	SQ FT	5,273	$16.00	$84,368.00
18	PAVER DRIVEWAY	SQ FT	197	$25.00	$4,925.00
19	CONSTRUCT DRAINAGE STRUCTURE DES G	EACH	2	$1,500.00	$3,000.00
20	CONSTRUCT DRAINAGE STRUC. DES 2'X3'	EACH	4	$2,000.00	$8,000.00
21	CONSTRUCT DRAINAGE STRUC. DES 4020-48	EACH	5	$2,750.00	$13,750.00
22	CONSTRUCT DRAINAGE STRUC. DES 4022-48	EACH	9	$2,750.00	$24,750.00
23	15" RC PIPE SEWER DES 3006 CL V	LIN FT	757	$88.00	$66,616.00
24	18" RC PIPE SEWER DES 3006 CL V	LIN FT	405	$95.00	$38,475.00
25	CASTING ASSEMBLY (STORM)	EACH	14	$1,100.00	$15,400.00
26	ADJUST CASTING (STORM)	EACH	3	$680.00	$2,040.00
27	CONNECT TO EXISTING STORM PIPE	EACH	3	$2,000.00	$6,000.00

SUBTOTAL:	*$1,101,774.00*
CONTINGENCIES (10%):	*$110,177.40*
ESTIMATED CONSTRUCTION COST:	*$1,211,951.40*
ADMINISTRATION, ENGINEERING, SURVEYING, INSPECTION (30%):	*$363,585.42*
TOTAL ESTIMATED PROJECT COST:	***$1,575,536.82***

ESTIMATED PROJECT COST
FOR
Downtown Reconstruction Phase 2
8/15/2023

STREET RECONSTRUCTION (EXTRA WIDTH - NON-ASSESSABLE)

ITEM NO.	BID ITEM	UNIT	EST QTY	UNIT PRICE	TOTAL
1	COMMON EXCAVATION (EV)	CU YD	112	$27.00	$3,024.00
2	SUBGRADE EXCAVATION (EV)	CU YD	5	$29.00	$145.00
3	GEOTEXTILE FABRIC	SQ YD	121	$2.00	$242.00
4	AGGREGATE BASE CLASS 5 (CV) - 12" DEPTH	TON	79	$28.50	$2,251.50
5	STABILIZING AGGREGATE (CV)	CU YD	5	$35.00	$175.00
6	SELECT GRANULAR BORROW (CV) - 12" DEPTH	CU YD	45	$29.00	$1,305.00
7	BITUMINOUS NON-WEAR COURSE - 3.0" DEPTH	TON	22	$84.00	$1,848.00
8	BITUMINOUS WEAR COURSE - 3.5" DEPTH	TON	26	$107.00	$2,782.00

SUBTOTAL:	*$11,772.50*
CONTINGENCIES (10%):	*$1,177.25*
ESTIMATED CONSTRUCTION COST:	*$12,949.75*
ADMINISTRATION, ENGINEERING, SURVEYING, INSPECTION (30%):	*$3,884.93*
TOTAL ESTIMATED PROJECT COST:	***$16,834.68***

ESTIMATED PROJECT COST
FOR
Downtown Reconstruction Phase 2
8/15/2023

STREET RECONSTRUCTION (EXTRA SECTION - NON-ASSESSABLE)

ITEM NO.	BID ITEM	UNIT	EST QTY	UNIT PRICE	TOTAL
1	MOBILIZATION	LUMP SUM	1	$72,000.00	$72,000.00
2	TRAFFIC CONTROL	LUMP SUM	1	$50,000.00	$50,000.00
3	REMOVE CONCRETE STAIRS	SQ FT	173	$12.00	$2,070.00
4	REMOVE SIGN	EACH	32	$350.00	$11,200.00
5	COMMON EXCAVATION (EV)	CU YD	5,595	$27.00	$151,065.00
6	SUBGRADE EXCAVATION (EV)	CU YD	931	$29.00	$26,999.00
7	GEOTEXTILE FABRIC	SQ YD	4,982	$2.00	$9,964.00
8	AGGREGATE BASE CLASS 5 (CV) - 12" DEPTH	TON	2,690	$28.50	$76,665.00
9	AGGREGATE BASE CLASS 5 (CV) - 4" DEPTH	CU YD	1,447	$28.50	$41,239.50
10	STABILIZING AGGREGATE (CV)	CU YD	931	$35.00	$32,585.00
11	SELECT GRANULAR BORROW (CV) - 12" DEPTH	CU YD	5,245	$29.00	$152,105.00
12	BITUMINOUS NON-WEAR COURSE - 3.0" DEPTH	TON	887	$84.00	$74,508.00
13	BITUMINOUS WEAR COURSE - 2.0" DEPTH	TON	645	$84.00	$54,180.00
14	BITUMINOUS WEAR COURSE - 3.5" DEPTH	TON	863	$107.00	$92,341.00
15	4" SOLID DOUBLE YELLOW LINE	LIN FT	949	$1.50	$1,422.95
16	4" SOLID LINE WHITE	LIN FT	2,542	$1.25	$3,177.50
17	PAVEMENT MARKINGS	EACH	4	$275.00	$1,100.00
18	CONCRETE STAIRS	SQ FT	173	$175.00	$30,187.50
19	SUMP PUMP SERVICE CONNECTION	EACH	10	$315.00	$3,150.00
20	STORMWATER TREATMENT / RAIN GARDENS	LUMP SUM	1	$35,000.00	$35,000.00
21	4" PERFORATED EDGE DRAIN	LIN FT	4,291	$23.00	$98,693.00
22	4" HDPE DRAIN TILE CLEANOUT	EACH	15	$300.00	$4,500.00
23	ROCK CONSTRUCTION ENTRANCE	EACH	1	$1,000.00	$1,000.00
24	SOD TYPE LAWN	SQ YD	3,515	$14.00	$49,210.00
25	FURNISH & INSTALL SIGN	EACH	32	$350.00	$11,200.00
26	2 1/2" CALIPER DECIDUOUS TREE	EACH	30	$250.00	$7,500.00
27	BUSINESS SIGNAGE	ALLOWANCE	1	$10,000.00	$10,000.00
28	STREET LIGHTING & WAYFINDING SIGNAGE	LUMP SUM	1	$400,000.00	$400,000.00
29	CONSTRUCTION TRAILER MOBILIZATION & SETUP	LUMP SUM	1	$2,000.00	$2,000.00

SUBTOTAL:	*$1,505,062.45*
CONTINGENCIES (10%):	*$150,506.24*
ESTIMATED CONSTRUCTION COST:	*$1,655,568.69*
ADMINISTRATION, ENGINEERING, SURVEYING, INSPECTION (30%):	*$496,670.61*
TOTAL ESTIMATED PROJECT COST:	***$2,152,239.30***

ESTIMATED PROJECT COST
FOR
Downtown Reconstruction Phase 2
8/15/2023

PARKING LOT RECONSTRUCTION (NON-ASSESSABLE)

ITEM NO.	BID ITEM	UNIT	EST QTY	UNIT PRICE	TOTAL
1	MOBILIZATION	LUMP SUM	1	$7,000.00	$7,000.00
2	TRAFFIC CONTROL	LUMP SUM	1	$1,500.00	$1,500.00
3	ROCK CONSTRUCTION ENTRANCE	EACH	1	$1,000.00	$1,000.00
4	REMOVE CONCRETE CURB & GUTTER	LIN FT	123	$6.00	$738.00
5	CLEAR & GRUB TREE	EACH	4	$650.00	$2,600.00
6	REMOVE BITUMINOUS PAVEMENT	SQ YD	1,313	$4.00	$5,252.00
7	REMOVE CONCRETE DRIVEWAY/WALK	SQ FT	1,927	$3.00	$5,781.00
8	COMMON EXCAVATION (EV)	CU YD	867	$27.00	$23,409.00
9	SUBGRADE EXCAVATION (EV)	CU YD	73	$29.00	$2,117.00
10	GEOTEXTILE FABRIC	SQ YD	2,198	$2.00	$4,396.00
11	AGGREGATE BASE CLASS 5 (CV) - 9" DEPTH	TON	877	$28.50	$24,994.50
12	STABILIZING AGGREGATE (CV)	CU YD	73	$35.00	$2,555.00
13	BITUMINOUS NON-WEAR COURSE - 3.0" DEPTH	TON	391	$84.00	$32,844.00
14	BITUMINOUS WEAR COURSE - 1.5" DEPTH	TON	197	$107.00	$21,079.00
15	CONSTRUCT DRAINAGE STRUCTURE DES G	EACH	4	$1,500.00	$6,000.00
16	12" RC PIPE SEWER DES 3006 CL V	LIN FT	311	$82.00	$25,502.00
17	CASTING ASSEMBLY (STORM)	EACH	4	$1,100.00	$4,400.00
18	CONNECT TO EXISTING STORM STRUCTURE	EACH	2	$2,000.00	$4,000.00
19	STORM DRAIN INLET PROTECTION	EACH	8	$150.00	$1,200.00
20	BIOROLL	LIN FT	330	$3.50	$1,155.00
21	4" CONCRETE WALK (w/ AGG. CL 5 BASE)	SQ FT	2,336	$9.25	$21,608.00
22	6" CONCRETE DRIVEWAY	SQ FT	163	$16.00	$2,608.00
23	4" SOLID LINE WHITE	LIN FT	3,589	$1.25	$4,486.25
24	PAVEMENT MARKINGS	EACH	3	$275.00	$825.00
25	SOD TYPE LAWN	SQ YD	128	$14.00	$1,792.00
26	TOPSOIL BORROW (LV)	CU YD	17	$45.00	$765.00

SUBTOTAL:	*$209,606.75*
CONTINGENCIES (10%):	*$20,960.68*
ESTIMATED CONSTRUCTION COST:	*$230,567.43*
ADMINISTRATION, ENGINEERING, SURVEYING, INSPECTION (30%):	*$69,170.23*
TOTAL ESTIMATED PROJECT COST:	***$299,737.65***

ESTIMATED PROJECT COST
FOR
Downtown Reconstruction Phase 2
8/15/2023

SIDEWALK (NON-ASSESSABLE)

ITEM NO.	BID ITEM	UNIT	EST QTY	UNIT PRICE	TOTAL
1	REMOVE CONCRETE WALK	SQ FT	20,183	$2.80	$56,512.40
2	REMOVE RAILING	LIN FT	53	$15.00	$787.50
3	4" CONCRETE WALK (w/ AGG. CL 5 BASE)	SQ FT	24,929	$9.25	$230,593.25
4	BUSINESS ENTRANCE MODIFICATIONS	ALLOWANCE	1	$7,500.00	$7,500.00
5	PEDESTRIAN RAMP	EACH	13	$3,000.00	$39,000.00
6	CONSTRUCT RETAINING WALL	SQ FT	263	$30.00	$7,890.00
7	METAL RAILING	LIN FT	53	$20.00	$1,050.00
8	CROSSWALK EXPOXY	SQ FT	1,644	$3.00	$4,932.00

SUBTOTAL:	*$348,265.15*
CONTINGENCIES (10%):	*$34,826.52*
ESTIMATED CONSTRUCTION COST:	*$383,091.67*
ADMINISTRATION, ENGINEERING, SURVEYING, INSPECTION (30%):	*$114,927.50*
TOTAL ESTIMATED PROJECT COST:	***$498,019.16***

ESTIMATED PROJECT COST
FOR
Downtown Reconstruction Phase 2
8/15/2023

SANITARY SEWER RECONSTRUCTION (ASSESSABLE)

ITEM NO.	BID ITEM	UNIT	EST QTY	UNIT PRICE	TOTAL
1	MOBILIZATION	LUMP SUM	1	$13,000.00	$13,000.00
2	REMOVE SANITARY MANHOLE	EACH	4	$825.00	$3,300.00
3	REMOVE SANITARY PIPE	LIN FT	1,134	$7.00	$7,938.00
4	REMOVE SANITARY SERVICE PIPE	LIN FT	1,037	$5.00	$5,185.00
5	EXTERNAL CHIMNEY SEAL	EACH	4	$400.00	$1,600.00
6	8" PVC PIPE SEWER SDR 35	LIN FT	1,102	$72.00	$79,344.00
7	6" PVC PIPE SEWER SERVICE SDR 26	LIN FT	1,037	$50.00	$51,850.00
8	8" X 6" SERVICE WYE	EACH	25	$625.00	$15,625.00
9	CONSTRUCT SANITARY MANHOLE	EACH	4	$6,500.00	$26,000.00
10	CASTING ASSEMBLY (SANITARY)	EACH	4	$1,500.00	$6,000.00
11	CONNECT TO EXISTING SANITARY SEWER PIPE	EACH	3	$2,000.00	$6,000.00
12	CONNECT TO EXISTING SANITARY SERVICE	EACH	25	$1,500.00	$37,500.00

SUBTOTAL:	*$253,342.00*
CONTINGENCIES (10%)	*$25,334.20*
ESTIMATED CONSTRUCTION COST:	*$278,676.20*
ADMINISTRATION, ENGINEERING, SURVEYING, INSPECTION (30%):	*$83,602.86*
TOTAL ESTIMATED PROJECT COST:	***$362,279.06***

ESTIMATED PROJECT COST
FOR
Downtown Reconstruction Phase 2
8/15/2023

SANITARY SEWER RECONSTRUCTION (NON-ASSESSABLE)

ITEM NO.	BID ITEM	UNIT	EST QTY	UNIT PRICE	TOTAL
1	MOBILIZATION	LUMP SUM	1	$2,000.00	$2,000.00
2	BYPASS PUMPING	LUMP SUM	1	$15,000.00	$15,000.00
3	VIBRATION MONITORING	LUMP SUM	1	$17,500.00	$17,500.00

SUBTOTAL:	*$34,500.00*
CONTINGENCIES (10%):	*$3,450.00*
ESTIMATED CONSTRUCTION COST:	*$37,950.00*
ADMINISTRATION, ENGINEERING, SURVEYING, INSPECTION (30%):	*$11,385.00*
TOTAL ESTIMATED PROJECT COST:	***$49,335.00***

ESTIMATED PROJECT COST
FOR
Downtown Reconstruction Phase 2
8/15/2023

WATERMAIN RECONSTRUCTION (ASSESSABLE)

ITEM NO.	BID ITEM	UNIT	EST QTY	UNIT PRICE	TOTAL
1	MOBILIZATION	LUMP SUM	1	$24,000.00	$24,000.00
2	REMOVE WATERMAIN	LIN FT	1,760	$7.00	$12,320.00
3	REMOVE WATERMAIN SERVICE	LIN FT	1,108	$3.00	$3,324.00
4	REMOVE GATE VALVE & BOX	EACH	5	$325.00	$1,625.00
5	REMOVE HYDRANT	EACH	3	$500.00	$1,500.00
6	6" DIP WATERMAIN	LIN FT	59	$88.00	$5,192.00
7	8" PVC WATERMAIN	LIN FT	1,702	$78.00	$132,756.00
8	3 LB ANODE	EACH	14	$150.00	$2,100.00
9	9 LB ANODE	EACH	4	$250.00	$1,000.00
10	WATERMAIN FITTINGS	POUND	1,650	$16.00	$26,400.00
11	6" GATE VALVE & BOX	EACH	3	$2,500.00	$7,500.00
12	8" GATE VALVE & BOX	EACH	9	$3,450.00	$31,050.00
13	1" CURB STOP & BOX	EACH	30	$1,100.00	$33,000.00
14	1" CORPORATION STOP	EACH	30	$900.00	$27,000.00
15	1" SERVICE PIPE (OPEN CUT)	LIN FT	1,190	$46.00	$54,740.00
16	1" SERVICE PIPE (DIRECTIONALLY DRILLED)	LIN FT	175	$175.00	$30,625.00
17	HYDRANT	EACH	3	$7,700.00	$23,100.00
18	WATER SERVICE CASTING ASSEMBLY	EACH	30	$450.00	$13,500.00
19	TRACER WIRE ACCESS BOX	EACH	3	$300.00	$900.00
20	TEMPORARY WATER SYSTEM	LUMP SUM	1	$30,000.00	$30,000.00
21	CONNECT TO EXISTING WATER SERVICE	EACH	30	$750.00	$22,500.00
22	CONNECT TO EXISTING WATERMAIN	EACH	4	$2,000.00	$8,000.00

SUBTOTAL:	*$492,132.00*
CONTINGENCIES (10%):	*$49,213.20*
ESTIMATED CONSTRUCTION COST:	*$541,345.20*
ADMINISTRATION, ENGINEERING, SURVEYING, INSPECTION (30%):	*$162,403.56*
TOTAL ESTIMATED PROJECT COST:	***$703,748.76***

ESTIMATED PROJECT COST
FOR
Downtown Reconstruction Phase 2
8/15/2023

WATERMAIN RECONSTRUCTION (NON-ASSESSABLE)

ITEM NO.	BID ITEM	UNIT	EST QTY	UNIT PRICE	TOTAL
1	MOBILIZATION	LUMP SUM	1	$7,000.00	$7,000.00
2	8" PVC WATERMAIN	LIN FT	408	$78.00	$31,824.00
3	6" DIP WATERMAIN	LIN FT	55	$88.00	$4,804.80
4	3 LB ANODE	EACH	3	$150.00	$450.00
5	WATERMAIN FITTINGS	LB	408	$16.00	$6,528.00
6	8" GATE VALVE & BOX	EACH	2	$3,450.00	$6,900.00
7	6" GATE VALVE & BOX	EACH	1	$2,500.00	$2,500.00
8	CONNECT TO EXISTING WATERMAIN	EACH	1	$2,000.00	$2,000.00
9	BORE FOUNDATION WALL/REMOVE & REPLACE FLOOR	EACH	14	$2,600.00	$36,400.00
10	RESET WATER METER & ADJUST PIPING	EACH	14	$800.00	$11,200.00
11	MOVE ELECTRICAL GROUND FROM WATER SERVICE	EACH	14	$500.00	$7,000.00
12	HAND EXCAVATION TO CONNECT WATER SERVICE (IN CRAWL SPACE)	EACH	14	$750.00	$10,500.00
13	CATHODIC PROTECTION TEST STATION	EACH	1	$2,000.00	$2,000.00
14	VIBRATION MONITORING	LUMP SUM	1	$17,500.00	$17,500.00

SUBTOTAL:	*$146,606.80*
CONTINGENCIES (10%):	*$14,660.68*
ESTIMATED CONSTRUCTION COST:	*$161,267.48*
ADMINISTRATION, ENGINEERING, SURVEYING, INSPECTION (30%):	*$48,380.24*
TOTAL ESTIMATED PROJECT COST:	***$209,647.72***

ESTIMATED PROJECT COST
FOR
Downtown Reconstruction Phase 2
8/15/2023

STORM WATER REUSE (NON-ASSESSABLE)

ITEM NO.	BID ITEM	UNIT	EST QTY	UNIT PRICE	TOTAL
1	MOBILIZATION	LUMP SUM	1	$100,000.00	$100,000.00
2	CLEAR & GRUB TREE	EACH	2	$650.00	$1,300.00
3	REMOVE CONCRETE CURB & GUTTER	LIN FT	190	$6.00	$1,140.00
4	REMOVE BITUMINOUS PAVEMENT	SQ YD	1,005	$4.00	$4,020.00
5	REMOVE CONCRETE DRIVEWAY/WALK	SQ FT	175	$3.00	$525.00
6	REMOVE PAVERS	SQ FT	700	$5.00	$3,500.00
7	GEOTEXTILE FABRIC	SQ YD	1,040	$2.00	$2,080.00
8	SELECT GRANULAR BORROW (CV) - 12" DEPTH	CU YD	382	$29.00	$11,078.00
9	AGGREGATE BASE CLASS 5 (CV) - 8" DEPTH	TON	456	$28.50	$12,996.00
10	BITUMINOUS NON-WEAR COURSE - 3.0" DEPTH	TON	186	$84.00	$15,624.00
11	BITUMINOUS WEAR COURSE - 1.5" DEPTH	TON	96	$107.00	$10,272.00
12	CONCRETE CURB & GUTTER (B618)	LIN FT	190	$28.75	$5,462.50
13	4" CONCRETE WALK (w/ AGG. CL 5 BASE)	SQ FT	100	$9.25	$925.00
14	6" CONCRETE DRIVEWAY	SQ FT	75	$16.00	$1,200.00
15	SALVAGE & INSTALL PERVIOUS PAVERS WITH NEW ROCK SECTION	SQ FT	850	$200.00	$170,000.00
16	8" PVC PIPE SEWER (DRILLED)	LIN FT	50	$150.00	$7,500.00
17	8" PVC PIPE SEWER SDR 35	LIN FT	100	$72.00	$7,200.00
18	CONNECT TO EXISTING SANITARY SEWER STRUCTURE	EACH	1	$2,000.00	$2,000.00
20	1" CURB STOP & BOX	EACH	1	$1,100.00	$1,100.00
21	1" SERVICE PIPE (OPEN CUT)	LIN FT	130	$46.00	$5,980.00
22	CONNECT TO EXISTING WATER SERVICE	EACH	1	$750.00	$750.00
23	SCADA	LUMP SUM	1	$60,000.00	$60,000.00
24	PUMP & FILTER SKID	LUMP SUM	1	$135,000.00	$135,000.00
25	ELECTRICAL	LUMP SUM	1	$55,000.00	$55,000.00
26	REUSE WATER TREATMENT (UV)	LUMP SUM	1	$135,000.00	$135,000.00
27	UNDERGROUND STORAGE TANK	LUMP SUM	1	$400,000.00	$400,000.00
28	HUFFCUTT PRECAST WALLS	LUMP SUM	1	$115,000.00	$115,000.00
29	REUSE BUILDING	LUMP SUM	1	$300,000.00	$300,000.00
30	HVAC EQUIPMENT	LUMP SUM	1	$10,000.00	$10,000.00
31	CONTROL VALVES & SYSYEM CONTROLLER	LUMP SUM	1	$10,000.00	$10,000.00
32	12" PVC STORM PIPE	LIN FT	50	$65.00	$3,250.00
33	36" RC PIPE SEWER DES 3006 CL V	LIN FT	105	$400.00	$42,000.00
34	CONSTRUCT DRAINAGE STRUC. DES 4020-84	EACH	1	$30,000.00	$30,000.00
35	CASTING ASSEMBLY (STORM)	EACH	1	$1,100.00	$1,100.00
36	4" CONDUIT FOR REUSE MAIN	LIN FT	2,855	$11.00	$31,405.00
37	1" REUSE MAIN HDD	LIN FT	2,475	$10.00	$24,750.00
38	2" REUSE MAIN HDD	LIN FT	380	$13.00	$4,940.00
39	4" REUSE MAIN HDD	LIN FT	1,388	$28.00	$38,864.00
40	4" GATE VALVE & BOX (REUSE SYSTEM)	EACH	2	$1,850.00	$3,700.00
41	CONNECT TO EXISTING REUSE MAIN	EACH	1	$750.00	$750.00
42	REUSE WATER METER BOX	EACH	1	$3,500.00	$3,500.00
43	STORM WATER REUSE ACCESS MANHOLE CASTING	EACH	5	$1,300.00	$6,500.00
44	STORM WATER REUSE BLOWOFF STRUCTURE CASTING	EACH	7	$1,250.00	$8,750.00
45	DUCTILE IRON FITTINGS (REUSE)	LUMP SUM	1	$8,000.00	$8,000.00
46	BLOWOFF IN PRECAST CONCRETE HANDHOLE (60")	EACH	7	$7,500.00	$52,500.00
47	ACCES MANHOLE WITH BLOWOFF (60")	EACH	1	$8,750.00	$8,750.00
48	ACCESS MANHOLE (60")	EACH	4	$8,200.00	$32,800.00
49	LANDSCAPING ALLOWANCE	ALLOWANCE	1	$4,500.00	$4,500.00

SUBTOTAL:	*$1,890,711.50*
CONTINGENCIES (10%):	*$189,071.15*
ESTIMATED CONSTRUCTION COST:	*$2,079,782.65*
ADMINISTRATION, ENGINEERING, SURVEYING, INSPECTION (30%):	*$623,934.80*
TOTAL ESTIMATED PROJECT COST:	***$2,703,717.45***

APPENDIX B

CITY ASSESSMENT POLICY

Section Extracted from City of Waconia Financial Policy & Guidelines
Last Amended June 19, 2017

Special Assessments

The financing for reconstruction projects is through the sale of General Obligation 429 Improvement Bonds. Minnesota State Statute requires a minimum assessed percentage of 20% for projects financed with 429 bonds.

With each reconstruction project, a feasibility study is completed and approved by the City Council. Once a draft of the feasibility study is complete, City staff will share the information with a qualified appraiser to determine the special benefit to each property in the reconstruction area. The City Council will use this appraisal information as a basis for finalizing the special assessments due by property owners for reconstruction projects.

Assessment Policy Summary:

- The portion of the project costs assessed to the abutting property owner shall be based on a linear front footage basis of the parcel or unit basis.
- The City pays 50% of the total project cost of a standard local street section and 100% of the cost of extra width and extra depth above the city standard local street section.
- Storm sewer costs are to be included in the total project cost of a city standard local street, assessed 50% (and City pays 50%), in accordance with the Street Assessment Policy.
- All or some of the following improvements may be incorporated in a reconstruction project. Costs for these improvements will be included in the overall project cost, with a contribution from the City: storm water ponding, street lights, relocation of overhead power lines, street signs, sidewalks and trails, and boulevard trees.
- Corner lots and parcels with multiple frontages shall be assessed 50% of the front footage on each side.
- A minimum assessment shall be levied to parcels identified within the project area having neither direct primary nor non-primary access to affected streets. The assessment shall be equal to 75% of the typical front footage identified within the project area. Parcels abutting county roads are exempt from this provision.
- Assessments will not be levied for seal coat and overlay operations.
- Assessments may be pre-paid to the City by benefiting properties
- Assessments will be billed to the benefiting property owner by the City; typically over a ten (10) year period, at an interest rate of one percent (1%) over the bond interest rate. Other terms of the assessment receivable may be available to the benefiting property owners.
    - For any project, where all the benefitting property owner(s) are governmental entities (school district, county, state, etc.), the City will assess the benefiting property owner(s) the actual bond interest rate, typically over a ten (10) year period.
- In the case where a benefiting property owner is delinquent in their assessment payment, assessments may be certified to real estate taxes over a ten (10) year period, at an interest rate one percent (1%) over the bond interest rate.
- Partial pre-payments for assessments exceeding $100,000.00 may be accepted by the City.

Infrastructure Improvement Cost Breakdown & Methodology

Improvement	Type of Construction	Method
Curb & Gutter	New Development	100% of the cost assessed to abutting property owner on linear front footage OR unit basis.
	Reconstruction (Complete)	The portion of the project costs assessed to the abutting property owner shall be based on a linear front footage basis of the parcel.
	Reconstruction (Spot repair)	100% of cost to be included in overall cost of project prior to assessment apportionment in accordance with policy.
Local Street	New Development	100% of the cost assessed to abutting property owner on linear front footage OR per unit basis.
	Reconstruction	50% of the cost to be assessed to abutting property owner on linear front footage OR per unit basis. 50% of the cost to be paid by City.
	Maintenance (Seat coat & overlay)	100% Paid with City funds.
Collector Street as defined by the City's Transportation Plan	New Development	100% of the construction cost of a city standard local street assessed to abutting property owner based on linear front footage OR per unit basis.
	Reconstruction	The portion of the project costs assessed to the abutting property owner shall be based on a linear front footage OR per unit basis. City pays 50% of the cost of the construction of city standard local street and 100% of the cost of construction above a city standard local street.
	Maintenance (Seat coat & overlay)	100% Paid with City funds.
Intersection	New Development	100% of the cost to be included as part of street project and apportioned according to appropriate street construction category.
	Reconstruction	100% of cost to be included in overall cost of project prior to assessment apportionment in accordance with policy.
Multiple Fronted Parcels - Corner Lot - Double Fronted Lot - Large Parcels - Etc.	Reconstruction	Front footage to be used in assessment methods described herein shall be calculated as follows: - 50% of the front footage on all sides of the parcel. 50% of the cost to be paid with City funds.

Table continues on next page

Improvement	Type of Construction	Method
Parcels with no driveway access to primary and non-primary streets.	Reconstruction	A minimum assessment shall be levied to parcels identified within the project area having no direct driveway access to neither primary nor non-primary streets, i.e. alley access. The assessment shall be equal to 75% of the typical front footage identified within the project area. Parcels abutting county roads are exempt from this provision.
Alley	New Development	100% of the cost assessed to abutting property owner on linear front footage OR per unit basis.
	Reconstruction	50% of the cost to be assessed to abutting property owner on linear front footage OR per unit basis. 50% of the cost to be paid with City funds.
Sanitary Sewer Trunk/Lateral	New Development	100% of the cost assessed to benefited area on unit basis.
	Reconstruction	50% of the cost assessed to benefited area on unit basis. 50% of the cost to be paid with City funds.
	Maintenance	100% of the cost to be paid with City funds.
Sanitary Sewer Service	New Development	100% of cost assessed to property owner.
	Reconstruction (Including main)	50% of the cost assessed to benefited area on a unit basis. 50% of the cost to be paid with City funds.
	Reconstruction (Stand alone service replacement)	100% of cost assessed to property owner.
Sanitary Sewer Oversizing	New Development	100% paid with City funds. (Materials cost above 8-inch pipe plus 20% for handling and installation.)
	Reconstruction	100% paid with City funds. (Materials cost above 8-inch pipe plus 20% for handling and installation.)
Lift Station	New Development	100% of the cost assessed to benefited area on a per unit basis.
Water Trunk/Lateral	New Development	100% of the cost assessed to benefited area on unit basis.
	Reconstruction	50% of the cost assessed to benefited area on unit basis. 50% of cost to be paid with City funds.
	Maintenance	100% of the cost to be paid with City funds.
Water Service	New Development	100% of cost assessed to property owner.
	Reconstruction (Including main)	50% of the cost assessed to benefited area on a unit basis. 50% of the cost to be paid with City funds.
	Reconstruction (Stand alone service replacement)	100% of cost assessed to property owner.
Water Oversizing	New Development	100% paid with City funds. (Materials cost above 8-inch pipe plus 20% for handling and installation.)
	Reconstruction	100% paid with City funds. (Materials cost above 8-inch pipe plus 20% for handling and installation.)
Storm Sewer Trunk/Lateral	New Development	100% of the cost assessed to benefited area on unit basis.
	Reconstruction	50% of the cost to be assessed to abutting property owner on linear front footage OR per unit basis. 50% of the cost to be paid with City funds.
	Maintenance	100% of the cost to be paid with City funds.
Storm Water Ponding	New Development	100% assessed to development.
	Reconstruction	Cost to be included in overall cost of project prior to assessment apportionment in accordance with policy. City makes contribution to the project.
	Maintenance	100% of the cost to be paid with City funds.

Table continues on next page

Improvement	Type of Construction	Method
Overhead Power Lines	Relocation	Cost to be included in overall cost of project prior to assessment apportionment in accordance with policy. City makes contribution to the project.
Street Lights	New Development	100% of material and installation cost on a unit basis paid by developer.
	Reconstruction	Cost to be included in overall cost of project prior to assessment apportionment in accordance with policy. City makes contribution to the project.
	Maintenance	100% of the cost to be paid with City funds.
Street Signs	New Development	100% of material and installation cost on a unit basis paid by developer.
	Reconstruction	Cost to be included in overall cost of project prior to assessment apportionment in accordance with policy. City makes contribution to the project.
	Maintenance	100% of the cost to be paid with City funds.
Sidewalks & Trails	New Development	100% of cost assessed on a unit basis to development.
	Reconstruction	Cost to be included in overall cost of project prior to assessment apportionment in accordance with policy. City makes contribution to the project.
	Maintenance	100% of the cost to be paid with City funds.
Boulevard Trees	New Development	100% of cost paid by developer.
	Reconstruction	Cost to be included in overall cost of project prior to assessment apportionment in accordance with policy. City makes contribution to the project.
	Maintenance	100% of the cost to be paid with City funds.

Deferred Special Assessments
Hardship Assessment Deferral for Senior Citizens, People with Disabilities, or Members of the National Guard or other Reserves Ordered to Active Military Service.

Pursuant to the authority for deferring special assessments as provided in Minnesota State Statute Section 435.193 through 435.195, the City Council may, in its discretion, defer the payment of special assessments for any homestead property owned by a person 65 years of age or older, one retired by virtue of a permanent and total disability, or a member of the National Guard or other reserves ordered to active military service for whom it would be a hardship to make the payments.

Eligibility
Any person 65 years of age or older, permanently and totally disabled (as determined by the Social Security Administrator), or a member of the National Guard or other reserve ordered to active military service may request deferment of special assessments levied against real property for public improvements if the following conditions are met.

1. Ownership. The applicant must be the fee simple owner of the property or must be a contract vendee for fee simple ownership. An applicant must provide either a recorded deed or contract for deed with the application to establish a qualified ownership interest as required here.

2. Homestead. The property must be the applicant's principal place of domicile and classified on the City's and County's real estate tax rolls as the applicant's homestead.

3. Income. The income threshold for eligibility of those applicants 65 years of age and older or disabled be established by the most recent U.S. Census Bureau Poverty Threshold compilations. Income eligibility would be determined by the submittal of the most recent federal tax filing form.

Interest on Deferred Assessment
Interest on the deferred assessment shall be forgiven until December 31st of the year before the first installment is payable.

Deferment Period
The deferment shall be granted for as long a period of time as the hardship exists and the conditions aforementioned have been met. However, it shall be the duty of the applicant to notify the City Administrator of any change in status that would affect eligibility or deferment.

The entire amount of deferred special assessments shall be due within sixty (60) days after loss of eligibility by the applicant. If the special assessment is not paid within the sixty (60) days, the City Administrator shall add thereto interest at a per annum interest rate of one percent (1%) above the bond interest rate and the total amount of principal and interest shall be certified to the County Auditor for collection with taxes the following year. Should the applicant demonstrate to the satisfaction of the City Council that full repayment of the deferred special assessment would cause the applicant particular undue financial hardship, the Council may order that the applicant pay within sixty (60) days a sum equal to the number of installments of deferred special assessments outstanding and unpaid to date, including principal and interest, with the balance thereafter paid according to the terms and conditions of the original special assessments.

Termination of Deferral Status
The option to defer the payment of special assessment shall terminate and all amounts accumulated plus applicable interest shall become due upon the occurrence of any one of the following events:

1. Sale of Property. The subject is sold, transferred, or subdivided in whole or in part.

2. Death of Owner. The death of the fee owner qualified for deferral status unless a surviving joint tenant, tenant in common, or contract vendee is eligible for the deferral benefit provided hereunder.

3. Nonhomestead Property. The subject property loses its homestead status for any reason.

4. No Hardship. The City Council determines that there would be no hardship to require an immediate or partial payment of the deferred special assessment.

Filling for Federal Status/Fee
An eligible applicant must file an application not later than thirty (30) days after the assessment is adopted by the City Council.

All deferral applications must be made on forms approved by the City and submitted to the City Administrator. The applicant will be charged an administrative filing fee, based on the current fee schedule.

Nothing herein shall be construed to prohibit the determination of hardship on the basis of exceptional and unusual circumstances not covered by the above noted requirements where the determination is made in a nondiscriminatory manner and does not give the applicant an unreasonable preference or advantage over other applicants.

Deferred Assessment Procedures

- Deferred Assessment Application form is provided to applicant/property owner by the City Administrator's Office.

- Applicant fills out the application form and provides the relevant information to document qualification for deferred assessment. Applicant then returns form to City Administrator's Office.

- City Administrator forwards the application to the Finance Director for review of qualifications. Finance Director makes recommendation to City Council to approve or deny the application.

- An approved application may be forwarded to the Carver County Recorder's office for recording and to the Carver County Taxpayer Services Division.

- The deferral information is entered into the City's property records data base.

- At such time the property no longer qualifies for the deferred assessment (upon a transfer of the property, loss of homestead status, or death, no hardship as determined by the Council), the County Auditor/Recorder's office will notify the City of the termination of the deferral status, and direct the party to the City Administrator's office to pay balance on the outstanding deferred assessment amount.

CITY OF WACONIA

APPLICATION AND AUTHORIZATION FOR DEFERRED PAYMENT ON SPECIAL ASSESSMENTS FOR SENIOR CITIZEN/PERMANENTLY DISABLED HOMESTEAD NATIONAL GUARD OR OTHER RESERVES ORDERED TO ACTIVE MILITARY SERVICE MINNESOTA STATUTES 435.193 TO 435.195

STATE OF MINNESOTA)
)
COUNTY OF CARVER)

Date: _____, _____, 20 ____

To: City Clerk, City of Waconia Minnesota
201 South Vine Street
Waconia, MN 55387

I, the undersigned, declare under penalties of perjury:

1. That I reside at _____

   a. That I am not less than 65 years of age and that the date of my birth is _____

   b. That I am permanently and totally disabled as it is used for social security purposes which disability is at least 90 percent of the total income of such disabled person from all sources YES_____ NO_____

   c. That I am a member of the National Guard or other reserves ordered to active military service

2. That I am the owner of the property legally described as _____

3. That my interest in the ownership of the above property was acquired on _____ and is as follows: 1. Sole ownership YES_____ NO_____
   2. Joint tenancy, held with _____
   3. Other undivided interest (Specify) _____

4. That the total gross annual household income does not exceed $_____ (Established by the most recent Q & Owner Entered Property Threshold computation)

A COPY OF YOUR MOST CURRENT MINNESOTA HOMEOWNER PROPERTY TAX REFUND RETURN FORM M1PR MUST ACCOMPANY THIS APPLICATION IF APPLICABLE.

Kinds of Income Received	Husband	Wife	Other Family Members
Salaries & Wages	$	$	$
Social Security			
Veterans Benefits			
Other Payments			
Money from Banks			
Unemployment Insurance			
Workmen's Compensation			
Net Rental Income			
Stock Dividends/Interest			
All Other			

10/2/2006

7. That my social security number is _____. Spouse _____

8. That on January 2, 20___ or December 1, 20___, I owned and occupied the above property as my homestead and such occupancy began on _____.

9. That the payments for improvements on the special assessments duly adopted by the City of Waconia as of _____ which have been allocated against the subject property would create undue personal hardship on my behalf and I respectfully request that payment be delayed and that such payments be so deferred for the years 20____ to 20___.

_____
Owner Signature

_____
Owner Signature

I _____, City Clerk of the City of Waconia, Carver County, State of Minnesota, do hereby certify that the application of _____ above named has been duly received and that in accordance with the powers of official record was duly
_____APPROVED _____DENIED as of _____, 20____

That in accordance with approval granted that the payments for special assessments on the applicant's subject property in the amount of $_____ for the year(s) _____ should be so deferred with interest at the annual rate of ½, until such time as it is deemed the applicant no longer qualifies or the property loses its eligibility.

Dated _____, 20____

_____
City Clerk

6/7/2000

APPENDIX C

GEOTECHNICAL REPORT

AMERICAN ENGINEERING TESTING, INC.

CONSULTANTS
- ENVIRONMENTAL
- GEOTECHNICAL
- MATERIALS
- FORENSICS

REPORT OF GEOTECHNICAL EXPLORATION

2022 and 2023 Infrastructure Improvements Projects

Waconia, Minnesota

AET No. 20-23155

Date:

March 10, 2021

Prepared for:

City of Waconia
310 East 10th Street
Waconia, Minnesota 55387

www.amengtest.com

AMERICAN ENGINEERING TESTING, INC.

CONSULTANTS
- ENVIRONMENTAL
- GEOTECHNICAL
- MATERIALS
- FORENSICS

March 10, 2021

City of Waconia
310 East 10th Street
Waconia, Minnesota 55387

Attn: Mr. Craig Eldred – Public Services Director

RE: Geotechnical Exploration
2022 and 2023 Infrastructure Improvements Projects
Waconia, Minnesota
AET No. 20-23155

Dear Mr. Eldred:

American Engineering Testing, Inc. (AET) is pleased to present the results of our subsurface exploration program and geotechnical engineering review for the City of Waconia's 2022 and 2023 Infrastructure Improvements projects. These services were performed according to our proposal to you dated September 15, 2020.

We are submitting an electronic (pdf) copy of the report to you. Additional copies are being sent on your behalf as noted below.

Please contact me if you have any questions about the report. I can also be contacted for arranging construction observation and testing services.

Sincerely,
American Engineering Testing, Inc.

Derek S. Van Heuveln, PE
Senior Engineer
Phone: (651) 789-4656
dvanheuveln@amengtest.com

cc: Mr. Jake Saulsbury, PE – Bolton & Menk, Inc.

SIGNATURE PAGE

Prepared for:

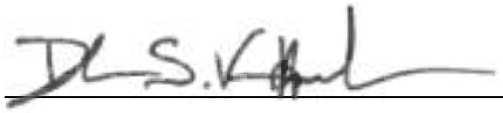
City of Waconia
310 East 10th Street
Waconia, Minnesota 55387

Attn: Mr. Craig Eldred – Public Services Director

Prepared by:

American Engineering Testing, Inc.
550 Cleveland Avenue North
St. Paul, Minnesota 55114
(651) 659-9001/www.amengtest.com

Authored by:



Derek S. Van Heuveln, PE
Senior Engineer

Reviewed by:

Gregory R. Reuter, PE, PG, D.GE
Principal Engineer/Vice President

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: Derek S. Van Heuveln

Date: March 10, 2021 License #: 45922

Type text here

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1.0 INTRODUCTION

The City of Waconia (City) is planning future infrastructure improvements projects for 2022 and 2023. To assist planning and design, you have 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 proposal to you dated September 15, 2020, which you authorized on September 17, 2020. The authorized scope consists of the following.

- Drilling 13 standard penetration test borings to depths ranging from 10 to 25 feet below grade.
- Performing soil laboratory testing, including water content, sieve analysis, and electrical resistivity testing on select samples.
- Conducting a geotechnical engineering review based on the data and preparing this report.

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

3.0 PROJECT INFORMATION

The following information was provided to us by the City and their designer, Bolton & Menk. The proposed 2022 Infrastructure Improvements project has two work areas. One project area consists of the replacement of retaining walls along the east and west sides of Oak Avenue at the lake channel outlet culvert. The west wall is one tier and the east wall consists of two tiers. These walls, which are located south of Pietz Avenue, are currently segmental block retaining walls, and have deteriorated due to road salt and erosion from the outlet channel; apart from this the walls have performed satisfactorily. Design for these walls has not begun; however, we understand that it is planned to replace these walls with new retaining walls constructed of large wet cast retaining wall blocks, that is, prefabricated modular block wall (PMBW) without soil reinforcement (e.g. a gravity PMBW), per MnDOT nomenclature. The bottom elevation of the

new walls will closely match the existing walls, and wall heights of 3 to 5 feet (similar to the existing walls) are anticipated. We have been provided with the Retaining Wall Details plan for the existing walls, dated October 14, 1996, as part of our review.

The second part of the 2022 project and the 2023 project includes utility replacement and street reconstruction in downtown Waconia. The project area generally includes Main Street West from Maple Street North to Spruce Street North, and portions of the cross streets within one block south of Main Street. The 2022 project will be from Maple Street to Olive Street, and the 2023 project will be from Olive Street to Spruce Street.

The sanitary sewer is planned to be replaced along Main Street between Maple Street and Pine Street, with smaller replacement areas along Olive Street and Elm Street south of Main Street. Following utility work, street reconstruction will be performed on Main Street and along portions of Olive Street, Elm Street, Pine Street, and Spruce Street.

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 that described 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 13 standard penetration test borings. The number of borings, boring locations, and boring depths were determined by the City and Bolton & Menk. 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. A density description or consistency is also noted for the natural soils, which is based on the standard penetration resistance (N-value).

The boring locations are shown on Figure 1 in Appendix A. The borings were located in the field by Bolton & Menk. Final boring locations were offset based on underground utilities identified as part of the Gopher State One Call utility clearance. Surface elevations at the boring locations

were recorded in the field by AET personnel using a GPS unit with ±½-foot (0.15 meter) accuracy.

4.2 Laboratory Testing

The laboratory test program included water content testing on fine grained (clayey) soils, sieve analysis (gradation only) testing on select samples, and electrical resistivity testing on samples taken from Borings B-12 and B-19. The test results appear in Appendix A on the individual boring logs adjacent to the samples upon which they were performed, on the data sheets following the logs, or presented in the report text below.

5.0 SITE CONDITIONS

5.1 Pavement and Aggregate Base Thickness

The bituminous pavement at our boring locations varied from approximately 2¼ inches (Boring B-22) to 8¼ inches (Borings B-11) thick, with an average of about 5¾ inches as measured from the augered boreholes. The varying pavement thickness could be due to overlays.

Apparent aggregate base materials were encountered at each boring location in a thickness that generally varied from approximately 4 to 18 inches. The base soils generally consisted of crushed limestone and silty sands with varying amounts of gravel. At Boring B-20, the possible aggregate base material consisted of a mixture of clayey sands and silty sands. Pieces of geotextile fabric were observed beneath the aggregate base at Borings B-10 to B-12. Please refer to table A for summary information.

Table 5.1– Pavement and Base Thickness

Soil Boring No.	Bituminous Thickness (inches)	Aggregate Base Thickness (inches)	Aggregate Base Type and AASHTO Classification
B-10	7½	12	Silty sand with gravel (A-1-b)
B-11	8¼	12	Crushed limestone (A-1-b)
B-12	7½	15	Silty sand with gravel (A-1-b)

Soil Boring No.	Bituminous Thickness (inches)	Aggregate Base Thickness (inches)	Aggregate Base Type and AASHTO Classification
B-13	6½	8½	Crushed limestone (A-1-b)
B-14	6¾	4	Silty sand with gravel (A-1-b)
B-15	6½	>12	Silty sand with gravel (A-1-b)
B-16	5¾	18	Silty sand (A-2-4)
B-17	4¾	4	Crushed limestone and silty sand (A-1-b)
B-18	5½	18	Gravelly silty sand (A-1-b)
B-19	7¼	17	Silty sand (A-2-4)
B-20	2½	9½	Clayey sand and silty sand (A-2-6)
B-21	5	12	Silty sand (A-2-4)
B-22	2¼	10	Silty sand with gravel (A-1-b)

5.2 Subsurface Soils/Geology

5.2.1 Oak Avenue Area (Borings B-10 and B-11)

Below the pavement and aggregate base, the Oak Avenue borings encountered fill to depths of 7 to 9¼ feet below grade. The fill could be roadway embankment, retaining wall backfill, or utility trench backfill. The fill consisted mainly of organic clays, lean clays, sandy lean clays, clayey sands, and silty sands with varying amounts of gravel. The N-values in the fill ranged from 4 to 15. The water content ranged from 13% to 38%.

Below the fill, the borings generally encountered naturally-deposited soft to very stiff sandy lean clays and clayey sands (A-6). Boring B-11 encountered a swamp deposit layer below the fill from 7 to 9½ feet below grade consisting of firm organic clay. The water content in the naturally-deposited soils ranged from 17% to 30%.

5.2.2 Main Street Area (Borings B-12 to B-22)

At the boring locations in the Main Street project areas, the borings encountered fill or possible fill to depths of 1 to 12 feet below grade. The fill could be roadway embankment or utility trench backfill. The fill consisted mainly of sandy lean clays, clayey sands, silty sands, and sands with silt with varying amounts of gravel. We observed pieces of bituminous in portions of the fill. Cinders were observed in the fill from 2 to 4½ feet at Boring B-19. The N-values in the fill ranged from 1 to 28. The water content in the clayey soils ranged from 11% to 28%.

Below the fill, the borings generally encountered naturally-deposited fine alluvium and till soils to the termination depths. A layer of firm organic clay (swamp deposit) was encountered at Boring B-12 from 12 to 14½ feet below grade. The water content of the organic clay was 26%.

The fine alluvial soils consist of lean clays and sandy lean clays. The N-values ranged from 6 to 17. The water content ranged from 24% to 33%. The till soils consist of sandy lean clays, clayey sands, and silty sands. The N-values in these soils ranged from 5 to 54. The water content in the clayey soils ranged from 14% to 23%. An apparent boulder was encountered in boring B-15 at a depth of approximately 5 feet.

5.3 Groundwater

We did not encounter groundwater in the majority of the boring locations at the time of our exploration. Groundwater was measured at a depth of 13.7 feet below grade at Boring B-14 and 21.4 feet below grade at Boring B-16. The majority of the site soils are relatively slow draining silty and clayey soils and an extended period of time would be required for groundwater to appear and stabilize in an open borehole; therefore, the absence of groundwater in our borings should not be taken to mean that groundwater would not be encountered in an excavation. Perched water levels can occur in sand and clay matrixes and groundwater may be encountered in some utility excavations. A discussion of the water level measurement methods is presented in Appendix A.

Groundwater levels fluctuate due to varying seasonal and annual rainfall and snow melt amounts, as well as other factors.

5.4 Review of Soil Properties

Bituminous pavements are "flexible' systems, and require a high level of strength/stability from the upper subgrade zone. Generally, the upper 4 feet of the subgrade is considered the critical subgrade zone. At the test locations, the fill soils in the critical subgrade zone encountered have moderate strength and stability, unless further disturbed.

The soils found in the upper 4 feet range from moderately fast draining sands with silt to slow draining lean clay, sandy lean clay, and clayey sand. These soils have a moderate to high susceptibility to frost heaving and freeze thaw weakening.

The soils in the upper 4 feet of the subgrade had water contents varying from near optimum for compaction, based on our experience with these soils and the standard Proctor test (ASTM D 698), to above optimum moisture, with some water contents as high as 38%. In general, the inorganic soils more than 4 feet below subgrade elevation had water contents that varied from 14% to as high as 33%. The water content in the organic clays encountered in Borings B-11 and B-12 ranged from 26% to 30%. A larger percentage of these soils would be considered above "optimum" water content, and it may be difficult to obtain proper compaction for utility trench backfill.

6.0 UTILITY RECOMMENDATIONS

6.1 Approach Discussion

The natural soils encountered in our borings were primarily clayey till and fine alluvial soils. These soils would generally be judged suitable to support the new utility pipes at depth. However, these till and alluvial soils can include cobbles and boulders, such as at encountered in Boring B-15. This may make excavating procedures somewhat more difficult than normal if they are encountered.

It should be noted that layers of organic clay were encountered at some of the boring locations. Utility pipe support and bedding will be significantly different in those zones than would be required in the alluvial and till soils encountered at our boring locations.

Groundwater was encountered at 2 of the 13 boring locations at depths ranging from approximately 13½ to 21½ feet below grade at the time of our exploration. Excavations for new

utilities are planned to extend to depths of 14 to 17 feet below grade. The soils at our borings were predominately cohesive (lean clays, sandy lean clays, and clayey sand till and fine alluvium, and organic clay swamp deposits); however sandier seams in the cohesive soil matrix can be waterbearing, as well as layers of silty sands such as encountered at Boring B-22. The project contractor should consider groundwater control, which will need to be carefully planned and executed, as part of their installation process. If dewatering is required, it is the responsibility of the contractor to design the dewatering system. We anticipate groundwater control may be possible by using sump pits and pumps due to the relatively low permeability sandy lean clays and clayey sands.

Please refer to the following sections for additional information.

6.2 Bedding and Backfilling

We judge the natural soils encountered at our boring locations should provide acceptable utility foundation support. Where clayey or silty soils are present at pipe grade in open excavations, a 4-inch thick granular bedding layer should be placed beneath pipes to improve support uniformity. In organic soils, this bedding layer should be increased to at least 12 inches. If the soils are soft and susceptible to disturbance, or if organic soils are present, we recommend placing a geotextile separator fabric between the subgrade and the pipe bedding to reduce mixing of the subgrade and the bedding. We also recommend that the contractors remove any cobbles/boulders in the utility line trenches prior to utility line installation. This will reduce the potential for the development of point loads on the pipe that would not be accounted for in the pipe design.

6.2.1 Pipe Bedding

For pipe bedding material, we recommend a sand or sand and gravel mix, such as MnDOT 3149.2B2, with less than 12% of the particles (by weight) passing the No. 200 sieve. Imported fill will be required for the pipe bedding.

Pipe bedding should be carefully placed and hand-compacted under the haunches of the pipe, around the pipe, and to a minimum of 6 inches above the crown. As backfill is placed in the trenches, special caution must be given to the densification of the soil around and over the pipe. The contractor may have to use special manual techniques to properly compact the backfill under the haunches of the pipe, in order to prevent voids and prevent lateral movement of the pipe.

The bedding must be in direct contact with the pipe before the trench is backfilled. This will also help prevent having dissimilar materials contact the metallic pipes and setting up potential corrosion cells.

6.2.2 Trench Backfill

The excavated non-organic soils can be used as backfill for new utility line trenches. The existing soils should be evaluated at the time of excavation to determine if these soils are suitable for use as trench backfill. Soils containing construction debris are generally not recommended for use as backfill, as the debris can make it difficult to adequately compact the entire lift thickness.

Utility trench backfill beneath pavements should be placed per the requirements of MnDOT Specification 2105.3F1 (Specified Density Method). The backfill soils should be placed in a maximum lift thickness of 1 foot or less for the granular soils and 8 inches or less for the cohesive soils. This specification requires soils placed within an excavation trench be compacted to a minimum of 100% of the *standard maximum dry unit weight* defined in ASTM: D698 (Standard Proctor test), at a water content 65% to 102% of the *standard optimum water content*.

The silty and clayey soils found at our borings are sensitive to changes in moisture content and could be difficult to compact at their natural moisture content and/or if they become wet and/or dry of optimum water content after they are excavated. Soils will need to be placed within a certain range of water (moisture) contents to attain desired compaction levels. Moisture conditioning to within this range can be time consuming, labor intensive, and requires favorable weather. Failure to compact the trench backfill to the recommended densities could result in excessive settlement of pavements constructed over this material. If it is not feasible to dry the soils then the backfill should be compacted in thin lifts, with a lower density anticipated and possibly some additional trench settlement. This is the “Quality Compaction Method,” MnDOT Specification 2105.3F.2. However, the top 3 feet of trench backfill should be dried to meet the recommend compaction specifications, as this is in the “critical” subgrade zone. Please refer to the enclosed standard sheets titled “Utility Excavation Backfilling” for additional information.

One method to mitigate differential utility trench backfill is to delay paving of the final wearing course of the pavement until the next construction season to allow settlement to occur and corrective grading/paving to be performed on areas of excessive differential settlement. The

base course of pavement can be sawcut and removed, the subgrade and aggregate base can be regraded/compacted, and the bituminous base course replaced prior to final paving.

In "green" areas, backfill soils should be placed in reasonable lift thicknesses (about 1 foot or less) and compacted to a minimum of 90% of the Standard Proctor density (ASTM: D698) and/or per the MnDOT "Quality Compaction Method." If lower compaction levels are attained, more noticeable subsidence at the surface can occur.

6.2.3 Utility Pipe Corrosion Potential

The soils encountered in the soil borings were predominately lean clays, sandy lean clays, and clayey sands, with occasional zones of organic clays, silty sands, and sands with silt. We performed soil resistivity on soil samples at Boring B-12 and B-19. The resistivity values were as follows:

Table 6.2.3 – Resistivity Values

Soil Boring No.	Depth of Sample Tested (ft.)	Natural Moisture (ohm-cm)	Water Added (ohm-cm)	Soil Type
B-12	7-11½	1210	1200	Fill - Sandy Lean Clay (CL)
B-19	7-9	1080	1010	Sandy Lean Clay (CL)

The above resistivity values, when compared to American Water Work Association (AWWA) charts and other sources, indicate that the clayey soils are considered corrosive. Organic soils are also considered corrosive. Silty sands are considered to be moderately corrosive. Corrosion can occur to buried metallic pipes that are not coated or protected from soils that are considered corrosive, or where fluctuating groundwater levels occur, or where dissimilar backfill has been placed.

In our opinion, the new watermains should have coated (or wrapped) pipes backfilled with a uniform sand bedding placed completely around the pipes so that clayey or organic soils are not

touching the pipes. The entire system should be designed to be electrically continuous. HDPE pipes installed for directional drilled utilities are not considered corrosive.

7.0 PAVEMENTS

7.1 Definitions

The italicized words used in this section have specific definitions. These definitions are presented on the attached Standard Sheet entitled "Definitions Relating to Pavement Construction" or in ASTM Standards or MnDOT Specifications. Some of these definitions are also noted in section 6.2 of this report.

7.2 Subgrade Preparation

7.2.1 Standard City Pavement Sections

The current City pavement sections incorporate the use of a drained *sand subbase* layer of *Select Granular Material* beneath the aggregate base layer for bituminous pavement systems. The purpose of the *sand subbase* is to provide improved drainage for the aggregate base and upper zone of the subgrade which better controls frost heaving and thaw weakening effects. The appropriate *sand subbase* thickness is usually a function of the underlying soil's frost and strength properties, and the traffic loadings.

The pavement sections, which also include geotextile fabric below the aggregate base, are as follows:

- Residential Section - 4½ inches bituminous, 6 inches aggregate base, and 12 inches of Select Granular Material (MnDOT 3149.2B.2).
- Truck Route Section - 6½ inches bituminous, 10 inches aggregate base, and 12 to 18 inches of Select Granular Material (MnDOT 3149.2B.2).

It is our opinion that for these project areas, a 1-foot thick *sand subbase* layer would suffice. Where there is a need to vary the thickness of the *sand subbase*, we recommend the thickness have a taper of no steeper than 10H:1V. The subcut and sand layer placement should extend slightly beyond the back of the curb to maintain frost uniformity.

Because the underlying subgrade soils are generally clayey, and will not allow infiltrating water to percolate quickly, the *sand subbase* layer should be provided with a proper means of subsurface drainage. At the bottom of the *sand subbase*, we recommend the installation of finger drains tied into catch basins. The subsurface drains should be properly engineered and installed per MnDOT Specification 2502 Subsurface Drains, (MnDOT Standard Specifications for Construction, 2018 Edition, pages 394 to 401).

7.2.2 Stability Improvement

The final subgrade should have proper stability within the critical subgrade zone. When clayey soils or higher silty content soils are present, stability should be evaluated using the *test roll* procedure. Where unstable soils are found using the *test roll* process, then these soils should be improved by means of scarification, drying, and recompaction; or by subcutting and replacement. We recommend the final soils remaining in place be capable of passing a *test roll* prior to placing the *sand subbase* and/or aggregate base. It is our judgement that a *test roll* should not be necessary on the *sand subbase* material, or where the roadway subgrade consists of sands and sands with silt; in this case, the *test roll* process should be performed at the top of the aggregate base material prior to pavement construction.

We caution that instability of soils present beneath the soils being reworked and compacted may limit the ability to compact the upper soils. In this case, greater depths of subcutting and stability improvement may be needed.

7.2.3 Geosynthetic Use

A Type V geotextile fabric can be used for separation purposes below the *sand subbase*. A geotextile fabric (or a geogrid) can be used as reinforcement to aid in off-setting subgrade instability. For stability improvement, the geotextile fabric should be placed on top of the subgrade, below a *sand subbase* layer, which better uses the tensile properties of the fabric. However, you should recognize that the use of a geotextile stabilization fabric over *unstable soils* may not necessarily provide an equivalent off-set (compared to proper soil stabilization). Geotextile fabric use and installation should meet the requirements of MnDOT Specification 3733. A Type V geotextile is judged appropriate for separation purposes. However, if you wish to provide subgrade reinforcement, then a stronger geotextile should be used (Type VI).

7.2.4 Fill Placement/Compaction

Following the subcutting and stabilization of existing soils as needed, fill can be placed as needed to re-attain subgrade elevation. Fill should be placed per the requirements of MnDOT Specification 2105.3.F.1 (Specified Density Method). This specification generally requires soils placed within the *critical subgrade zone* be compacted to a minimum of 100% of the *standard maximum dry unit weight* defined in ASTM: D698 (Standard Proctor test), at a water content 65% to 102% of the *standard optimum water content*. A reduced minimum compaction level of 95% of the *standard maximum dry unit weight* can be used below the *critical subgrade zone*. The moisture content below the upper 3-foot zone shall be from 65% to 115% of the *standard optimum moisture content*. The *sand subbase* can be considered part of a composite subgrade; and the top of the subbase can be figured as the top of the 3-foot subgrade zone needing the 100% compaction level. However, the lower (dry) end of the water content range requirement does not need to apply to the sand subbase.

7.3 Subgrade R-value

The limiting on-site subgrade soils are the lean clay, sandy lean clay, and clayey sand soils. Based on the laboratory classification, we recommend using a design R-value of 12.

7.4 Aggregate Base

New aggregate base imported for pavement support should meet the gradation and quality requirements for Class 5, 5Q, or 6 per MnDOT Spec. 3138. 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 MnDOT Spec. 2211.3.D.2.c.

7.5 Bituminous Pavement Comments

The bituminous materials should meet appropriate MnDOT 2360 specifications. The mix designs presented previously meet minimum requirements. We recommend limiting RAP within the upper wear course to a maximum of 10% and in lower courses to a maximum of 20% to reduce thermal cracking. Minimizing the number of mixes and binder oils (PG grades) used on a project is generally more economical. Other mix design alternatives include the following options:

- Size-A aggregate (½-inch minus) can be used instead of the Size-B aggregate (¾-inch minus) Size-A aggregate generally provides a "finer" pavement surface and therefore tighter longitudinal joints. Size-B aggregate will generally accommodate Recycled Asphalt Pavement (RAP) more readily than size-A aggregate.
- The use of an F-binder oil (PG 58V-34) in the wear layers will reduce rutting caused by turning movements, slow speeds, and starting/stopping traffic. It will also result in less thermal cracking of the pavement and subsequently less maintenance and better long-term pavement performance.

Regardless of the improvement approach selected, all bituminous pavements require on-going maintenance to reach their design life. Even if placed and compacted properly over stable subgrade conditions, bituminous pavements typically experience cracking in 1 to 3 years, primarily due to temperature-related expansion and shrinkage. We recommend that a regularly scheduled maintenance program consisting of patching of cracks and local distressed areas be implemented. Seal coating of the pavement surface after 3 to 5 years also helps prolong the pavement life.

8.0 RETAINING WALLS

8.1 Approach Discussion

We understand your desired wall type is a prefabricated modular block wall (PMBW) without soil reinforcement (e.g. a gravity PMBW). We recommend that the walls be designed and constructed per MnDOT Special Provision S-2411. As noted, no drawings or plans have been provided to us for the new retaining walls. The City has provided us with a topographic plan view of the area showing that the replacement walls will be placed on the east and west sides of Oak Avenue at the lake outlet culvert. The culvert consists of a 72-inch diameter corrugated metal pipe. You indicated that the walls will be constructed in approximately the same lengths as the existing walls (120 feet for the east wall and 190 feet for the west wall). Exposed wall heights are anticipated to be approximately 3 to 5 feet, similar to the existing walls. Based on the site survey provided, we assume the proposed ground surface elevation along the wall alignment will match the existing walls, which range from 958 to 963 feet on the east wall and 958 to 965 feet on the west wall. It is in our experience that an exposed height of 8 feet is the normal limit using the MnDOT Special Provision for PMBWs without soil reinforcement.

Our recommended approach to prepare the retaining wall foundation is to excavate the fill and swamp deposited soils below the retaining wall to the underlying naturally-deposited sandy lean clay till at about elevation 951 feet, and placing engineered fill in lifts to re-attain bottom of leveling pad elevation. Excavations to elevation 951 feet will be near the invert elevation of the culvert, and would likely require damming of the outlet channel (e.g. coffer dams) and bypass pumping or other water control to allow earthwork to occur in dry conditions.

If the City is willing to accept an increased risk of greater than normal settlement and wall movement, the walls could be reconstructed in a similar configuration, supported on the in-place foundation soils. The existing walls have performed satisfactorily in regard to settlement and lateral movement, and future wall performance would be anticipated to be similar as long as a similar geometry (grades, exposed heights, alignments) was used for the replacement walls. Geometry changes, such as replacing the current two-tiered east wall with a single wall or increasing wall heights, would result in additional settlement and risk for the City with this approach.

To reduce the risk of greater than normal wall settlement with either the approach of reconstructing the walls in a similar configuration, or with geometry changes, consideration could be given to using compaction grouting to strengthen the existing fill and swamp deposited soils in place, and constructing the new walls on these compaction grouted soils. Compaction grouting is performed by a specialty contractor and consists of inserting a ported probe to the design treatment depth and injecting grout under pressure in lifts as the probe is retracted. The grout is injected in a series of overlapping bulbs, which work to increase the stiffness of the surrounding soils. This approach would be performed to increase the bearing capacity of the in-place soils, reduce foundation settlement, and reduce the required excavation depths, which should result in a lesser need for groundwater/outlet channel control measures. Design of compaction grouting is performed by a specialty contractor based on the conditions encountered at a project site. One local contractor that performs compaction grouting services is Veit & Company, Inc.

Our scope of services did not include global stability analysis, internal stability analysis, or external stability analysis items of sliding, overturning, and compound failure of the walls. We understand that these analyses will be performed by others.

8.2 Design Recommendations

Based on our geotechnical review, we recommend the wall designer utilize the soil parameters in Table 8.2-1 to design the wall and evaluate stability. Please refer to the attached MnDOT Figure 2411-1 "Gravity PMBW Material Definitions/Typical Cross Sections" for additional information.

Table 8.2-1. Soil Parameters for PMBW External Stability Evaluation

Soil Description	Unit Weight (pcf)	Drained Friction Angle (degrees)	Undrained Cohesion (psf)
Backfill Soils	125	34	0
Retained Soil	120	28	0
Foundation Soils*	120	28	1,000

*Assuming soil correction is performed.

We recommend the retained soil parameters based on the existing mixed fill soils, including lean clays, sandy lean clays, clay sands, and silty sands. The foundation soils are assumed to consist of the underlying stiff sandy lean clay till. Additional borings or test pit excavations could be performed to provide additional information on the strength of the retained soil.

We recommend the bottom of the leveling pad be embedded at least 4 feet (i.e. minimum 4 feet of cover for the bottom of the wall) for frost protection, and that a minimum 6-inch thick unreinforced concrete leveling pad be utilized, which is consistent with the PMBW special provisions.

Gravity PMBW's are not allowed to support traffic within a 1V:1H horizontal distance measured from the front face bottom corner of the bottom block per MnDOT standards. For example, assuming the anticipated maximum exposed wall height of 5 feet and assuming the lowest block course is 3½ feet below grade (on top of the leveling pad) results in the roadway being no closer than 8½ feet behind the top of the wall to satisfy the design standard. A thicker leveling pad could be used to raise the lowest course of block and reduce the roadway set back distance.

8.3 Grading Recommendations

8.3.1 Excavation

To prepare the retaining wall area for foundation support, we recommend the excavation of all fill and swamp deposited soils from within the retaining wall footprint to the underlying naturally-deposited stiff sandy lean clay till. Excavations should extend at least 6 inches below the proposed bottom of wall elevation for the placement of a leveling pad (typically unreinforced concrete per the MnDOT PMBW special provisions). This would result in excavation depths at the boring locations as shown in Table 8.3.1.

Table 8.3.1 – Recommended Excavation Depths

Boring Location	Surface Elevation (ft)	Excavation Depth (ft)	Approximate Excavation Elevation (ft)
B-10	962.8	12	951
B-11	962.9	12	951

The depth/elevation indicated in Table 8.3.1 is based on the soil condition at the specific boring location. Since conditions will vary away from the boring location, it is recommended that AET geotechnical personnel observe and confirm the competency of the soils in the entire excavation bottom prior to new fill or leveling pad placement.

Where the excavation extends below foundation grade, the excavation bottom and resultant engineered fill system must be oversized laterally beyond the planned outside edges of the foundations to properly support the lateral loads exerted by that foundation. This excavation/engineered fill lateral extension should at least be equal to the vertical depth of fill needed to attain foundation grade at that location (i.e., 1H:1V lateral oversize).

8.3.2 Excavations Adjacent to Existing Utilities, Roadways, and Culvert

Extreme care should be exercised when excavating adjacent to the existing culvert, pavements, and utilities, as these activities could possibly undermine foundations, or other grade supported improvements. Excavations should not extend below any existing slabs, pavements, or utilities. Excavation slopes adjacent to the existing structures or utilities should be cut in a benched pattern which should exhibit an overall slope of approximately 2H:1V or flatter and individual benches should not be taller than 2 feet. If this cannot be accomplished, underpinning or soil stabilization may be needed for proper support of the existing structure.

Groundwater and outlet channel water control may be required to allow excavations and earthwork operations adjacent to the culvert to be performed under dry conditions. If groundwater is encountered, the level of drawdown should be achieved before the excavation reaches the planned elevation and maintained at least 2 feet below the lowest anticipated subgrade or subcut elevation. The water table should not be lowered more than necessary to provide a dry excavation, to reduce the risk of settlement of adjacent structures, pavements, and sewers. It is the responsibility of the designers of the dewatering system to assess the effects of lowering the groundwater on adjacent structures, pavements, or sewers.

8.3.3 Subgrade Fill Placement and Compaction

Fill placed to attain grade for foundation support (i.e. to backfill any excavations that may be needed below the leveling pad) should be compacted in thin lifts, such that the entire lift achieves a minimum compaction level of 98% of the standard maximum dry unit weight per ASTM:D698 (Standard Proctor test). Fill placed outside of the 1:1 oversize zone below the leveling pad should have a minimum compaction level of 95% of the standard maximum dry unit weight. All fill should be free of debris, rubble, organics, and other unsuitable materials. All fill soils should be compacted with equipment which will densify the entire lift of fill. Fill should not be placed over frozen soils, and frozen soils should not be used as fill.

8.4 Foundation Support Recommendations

The MnDOT PMBW standard plans require an allowable bearing pressure of 2,000 psf for walls up to 10 feet tall (8-foot exposed height, with minimum 2 feet embedment) with level fill at the top of the wall.

Based on the conditions encountered, it is our opinion the encountered soil conditions would be suitable for conventional foundation design for PMBW retaining walls based on an allowable soil bearing pressure of up to 2,000 psf. It is our judgment this design pressure will have a factor of safety of at least 3 with respect to the ultimate bearing capacity. We estimate that total settlements under these loadings should not exceed 1-inch and differential settlements are estimated to be less than 1"/200" over the length of each wall assuming the soils along the length of the wall are uniform as depicted in the borings.

The bottoms of all foundation excavations should be free of water and loose soil prior to placing structural fill or concrete. Structural fill should be placed soon after excavating to reduce bearing

soil disturbance, and concrete should be placed soon after excavating or completion of the structural fill placement. If the materials at bearing level become excessively dry, disturbed, saturated, or frozen, the affected material should be removed and replaced prior to placing concrete.

8.5 Wall Backfill Recommendations

The new wall backfill should consist of *Select Granular Material Modified 10%* per the MnDOT PMBW special provisions. The new fill material should provide a minimum friction angle of 34 degrees, which should be confirmed via material testing in accordance with Standard Method of Direct Shear Test of Soils under Consolidated Drained Conditions (ASTM: D3080/AASHTO T236). The zone of sand backfill should extend behind the wall to a 2V:1H (i.e. 63 degree) backslope up from the back of the leveling pad for the blocks.

Wall backfill should be compacted in thin lifts, such that the entire lift achieves a minimum compaction level of at least 95% of the standard maximum dry unit weight per ASTM: D698 (Standard Proctor test). Note the MnDOT PMBW specifications or the wall designer may require a higher compaction level, particularly if the backfill supports pavements or other surface structures.

Compaction within 3 feet of the back of the retaining wall should be accomplished with hand-operated tampers or other lightweight compactors. Over-compaction may cause excessive lateral earth pressures which could result in unexpected wall movement or cracking.

8.6 Wall Drainage Recommendations

We recommend that a perforated drainpipe wrapped with Type I geotextile (meeting MnDOT Spec. 3733) be placed immediately behind the block at the same elevation as the lowest block course, on top of the concrete leveling pad. The drain pipe should extend through the wall at maximum intervals of 150 feet to gravity outlet or connect to the existing storm sewer system, if feasible.

9.0 CONSTRUCTION CONSIDERATIONS

9.1 Potential Difficulties

9.1.1 Water in Excavations

Groundwater was observed in 2 of the 13 borings drilled in the planned project areas. Groundwater should also be expected near the level of the lake outlet channel. Water also 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.

If groundwater is encountered, the level of drawdown should be achieved before the excavation reaches the planned elevation and maintained at least 2 feet below the lowest anticipated subgrade or subcut elevation. The water table should not be lowered more than necessary to provide a dry excavation, to reduce the risk of settlement of adjacent structures, pavements, and sewers. It is the responsibility of the designers of the dewatering system to assess the effects of lowering the groundwater on adjacent structures, pavements, or sewers.

9.1.2 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.

9.1.3 Cobbles and Boulders

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

9.2 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.

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

10.0 ASTM 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.

11.0 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.”

UTILITY EXCAVATION BACKFILLING

GENERAL

Clayey and silty soils are often difficult to compact, as they may be naturally wet or dry, or may become wet due to ground water or runoff water during construction. Soils will need to be placed within a certain range of water (moisture) content to attain desired compaction levels. Moisture conditioning to within this range can be time consuming and labor intensive, and will require favorable weather.

The degree of compaction and the soil type used for backfill within open cut utility excavations depends on the eventual function of the overlying land surface. Details are as follows:

ROADWAYS

Where trenches are located below roadways, we recommend using inorganic fill and compacting these soils per MnDOT Specification 2105.3F1 (Specified Density Method). On MnDOT funded roads, the 2016 Specification requires 100% compaction over the entire trench depth. On non-MnDOT funded roads, we feel the specification can be relaxed to the previous version of achieving 100% of the Standard Proctor density in the upper 3-foot subgrade zone, and 95% below this depth. Note that this specification also includes moisture content range requirements which are important for proper subgrade stability.

Where available soils are wet or of poor quality, it may be possible to use the “Quality Compaction Method” (MnDOT Specification 2105.3F2) for soils below the upper 3-foot subgrade zone if you can tolerate some subsidence. However, a high level of stability is still important within the upper subgrade zone and recommend that the “Specified Density Method" be used in this upper subgrade area. We caution that if backfill soils in the lower trench area are significantly unstable, it may be difficult or even impossible to properly compact soils within the upper 3-foot subgrade zone. In this case, road subgrade stability can be improved by placing a geotextile reinforcement fabric directly over the unstable soils followed by properly drained granular fill placement.

STRUCTURAL AREAS

If fill is placed beneath or within the significant zone of influence of a structure (typically a 1:1 lateral oversize zone), the soil type and minimum compaction level will need to be evaluated on an individual basis. Because trenches result in variable fill depths over a short lateral distance, higher than normal compaction levels and/or more favorable (sandy) soil fill types may be needed. If this situation exists, it is important that special geotechnical engineering review be performed.

NON-STRUCTURAL AREAS

In grass/ditch areas, backfill soils should be placed in reasonable lift thicknesses and compacted to a minimum of 90% of the Standard Proctor density (ASTM: D698) and/or per the MnDOT “Quality Compaction Method.” If lower compaction levels are accepted, more noticeable subsidence at the surface can occur. Steep or high slopes require special consideration, and if this situation exists, it is important that special geotechnical engineering review be performed.

SPECIAL CASES

Structural retention systems are often used to reduce impacts on adjacent streets/improvements. If localized excavations/pits or annular spaces are created which need to be backfilled, it may not be possible to place and compact soils by the conventional means of backfilling. Retraction of structural systems can also leave soils loosened. Significant settlement can occur in areas where backfill cannot be compacted. If these situations are located in non-structural or non-paved areas, it may be reasonable to accept the settlements and associated follow-up maintenance in order avoid the high cost of trying to compact the soil or placing flowable lean concrete fill. However, there may be areas where fill settlement needs to be avoided, especially as the settlement will be differential from the surrounding surface, or differential from a buried structure in the case of higher piping entering the structure. Where settlement needs to be avoided, the specification should require that the contractor submit a backfill compaction plan along with the retention plan. Improper sequencing of retention system removal and backfilling of the pits could result in excessive settlement and/or lateral movement of nearby improvements.

DEFINITIONS RELATING TO PAVEMENT CONSTRUCTION

Top of subgrade: Grade which contacts the bottom of the aggregate base layer.

Sand subbase: Uniform thickness sand layer placed as the top of subgrade which is intended to improve the frost and drainage characteristics of the pavement system by increasing drainage of excess water in the aggregate base and subbase, by reducing and "bridging" frost heaving, and by reducing spring thaw weakening effects.

Critical subgrade zone: The subgrade portion beneath and within three vertical feet of the top of subgrade. A sand subbase, if placed, would be considered the upper portion of the critical subgrade zone.

Suitable Grading Material: Mineral soil materials, typically from the project site, excluding the following: 1) soils which have an organic content exceeding 3%, 2) cohesive soils having a Liquid Limit exceeding 50%, 3) soils which include debris, cobbles, and/or boulders, and 4) soils which are considered acceptable from an environmental standpoint. The soil must also be capable of attaining the specified compaction level at its current water content or at a water content that can be reasonably scarified, blended, and moisture conditioned to a uniform water content in order to uniformly meet compaction requirements.

Granular Material: Soils meeting MnDOT Specification 3149.2B.1. This refers to granular soils which, of the portion passing the 1" sieve, contain less than 20% by weight passing the #200 sieve.

Select Granular Material: Soils meeting MnDOT Specification 3149.2B.2. This refers to granular soils which, of the portion passing the 1" sieve, contain less than 12% by weight passing the #200 sieve.

Select Granular Material (Super Sand): Soils meeting MnDOT Specification 3149.2B.3. This material is cleaner and coarser than Select Granular Material (see specification for specific requirements).

Compaction Subcut: Construction of a uniform thickness subcut below a designated grade to provide uniformity and compaction within the subcut zone. Replacement fill can be the materials subcut, although the reused soils should be blended to a uniform soil condition, moisture conditioned as needed to meet MnDOT Specification 2105.F; and re-compacted per the Specified Density Method defined in MnDOT Specification 2105.3F.1.

Test Roll: A means of evaluating the near-surface stability of subgrade soils (usually non-granular). Suitability is determined by the depth of rutting or deflection caused by passage of heavy rubber-tired construction equipment, such as a loaded dump truck, over the test area. Yielding of less than 1" is normally considered acceptable, although engineering judgment may be applied depending on the equipment used, soil conditions present, and/or depth below final grade.

Unstable Soils: Subgrade soils which do not pass a test roll. Unstable soils typically have water content exceeding the *standard optimum water content* defined in ASTM:D698 (Standard Proctor test).

Organic Soils: Soils which have sufficient organic content such that the soils engineering properties are negatively affected (typically more than 3% organic content). These soils are usually black to dark brown in color.

Appendix A

Geotechnical Field Exploration and Testing
Boring Log Notes
Unified Soil Classification System
AASHTO Classification System
Figures 1 to 3 – Boring Locations
Subsurface Boring Logs
Sieve Analysis Tests
MnDOT Figure 2411-1 Gravity PMBW Material Definitions/Typical Cross Sections

Appendix A
Geotechnical Field Exploration and Testing
Report No. 20-23155

A.1 FIELD EXPLORATION

The subsurface conditions at the site were explored by drilling and sampling 13 standard penetration test borings. The locations of the borings appear on Figure 1, preceding the Subsurface Boring Logs in this appendix.

A.2 SAMPLING METHODS

A.2.1 Split-Spoon Samples (SS) - Calibrated to N_{60} Values

Standard penetration (split-spoon) samples were collected in general accordance with ASTM: D1586 with one primary modification. 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. Our method uses a modified hammer weight, which is determined by measuring the system energy using a Pile Driving Analyzer (PDA) and an instrumented rod.

In the past, standard penetration N-value tests were performed using a rope and cathead for the lift and drop system. The energy transferred to the split-spoon sampler was typically limited to about 60% of its potential energy due to the friction inherent in this system. This converted energy then provides what is known as an N_{60} blow count.

The most recent drill rigs incorporate an automatic hammer lift and drop system, which has higher energy efficiency and subsequently results in lower N-values than the traditional N_{60} values. By using the PDA energy measurement equipment, we are able to determine actual energy generated by the drop hammer. With the various hammer systems available, we have found highly variable energies ranging from 55% to over 100%. Therefore, the intent of AET's hammer calibrations is to vary the hammer weight such that hammer energies lie within about 60% to 65% of the theoretical energy of a 140-pound weight falling 30 inches. The current ASTM procedure acknowledges the wide variation in N-values, stating that N-values of 100% or more have been observed. Although we have not yet determined the statistical measurement uncertainty of our calibrated method to date, we can state that the accuracy deviation of the N-values using this method is significantly better than the standard ASTM Method.

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 (USC) system. The USC system 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 USC system, 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 ground water 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 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.5.2 Sieve Analysis of Soils (thru #200 Sieve)

Conducted per AET Procedure 01-LAB-040, which is performed in general conformance with ASTM: D6913, Method A.

A.5.3 Laboratory Soil Resistivity using the Wenner Four-Electrode Method

Conducted per AET Procedure 01-LAB-090, which is performed using Soil Box apparatus in the laboratory in general accordance with ASTM: G57

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 for a period of 30 days.

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
(Calibrated Hammer Weight)

The standard penetration test consists of driving a split-spoon sampler with a drop hammer (calibrated weight varies to provide N_{60} values) and 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").

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≥4 and 1≤Cc≤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≥6 and 1≤Cc≤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]

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.

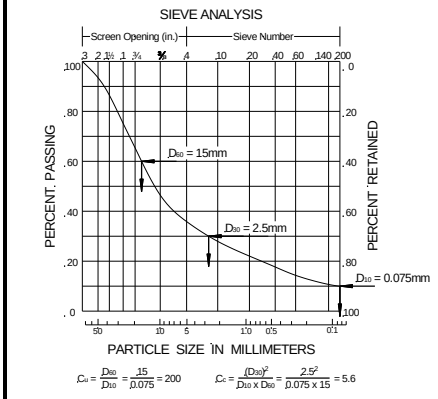
[N]PI≥4 and plots on or above "A" line.

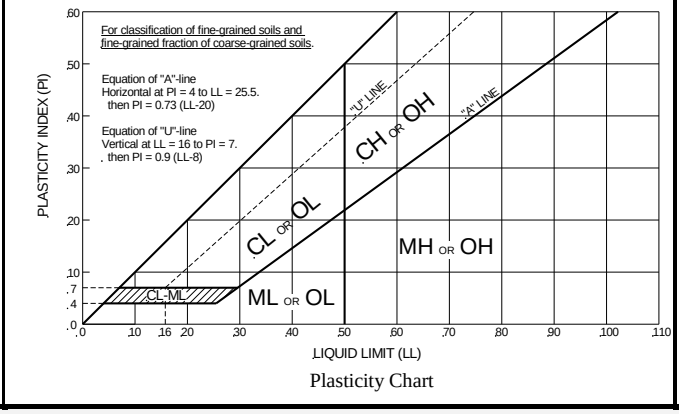
[O]PI<4 or plots below "A" line.

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

[Q]PI plots below "A" line.

[R]Fiber Content description shown below.





Plasticity Chart

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

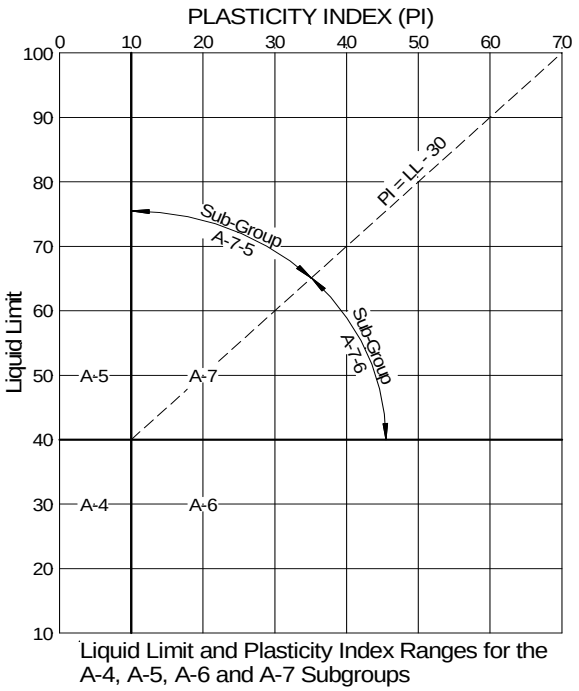
Classification of Soils and Soil-Aggregate Mixtures

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%.



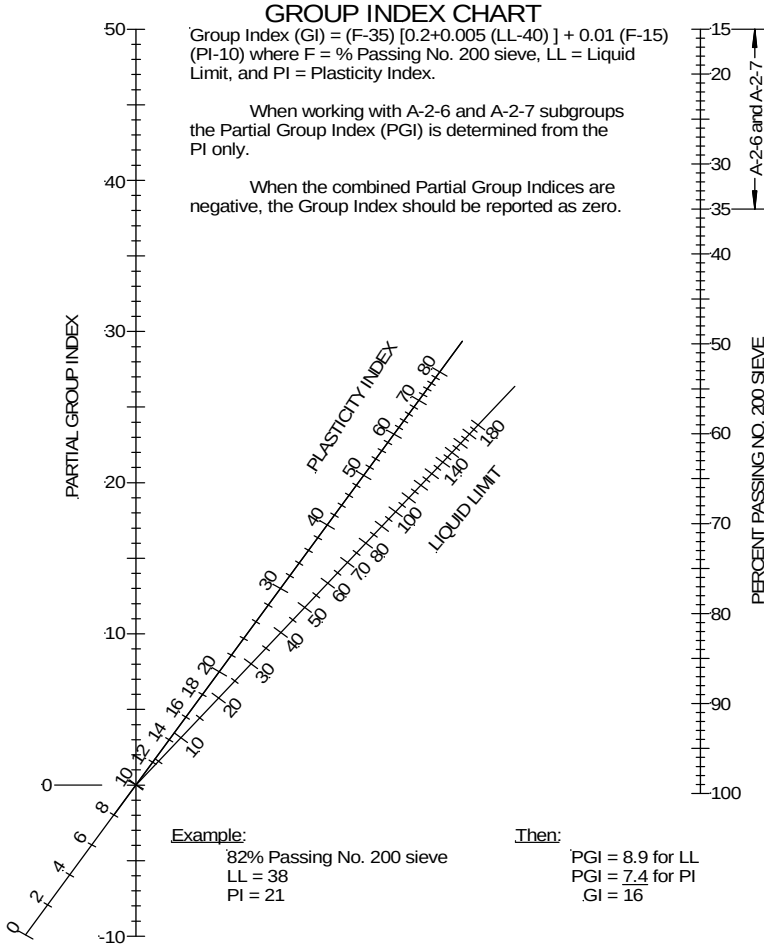
Liquid Limit and Plasticity Index Ranges for the A-4, A-5, A-6 and A-7 Subgroups

GROUP INDEX CHART

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.

2022 Infrastructure Improvements

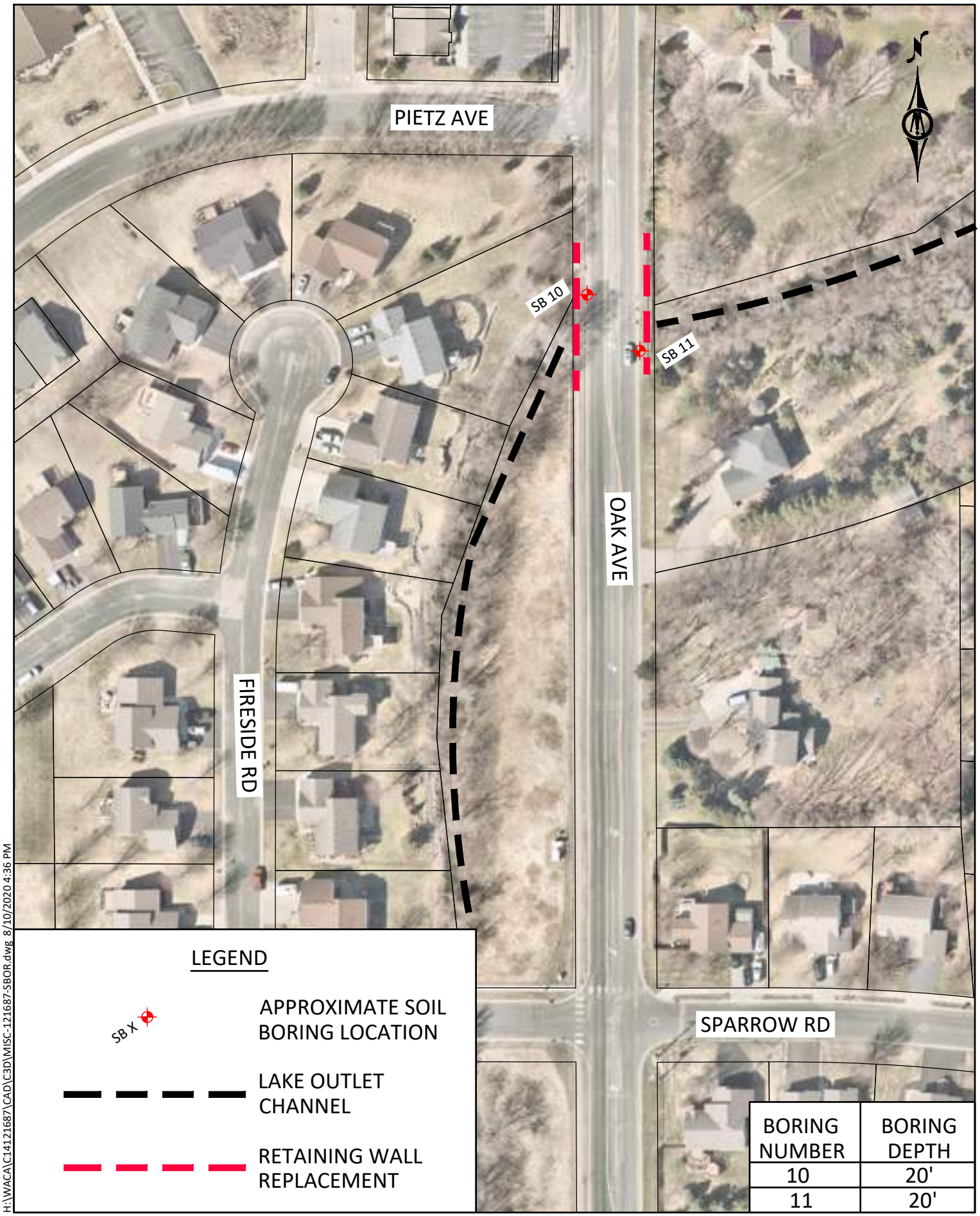
City of Waconia

Soil Boring Locations

August 2020

BOLTON & MENK

HORZ. SCALE 0 50 100 FEET



LEGEND

- SB X — APPROXIMATE SOIL BORING LOCATION
- LAKE OUTLET CHANNEL
- RETAINING WALL REPLACEMENT

BORING NUMBER	BORING DEPTH
10	20'
11	20'

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2022 Infrastructure Improvements

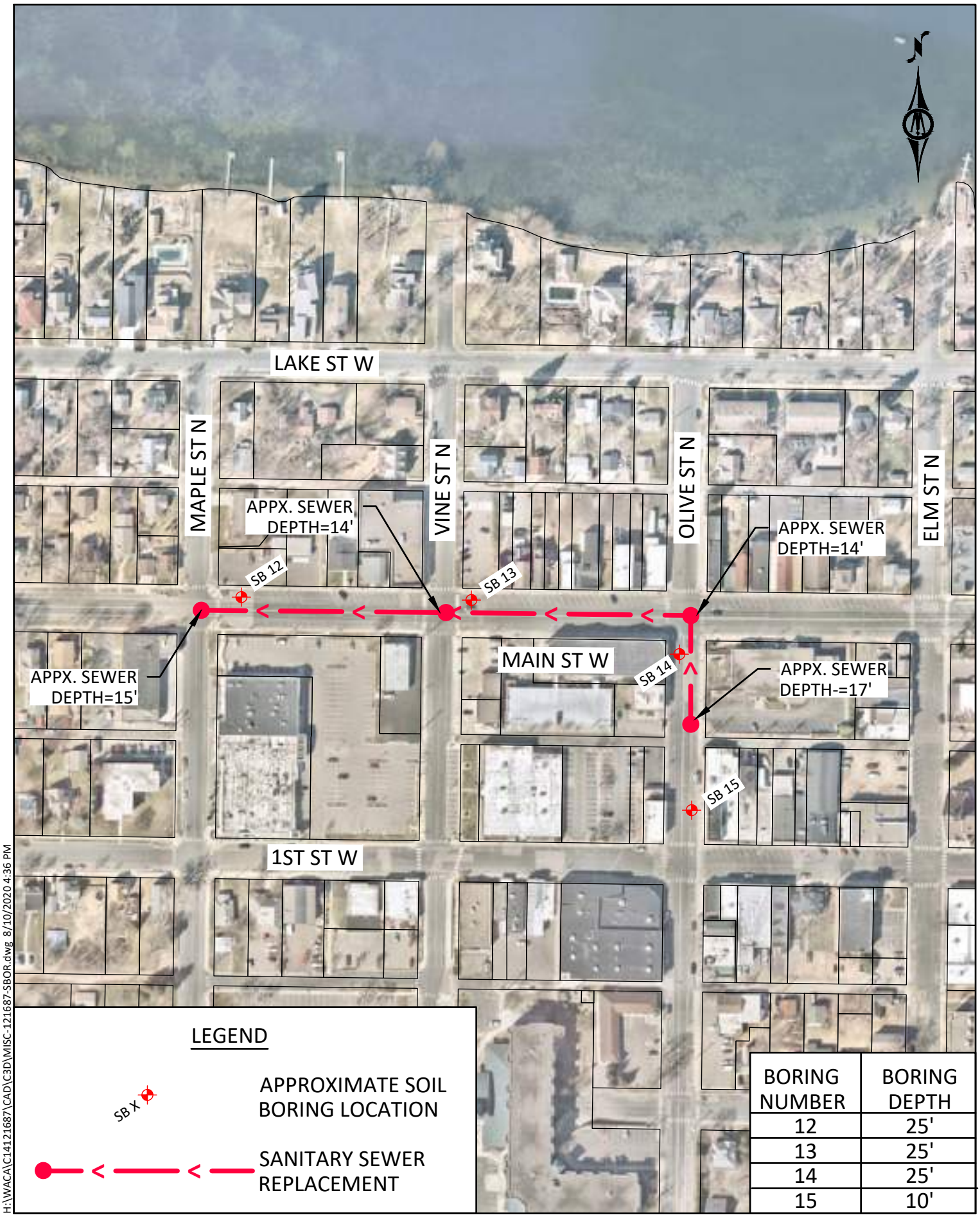
City of Waconia

Soil Boring Locations

August 2020

BOLTON & MENK

HORZ. SCALE 0 100 200 FEET



LEGEND

SB X — APPROXIMATE SOIL BORING LOCATION

SANITARY SEWER REPLACEMENT

BORING NUMBER	BORING DEPTH
12	25'
13	25'
14	25'
15	10'

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2023 Infrastructure Improvements

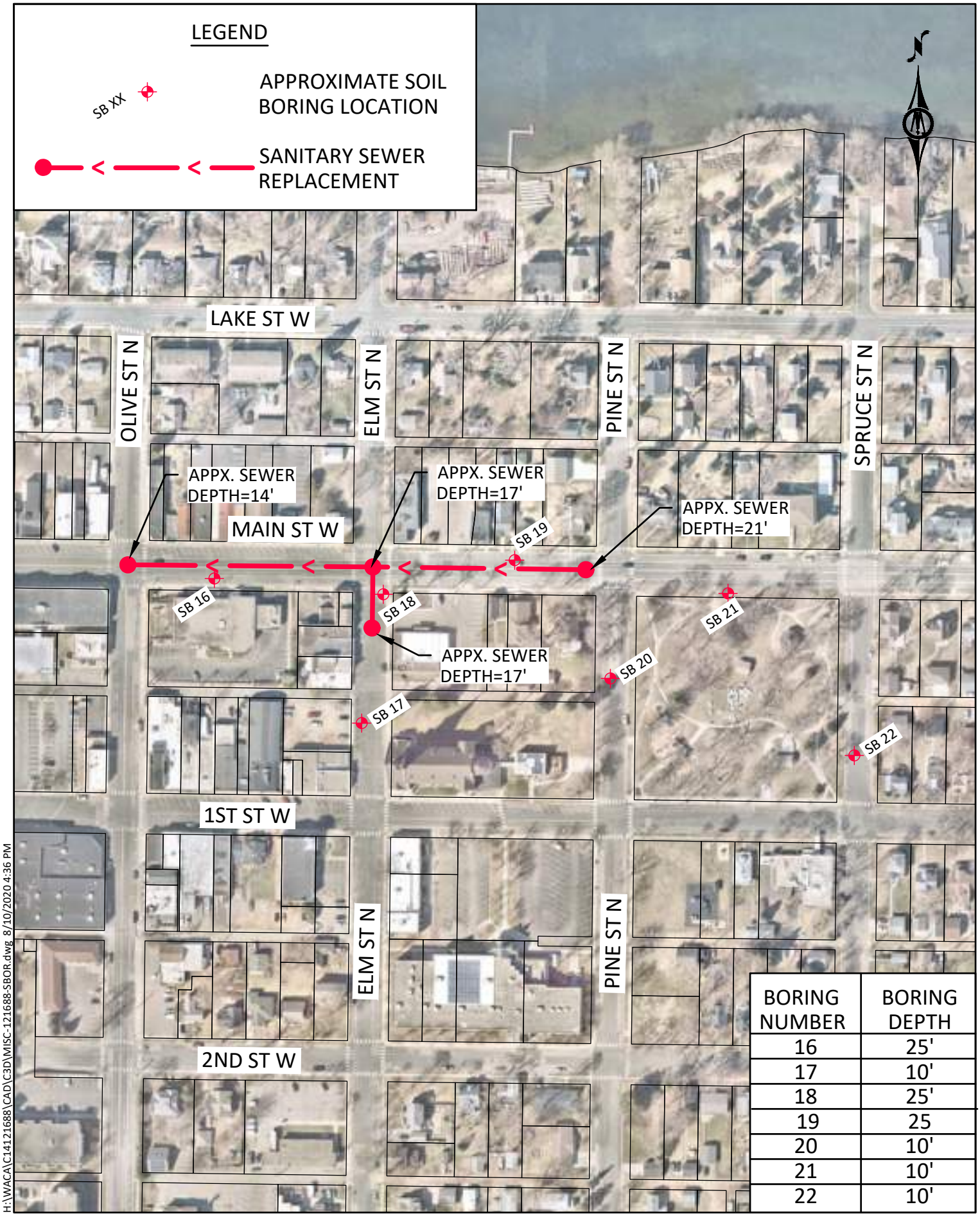
City of Waconia

Soil Boring Locations

August 2020

BOLTON & MENK

HORZ. SCALE 0 100 200 FEET



BORING NUMBER	BORING DEPTH
16	25'
17	10'
18	25'
19	25
20	10'
21	10'
22	10'

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AMERICAN ENGINEERING TESTING, INC.

SUBSURFACE BORING LOG

AET No: **20-23155** Log of Boring No. **B-10 (p. 1 of 1)**

Project: **2022 and 2023 Infrastructure Improvement Projects; Waconia, MN**

Surface Elevation 962.8

DEPTH IN FEET	MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS WC	DEN	LL	PL	%-#200
	7½" Bituminous pavement	FILL			SU						
1	FILL, mostly silty sand with gravel, brown, A-1-b		16	M	SS	12	13				
2	FILL, mostly clayey sand, a little gravel, geofabric, brown and black, A-6										
3	FILL, mostly lean clay, brown, A-6		10	M	SS	14	38				
4											
5	FILL, mixture of sandy lean clay and lean clay, brown and dark brown, A-6		7	M	SS	14	17				
6											
7											
8	FILL, mixture of organic clay and sandy lean clay, a little gravel, brown and black, A-6 and A-8		4	M	SS	12	31				
9											
10	SANDY LEAN CLAY, a little gravel, trace roots, brown to gray, soft to stiff, A-6 (CL)	TILL	4	M	SS	20	29				
11											
12											
13			7	M	SS	24	21				
14											
15	CLAYEY SAND, a little gravel, gray, stiff, A-6 (SC)		12	M	SS	18	20				
16											
17											
18											
19			12	M	SS	18	18				
	END OF BORING										

DEPTH: DRILLING METHOD

0-17½' 3.25" HSA

BORING COMPLETED: **10/8/20**

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

WATER LEVEL MEASUREMENTS

DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL	WATER LEVEL
10/8/20	**12:20**	**19.5**	**17.5**	**19.1**		**None**
10/8/20	**12:30**	**19.5**	**17.5**	**19.1**		**None**

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

AET_CORP 20-23155.GPJ AET+CPT+WELL_20181012_JG.GDT 12/15/20

AMERICAN ENGINEERING TESTING, INC.

SUBSURFACE BORING LOG

AET No: **20-23155** Log of Boring No. **B-11 (p. 1 of 1)**

Project: **2022 and 2023 Infrastructure Improvement Projects; Waconia, MN**

DEPTH IN FEET	Surface Elevation 962.9 MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS WC	DEN	LL	PL	%-#200
	8¼" Bituminous pavement	FILL			SU						
1	12" FILL, mostly crushed limestone, brown, A-1-b		39	M	SS	15	19				
2	FILL, mostly clayey sand, a little gravel, geofabric, black, A-6										
3			15	M	SS	17	26				
4	FILL, mixture of organic clay and gravelly silty sand, black, A-2-4 and A-8										
5	FILL, mostly organic clay, a little silty sand and gravel, black, A-8										
6			15	M	SS	18	27				
7											
8	ORGANIC CLAY, black, firm, A-8 (OL/OH)	SWAMP DEPOSIT	6	M	SS	12	30				
9											
10	SANDY LEAN CLAY, a little gravel, gray to brown, firm to stiff, A-6 (CL)	TILL	5	M	SS	17	25 22				
11											
12											
13			11	M	SS	24	20				
14											
15	CLAYEY SAND, a little gravel, gray, stiff to very stiff, A-6 (SC)		14	M	SS	18	17				
16											
17											
18			18	M	SS	18	17				
19											
	END OF BORING										

DEPTH: DRILLING METHOD

0-17½' 3.25" HSA

BORING COMPLETED: **10/8/20**

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

WATER LEVEL MEASUREMENTS

DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL	WATER LEVEL
10/8/20	**1:30**	**19.5**	**17.5**	**19.0**		**None**
10/8/20	**1:40**	**19.5**	**17.5**	**19.0**		**None**

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

AET_CORP 20-23155.GPJ AET+CPT+WELL_20181012_JG.GDT 1/29/21

AMERICAN ENGINEERING TESTING, INC.

SUBSURFACE BORING LOG

AET No: **20-23155** Log of Boring No. **B-12 (p. 1 of 1)**

Project: **2022 and 2023 Infrastructure Improvement Projects; Waconia, MN**

Surface Elevation 1011.5

DEPTH IN FEET	MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS WC	DEN	LL	PL	%-#200
	7½" Bituminous pavement	FILL			SU						
1	FILL, mostly silty sand with gravel, pieces of concrete, geotextile, brown, A-1-b		75	M	SS	3					
2											
3	FILL, mostly silty sand with gravel, a little clayey sand and gravel, pieces of bituminous pavement, brown, A-1-b		28	M	SS	22					
4											
5	FILL, mostly sandy lean clay, a little gravel, brown and dark brown, A-6		11	M	SS	18	24				
6											
7											
8			2	M	SS	4	23				
9											
10			5	M	SS	10	21				
11											
12	ORGANIC CLAY, black, firm, A-8 (OL/OH)	SWAMP DEPOSIT									
13			8	M	SS	12	26				
14											
15	SANDY LEAN CLAY, slightly organic, dark brown, grayish brown, firm, A-6 (CL)	FINE ALLUVIUM	7	M	SS	22	24				
16											
17											
18	SANDY LEAN CLAY, a little gravel, brown and gray mottled, a little light gray, stiff, laminations of silt, A-6 (CL)	TILL	14	M	SS	15	14				
19											
20	CLAYEY SAND, a little gravel, brown and a little dark brown, very stiff, laminations of sandy silt, A-6 (SC)		22	M	SS	13	18				
21											
22	CLAYEY SAND, a little gravel, brown, very stiff, laminations of silty sand, A-6 (SC)										
23			24	M	SS	17	20				
24	**END OF BORING**										

DEPTH: DRILLING METHOD

0-22½' 3.25" HSA

BORING COMPLETED: **10/6/20**

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

WATER LEVEL MEASUREMENTS

DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL	WATER LEVEL
10/6/20	**11:40**	**24.0**	**22.5**	**23.9**		**None**
10/6/20	**11:50**	**24.0**	**22.5**	**23.9**		**None**

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

AET_CORP 20-23155.GPJ AET+CPT+WELL_20181012_JG.GDT 12/15/20

AMERICAN ENGINEERING TESTING, INC.

SUBSURFACE BORING LOG

AET No: **20-23155** Log of Boring No. **B-13 (p. 1 of 1)**

Project: **2022 and 2023 Infrastructure Improvement Projects; Waconia, MN**

DEPTH IN FEET	Surface Elevation 1012.3 MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS WC	DEN	LL	PL	%-#200
	6½" Bituminous pavement	FILL			SU						
1	8½" FILL, crushed limestone, light brown A-1-b		18	M	SS	17					
2	FILL, mostly silty sand, a little clayey sand and gravel, brown, A-2-4										
3			26	M	SS	19					
4											
5	FILL, mostly gravelly sand with silt, brown, A-1-b										
6			18	M	SS	10					
7											
8	SANDY LEAN CLAY, brown, a little gray, firm, laminations of sand and silt, A-6 (CL)	FINE ALLUVIUM	6	M	SS	18	29				
9											
10	SANDY LEAN CLAY, a little gravel, brown, firm, laminations of silty sand, A-6 (CL)	TILL									
11			5	M	SS	24	18				
12											
13	SANDY LEAN CLAY, a little gravel, gray, very stiff to stiff, A-6 (CL)		19	M	SS	24	17				
14											
15			14	M	SS	18	18				56
16											
17											
18	CLAYEY SAND, a little gravel, gray, a little brown, hard, laminations of silty sand, A-6 (SC)										
19											
20			47	M	SS	18	15				
21											
22	CLAYEY SAND, a little gravel, gray, a little light gray, hard, laminations of sand (SC)										
23			54	M	SS	6	15				
24	**END OF BORING**										

DEPTH: DRILLING METHOD	WATER LEVEL MEASUREMENTS							NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG
0-22½' 3.25" HSA	DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL	WATER LEVEL	
	10/6/20	**10:10**	**24.0**	**22.5**	**23.8**		**None**	
	10/6/20	**10:20**	**24.0**	**22.5**	**23.8**		**None**	
BORING COMPLETED: **10/6/20**								
DR: **DS** LG: **SB** Rig: **1C**								

AET_CORP 20-23155.GPJ AET+CPT+WELL_20181012_JG.GDT 12/15/20

AMERICAN ENGINEERING TESTING, INC.

SUBSURFACE BORING LOG

AET No: **20-23155** Log of Boring No. **B-14 (p. 1 of 1)**

Project: **2022 and 2023 Infrastructure Improvement Projects; Waconia, MN**

Surface Elevation 1017.4

DEPTH IN FEET	MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS WC	DEN	LL	PL	%-#200
	6¾" Bituminous pavement	FILL			SU						
1	FILL, mostly silty sand with gravel, brown, A-1-b		11	M	SS	15	11				
2	FILL, mostly clayey sand, a little silty sand and gravel, brown, A-6										
3			7	M	SS	7	11				
4											
5											
6			4	M	SS	4	14				
7											
8	FILL, mostly sandy lean clay, a little gravel, brown, A-6		1	M	SS	12	22				
9											
10	SANDY LEAN CLAY, a little gravel, brown to brown and dark brown mottled, firm to very stiff, A-6 (CL)	TILL	7	M	SS	18	19				
11											
12											
13			18	M ▼	SS	22	18				
14											
15	SANDY LEAN CLAY, a little gravel, grayish brown, stiff to very stiff, A-6 (CL)		15	M	SS	18	19				
16											
17											
18											
19											
20			18	M	SS	18	21				
21											
22											
23			16	M	SS	18	22				
24	**END OF BORING**										

DEPTH: DRILLING METHOD

0-22½' 3.25" HSA

BORING COMPLETED: **10/6/20**

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

WATER LEVEL MEASUREMENTS

DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL	WATER LEVEL
10/6/20	**1:10**	**24.0**	**22.5**	**24.0**		**19.6**
10/6/20	**1:30**	**24.0**	**22.5**	**23.9**		**13.7**

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

AET_CORP 20-23155.GPJ AET+CPT+WELL_20181012_JG.GDT 12/15/20

AMERICAN ENGINEERING TESTING, INC.

SUBSURFACE BORING LOG

AET No: **20-23155** Log of Boring No. **B-15 (p. 1 of 1)**

Project: **2022 and 2023 Infrastructure Improvement Projects; Waconia, MN**

DEPTH IN FEET	Surface Elevation 1025.6 MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS WC	DEN	LL	PL	%-#200
	6½" Bituminous pavement	FILL			SU						
1	FILL, mostly silty sand with gravel, pieces of bituminous pavement at 3', brown and black, A-1-b		16	M	SS	14					
2											
3			20	M	SS	10					
4											
5	FILL, mostly sandy lean clay, a little silty sand and gravel (apparent boulder at 5'), brown, a little light tan, A-6		55/.6	M	SS	6	17				
6											
7											
8	SANDY LEAN CLAY, a little gravel, grayish brown and brown mottled, a little light gray, stiff, laminations of silt and sandy silt, stiff, A-6 (CL)	TILL									
9			12	M	SS	24	20				
	END OF BORING										

DEPTH:	DRILLING METHOD	WATER LEVEL MEASUREMENTS							NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG
		DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL	WATER LEVEL	
0-7½'	**3.25" HSA**	**10/6/20**	**1:50**	**9.5**	**7.5**	**9.4**		**None**	
BORING COMPLETED:	**10/6/20**								
DR: **DS**	LG: **SB** Rig: **1C**								

AET_CORP 20-23155.GPJ AET+CPT+WELL_20181012_JG.GDT 1/29/21

AMERICAN ENGINEERING TESTING, INC.

SUBSURFACE BORING LOG

AET No: **20-23155** Log of Boring No. **B-16 (p. 1 of 1)**

Project: **2022 and 2023 Infrastructure Improvement Projects; Waconia, MN**

Surface Elevation 1019.7

DEPTH IN FEET	MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS WC	DEN	LL	PL	%-#200
	5¾" Bitiuminous pavement	FILL			SU						
1	FILL, mostly silty sand, a little gravel, brown, A-2-4		27	M	SS	17					
2											
3	FILL, mostly clayey sand, a little silty sand, gravel and bituminous pavement, brown, A-6		17	M	SS	18	15				
4											
5	SANDY LEAN CLAY, a little gravel, brown, a little gray mottled to brown, stiff to very stiff, A-6 (CL)	TILL	11	M	SS	22	19				
6											
7											
8			13	M	SS	24	20				
9											
10			15	M	SS	24	20				
11											
12											
13			17	M	SS	24	18				
14											
15			15	M	SS	24	19				54
16											
17											
18											
19											
20			16	M	SS	18	19				
21				▼							
22	CLAYEY SAND, a little gravel, brown, hard, lens of silty sand, A-6 (SC)										
23			39	M/W	SS	18	16				
24	**END OF BORING**										

DEPTH: DRILLING METHOD	WATER LEVEL MEASUREMENTS						
	DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL	WATER LEVEL
0-22½;' 3.25" HSA	**10/7/20**	**9:40**	**24.0**	**22.5**	**24.0**		**23.0**
	10/7/20	**9:50**	**24.0**	**22.5**	**24.0**		**21.4**
BORING COMPLETED: **10/7/20**							
DR: **DS** LG: **SB** Rig: **1C**							

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

AET_CORP 20-23155.GPJ AET+CPT+WELL_20181012_JG.GDT 1/29/21

AMERICAN ENGINEERING TESTING, INC.

SUBSURFACE BORING LOG

AET No: **20-23155** Log of Boring No. **B-17 (p. 1 of 1)**

Project: **2022 and 2023 Infrastructure Improvement Projects; Waconia, MN**

DEPTH IN FEET	Surface Elevation 1039.3 MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS WC	DEN	LL	PL	%-#200
	4¾" Bituminous pavement	FILL			SU						
1	FILL, mixture of crushed limestone and silty sand, brown, A-1-b		9	M	SS	10	21				
2	FILL, mostly clayey sand, a little gravel, brown, A-6	TILL									
3	CLAYEY SAND, a little gravel, brown, stiff, A-6 (SC)		10	M	SS	16	20				
4											
5											
6			11	M	SS	24	18				
7											
8											
9			12	M	SS	24	20				
	END OF BORING										

DEPTH: DRILLING METHOD	WATER LEVEL MEASUREMENTS							NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG
	DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL	WATER LEVEL	
0-7½' 3.25" HSA	**10/7/20**	**2:05**	**9.5**	**7.5**	**9.5**		**None**	
BORING COMPLETED: **10/7/20**								
DR: **DS** LG: **SB** Rig: **1C**								

AET_CORP 20-23155.GPJ AET+CPT+WELL_20181012_JG.GDT 12/15/20

AMERICAN ENGINEERING TESTING, INC.

SUBSURFACE BORING LOG

AET No: **20-23155** Log of Boring No. **B-18 (p. 1 of 1)**

Project: **2022 and 2023 Infrastructure Improvement Projects; Waconia, MN**

DEPTH IN FEET	Surface Elevation 1032.1 MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS WC	DEN	LL	PL	%-#200
	5½" Bituminous pavement	FILL			SU						
1	FILL, mostly gravelly silty sand, brown, A-1-b		28	M	SS	15					
2											
3	FILL, mostly gravelly clayey sand, brown, A-2-6		6	M	SS	19	12				
4											
5	FILL, mostly clayey sand, a little gravel, brown, A-6		6	M	SS	8	18				
6											
7	SANDY LEAN CLAY, a little gravel, brown, firm to very stiff, A-6 (CL)	TILL									
8			7	M	SS	20	18				
9											
10			12	M	SS	24	20				
11											
12											
13			19	M	SS	24	19				
14											
15			20	M	SS	18	20				
16											
17											
18											
19											
20			15	M	SS	18	20				56
21											
22											
23											
24			15	M	SS	18	19				
	END OF BORING										

DEPTH: DRILLING METHOD	WATER LEVEL MEASUREMENTS							NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG
0-23' 3.25" HSA	DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL	WATER LEVEL	
	10/7/20	**11:30**	**24.5**	**23.0**	**24.3**		**None**	
	10/7/20	**11:40**	**24.5**	**23.0**	**24.3**		**None**	
BORING COMPLETED: **10/7/20**								
DR: **DS** LG: **SB** Rig: **1C**								

AET_CORP 20-23155.GPJ AET+CPT+WELL_20181012_JG.GDT 12/15/20

AMERICAN ENGINEERING TESTING, INC.

SUBSURFACE BORING LOG

AET No: **20-23155** Log of Boring No. **B-19 (p. 1 of 1)**

Project: **2022 and 2023 Infrastructure Improvement Projects; Waconia, MN**

DEPTH IN FEET	Surface Elevation 1039.6 MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS WC	DEN	LL	PL	%-#200
	7¼" Bituminous pavement	FILL			SU						
1	FILL, mostly silty sand, a little gravel, brown, A-2-4		19	M	SS	15					
2											
3	FILL, mixture of clayey sand and silty sand with cinders, a little gravel, brown and dark brown. A-2-4 and A-6		11	M	SS	19	15				
4											
5	SANDY LEAN CLAY, a little gravel, brown to brown with a little gray mottled, stiff, A-6 (CL)	TILL	13	M	SS	22	18				
6											
7											
8			14	M	SS	20	20				
9											
10			12	M	SS	24	21				
11											
12											
13			13	M	SS	24	22				
14											
15			13	M	SS	18	21				
16											
17											
18											
19											
20			15	M	SS	18	20				
21											
22											
23											
24			12	M	SS	18	21				57
	END OF BORING										

DEPTH: DRILLING METHOD **0-23' 3.25" HSA**

BORING COMPLETED: **10/7/20**

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

WATER LEVEL MEASUREMENTS

DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL	WATER LEVEL
10/7/20	**1:10**	**24.5**	**23.0**	**24.0**		**None**
10/7/20	**1:20**	**24.5**	**23.0**	**24.0**		**None**

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

AET_CORP 20-23155.GPJ AET+CPT+WELL_20181012_JG.GDT 12/15/20

AMERICAN ENGINEERING TESTING, INC.

SUBSURFACE BORING LOG

AET No: **20-23155** Log of Boring No. **B-20 (p. 1 of 1)**

Project: **2022 and 2023 Infrastructure Improvement Projects; Waconia, MN**

Surface Elevation 1047.1

DEPTH IN FEET	MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS WC	DEN	LL	PL	%-#200
	2½" Bituminous pavement	FILL			SU		7				
1	FILL, mixture of clayey sand and silty sand, a little gravel, dark brown, A-2-6	TOPSOIL OR FILL	2	M	SS	6	28				
2	LEAN CLAY with sand, slightly organic, dark grayish brown, A-6 (possible fill) (CL)	TILL									
3	SANDY LEAN CLAY, a little gravel, brown, stiff, A-6 (CL)		12	M	SS	10	22				
4											
5	SANDY LEAN CLAY, a little gravel, brown, a little gray and light brown, stiff, laminations of sandy silt, A-6 (CL)										
6			11	M	SS	20	22				
7											
8	LEAN CLAY, brown, a little gray, stiff, laminations of silt, A-6 (CL)	FINE ALLUVIUM	11	M	SS	24	33				
9											
	END OF BORING										

DEPTH: DRILLING METHOD	WATER LEVEL MEASUREMENTS							NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG
	DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL	WATER LEVEL	
0-7½' 3.25" HSA	**10/8/20**	**10:50**	**9.5**	**7.5**	**9.5**		**None**	
BORING COMPLETED: **10/8/20**								
DR: **DS** LG: **SB** Rig: **1C**								

AET_CORP 20-23155.GPJ AET+CPT+WELL_20181012_JG.GDT 12/15/20

AMERICAN ENGINEERING TESTING, INC.

SUBSURFACE BORING LOG

AET No: **20-23155** Log of Boring No. **B-21 (p. 1 of 1)**

Project: **2022 and 2023 Infrastructure Improvement Projects; Waconia, MN**

DEPTH IN FEET	Surface Elevation 1043.2 MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS WC	DEN	LL	PL	%-#200
	5" Bituminous pavement	FILL			SU						
1	FILL, mostly silty sand, a little gravel, brown, A-2-4		25	M	SS	17					
2	FILL, mostly silty sand with gravel, pieces of bituminous, dark brown, A-1-b										
3			11	M	SS	19					
4	SANDY LEAN CLAY, a little gravel, brown, stiff, A-6 (CL)	TILL					23				
5	SANDY LEAN CLAY, a little gravel, brown, a little light brown, stiff, laminations of sandy silt, A-6 (CL)										
6			11	M	SS	22	22				
7											
8	SANDY LEAN CLAY, a little gravel, brown mottled, very stiff, A-6 (CL)										
9			18	M	SS	18	19				
	END OF BORING										

DEPTH: DRILLING METHOD	WATER LEVEL MEASUREMENTS							NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG
	DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL	WATER LEVEL	
0-7½' 3.25" HSA	**10/8/20**	**9:35**	**9.5**	**7.5**	**9.5**		**None**	
BORING COMPLETED: **10/8/20**								
DR: **DS** LG: **SB** Rig: **1C**								

AET_CORP 20-23155.GPJ AET+CPT+WELL_20181012_JG.GDT 12/15/20

AMERICAN ENGINEERING TESTING, INC.

SUBSURFACE BORING LOG

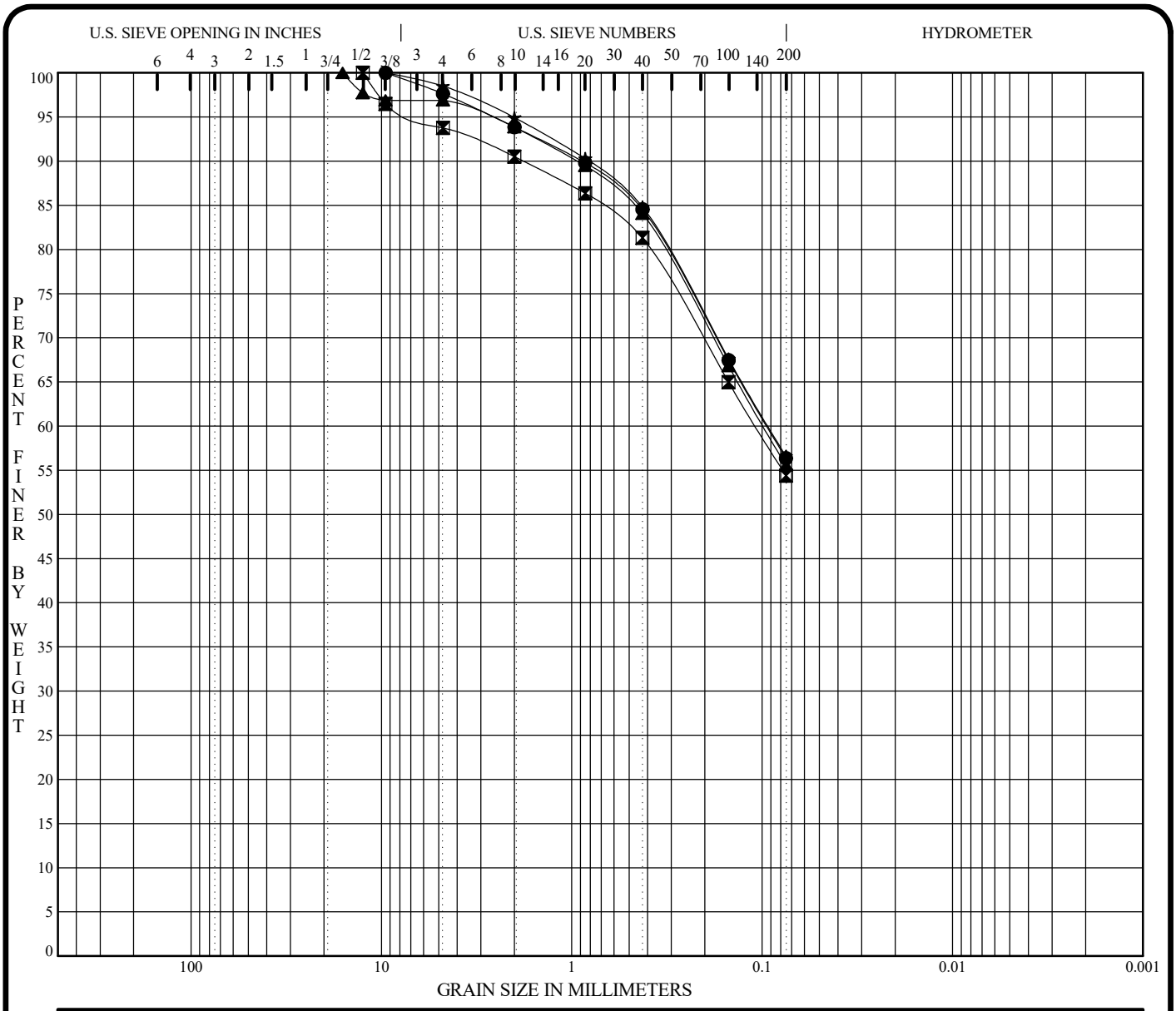
AET No: **20-23155** Log of Boring No. **B-22 (p. 1 of 1)**

Project: **2022 and 2023 Infrastructure Improvement Projects; Waconia, MN**

DEPTH IN FEET	Surface Elevation 1047.8 MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS WC	DEN	LL	PL	%-#200
	2¼" Bituminous pavement	FILL			SU						
1	FILL, mostly silty sand with gravel, brown, A-1-b		15	M	SS	17	26				
2	FILL, mixutre of lean clay, slightly organic, and silty sand, a little gravel, pieces of bituminous, dark brown and black, A-6	FINE ALLUVIUM									
3			17	M	SS	14	30				
4	LEAN CLAY, brown, a little gray, very stiff, A-7-6										
5	SILTY SAND, a little gravel, brown, medium dense, laminations of clayey sand, A-2-4 (SM)	TILL	11	M	SS	20	10				
6	SANDY LEAN CLAY, a little gravel, brown and gray mottled, a little light brown, stiff to very stiff, laminations of sandy silt and silty sand, A-6 (CL)										
7											
8			23	M	SS	22	19				
9											
	END OF BORING										

DEPTH:	DRILLING METHOD	WATER LEVEL MEASUREMENTS							NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG
		DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL	WATER LEVEL	
0-7½'	**3.25" HSA**	**10/8/20**	**10:20**	**9.5**	**7.5**	**9.5**		**None**	
BORING COMPLETED:	**10/8/20**								
DR: **DS**	LG: **SB** Rig: **1C**								

AET_CORP 20-23155.GPJ AET+CPT+WELL_20181012_JG.GDT 12/15/20



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	MC%	LL	PL	PI	Cc	Cu
●	**B-13**	**14.5'**	**SANDY LEAN CLAY (CL)**	**18**					
⧓	**B-16**	**14.5'**	**SANDY LEAN CLAY (CL)**	**19**					
▲	**B-18**	**19.5'**	**SANDY LEAN CLAY (CL)**	**20**					
★	**B-19**	**23.0'**	**SANDY LEAN CLAY (CL)**	**21**					

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**B-13**	**14.5'**	**9.50**	**0.09**			**2.4**	**41.3**	**56.4**	
⧓	**B-16**	**14.5'**	**12.50**	**0.11**			**6.2**	**39.4**	**54.4**	
▲	**B-18**	**19.5'**	**16.00**	**0.10**			**3.1**	**41.3**	**55.6**	
★	**B-19**	**23.0'**	**9.50**	**0.09**			**1.5**	**41.9**	**56.6**	

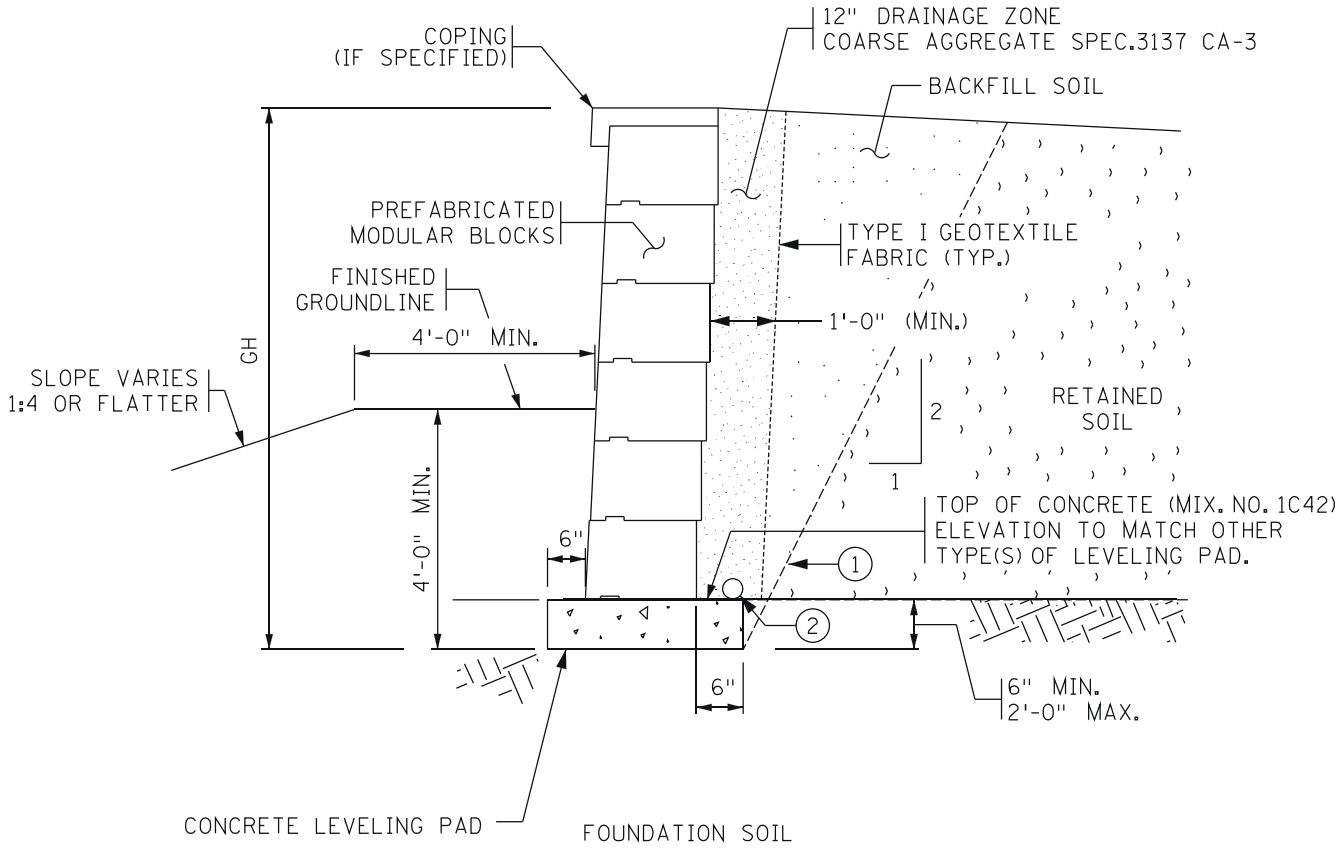
PROJECT **2022 and 2023 Infrastructure Improvement Projects; Waconia, MN**

AET JOB NO. **20-23155**

DATE **10/7/20**

AMERICAN ENGINEERING TESTING, INC.

GRADATION CURVES



TYPICAL SECTION OF GRAVITY WALL

NOT TO SCALE
LEVEL FILL

(1) PAY LIMIT (2:V TO 1:H) ACTUAL EXCAVATION SLOPE IS DETERMINED BY DESIGNER PREFERENCE OR OSHA REGULATIONS OF IN-SITU SOILS: EXCAVATION BEYOND THESE LIMITS AT CONTRACTORS EXPENSE.

(2) 4" THERMOPLASTIC PERFORATED PIPE, SPEC. 3245. WRAP WITH TYPE 1 GEOTEXTILE, SPEC. 3733, INSTALLATION AS PER SPEC. 2502. CONNECT TO DRAINAGE SYSTEM OR OUTLET THROUGH WALL USING 6" T.P. NON-PERFORATED PIPE WITH RODENT SCREEN. ALL WORK INCIDENTAL.

Figure 2411-1 Gravity PMBW Material Definitions/ Typical Cross Sections

Appendix B

Geotechnical Report Limitations and Guidelines for Use

Appendix B
Geotechnical Report Limitations and Guidelines for Use
Report No. 20-23155

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 <u>not</u> 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, 1300 Piccard Drive, LL14, Rockville, MD 20850
Telephone: 301/565-2733: www.geoprofessional.org, 2019

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 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.