FEASIBILITY STUDY

FOR

DOWNTOWN RECONSTRUCTION, PHASE 1 PROJECT

CITY OF WACONIA, MN



SEPTEMBER 2022

Prepared by: Bolton & Menk, Inc. 2638 Shadow Lane Suite 200 Chaska, MN 55318



Real People. Real Solutions.

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September 14, 2022

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

RE: Downtown Reconstruction, Phase 1 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 1 Project. These components include the following:

- Street reconstruction, sidewalk reconstruction, sanitary sewer, watermain, and storm sewer replacements of Main Street from Maple Street to Olive Street and of Olive Street from Main Street to First Street.
- Constructing a new stormwater reuse system consisting of an underground storage chamber in the alley 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 D. taublary

Jake S. Saulsbury, P.E.

Enclosure

FEASIBILITY STUDY

FOR

DOWNTOWN RECONSTRUCTION, PHASE 1 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.

he D. Jaublary

Jake S. Saulsbury, P.E.

Date: September 14, 2022

Registration No. <u>42713</u>

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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 recommendations for design, 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:

- Reconstruction of West Main Street (from South Maple Street to South Olive Street) and South Olive Street (from West Main Street to West 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 Olive Street.
 - Reconstruction of the streets to the City's truck route section.
 - Replacement of the sanitary sewer system, including service laterals.
 - Replacement and upsizing 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 and Olive Street.
- Construction of a stormwater reuse system on Main Street and in the alley to the north of Main Street.

Several options for the footprint of Main Street were shared online and at Open Houses. After gathering input and reviewing the options, the City Council elected the footprint that generally consists of the following:

- Maintain 60-degree angled parking on the north side of Main Street.
- Maintain parallel parking on the south side of Main Street.
- Reduce the total roadway width (curb to curb) by approximately 3 feet.

- Increase the total sidewalk width by approximately 3 feet (primarily on the north side).
- Add bumpouts consistent with findings from the previous Downtown Master Plan and consistent with previous projects in the downtown area.

The contents of this Feasibility Study and the widths of the roadway, parking areas, and sidewalks contained herein reflect this City Council direction discussed above.

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:

		\$5,784,500
2.)	Storm Water Reuse System	<u>\$1,191,000</u>
1.)	Street and Utility Reconstruction	\$4,593,500

The proposed method of financing for the Downtown Reconstruction, Phase 1 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, 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.

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 1 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

Figure 1.1: Project Location Map



City of Waconia

September 2022

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A. STREET IMPROVEMENTS

Figure No. 2.1 indicates the proposed street improvements on Main Street and Olive Street. The street improvements include removal of the existing road sections on each of the highlighted roads and rebuilding them to current city truck route standards, including replacement of existing curb and gutter sections. Adjustments in street widths are recommended as outlined below:

Road	То	From	Existing Width	Proposed Width	Road Section
Main Street	Maple St.	Olive St.	≈ 63.0 '	60.0'	Truck
Olive Street	Main St.	1st St.	≈ 51.0 '	44.0'	Truck

Proposed Road Widths (Back of Curb-to-Back of Curb)

Main Street is proposed to be narrowed by approximately 3.0-feet overall. The road is proposed to be narrowed approximately 4.0-feet south on the north side of the road and expanded 1.0-feet south on the south side of the road. Proposed parking on the north side of the road will be angled parking stalls. Proposed parking on the south side will be parallel parking stalls. Olive Street is proposed to be narrowed by approximately 7.0-feet. The road is proposed to be narrowed approximately 3.5-feet on each side of the road. The proposed road width of Olive Street is consistent with previously constructed improvements along Olive Street, Vine Street and Maple Street in recent years. Parking is proposed to be parallel parking stalls on both sides of the road.

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 section is constructed on top of a compacted subgrade. The typical section for the City standard truck route section is shown on Figure No. 2.2. The results of the soils investigation indicate poor soils could be encountered near the west end of Main Street. To provide a suitable subgrade and to support the proposed utility work, additional select granular borrow and 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.

Curb bumpouts are proposed at the intersection of Main Street and Vine Street, and the intersection of Main Street and Olive Street. These bumpouts would approximately match the existing bumpouts at the intersection of Main Street and Maple Street. Bumpouts are beneficial to reduce pedestrian crossing distances where a wide street footprint is proposed. By implementing these bumpouts, the pedestrian crossing distance is reduced from approximately 60 feet to approximately 34 feet on Main Street. The bumpouts also provide a location for potential rain gardens and other stormwater treatment systems. Truck turning movements have been analyzed for these proposed bumpouts. Very large trucks, WB-62s, will need to encroach into both driving lanes in order to avoid dragging trailers over the bumpout curbs if taking a right turn. These truck turning movements along with the turning movements for the city's largest fire truck are shown on Figure 2.3 and 2.4.

The phasing for construction will generally fall into two large stages, one being Main Street from Maple Street to Olive Street, the other Olive Street from Main Street to First Street. Within these larger phases, there will be many smaller scale phases to help keep adequate parking, pedestrian access, and business access available at all times. The smaller phases will be continually changing as the work progresses from utilities to street construction and will be adjusted as necessary. Figures will be created during final design and the construction process to show where parking and business access will be available during certain phases.

B. STORM SEWER IMPROVEMENTS

The existing storm sewer systems on Main Street and Olive Street will be removed and reconstructed as shown on Figure No. 2.5. The existing drainage patterns will primarily be maintained. The majority of stormwater on Main Street and Olive Street will be routed through proposed storm sewer infrastructure to the Stormwater Reuse System located in the alley north of Main Street.

Additional stormwater treatment will be required in order to meet the Carver County Watershed Management Organization's rules. A combination of rain gardens and pervious pavers will achieve the required treatment volumes. Either of these treatment systems on their own would not meet the requirements for this project. The proposed rain gardens would be located near or in the bumpouts, in a similar fashion to previous projects that have been constructed nearby. The pervious pavers are planned to be constructed in the city's parking lot on the south side of Main Street that enters the lower level of the parking ramp. The extent of the pavers to be constructed will need to be further analyzed to determine if the project intends to meet minimum requirements or to create extra stormwater credits above and beyond minimums.

The total estimated cost for the proposed street and storm sewer reconstruction improvements is \$2,643,202. Of this amount, \$387,045 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 are also shown on Figure 2.1. The current sidewalk along the north side of Main Street is proposed to be reconstructed and expanded to a width of 12-feet. The current sidewalk along the south side of Main Street is proposed to be reconstructed to a width of 6 feet from Maple Street to Vine Street, and a width of 8-feet from Vine Street to Olive Street. The current sidewalk along the both sides of Olive Street is proposed to be reconstructed in the same location to a width of 9-feet to 13-feet depending on building locations. 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 \$459,756 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 Olive Street, as shown on Figure 2.6. 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 existing buildings. The sewer will connect to the sewer line on Maple Street and ultimately flow to the L-52 Lift Station. Sanitary manholes will be reconstructed and new sewer will be stubbed out of the intersections and connected to the existing pipes east of the Main Street and Olive Street intersection.

The total estimated cost for all of the sanitary sewer improvements is \$507,202. Of this amount, \$207,083 is considered assessable. Itemized cost estimates are provided in Appendix A. Financing and funding is discussed in Section 4.

E. WATERMAIN IMPROVEMENTS

Figure No. 2.7 indicates the proposed watermain improvements. The existing watermain consists of 6-inch mains on Main Street and Olive 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 proposed work includes connecting to the new main installed at the Main Street and Maple Street intersection installed at part of the 2014 Infrastructure Improvement Project. The watermain reconstruction will stop short of the intersection of Olive Street and First Street in order to not impact that intersection. The new watermain will be stubbed out to the east of the Main Street and Olive Street intersection will not need to be reconstructed again with future adjacent projects.

Water services along Main 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 \$983,243. Of this amount, \$266,114 is considered assessable. Itemized cost estimates are provided in Appendix A. Financing and funding is discussed in Section 4.



<u>LEGEND</u>



PROPOSED SIDEWALK RECONSTRUCTION

PROPOSED STREET RECONSTRUCTION



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City Of Waconia



Figure 2.3: Fire Truck Turning Movements September 2022





City Of Waconia



Figure 2.4: Semi Truck Turning Movements September 2022





MAIN ST







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A. STORMWATER REUSE SYSTEM

Over the past few years, the drainage system in the downtown area has been analyzed in order to develop potential improvement options that will improve management of stormwater runoff and the quality of discharge to Lake Waconia. As part of the downtown analysis, a piece of this study falls within the limits of the Downtown Reconstruction, Phase 1 Project. The most efficient and cost-effective way to construct this portion of the reuse system is in conjunction with the planned street and utility improvements. The overall project is shown in Figure No. 3.1.

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 along Main Street and 1st Street. The stored water will receive Sodium Hypochlorite treatment prior to being utilized for irrigation. 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 \$1,191,050 which is not considered an assessable cost. An itemized cost estimate is provided in Appendix A. Financing and funding is discussed in Section 4.



City of Waconia



September 2022



A. FINANCING

The proposed method of financing for the Downtown Reconstruction, Phase 1 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 is \$5,784,454. 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 (Anticipated to be approved at January Carver County Board Meeting)
- \$200,000 2023 Watershed-Based Implementation Funding (Pending, Grant Application Submitted in May)
- \$250,000 2023 Clean Water Fund Grant (Pending, Grant Application Submitted in August 2022)

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	\$459,756	City	PIR Funds
Total Project Cost:	\$459,756		
Street / Storm Reconstruction Costs			
Extra Section Depth / Width Cost	\$1,664,904	City	New Special Debt Levy
Street / Storm Reconstruction Cost	\$978,298		
Total Street / Storm Reconstruction Cost:	\$2,643,202		
Assessment Calculations			
Standard Street Section Cost	\$978,298		
City Contribution (50%)	\$489,149	City	New Special Debt Levy
Assessable Eligible Portion (50%)	\$489,149		
Total Front Footage	2,079.32		
Corner Lot Front Footage (Feet)	440.00		
Assessment Basis Front Footage (Feet)	1,639.32		
Assessable Cost Per Front Foot	\$298.39		
Non-Assessable Front Footage (Feet)	342.19		
Non-Assessable Cost	\$102,105	City	New Special Debt Levy
City Front Footage (Feet)	183.66		
City Front Footage Cost	\$54,802		
Assessment Front Footage (Feet)	1,297.13		
Total Assessed Amount	\$387,045	Assessment	Special Assessments
Total City Cost:	\$2,715,914		
Total Assessed Amount:	\$387,045		
Total Project Cost:	\$3,102,959		

D. SANITARY SEWER

The sanitary sewer proposed for reconstruction services commercial properties. Commercial properties are converted to equivalent residential units (ERUs) based on the previous 12 month's water usage. Three 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
James Rentals LLC	140 Main Street W	304,000	833	275	3.0
Vici Scheuble	112 Main Street W	178,000	488	275	1.5
First Natl Bank of Waconia	53 Main Street W	311,000	852	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, extra depth, and oversizing are isolated as City costs and not included in the assessment calculations. For this project, there are costs included for soil corrections but there is no extra depth or oversizing.

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	\$414,166		
City Contribution Cost	\$93,036	City	Sewer Fund
Total Project Cost:	\$507,202		
Assessment Calculations			
Assessment Eligible Portion	\$414,166		
City Contribution (50%)	\$207,083	City	Sewer Fund
Assessable Eligible Portion (50%)	\$207,083		
Sanitary Sewer Units	23.5		
Assessment Per Unit	\$8,812.04		
Assessable Units	23.5		
Non-Assessable Units	0		
Non-Assessable Cost	\$0	City	Sewer Fund
Total Assessed Amount	\$207,083	Assessment	Special Assessments
Total City Cost:	\$300,119		·
Total Assessed Amount:	\$207,083		
Total Project Cost:	\$507,202		

E. WATERMAIN

The watermain proposed for reconstruction services commercial properties. Same as with the sanitary sewer, multi-family properties are converted to equivalent residential units (ERUs) based on the previous 12 month's water usage. Three 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
James Rentals LLC	140 Main Street W	304,000	833	275	3.0
Vici Scheuble	112 Main Street W	178,000	488	275	1.5
First Natl Bank of Waconia	53 Main Street W	311,000	852	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, and oversizing are isolated as City costs and not included in the assessment calculations. For this project, there are costs included for soil corrections and looping but there is no oversizing.

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	\$451,015	City	Water Fund
Standard Water System Costs	\$532,228		
Total Project Cost:	\$983,243		
Assessment Calculations			
Assessment Eligible Portion	\$532,228		
City Contribution (50%)	\$266,114	City	Water Fund
Assessable Eligible Portion (50%)	\$266,114		
Watermain Units	24.5		
Assessment Per Unit	\$10,861.80		
Assessable Units	24.5		
Non-Assessable Units	0		
Non-Assessable Cost	\$0	City	Water Fund
Total Assessed Amount	\$266,114	Assessment	Special Assessments
Total City Cost:	\$717,129		
Total Assessed Amount:	\$266,114		
Total Project Cost:	\$983,243		

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 \$1,191,050.

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)	\$860,242	Special Assessments
Street & Utility Reconstruction (City Cost)	\$3,733,162	Combined Bond Funds & PIR Capital Improvement Funds
Stormwater Reuse Improvements	\$1,191,050	Stormwater Funds & Grant Funds
Total Overall Project Cost:	\$5,784,454	

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 Soil Corrections

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 14.9%. 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 4.1), a preliminary assessment roll (Table 4.1) for the street reconstruction project area, and debt service and proposed funding sources (Tables 4.2).



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PROP. NO.	OWNER	PROPERTY ADDRESS	P.I.D.
1	KELLIE MOUNTAIN	17 N MAPLE STREET	750503540
2	MAPLE & MAIN LLC	246 MAIN ST W	750503530 / 750503520
3	GAIL D & LUANN K SCHUETTE	222 MAIN ST W	750503510
4	HUDINSKI LLC	212 MAIN ST W	750503501
5	HUDINSKI LLC	200 MAIN ST W	750503481
6	HUDINSKI LLC	N/A	750503740
7	JAMES RENTALS LLC	140 MAIN ST W	750503731
8	JAMES RENTALS LLC	136 MAIN ST W	750503700
9	PAMELA K HUCKY	132 MAIN ST W	750503690
10	ROSS MEUFFELS	128 MAIN ST W	750503670
11	LEIVERMANN PARTNERS LLP	124 MAIN ST W	750503660
12	VICI L SCHEUBLE	116 MAIN ST W	750503640
13	VICI L SCHEUBLE	112 MAIN ST W	750503620
14	L S MANAGEMENT LLC	104 MAIN ST W	750503590
15	RYAN SUDHEIMER	100 MAIN ST W	750503610
16	MARY ANN & RONALD C EVERSON	56 MAIN ST W	750503880
17	DAVID R III & PEGGY C PHILP	48 MAIN ST W	750503860
18	WACONIA CITY	217 MAIN ST W	750503030
19	STATEWIDE GAS INVESTMENTS LLC	201 MAIN ST W	750503040
20	CHARLES H & JULIE STEINHAGEN	155 MAIN ST W	750502840
21	WACONIA CITY	141 MAIN ST W	750502860
22	MAIN STREET EXCHANGE LLC	101 MAIN ST W	750502900
23	AMBLARD ESTATES LLC	24 OLVIE ST S	750502930
24	JNJN LLC	100 1ST ST W	750502780
25	44W FIRST STREET LLC	44 1ST ST W	750502700
26	FIRST NATL BANK OF WACONIA	53 MAIN ST W	750502720

TABLE 4.1 - PRELIMINARY ASSESSMENT ROLL - MAIN STREET / OLIVE STREET DOWNTOWN RECONSTRUCTION, PHASE 1 PROJECT 9/14/2022

PROP. NO.	OWNER	PROPERTY ADDRESS	P.I.D.	OWN	ER ADDRESS		F/F	*STREET ASSESSMENT	WATERMAIN UNITS	WATERMAIN ASSESSMENT	SANITARY SEWER UNITS	SANITARY SEWER ASSESSMENT	TOTAL ASSESSMENT	**ANNUAL ASSESSMENT PAYMENT
1	KELLIE MOUNTAIN	17 N MAPLE STREET	750503540	17 N MAPLE STREET	WACONIA, MN	55387	0.00	\$0.00	1.0	\$10,861.80	0.0	\$0.00	\$10,861.80	\$1,406.65
2	MAPLE & MAIN LLC	246 MAIN ST W	750503530 / 750503520	5555 SYLVAN LN	EXCELSIOR, MN	55331	88.00	\$26,257.91	1.0	\$10,861.80	1.0	\$8,812.04	\$45,931.75	\$5,948.37
3	GAIL D & LUANN K SCHUETTE	222 MAIN ST W	750503510	11623 COUNTY ROAD 13 SE	WATERTOWN, MN	55388-8231	50.00	\$14,919.27	1.0	\$10,861.80	1.0	\$8,812.04	\$34,593.10	\$4,479.97
4	HUDINSKI LLC	212 MAIN ST W	750503501	3650 BIG WOODS BLVD	CHASKA, MN	55318-9235	52.00	\$15,516.04	1.0	\$10,861.80	1.0	\$8,812.04	\$35,189.87	\$4,557.25
5	HUDINSKI LLC	200 MAIN ST W	750503481	3650 BIG WOODS BLVD	CHASKA, MN	55318-9235	26.00	\$7,758.02	1.0	\$10,861.80	1.0	\$8,812.04	\$27,431.86	\$3,552.55
6	HUDINSKI LLC	N/A	750503740	3650 BIG WOODS BLVD	CHASKA, MN	55318-9235	29.00	\$8,653.17	0.0	\$0.00	0.0	\$0.00	\$8,653.17	\$1,120.63
7	JAMES RENTALS LLC	140 MAIN ST W	750503731	300 W LAKE ST	WACONIA, MN	55387-1016	52.00	\$15,516.04	3.0	\$32,585.39	3.0	\$26,436.13	\$74,537.55	\$9,652.95
8	JAMES RENTALS LLC	136 MAIN ST W	750503700	300 W LAKE ST	WACONIA, MN	55387-1016	22.00	\$6,564.48	1.0	\$10,861.80	1.0	\$8,812.04	\$26,238.32	\$3,397.98
9	PAMELA K HUCKY	132 MAIN ST W	750503690	132 MAIN ST W	WACONIA, MN	55387-1022	22.00	\$6,564.48	1.0	\$10,861.80	1.0	\$8,812.04	\$26,238.32	\$3,397.98
10	ROSS MEUFFELS	128 MAIN ST W	750503670	128 MAIN ST W	WACONIA, MN	55387-1022	22.00	\$6,564.48	1.0	\$10,861.80	1.0	\$8,812.04	\$26,238.32	\$3,397.98
11	LEIVERMANN PARTNERS LLP	124 MAIN ST W	750503660	124 MAIN ST W	WACONIA, MN	55387-1022	44.00	\$13,128.95	1.0	\$10,861.80	1.0	\$8,812.04	\$32,802.79	\$4,248.11
12	VICI L SCHEUBLE	116 MAIN ST W	750503640	715 OLD BEACH LN	WACONIA, MN	55387	22.00	\$6,564.48	0.0	\$0.00	0.0	\$0.00	\$6,564.48	\$850.13
13	VICI L SCHEUBLE	112 MAIN ST W	750503620	715 OLD BEACH LN	WACONIA, MN	55387	28.00	\$8,354.79	1.5	\$16,292.69	1.5	\$13,218.06	\$37,865.55	\$4,903.76
14	L S MANAGEMENT LLC	104 MAIN ST W	750503590	425 LAKE ST	WACONIA, MN	55387-1019	20.00	\$5,967.71	1.0	\$10,861.80	1.0	\$8,812.04	\$25,641.54	\$3,320.70
15	RYAN SUDHEIMER	100 MAIN ST W	750503610	11855 COUNTY ROAD 152	COLOGNE, MN	55322-9140	20.00	\$5,967.71	1.0	\$10,861.80	1.0	\$8,812.04	\$25,641.54	\$3,320.70
16	MARY ANN & RONALD C EVERSON	56 MAIN ST W	750503880	11030 NORTH SHORE RD	WACONIA, MN	55387-9659	10.83	\$3,231.51	1.0	\$10,861.80	1.0	\$8,812.04	\$22,905.35	\$2,966.35
17	DAVID R III & PEGGY C PHILP	48 MAIN ST W	750503860	10720 NORTH SHORE RD	WACONIA, MN	55387-9658	44.00	\$13,128.95	1.0	\$10,861.80	1.0	\$8,812.04	\$32,802.79	\$4,248.11
18	WACONIA CITY	217 MAIN ST W	750503030	201 VINE ST S	WACONIA, MN	55387-1337	132.00	\$39,386.86	0.0	\$0.00	0.0	\$0.00	\$39,386.86	\$5,100.78
19	STATEWIDE GAS INVESTMENTS LLC	201 MAIN ST W	750503040	201 MAIN ST W	WACONIA, MN	55387-1025	33.00	\$9,846.72	1.0	\$10,861.80	1.0	\$8,812.04	\$29,520.55	\$3,823.05
20	CHARLES H & JULIE STEINHAGEN	155 MAIN ST W	750502840	8075 AIRPORT RD	WACONIA, MN	55387-9631	32.00	\$9,548.33	1.0	\$10,861.80	1.0	\$8,812.04	\$29,222.17	\$3,784.40
21	WACONIA CITY	141 MAIN ST W	750502860	201 VINE ST S	WACONIA, MN	55387-1337	51.66	\$15,414.58	0.0	\$0.00	0.0	\$0.00	\$15,414.58	\$1,996.26
22	MAIN STREET EXCHANGE LLC	101 MAIN ST W	750502900	13911 RIDGEDALE DR	MINNETONKA, MN	55305-4739	143.03	\$42,678.05	1.0	\$10,861.80	1.0	\$8,812.04	\$62,351.89	\$8,074.85
23	AMBLARD ESTATES LLC	24 OLVIE ST S	750502930	PO BOX 144	WACONIA, MN	55387	85.28	\$25,446.30	1.0	\$10,861.80	1.0	\$8,812.04	\$45,120.14	\$5,843.26
24	JNJN LLC	100 1ST ST W	750502780	4671 FABLE HILL WAY N	HUGO, MN	55038	78.50	\$23,423.25	0.0	\$0.00	0.0	\$0.00	\$23,423.25	\$3,033.42
25	44W FIRST STREET LLC	44 1ST ST W	750502700	8925 HIGHVIEW CT	VICTORIA, MN	55386	78.50	\$23,423.25	0.0	\$0.00	0.0	\$0.00	\$23,423.25	\$3,033.42
26	FIRST NATL BANK OF WACONIA	53 MAIN ST W	750502720	PO BOX 80615	INDIANAPOLIS, IN	46280	111.33	\$33,219.24	3.0	\$32,585.39	3.0	\$26,436.13	\$92,240.75	\$11,945.60
*Cost per	FF = \$298.39 (Original Calculation)	-					Totals:	\$387,044.53	24.5	\$266,114.00	23.5	\$207,083.00	\$860,241.53	\$111,405.21

**Based on a 5.00% Interest Rate and a 10 Year Term.

TOTAL FRONT FOOTAGE: 2,079.32

CORNER LOT CREDIT: 440.00 ASSESSMENT BASIS FRONT FOOTAGE: 1,639.32

NON-ASSESSABLE FRONT FOOTAGE: 342.19

ASSESSMENT FRONT FOOTAGE: 1,297.13

TABLE 4.2 DEBT SERVICE & PROPOSED FUNDING SOURCES FOR DOWNTOWN RECONSTRUCTION, PHASE 1 PROJECT

9/14/2022

	TOTALS				DEBT SERVICE / FUNDING SOURCE							
	TOTAL	TOTAL	TOTAL	TOTAL	TOTAL	DEBT SVC	DEBT SVC	DEBT SVC	DEBT SVC	DEBT SVC		RECOMMENDED
PROPOSED PROJECTS	PROJECT	ASSESS.	CITY	ASSESS.	DEBT	ASSMT	GENERAL/	STM WTR	SEWER	WATER	TOTAL	FINANCING
	COST	AMOUNT	COST	%	SERVICE	REVENUE	PIR FUND	FUND	FUND	FUND	REVENUE	OPTION
STREET & UTILITY RECONSTRUCTION	\$4,593,404	\$860,242	\$3,733,162	18.7%	\$566,325	\$106,060	\$260,807	\$74,041	\$37,002	\$88,416	\$566,325	\$5,000,000
STORMWATER REUSE	\$1,191,050	\$0	\$1,191,050	0.0%	\$146,846	\$0	\$0	\$146,846	\$0	\$0	\$146,846	\$5,900,000
TOTALS:	\$5,784,454	\$860,242	\$4,924,212	14.9%	\$713,171	\$106,060	\$260,807	\$220,887	\$37,002	\$88,416	\$713,171	Complified Bolid

Notes:

1.) All Debt Service Projections are Based on a 10-Year Bond At 4.0%.

2.) Actual Assessment Revenue Debt Service Will Be Based On Interest Rate 1.0% Above Bonding Cost (=4.0% + 1.0% = 5.0%) With a 10-Year Term.

APPENDIX A

ITEMIZED COST ESTIMATES
STREET RECONSTRUCTION (ASSESSABLE)

ITEM NO.	BID ITEM	UNIT	EST QTY	UNIT PRICE	TOTAL
1	MOBILIZATION	LUMP SUM	1	\$30,000.00	\$30,000.00
2	REMOVE CONCRETE CURB & GUTTER	LIN FT	2,335	\$3.50	\$8,172.50
3	REMOVE BITUMINOUS PAVEMENT	SQ YD	8,052	\$2.50	\$20,130.00
4	REMOVE CONCRETE DRIVEWAY/WALK	SQ FT	17,909	\$1.25	\$22,386.25
5	REMOVE BITUMINOUS DRIVEWAY	SQ FT	4,268	\$4.25	\$18,139.00
6	REMOVE DRAINAGE STRUCTURE	EACH	19	\$750.00	\$14,250.00
7	REMOVE DRAINAGE PIPE	LIN FT	1,152	\$27.00	\$31,104.00
8	COMMON EXCAVATION (EV)	CU YD	3,819	\$27.00	\$103,113.00
9	GEOTEXTILE FABRIC	SQ YD	5,610	\$2.00	\$11,220.00
10	AGGREGATE BASE CLASS 5 (CV) - 8" DEPTH	TON	2,420	\$25.00	\$60,500.00
11	CONCRETE CURB & GUTTER (B618)	LIN FT	2,982	\$20.00	\$59,640.00
12	BITUMINOUS NON-WEAR COURSE - 3.0" DEPTH	TON	634	\$90.00	\$57,060.00
13	BITUMINOUS WEAR COURSE - 1.5" DEPTH	TON	318	\$100.00	\$31,800.00
14	3" BITUMINOUS DRIVEWAY	SQ FT	4,268	\$5.00	\$21,340.00
15	6" CONCRETE DRIVEWAY	SQ FT	2,461	\$9.00	\$22,149.00
16	CONSTRUCT DRAINAGE STRUC. DES 2'X3'	EACH	5	\$1,300.00	\$6,500.00
17	CONSTRUCT DRAINAGE STRUC. DES 4020-48	EACH	10	\$2,750.00	\$27,500.00
18	CONSTRUCT DRAINAGE STRUC. DES 4020-60	EACH	2	\$3,500.00	\$7,000.00
19	15" RC PIPE SEWER DES 3006 CL V	LIN FT	504	\$85.00	\$42,840.00
20	24" RC PIPE SEWER DES 3006 CL V	LIN FT	750	\$95.00	\$71,250.00
21	CASTING ASSEMBLY (STORM)	EACH	14	\$1,000.00	\$14,000.00
22	ADJUST CASTING (STORM)	EACH	2	\$680.00	\$1,360.00
23	CONNECT TO EXISTING STORM PIPE	EACH	3	\$890.00	\$2,670.00

\$684,123.75 SUBTOTAL:

CONTINGENCIES (10%): \$68,412.38

\$752,536.13 \$225,760.84

ESTIMATED CONSTRUCTION COST: ADMINISTRATION, ENGINEERING, SURVEYING, INSPECTION (30%): TOTAL ESTIMATED PROJECT COST:

\$978,296.96

STREET RECONSTRUCTION (EXTRA SECTION - NON-ASSESSABLE)

ITEM NO.	BID ITEM	UNIT	EST QTY	UNIT PRICE	TOTAL
1	MOBILIZATION	LUMP SUM	1	\$56,000.00	\$56,000.00
2	JOB TRAILER	LUMP SUM	1	\$50,000.00	\$50,000.00
3	TRAFFIC CONTROL	LUMP SUM	1	\$50,000.00	\$50,000.00
4	REMOVE BITUMINOUS PAVEMENT	SQ YD	424	\$2.50	\$1,060.00
5	REMOVE CONCRETE CURB & GUTTER	LIN FT	206	\$3.50	\$721.00
6	REMOVE CONCRETE STAIRS	SQ FT	375	\$11.00	\$4,125.00
7	SALVAGE & REINSTALL SIGN	EACH	28	\$350.00	\$9,800.00
8	COMMON EXCAVATION (EV)	CU YD	2,775	\$27.00	\$74,925.00
9	SUBGRADE EXCAVATION (EV)	CU YD	109	\$25.00	\$2,725.00
10	GEOTEXTILE FABRIC	SQ YD	2,172	\$2.00	\$4,344.00
11	AGGREGATE BASE CLASS 5 (CV) - 12" DEPTH	TON	1,547	\$25.00	\$38,675.00
12	AGGREGATE BASE CLASS 5 (CV) - 4" DEPTH	TON	1,210	\$25.00	\$30,250.00
13	STABILIZING AGGREGATE (CV)	TON	214	\$30.00	\$6,420.00
14	SELECT GRANULAR BORROW (CV) - 12" DEPTH	CU YD	3,318	\$28.00	\$92,904.00
15	BITUMINOUS NON-WEAR COURSE - 3.0" DEPTH	TON	387	\$85.00	\$32,895.00
16	BITUMINOUS WEAR COURSE - 2.0" DEPTH	TON	423	\$90.00	\$38,070.00
17	BITUMINOUS WEAR COURSE - 3.5" DEPTH	TON	451	\$100.00	\$45,100.00
18	PAVE DRAIN	SQ YD	405	\$400.00	\$162,000.00
19	CONCRETE CURB & GUTTER (B618)	LIN FT	242	\$20.00	\$4,840.00
20	4" SOLID DOUBLE YELLOW LINE	LIN FT	1,160	\$1.00	\$1,159.78
21	4" SOLID LINE WHITE	LIN FT	2,119	\$0.50	\$1,059.50
22	PAVEMENT MARKINGS	EACH	4	\$150.00	\$600.00
23	CONCRETE STAIRS	SQ FT	375	\$85.00	\$31,875.00
24	SUMP PUMP SERVICE CONNECTION	EACH	22	\$315.00	\$6,930.00
25	STORMWATER TREATMENT / RAIN GARDENS	LUMP SUM	1	\$100,000.00	\$100,000.00
26	4" PERFORATED EDGE DRAIN	LIN FT	2,586	\$15.00	\$38,790.00
27	4" HDPE DRAIN TILE CLEANOUT	EACH	12	\$250.00	\$3,000.00
28	ROCK CONSTRUCTION ENTRANCE	EACH	6	\$1,000.00	\$6,000.00
29	SOD TYPE LAWN	SQ YD	0	\$11.00	\$0.00
30	SALVAGE & INSTALL SIGNS	EACH	0	\$350.00	\$0.00
31	2 1/2" CALIPER DECIDUOUS TREE	EACH	0	\$250.00	\$0.00
32	BUSINESS SIGNAGE	ALLOWANCE	1	\$20,000.00	\$20,000.00
33	STREET LIGHTING	LUMP SUM	1	\$200,000.00	\$200,000.00
34	HOLIDAY LIGHTING POLES	LUMP SUM	1	\$50,000.00	\$50,000.00

SUBTOTAL: \$1,164,268.28 \$116,426.83

CONTINGENCIES (10%): ESTIMATED CONSTRUCTION COST: \$1,280,695.11

\$384,208.53

ADMINISTRATION, ENGINEERING, SURVEYING, INSPECTION (30%): TOTAL ESTIMATED PROJECT COST: \$1,664,903.64

SIDEWALK (NON-ASSESSABLE)

ITEM NO.	BID ITEM	UNIT	EST QTY	UNIT PRICE	TOTAL
1	REMOVE CONCRETE WALK	SQ FT	17,909	\$2.80	\$50,145.20
2	REMOVE RAILING	LIN FT	101	\$10.00	\$1,008.00
3	4" CONCRETE WALK (w/ AGG. CL 5 BASE)	SQ FT	29,068	\$7.50	\$218,010.00
4	BUSINESS ENTRANCE MODIFICATIONS	ALLOWANCE	1	\$30,000.00	\$30,000.00
5	PEDESTRIAN RAMP	EACH	8	\$1,500.00	\$12,000.00
6	CONSTRUCT RETAINING WALL	SQ FT	202	\$30.00	\$6,060.00
7	METAL RAILING	LIN FT	101	\$20.00	\$2,016.00
8	CROSSWALK EXPOXY	SQ FT	756	\$3.00	\$2,268.00

SUBTOTAL: \$321,507.20 CONTINGENCIES (10%): \$32,150.72 ESTIMATED CONSTRUCTION COST: \$353,657.92

ADMINISTRATION, ENGINEERING, SURVEYING, INSPECTION (30%): TOTAL ESTIMATED PROJECT COST: \$106,097.38

\$459,755.30

SANITARY SEWER RECONSTRUCTION (ASSESSABLE)

ITEM NO.	BID ITEM	UNIT	EST QTY	UNIT PRICE	TOTAL
1	MOBILIZATION	LUMP SUM	1	\$14,000.00	\$14,000.00
2	REMOVE SANITARY MANHOLE	EACH	3	\$800.00	\$2,400.00
3	REMOVE SANITARY PIPE	LIN FT	1,253	\$7.00	\$8,771.00
4	REMOVE SANITARY SERVICE PIPE	LIN FT	785	\$5.00	\$3,925.00
5	EXTERNAL CHIMNEY SEAL	EACH	3	\$400.00	\$1,200.00
6	8" PVC PIPE SEWER SDR 35	LIN FT	1,150	\$63.00	\$72,450.00
7	6" PVC PIPE SEWER SERVICE SDR 26	LIN FT	785	\$40.00	\$31,400.00
8	8" X 6" SERVICE WYE	EACH	22	\$600.00	\$13,200.00
9	CONSTRUCT SANITARY MANHOLE	EACH	3	\$5,500.00	\$16,500.00
10	CASTING ASSEMBLY (SANITARY)	EACH	3	\$1,000.00	\$3,000.00
11	SEWER SERVICE CASTING ASSEMBLY	EACH	22	\$1,000.00	\$22,000.00
12	CONNECT TO EXISTING SANITARY SEWER PIPE	EACH	2	\$890.00	\$1,780.00
13	CONNECT TO EXISTING SANITARY SERVICE	EACH	22	\$4,500.00	\$99,000.00

SUBTOTAL: \$289,626.00 CONTINGENCIES (10%) \$28,962.60 ESTIMATED CONSTRUCTION COST: \$318,588.60

ADMINISTRATION, ENGINEERING, SURVEYING, INSPECTION (30%): TOTAL ESTIMATED PROJECT COST: \$95,576.58

\$414,165.18

SANITARY SEWER RECONSTRUCTION (NON-ASSESSABLE)

ITEM NO.	BID ITEM	UNIT	EST QTY	UNIT PRICE	TOTAL
1	MOBILIZATION	LUMP SUM	1	\$4,000.00	\$4,000.00
2	BYPASS PUMPING	LUMP SUM	1	\$15,000.00	\$15,000.00
3	6" PVC PIPE SEWER SERVICE SDR 26	LIN FT	100	\$5.00	\$500.00
4	8" X 6" SERVICE WYE	EACH	2	\$400.00	\$800.00
5	EXPORT UNSUITABLE TRENCH EXC. MATERIAL	CU YD	620	\$20.00	\$12,400.00
6	GRANULAR BORROW FOR TRENCH BACKFILL	CU YD	620	\$28.00	\$17,360.00
7	VIBRATION MONITORING	LUMP SUM	1	\$15,000.00	\$15,000.00

SUBTOTAL: \$65,060.00

CONTINGENCIES (10%): ESTIMATED CONSTRUCTION COST: \$6,506.00

\$71,566.00

ADMINISTRATION, ENGINEERING, SURVEYING, INSPECTION (30%): \$21,469.80

TOTAL ESTIMATED PROJECT COST: \$93,035.80

WATERMAIN RECONSTRUCTION (ASSESSABLE)

ITEM NO.	BID ITEM	UNIT	EST QTY	UNIT PRICE	TOTAL
1	MOBILIZATION	LUMP SUM	1	\$18,000.00	\$18,000.00
2	REMOVE WATERMAIN	LIN FT	1,558	\$7.00	\$10,906.00
3	REMOVE WATERMAIN SERVICE	LIN FT	777	\$3.00	\$2,331.00
4	REMOVE GATE VALVE & BOX	EACH	10	\$325.00	\$3,250.00
5	REMOVE HYDRANT	EACH	3	\$350.00	\$1,050.00
6	6" DIP WATERMAIN	LIN FT	104	\$80.00	\$8,320.00
7	8" PVC WATERMAIN	LIN FT	1,204	\$65.00	\$78,260.00
8	3 LB ANODE	EACH	4	\$150.00	\$600.00
9	9 LB ANODE	EACH	4	\$250.00	\$1,000.00
10	WATERMAIN FITTINGS	POUND	1,433	\$15.00	\$21,495.00
11	6" GATE VALVE & BOX	EACH	3	\$2,500.00	\$7,500.00
12	8" GATE VALVE & BOX	EACH	5	\$3,300.00	\$16,500.00
13	1" CURB STOP & BOX	EACH	21	\$800.00	\$16,800.00
14	1" CORPORATION STOP	EACH	21	\$600.00	\$12,600.00
15	1" SERVICE PIPE	LIN FT	827	\$40.00	\$33,080.00
16	HYDRANT	EACH	3	\$6,200.00	\$18,600.00
17	WATER SERVICE CASTING ASSEMBLY	EACH	22	\$450.00	\$9,900.00
18	TRACER WIRE ACCESS BOX	EACH	1	\$300.00	\$300.00
19	TEMPORARY WATER SYSTEM	LUMP SUM	1	\$30,000.00	\$30,000.00
20	CONNECT TO EXISTING WATER SERVICE	EACH	22	\$3,500.00	\$77,000.00
21	CONNECT TO EXISTING WATERMAIN	EACH	3	\$1,565.00	\$4,695.00

SUBTOTAL: \$372,187.00 \$37,218.70

CONTINGENCIES (10%): ESTIMATED CONSTRUCTION COST: \$409,405.70

ADMINISTRATION, ENGINEERING, SURVEYING, INSPECTION (30%): TOTAL ESTIMATED PROJECT COST: \$122,821.71 \$532,227.41

WATERMAIN 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	EXPORT UNSUITABLE TRENCH EXC. MATERIAL	CU YD	620	\$20.00	\$12,400.00
3	GRANULAR BORROW FOR TRENCH BACKFILL	CU YD	620	\$28.00	\$17,360.00
4	BORE FOUNDATION WALL/REMOVE & REPLACE FLOOR	EACH	22	\$5,000.00	\$110,000.00
5	RESET WATER METER & ADJUST PIPING	EACH	22	\$2,500.00	\$55,000.00
6	MOVE ELECTRICAL GROUND FROM WATER SERVICE	EACH	22	\$1,500.00	\$33,000.00
7	HAND EXCAVATION TO CONNECT WATER SERVICE (IN CRAWL SPACE)	EACH	22	\$2,200.00	\$48,400.00
8	1" CURB STOP & BOX	EACH	2	\$830.00	\$1,660.00
9	1" CORPORATION STOP	EACH	2	\$715.00	\$1,430.00
10	1" SERVICE PIPE	LIN FT	150	\$35.00	\$5,250.00
11	6" PVC WATERMAIN	LIN FT	90	\$43.00	\$3,870.00
12	6" GATE VALVE & BOX	EACH	2	\$2,000.00	\$4,000.00
13	WATERMAIN FITTINGS	POUND	350	\$11.50	\$4,025.00
14	CATHODIC PROTECTION TEST STATION	EACH	1	\$2,000.00	\$2,000.00
15	VIBRATION MONITORING	LUMP SUM	1	\$15,000.00	\$15,000.00

SUBTOTAL: \$315,395.00

CONTINGENCIES (10%): ESTIMATED CONSTRUCTION COST: \$31,539.50 \$346,934.50

ADMINISTRATION, ENGINEERING, SURVEYING, INSPECTION (30%): TOTAL ESTIMATED PROJECT COST: \$104,080.35

\$451,014.85

STORM WATER REUSE (NON-ASSESSABLE)

ITEM NO.	BID ITEM	UNIT	EST QTY	UNIT PRICE	TOTAL
1	MOBILIZATION	LUMP SUM	1	\$40,000.00	\$40,000.00
2	TRAFFIC CONTROL	LUMP SUM	1	\$8,000.00	\$8,000.00
3	REMOVE CONCRETE CURB & GUTTER	LIN FT	170	\$3.50	\$595.00
4	REMOVE BITUMINOUS PAVEMENT		529	\$2.50	\$1,322.50
5	REMOVE CONCRETE DRIVEWAY/WALK	SQ FT	2,145	\$1.25	\$2,681.25
6	PUMP STATION	LUMP SUM	1	\$130,000.00	\$130,000.00
7	ELECTRICAL	LUMP SUM	1	\$80,000.00	\$80,000.00
8	UNDERGROUND STORAGE	CU FT	4,880	\$35.00	\$170,800.00
9	TREATMENT BUILDING	EACH	1	\$60,000.00	\$60,000.00
10	TREATMENT & DISINFECTION	LUMP SUM	1	\$30,000.00	\$30,000.00
11	HVAC EQUIPMENT	LUMP SUM	1	\$10,000.00	\$10,000.00
12	2" REUSE MAIN HDD	LIN FT	750	\$40.00	\$30,000.00
13	6" REUSE MAIN HDD	LIN FT	500	\$65.00	\$32,500.00
14	4" HYDRANT	EACH	1	\$5,000.00	\$5,000.00
15	36" RC PIPE SEWER DES 3006 CL III	LIN FT	231	\$140.00	\$32,340.00
16	CONSTRUCT DRAINAGE STRUC. DES 4020-60	LIN FT	30	\$850.00	\$25,500.00
17	SAFL BAFFLE	EACH	1	\$9,000.00	\$9,000.00
18	CASTING ASSEMBLY (STORM)	EACH	3	\$1,300.00	\$3,900.00
19	CONNECT TO EXISTING STORM STRUCTURE	EACH	1	\$1,250.00	\$1,250.00
20	REUSE FITTINGS AND HARDWARE	LUMP SUM	1	\$15,000.00	\$15,000.00
21	BLOWOFF & CONNECTION BOXES	LUMP SUM	1	\$10,000.00	\$10,000.00
22	COMMON EXCAVATION (EV)	CU YD	423	\$27.00	\$11,421.00
23	GEOTEXTILE FABRIC	SQ YD	598	\$2.00	\$1,196.00
24	AGGREGATE BASE CLASS 5 (CV) - 12" DEPTH	TON	159	\$25.00	\$3,975.00
25	AGGREGATE BASE CLASS 5 (CV) - 8" DEPTH	TON	157	\$25.00	\$3,932.50
26	SELECT GRANULAR BORROW (CV) - 12" DEPTH	CU YD	220	\$24.00	\$5,280.00
27	CONCRETE CURB & GUTTER (B618)	LIN FT	170	\$20.00	\$3,400.00
28	BITUMINOUS NON-WEAR COURSE - 3.0" DEPTH	TON	98	\$90.00	\$8,820.00
29	BITUMINOUS WEAR COURSE - 1.5" DEPTH	TON	35	\$90.00	\$3,150.00
30	BITUMINOUS WEAR COURSE - 3.5" DEPTH	TON	37	\$100.00	\$3,700.00
31	4" CONCRETE WALK	SQ FT	1,831	\$6.50	\$11,901.50
32	6" CONCRETE DRIVEWAY	SQ FT	173	\$9.00	\$1,557.00
33	3" BITUMINOUS DRIVEWAY	SQ FT	150	\$4.50	\$675.00
34	CONSTRUCT DRAINAGE STRUC. DES 4020-48	EACH	2	\$2,750.00	\$5,500.00
35	36" RC PIPE SEWER DES 3006 CL V	LIN FT	425	\$140.00	\$59,500.00
36	CASTING ASSEMBLY (STORM)	EACH	2	\$1,000.00	\$2,000.00
37	ADJUST CASTING (STORM)	EACH	1	\$680.00	\$680.00
38	CONNECT TO EXISTING STORM STRUCTURE	EACH	1	\$1,250.00	\$1,250.00
39	STORM DRAIN INLET PROTECTION	EACH	10	\$150.00	\$1,500.00
40	BIOROLL	LIN FT	450	\$3.50	\$1,575.00
41	ROCK CONSTRUCTION ENTRANCE	EACH	1	\$1,000.00	\$1,000.00
42	LANDSCAPING	ALLOWANCE	1	\$3,000.00	\$3,000.00

SUBTOTAL: \$832,901.75

 CONTINGENCIES (10%):
 \$83,290.18

 ESTIMATED CONSTRUCTION COST:
 \$916,191.93

 ADMINISTRATION, ENGINEERING, SURVEYING, INSPECTION (30%):
 \$274,857.58

 TOTAL ESTIMATED PROJECT COST:
 \$1,191,049.50

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	New Development	100% of the construction cost of a city standard local
the City's Transportation		street assessed to abutting property owner based on
Plan		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	Reconstruction	Front footage to be used in assessment methods
- Corner Lot		described herein shall be calculated as follows:
- Double Fronted Lot		- 50% of the front footage on all sides of the parcel. 50%
- Large Parcels		of the cost to be paid with City funds.
- Etc.		

Table continues on next page

Improvement	Type of Construction	Method
Parcels with no driveway	Reconstruction	A minimum assessment shall be levied to parcels
access to primary and non-		identified within the project area having no direct
primary streets.		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	New Development	100% of the cost assessed to benefited area on unit basis.
Trunk/Lateral		
	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	100% of cost assessed to property owner.
	(Stand alone service replacement)	
Sanitary Sewer Oversizing	New Development	100% paid with City funds. (Materials cost above 8-inch
	Deconstruction	1000/ neid with City funds (Materials cost shows 9 in sh
	Reconstruction	100% paid with City Junds. (Materials cost above 8-inch
Lift Station	Now Dovelopment	100% of the cost accessed to benefited area on a per unit
	New Development	hasis
Water Trunk /Lateral	New Development	100% of the cost assessed to benefited area on unit basis
Water Trunky Latera	New Development	100 % of the cost assessed to beneficed at ca off and 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	100% of cost assessed to property owner.
	(Stand alone service replacement)	
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. <u>Ownership</u>. 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. <u>Homestead</u>. 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. <u>Income</u>. 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. <u>Sale of Property</u>. The subject is sold, transferred, or subdivided in whole or in part.

2. <u>Death of Owner</u>. 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. <u>Nonhomestead Property</u>. The subject property loses its homestead status for any reason.
- 4. <u>No Hardship</u>. 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 MIN	INESOTA)				
COUNT	Y OF C	ARVER)		Date		20
То:	City Cle 201 Sou Waconia	erk, City of Waconia, Minnesota ath Vine Street a, MN 55387		Duite		, 20
I, the un	dersigned	d, declare under penalties of perjury:				
1.	That I re	eside 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 of the total income of such disabled person	as is used for social from all sources.	security pur YES	poses, which aid i	s at least 90 percent
	c.	That I am a member of the National Guard	or other reserves or	dered to activ	ve military service	
2.	That I ar	m the owner of the property legally describe	d as			
3.	That my	y interest in the ownership of the above prop	erty was acquired or	3		
	and is as	s follows: l. Sole ownership 2 Joint tenancy held with		YES	NO	
		3. Other undivided interest (Spec	ify)			
4.	That the Census I	e total gross annual household income does r Bureau Poverty Threshold compilation.)	not exceed \$	(Es	tablished by the m	ost recent U.S.

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	8	\$	\$
Social Security			
Veteran's Benefits			
Other Retirement			
Money from Rents			
Unemployment Insurance			
Workmen's Compensation			
Disability Benefits			
Stock Dividends/Interest			
All Other			

7	T	bot my gooid	soomise					
,	. 1	nat my sociat	i security number is	-	-	Spouro		
		-	,	 		ODDUSE	-	

- 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 ______

Owner Signature

Owner Signature

That in accordance with approval granted, that the payment 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 %, until such time as it is deemed the applicant no longer qualifies or the property loses its eligibility.

Dated______ 20 _____

City Clerk

10/2/2008

APPENDIX C

GEOTECHNICAL REPORT



GEOTECHNICAL

- MATERIALS
- FORENSICS

REPORT OF GEOTECHNICAL EXPLORATION 2022 and 2022 Infrastructure Improvemen

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





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.

AMERICAN ENGINEERING TESTING, INC.

SIGNATURE PAGE

Prepared for:

Prepared by:

City of Waconia 310 East 10th Street Waconia, Minnesota 55387 American Engineering Testing, Inc. 550 Cleveland Avenue North St. Paul, Minnesota 55114 (651) 659-9001/www.amengtest.com

Attn: Mr. Craig Eldred – Public Services Director

Authored by:

Derek S. Van Heuveln, PE Senior Engineer

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

Name: Derek S. Van Heuveln

Date: March 10, 2021 License #: 45922

Reviewed by:

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

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Unauthorized use or copying of this document is strictly prohibited by anyone other than the client for the specific project.

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STANDARD SHEETS

Utility Excavation Backfilling Definitions Relating to Pavement Construction

AMERICAN ENGINEERING TESTING, INC.

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APPENDIX B – Geotechnical Report Limitations and Guidelines for Use

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 $\pm \frac{1}{2}$ -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 $2\frac{1}{4}$ inches (Boring B-22) to $8\frac{1}{4}$ inches (Borings B-11) thick, with an average of about $5\frac{3}{4}$ 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.

Soil Boring No.	Bituminous Thickness (inches)	Aggregate Base Thickness (inches)	Aggregate Base Type and AASHTO Classification
B-10	71⁄2	12	Silty sand with gravel (A-1-b)
B-11	81⁄4	12	Crushed limestone (A-1-b)
B-12	71⁄2	15	Silty sand with gravel (A-1-b)

Table 5.1– Pavement and H	Base Thickness
---------------------------	----------------

Report of Geotechnical Exploration 2022 and 2023 Infrastructure Improvements Projects; Waconia, Minnesota March 10, 2021 Report No. 20-23155

Soil Boring No.	Bituminous Thickness (inches)	Aggregate Base Thickness (inches)	Aggregate Base Type and AASHTO Classification
B-13	6½	81/2	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	53⁄4	18	Silty sand (A-2-4)
B-17	43/4	4	Crushed limestone and silty sand (A-1-b)
B-18	51/2	18	Gravelly silty sand (A-1-b)
B-19	7¼	17	Silty sand (A-2-4)
B-20	21/2	91/2	Clayey sand and silty sand (A-2-6)
B-21	5	12	Silty sand (A-2-4)
B-22	21⁄4	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 9¹/₄ 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 $9\frac{1}{2}$ 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 14¹/₂ 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 $13\frac{1}{2}$ to $21\frac{1}{2}$ 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:

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)

 Table 6.2.3 – Resistivity Values

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 4¹/₂ inches bituminous, 6 inches aggregate base, and 12 inches of Select Granular Material (MnDOT 3149.2B.2).
- Truck Route Section 6¹/₂ 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 inplace 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.

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

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

*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 $3\frac{1}{2}$ feet below grade (on top of the leveling pad) results in the roadway being no closer than $8\frac{1}{2}$ 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.

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

 Table 8.3.1 – Recommended Excavation Depths

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 handoperated 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 <u>www.osha.gov).</u> 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."

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.

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.

Report of Geotechnical Exploration 2022 and 2023 Infrastructure Improvements Projects; Waconia, Minnesota March 10, 2021 Report No. 20-23155

AMERICAN ENGINEERING TESTING, INC.

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

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 N60 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 N₆₀ 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.

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

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.

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 1 ¹ / ₂ 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
10	In Inches
LG:	Field logger (initials)
MC:	Column used to describe moisture condition of
N (DDE).	Standard population registeries (N. value) in blows per
N (BPF):	Standard penetration resistance (N-value) in blows per
NO	NO wireline core barrel
NQ.	NQ witeline core barrel
PDA	Rotary drilling with compressed air and roller or drag
KDA.	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
WD.	nammer
WK:	O4 millimator wiraling core barrel
94mm: ▼.	94 minimeter whenne core darrei Weter level directly measured in horing
<u>•</u> .	water level uneculy measured in borning

 $\overline{\bigtriangledown}$: 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.



						TESTING, INC.
Criteria fo	or Assigning Group Sy	mbols and Group N	ames Using Laboratory Test	s ^A Group	Soil Classification Group Name ^B	ABased on the material passing the 3-in
				Symbol	Group Name	(75-mm) sieve.
Coarse-Grained Soils More	Gravels More than 50% coarse	Clean Gravels Less than 5%	$Cu \ge 4$ and $1 \le Cc \le 3^{E}$	GW	Well graded gravel	boulders, or both, add "with cobbles or
than 50% retained on	fraction retained on No. 4 sieve	fines ^C	Cu<4 and/or 1>Cc>3 ^E	GP	Poorly graded grave	el ^F boulders, or both" to group name. ^C Gravels with 5 to 12% fines require dual
No. 200 sieve		Gravels with	Fines classify as ML or	MH GM	Silty gravel ^{F.G.H}	symbols:
		than 12% fines ^C	Fines classify as CL or C	CH GC	Clayey gravel ^{F.G.H}	GW-GC well-graded gravel with sht
	Sands 50% or more of coarse	Clean Sands Less than 5%	$Cu \ge 6$ and $1 \le Cc \le 3^E$	SW	Well-graded sand ^I	GP-GM poorly graded gravel with silt GP-GC poorly graded gravel with clay ^D Sands with 5 to 12% fines require dual
	fraction passes	fines ^D	Cu<6 and/or 1>Cc>3 ^E	SP	Poorly-graded sand	symbols:
	10. 4 sieve	Sands with Fines more	Fines classify as ML or	MH SM	Silty sand ^{G.H.I}	SW-SW well-graded sand with silt SW-SC well-graded sand with clay SP-SM poorly graded sand with silt
Eine Casimal	0'14	than 12% fines D	Fines classify as CL or C	CH SC	Clayey sand ^{G.H.I}	SP-SC poorly graded sand with clay
Soils 50% or	Liquid limit less	inorganic	"A" line ^J	ove CL	Lean clay	(D ₃₀) ²
more passes the No. 200	than 50		PI<4 or plots below "A" line ^J	ML	Silt ^{K.L.M}	$^{L}Cu = D_{60} / D_{10}, Cc = $
sieve		organic	<u>Liquid limit–oven dried</u> Liquid limit – not dried	<0.75 OL	Organic clay ^{K.L.M.N} Organic silt ^{K.L.M.O}	^F If soil contains ≥15% sand, add "with sand" to group name
Chart below)	6:1, 1.01	· ·				^G If fines classify as CL-ML, use dual
	Liquid limit 50	inorganic	PI plots on or above "A"	line CH	Fat clay	^H If fines are organic, add "with organic
	or more		PI plots below "A" line	МН	Elastic silt ^{K.L.M}	In soil contains $\geq 15\%$ gravel, add "with
		organic	Liquid limit–oven dried	<0.75 OH	Organic clay ^{KLMP}	gravel" to group name. ^J If Atterberg limits plot is hatched area,
*** 11 ·					Organic silt	soil is a CL-ML silty clay. ^K If soil contains 15 to 29% plus No. 200
soil			in color, and organic ir	n odor	Peat	add "with sand" or "with gravel",
			£0			^L If soil contains ≥30% plus No. 200,
Screen Opening	(in.) - Sieve Number		For classification of fine-grained fine-grained fine-grained fraction of coarse-gr	soils and ained soils.		group name.
100		.0	50 - Equation of "A"-line Horizontal at PI = 4 to LL = 25.5.			[™] If soil contains ≥30% plus No. 200, predominantly gravel, add "gravelly"
.80 2		.20	then PI = 0.73 (LL-20)	No Ch	- <u>K</u>	to group name. ^N Pl>4 and plots on or above "A" line.
JISS .60	_D₀o = 15mm	.40 NIETAIN	Vertical at LL = 16 to Pl = 7. then Pl = 0.9 (LL-8) 30	<u>Ck.</u>		^o Pl ⁻ 4 or plots below "A" line. ^P Pl plots on or above "A" line
Ы 40			PLAS			^Q Pl plots below "A" line.
20 EK	D ₃₀ = 2.5mm	PERO		MH a	DR OH	Fiber Content description snown below.
		$D_{10} = 0.075$ mm	10 7 4			
		100	0 10 16 20 30	40 50 60	70 80 90 .100	
PAR IICL $C_u = \frac{D_{00}}{D_{10}} = \frac{.15}{0.075} = \frac{.15}{.0.075}$	= 200 $C_c = \frac{(D_{20})^2}{D_{10} \times D_{20}} = \frac{2.5^2}{0.075 \times 15} =$	5.6		LIQUID LIMIT (LL) Plasticity Chart		
	ADDIT	IONAL TERMIN	OLOGY NOTES USED BY	AET FOR SOIL IDI	ENTIFICATION AN	D DESCRIPTION
_	Grain Size		Gravel Percentages	Consistency	y of Plastic Soils	Relative Density of Non-Plastic Soils
Term	Particle S	Size	<u>Term</u> <u>Percer</u>	<u>nt Term</u>	<u>N-Value, BPF</u>	Term <u>N-Value, BPF</u>
Boulders Cobbles	Over 1 3" to 12	2" A 2" V	Little Gravel3% - 14With Gravel15% - 2	4% Very Soft 9% Soft	less than 2 2 - 4	Very Loose 0 - 4 Loose 5 - 10
Gravel	#4 sieve	to 3" G	bravelly 30% - 5	0% Firm	5 - 8	Medium Dense 11 - 30
Fines (silt & cl	lay) Pass #200	sieve		Very Stiff	9 - 13 16 - 30	Very Dense Greater than 50
Mo	oisture/Frost Condition		Layering Notes	Hard Peat I	Greater than 30 Description	Organic Description (if no lab tests)
D (Drv):	(MC Column) Absence of moisture	e, dusty, dry to				Soils are described as <u>organic</u> , if soil is not pear and is judged to have sufficient organic fines
(,). M (Moist):	touch.	water not	aminations: Layers less than 1/2" thick of	Term	Fiber Content (Visual Estimate)	content to influence the Liquid Limit properties
wi (ivi0ist).	visible. Soil may st	ill have a high	differing mater	ial Fibric Peat	Greater than 67%	Root Inclusions
W (Wet/	water content (over Free water visible, in	"optimum").	D 1	Hemic Peat:	33 – 67%	with roots: Judged to have sufficient quantity of roots to influence the soil
Waterbearing)	: describe non-plastic Waterbearing usual	soils.	enses: Pockets or laye greater than ¹ / ₂	" Sapric Peat:	Less than 33%	properties. Trace roots: Small roots present, but not judged
E (E	sands and sand with	silt.	thick of differir material or colo	ng pr.		to be in sufficient quantity to
r (rrozen):	Son nozen					significantly affect soft properties.

01CLS021 (07/08)

AASHTO SOIL CLASSIFICATION SYSTEM AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS

			Gra	nular Mate	rials				Silt-Clav	Materials	
General Classification		(3	5% or less	passing N	o. 200 siev	ve)		(More tha	an 35% pa	ssing No. 2	200 sieve)
	A	-1			А	-2					A-7
Group Classification	A 1 c	A 1 h	A 2	A 2 4	A 2 F	A 2 6	A 2 7	A 4	A E	A 6	A-7-5
	A-1-a	A-1-D	A-3	A-2-4	A-2-5	A-2-0	A-2-7	A-4	A-5	A-0	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 m	nax.	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 Fr Gravel a	agments, Ind Sand	Fine Sand	Silty	or Clayey (Gravel and	Sand	Silty	Soils	Claye	y Soils
General Ratings as Subgrade			Exc	cellent to G	ood				Fair to	o Poor	

Classification of Soils and Soil-Aggregate Mixtures

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%.



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 classification 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.





11

20'

2022 Infrastructure Improvements

City of Waconia

Soil Boring Locations

100





2023 Infrastructure Improvements





A	ET I	No: 20-23155					L	og of	Bo	ring N	0]	B-10	(p. 1	of 1)	
Pı	rojec	et: 2022 and 2023 In	frastructu	ire Impro	ovemer	nt Projects; V	Naco	nia, I	MN	I						
DEF	TH	Surface Elevation	962.8			GEOLOGY	N	MC	SA	MPLE	REC	FIELI) & LA	BORA	FORY '	TESTS
FE	ÈT	MATERIAL	DESCRIPTIO	ON			N	MC]	ГҮРЕ	IN.	WC	DEN	LL	PL	% -#20
	1	7 ¹ / ₂ " Bituminous pavement	th gravel h	rown		FILL			K	SU						
		A-1-b		nown,		-	16	Μ	М	SS	12	13				
	2 -	FILL, mostly clayey sand, geofabric, brown and black	a little grav k, A-6	vel,		-			\square							
	3 -	FILL, mostly lean clay, bro	own, A-6				10	M	Ň	SS	14	38				
	4 –					-			सि							
	5 -	FILL, mixture of sandy lea brown and dark brown, A-	n clay and 6	lean clay,			7	м	M	22	14	17				
	6 –							101	\mathbb{N}	55	17	17				
	7 —	FILL mixture of organic of	lay and sar	ndv lean		-			R							
	8 –	clay, a little gravel, brown	and black,	A-6 and			4	M	X	SS	12	31				
	9 -	A-0														
	10 -	SANDY LEAN CLAY, a	little grave	l, trace		TILL	1		<u><</u> 1							
	11 -	roots, brown to gray, soft t	to stiff, A-6	6 (CL)			4	Μ	X	SS	20	29				
	12 _								ष्ट्र							
	12								М	00		01				
	13 -						/	M	\mathbb{N}	88	24	21				
	14 -	CLAVEV SAND a little		tiff A G					षि							
	15 -	(SC)	graver, gray	, sun, A-0			12	Μ	X	SS	18	20				
	16 –								रि							
	17 –								ł							
	18 —						12	м	М	66	10	10				
	19 –						12	M	\mathbb{N}	22	18	18				
		END OF BORING				<										
07/0																
- 171																
20.01																
-																
- 2018																
+WELI																
	DEP	TH: DRILLING METHOD			WAT	ER LEVEL MEA	ASURI	EMEN	TS		1	1	· ·	NOTE:	REFF	ER TO
PJ AE	0.17	7½' 3 75" HS A	DATE	TIME	SAMP	LED CASING	CAV	/E-IN PTH	FI I	DRILLII UID I F	NG VEL	WATI LEVF	ER	THE A	TTAC	HED
155.6	U-1	1/2 3.23 113A	10/8/20	12:20	19.	5 17.5	19	9.1				Non	e	SHEE	ΓS FOI	R AN
20-23			10/8/20	12:30	19.	5 17.5	1	9.1				Non	e I	EXPLA	NATIO	ON OF
	ORIN OMPI	G Leted: 10/8/20											Т	ERMI	IOLOG	GY ON
ID F	R: D	S LG: SB Rig: 1C												TH	IS LO	G



AMERICAN ENGINEERING TESTING, INC.

Γ	AET 1	No: 20-23155					L	og of	Bo	ring N	o	I	3-11	(p. 1	of 1)	
	Projec	et: 2022 and 2023 In	frastructu	ire Impro	vemer	nt Projects; V	Waco	nia, I	MN	I						
I	DEPTH	Surface Elevation	962.9			GEOLOGY	N	MC	SA	MPLE	REC	FIELI) & LA	ABORA	FORY 7	TESTS
	FEET	MATERIAL I	DESCRIPTIO	DN			IN	MC		ГҮРЕ	IN.	WC	DEN		PL	%- #200
	1 —	8 ¹ / ₄ " Bituminous pavement	limestone	brown		FILL			1	SU						
	2 _	A-1-b	11	1		-	39	M	М	SS	15	19				
	2	FILL, mostly clayey sand, geofabric, black, A-6	a little grav	/el,			15	M	М	55	17	26				
	3 - 4 -	FILL, mixture of organic c sand, black, A-2-4 and A-8	lay and gra	welly silty			15		А И	33	1/	20				
	5 —	FILL, mostly organic clay,	a little silt	y sand and					\square							
	6 —	graver, black, A-o					15	M	M	SS	18	27				
	7 —	ORGANIC CLAY, black,	OL/OH)		SWAMP	-		R								
	8 —					DEPOSIT	6	Μ	X	SS	12	30				
	9 —	SANDY LEAN CLAV 2	little gravel	grav to		TILL			ष्ट्र			25				
	10 -	brown, firm to stiff, A-6 (C	CL)	, gray to		TILL	5	M	X	SS	17	22				
	11 —								F							
	12 -						11	м	\mathbb{N}	22	24	20				
	14 -							IVI	\square	55	27	20				
	15 _	CLAYEY SAND, a little g	gravel, gray	, stiff to					R							
	15	very stiff, A-6 (SC)		-			14	M	M	SS	18	17				
	17								Ħ							
	17 -								R							
	10						18	М	X	SS	18	17				
	19 -	END OF BORING							$\left \right\rangle$							
_																
1/29/2																
G.GDT																
1012_J																
2018																
+WELL																
T+CPT	DEP	TH: DRILLING METHOD		1	WAT	ER LEVEL ME	ASURI	EMEN	TS		I	1		NOTE:	REFE	R TO
3PJ AE	0-1	7½' 3.25" HSA	DATE	TIME	SAMPI DEPT	LED CASING TH DEPTH	CAV DE	/E-IN PTH	FL	ORILLIN UID LE	NG VEL	WATI LEVE	ER EL	THE A	TTAC	HED
23155.(10/8/20	1:30	19.	5 17.5	1	9.0				Non	e	SHEE	FS FOF	R AN
P 20-2	DODD	G	10/8/20	1:40	19.	5 17.5	1	9.0				Non	e]]	EXPLA	NATIC	ON OF
COR	COMP	LETED: 10/8/20											Т	ERMIN	NOLOC	iY ON
AEI	DR: D	S LG: SB Rig: 1C												IH	12 LO(Ľ



AET	No: 20-23155					L	og of	Bo	ring N	o	I	B-12	(p. 1	of 1)	
Proje	ect: 2022 and 2023 In	frastructu	ire Impro	ovemen	t Projects;	Waco	onia, I	MN	I						
DEPTH	Surface Elevation	1011.5			GEOLOGY	. N	MC	SA	AMPLE	REC	FIELI	D & LA	ABORA	FORY '	TESTS
FEET	MATERIAL	DESCRIPTIO	DN				WIC		ГҮРЕ	IN.	WC	DEN		PL	% -#20
1 -	- FILL, mostly silty sand wi	th gravel, p	vieces of		FILL			51	SU						
2 -	concrete, geotextile, brown	n, Ă-1-b			-	75	M	Д	SS	3					
3 -	FILL, mostly silty sand wi clayey sand and gravel, pic pavement, brown, A-1-b	th gravel, a eces of bitu	little minous			28	М		SS	22					
5 -	FILL, mostly sandy lean cl brown and dark brown, A-	lay, a little	gravel,		-	11	м	ST ST	55	10	24				
6 -	_						IVI		22	10	24				
7 -	_						м	<u>s</u> i	55	1	22				
9 -	-						IVI	\square	55	4	23				
10 -	_					5	м	<u></u>	55	10	21				
11 -	_					5	M		22	10	21				
12 -	ORGANIC CLAY, black,	firm, A-8 ((OL/OH)		SWAMP DEPOSIT			$\left \right\rangle$		10					
13 -	_					8	M	Д	22	12	26				
15 -	SANDY LEAN CLAY, sl	ightly orga	nic, dark		FINE ALLUVIUN			R	~~						
16 -		n, 11 0 (CL)				M	Å	SS	22	24				
17 -	SANDY LEAN CLAY, a and gray mottled, a little li laminations of silt, A-6 (C	little grave ght gray, st L)	l, brown iff,		TILL	14	М	R R	SS	15	14				
20 -	CLAYEY SAND, a little g little dark brown, very stiff silt, A-6 (SC)	gravel, brov f, laminatio	vn and a ns of sand	y		22	М	X	SS	13	18				
22 -	CLAYEY SAND, a little g stiff, laminations of silty sa	gravel, brow and, A-6 (S	wn, very SC)			24	м		99	17	20				
24 -						24		Д	22	1/	20				<u> </u>
	END OF BORING														
DE	PTH: DRILLING METHOD			WAT	ER LEVEL M	EASUR	EMEN	TS	<u> </u>	1	1		NOTE:	REFF	R TO
B 0-2	22½' 3.25" HSA	DATE	TIME	SAMPI DEPT	LED CASING TH DEPTH	G CA' I DE	VE-IN EPTH	I FL	DRILLI UID LE	NG EVEL	WATE LEVE	ER EL	THE A	TTAC	HED
120.		10/6/20	11:40	24.0) 22.5	2	3.9				Non	e	SHEE	FS FOF	R AN
		10/6/20	11:50	24.0) 22.5	2	3.9				Non	e ¹	EXPLA	NATIC	ON OF
COMPLETED: 10/6/20												1	ERMIN	NOLO(϶Υ ΟΝ
DR: I	R: DS LG: SB Rig: 1C												TH	IS LO	J



AMERICAN ENGINEERING TESTING, INC.

AET	No: 20-23155					L	og of	Bo	ring N	o]	3-13	(p. 1	of 1)	
Proje	ct: 2022 and 2023 In	frastructu	ire Impro	vemer	t Projects;	Waco	onia, I	MN	I						
DEPTH	Surface Elevation	1012.3			GEOLOGY	. N	MC	SA	MPLE	REC	FIELI) & LA	BORA	FORY	TESTS
FEET	MATERIAL	DESCRIPTIO	ON			IN	MC		ГҮРЕ	IN.	WC	DEN	LL	PL	%- #20
	6 ¹ / ₂ " Bituminous pavement	ne light b	rown Λ_{-1}		FILL			R	SU						
	FILL, mostly silty sand, a	little clayey	/ sand and			18	M	Х	SS	17					
2 -	gravel, brown, A-2-4							\square							
3 -	-					26	M	Ň	SS	19					
4 -	-							स्रि							
5 -	FILL, mostly gravelly sand A-1-b	l with silt,	brown,			18	м	M	22	10					
6 -	-					10	IVI	\mathbb{N}	55	10					
7 -	SANDY LEAN CLAY br	own a littl	e grav		FINE	_		R							
8 -	firm, laminations of sand a	nd silt, A-0	6 (CL)		ALLUVIUN	¹ 6	M	X	SS	18	29				
9 -	-														
10 -	SANDY LEAN CLAY, a	little grave	l, brown,		TILL										
11 -	- Tirm, laminations of silty s	and, A-6 (C	_L)			5	M	M	SS	24	18				
12 -								स्रि							
13 -	SANDY LEAN CLAY, a stiff to stiff, A-6 (CL)	little grave	l, gray, ver	у ///		10	м	M	22	24	17				
14							111	\square	55	27	1/				
14								R							
15 -	-					14	M	Х	SS	18	18				56
16 -								Ł							
17 -								ł							
18 -	CLAYEY SAND, a little g	gravel, gray	y, a little					ł							
19 -	brown, hard, laminations o	of silty sand	l, A-6 (SC)					ł							
20 -	_					47	M	X	SS	18	15				
21 -	_							प्ति							
22 -	CLAYEY SAND, a little g	gravel, gray	y, a little (SC)					Ħ							
23 -			(20)			54	M	\square	SS	6	15				
24 -	END OF BODINC							Д							
	END OF BORING														
А А А		1													
DE	PTH: DRILLING METHOD			WAT	ER LEVEL M	EASUR	EMEN	TS	יי די דו חר		117 4 77		NOTE:	REFE	R TO
0-2	22½' 3.25" HSA	DATE	TIME	SAMPI DEP1	H CASING	J CA DE	VE-IN EPTH	FL	UID LE	VEL	LEVE	EK EL	THE A	TTAC	HED
GG152-		10/6/20	10:10	24.0) 22.5	2	3.8	_			Non	e ,	SHEET	IS FOR	R AN
	NG	10/6/20	10:20	24.0) 22.5	2	3.8	-			Non	$\frac{\mathbf{e}}{\mathbf{r}}$	ERMIN		IN OF
	PLETED: 10/6/20					+				¹	TH	IS LOC	3 3		
∦_ DR: L	13 LG: SB Rig: IC														



SUBSURFACE BORING LOG

AET No:20-23155Log of Boring No.B-14 (p. 1 of 1)Project:2022 and 2023 Infrastructure Improvement Projects; Waconia, MN																
Projec	ct: 2022 and 2023 In	frastructu	ıre Impro	vemer	nt Pr	ojects; V	Vaco	nia, l	MN	I						
DEPTH	Surface Elevation	1017.4			GE	OLOGY	N	MC	SĄ	MPLE	REC	FIELI) & LA	BORAT	FORY 1	FESTS
FËÈT	MATERIAL I	DESCRIPTIO	DN		БПТ						IN.	WC	DEN	LL	PL	%-#200
1 -	FILL, mostly silty sand with	th gravel, b	orown,			- -	11		SI SI	50	1.5	11				
2 -	A-1-b	a little silts	v sand and					M	Д	22	15					
3 -	gravel, brown, A-6	a nuce sitty	Sund and				7	М	M	SS	7	11				
4 -	_								Д	22						
5 -									K							
6-							4	М	X	SS	4	14				
7 -									R							
8 –	FILL, mostly sandy lean cl brown, A-6	ay, a little	gravel,				1	м	M	88	12	22				
0_							1.41	Д	55	12						
	SANDY LEAN CLAY, a	little grave	l, brown to		TILI				R							
11 -	brown and dark brown mot stiff, A-6 (CL)	ttled, firm t	to very				7	М	X	SS	18	19				
12 -	-								R							
13 -	-						18	M	M	SS	22	18				
14 -	-						10	T	Д	22		10				
15 -	SANDY LEAN CLAY, a	little grave	l, grayish				1.5		R	00	10	10				
16 -	brown, stiff to very stiff, A	6 (CL)					15	M	Д	22	18	19				
17 -	-								ł							
18 -	-								ł							
19 -									ł							
20 -	_						19	м		55	18	21				
21 -	-						10	111		50	10					
22 -	-								ł							
23 –							16	М	\square	SS	18	22				
10L8L0	END OF BORING								Д							
	DRILLING METHOD			WAT		VFI MEA	SUPE	MEN								
		DATE	TIME	SAMPI		CASING	CAV	Æ-IN	1.3	ORILLI	NG.	WATI	ER	NOTE: THF A	REFE	k TO hed
- <u></u>	2½' 3.25" HSA	10/6/20	1:10	24.0	ин 0	22.5	DE. 24	етн 1.0	FL	UID LE	VEL	19.6	5	SHEET	TS FOR	AN AN
20-23		10/6/20	1:30	24.0	0	22.5	- 23	3.9				13.7	7 E	EXPLA	NATIC	N OF
BORING COMPLETED: 10/6/20													Т	ERMIN	IOLOC	Y ON
DR: DS LG: SB Rig: 1C														TH	IS LOO	3

01-DHR-060



Γ	AET	No: 20-23155					Lo	og of	Bo	ring N	o	I	B-15	(p. 1	of 1)	
	Projec	t: 2022 and 2023 In	frastructu	ire Impro	vemer	t Projects; V	Vaco	nia, l	MN	ſ						
	DEPTH	Surface Elevation	1025.6			GEOLOGY	N	MC	SA	MPLE	REC	FIELI) & LA	BORA	FORY 1	FESTS
	FEET	MATERIAL	DESCRIPTIO	ON				NIC]	TYPE	IN.	WC	DEN	LL	PL	%- #200
	1 -	6 ¹ / ₂ " Bituminous pavement FILL, mostly silty sand wi bituminous pavement at 3 ¹ / ₂	th gravel, p brown and	vieces of d black,		FILL	16	М	KI KI	SU SS	14					
	2 — 3 —	A-1-0					20	М	$\left \right $	SS	10					
	4 5 6	FILL, mostly sandy lean cl and gravel (apparent bould little light tan, A-6	ay, a little er at 5'), bi	silty sand cown, a		-	55/.6	М	TTTT X	SS	6	17				
	7 - 8 - 9 -	SANDY LEAN CLAY, a brown and brown mottled, stiff, laminations of silt and (CL)	little grave a little ligh d sandy silt	l, grayish 1t gray, t, stiff, A-6		TILL	12	М		SS	24	20				
ELL_20181012_JG.GDI_1/29/21																
1	DEP	TH: DRILLING METHOD			WAT	 ER LEVEL MEA	 ASURE	emen'	TS					 NOTE:	REFE	R TO
	۰ n <i>י</i>	7 ¹ /' 3 25" HSA	DATE	TIME	SAMPI DEPT	LED CASING H DEPTH	CAV	/E-IN PTH	I FL	DRILLIN UID LE	NG VEL	WATH LEVF	ER	THE A	TTAC	HED
5155.G	<u>U-</u>	172 J.2 5 H5A	1:50	9.5	7.5	9	.4	1			Non	e	SHEET	IS FOR	AN AN	
20-20											1	EXPLA	NATIC	N OF		
CORF	BORIN COMPI	G LETED: 10/6/20									Г	ERMIN	IOLOC	Y ON		
AEI	DR: D	S LG: SB Rig: 1C												TH	IS LOO	Ĵ



AET	No: 20-23155		Lo	og of	Bo	ring N	o	F	B-16	(p. 1	of 1)					
Project: 2022 and 2023 Infrastructure Improvement Projects; Waconia, MN																
DEPTH	Surface Elevation	1019.7			GEOLOGY	N	MC	SA	MPLE	REC	FIELD) & LA	BORA	FORY '	FESTS	
FEET	MATERIAL I	DESCRIPTIO	DN				IVIC]	TYPE	IN.	WC	DEN	LL	PL	%- #200	
1-	5 ³ / ₄ " Bitiuminous pavemen	t ittle gravel	. brown.	-/ '	FILL			K	SU							
	A-2-4	8	·, · ·,			27	M	\mathbb{N}	SS	17						
	FILL, mostly clayey sand, gravel and bituminous paye	a little silty ement, broy	v sand, wn. A-6			17	м	М	55	10	15					
	8	,	,				IVI	Μ	55	18	15					
4 -	SANDY LEAN CLAY a	ittle grave	brown a		FILL	-		R								
5-	little gray mottled to brown	n, stiff to ve	ery stiff,			11	М	X	SS	22	19					
6 -	A-0 (CL)							F								
7 -	-							\square								
8 -	-					13	M	M	SS	24	20					
9 -	-							सि								
10 -	-					15	М	\mathbb{N}	SS	24	20					
11 -	-							Д								
12 -	_							K								
13 -	-					17	М	X	SS	24	18					
14 -	-							R								
15 -	-					15	м	М	55	24	10				54	
16 -	-					15	IVI	\square	55	24	19				54	
17 -	-							Ħ								
18 -	-							Ħ								
19 -	-							ł								
20 -	-					16	М	\square	SS	18	19					
21 -	-							प्ति								
¥ 22 −	CLAYEY SAND a little o	ravel brov	vn hard				-	Ħ								
23 -	lens of silty sand, A-6 (SC)	vii, iiuiu,			39	M/W	M	SS	18	16					
24 -	FND OF BORING							А		10	10					
	END OF DOMING															
A+1																
¥∣ DEI ₩	DEPTH: DRILLING METHOD		TD C	WATE	R LEVEL MEA	ASURE	EMEN')RII I M	NG	WATE	ER	NOTE:	REFE	R TO	
G 0-22	0-22½;' 3.25" HSA			DEPTH	I DEPTH	DE	PTH'	FĽ	UID LE	VEL	LEVE		THE A	THE ATTACHED		
20-2315			9:40 9:50	24.0	22.5	24	4.0	-			23.0	″ ı	EXPLA	LIS FOR AN		
BORIN COMP	NG LETED: 10/7/20	10///20	7.50	24.0	22.0						-1.7	т	ERMIN	GY ON		
\overline{A} DR: D	S LG: SB Rig: <u>1</u> C												THIS LOC			



AET	AET No: 20-23155								Log of Boring No B-17 (p. 1 of 1)									
Project: 2022 and 2023 Infrastructure Improvement Projects; Waconia, MN																		
DEPTH	Surface Elevation	1039.3			GEOLOGY	N	MC	SA	MPLE	REC	FIELI) & LA	BORAT	ORY	FESTS			
FEET	MATERIAL I	DESCRIPTIO	DN			IN	IVIC]	TYPE	IN.	WC	DEN	LL	PL	%- #200			
1 -	-\FILL, mixture of crushed 1	imestone a	nd silty	-/=-	FILL		M	\mathbb{N}	50	10	21							
2 -	sand, brown, A-1-b	a littla graz	val brown			9	M	Д	22	10	21							
3 -	A-6	a nuie grav	/el, brown,		TILL	10	м	М	22	16	20							
	CLAYEY SAND, a little g	gravel, brov	vn, stiff,			10	111	\square	55	10	20							
5								R										
5						11	М	X	SS	24	18							
								स्र										
								R										
8 -						12	М	X	SS	24	20							
9 -	END OF BORING							$\langle \rangle$										
5																		
Z/GL/Z																		
201810																		
DE	PTH: DRILLING METHOD			WAT	LEVEL MEA	 SURE	l EMEN'	⊥⊥ TS					 NOTE:	DEEE				
			TIME	SAMPI	ED CASING	CAV	/E-IN	I		NG VEI	WATH	ER	THE A	TTAC	HED			
- U -	-172 3.25" H8A	10/7/20	2:05	9.5	7.5	9	.5			V LL	Non	e	SHEET	S FOF	R AN			
20-23												I	EXPLA	NATIC	ON OF			
BORIN COMP	NG PLETED: 10/7/20										Т	ERMIN	IOLOC	FY ON				
DR: D	OS LG: SB Rig: 1C												TH	IS LOO	3			



Γ	AET No: 20-23155									Log of Boring No B-18 (p. 1 of 1)									
	Projec	et: 2022 and 2023 In	frastructu	ure Impro	vemer	nt Pr	ojects; V	Vaco	nia, I	MN	I								
Ι	DEPTH	Surface Elevation	1032.1			GE	EOLOGY	N	MC	SA	MPLE	REC	FIELD) & LA	ABORA	FORY	TESTS		
	FEET	MATERIAL I	DESCRIPTIO	NC			-	IN	IVIC		TYPE	IN.	WC	DEN		PL	%- #200		
	1 —	5 ¹ / ₂ " Bituminous pavement FILL, mostly gravelly silty	sand, brow	wn, A-1-b		FILI	_	28	м	M	SU	15							
	2 —	FILL mostly movelly alar			6	_		20	101	А	55	15							
	3 —	FILL, mostry graveny ciay	ey sand, bi	rown, A-2-0	5			6	М	M	SS	19	12						
	4 —																		
	5 —	FILL, mostly clayey sand,	a little grav	vel, brown,		-				ξ1									
	6 —	A-6						6	М	X	SS	8	18						
	7 —							-		स्रि									
	8 —	SANDY LEAN CLAY, a firm to very stiff, A-6 (CL)	little grave	l, brown,		TILI	L	7	M	M	SS	20	18						
	9 —																		
	10 -																		
	11 —							12	M	Ŵ	SS	24	20						
	12 —									R									
	13 —							19	М	X	SS	24	19						
	14 —									म									
	15 —									\square	~~								
	16 —							20	M	Ŵ	SS	18	20						
	17 —									Ŧ									
	18 —									Ħ									
	19 —									Į									
	20 —							15	М	\square	SS	18	20				56		
2/15/20	21 —									प्ति									
3DT 12	22 —									Ħ									
12_JG.C	23 —									K									
018101	24 —							15	Μ	М	SS	18	19						
<u>NELL</u>		END OF BORING									_								
+CPT+/	DEPTH: DRILLING METHOD V				WAT	 ER LF	EVEL MEA	 SURF	 EMEN'	 TS						DEFE			
U AET			DATE	TIME	SAMPI		CASING	CAV	Æ-IN	L I		NG	WATE	ER	THE A	TTAC	HED		
155.GF	0-23' 3.25" HSA		10/7/20	11:30	24.5	5	23.0	24	1.3	rL		VEL	None S		SHEETS FOR AN				
20-23	10,7/20			11:40	24.	5	23.0	24	4.3				Non	e	EXPLA	NATIC	ON OF		
CORP	BORIN COMP	G LETED: 10/7/20]	FERMIN	IOLOC	JY ON		
AEL	DR: D	S LG: SB Rig: 1C													TH	IS LOO	3		



SUBSURFACE BORING LOG

AET	Г No: 20-23155			Log of Boring No B-19 (p. 1 of 1)												
Proje	ect: 2022 and 2023 In	frastructu	ire Improv	vemer	t Projects;	Wac	onia,	MN	[
DEPTH	I Surface Elevation	1039.6			GEOLOGY	, N	MC	SA	MPLE	REC	FIELI) & LA	BORA	FORY 7	FESTS	
FËÈT	MATERIAL I	DESCRIPTIO	DN		FH I					IN.	WC	DEN	LL	PL	%- #200	
	- FILL, mostly silty sand, a	little gravel	, brown,	_	FILL			51	SU							
2	A-2-4					19	M	Й	SS	15						
	FILL, mixture of clayey sa cinders, a little gravel, brow	nd and silt wn and dar	y sand with k brown.			11	м	М	55	10	15					
	A-2-4 and A-6						IVI	\mathbb{N}	55	19	15					
4	SANDY LEAN CLAY, a	little grave	l. brown to		TILL			R								
5	brown with a little gray mo	ottled, stiff,	A-6 (CL)			13	M	X	SS	22	18					
6								F								
7	7							\square								
8						14	M	M	SS	20	20					
9	-							团								
10	-					12	М	M	SS	24	21					
11	-							Д								
12	-							K								
13	-					13	М	X	SS	24	22					
14	-							प्ति								
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20	_					15	м	\square	22	18	20					
21	_						141		50	10	20					
22	_							ł								
23	_							ł								
	_					12	М	X	SS	18	21				57	
111 - 70	END OF BORING				1		-	$\left \right\rangle$								
		1														
DE	DEPTH: DRILLING METHOD			WAT	ER LEVEL M	EASUR	EMEN	TS	יי ד דו מר		W 7 A TT		NOTE:	REFE	REFER TO	
	0-23' 3.25" HSA		TIME	DEPT	H DEPTH	I DI	EPTH	FL	UID LE	VEL	LEVE	EL	THE A	TTAC	HED	
36162-0			1:10	24.5	5 23.0	2	24.0	_			Non	e T	SHEE	IS FOF	CAN	
BORI	BORING 10/7/20			24.5	23.0	-	24.0	+			Non		ERMIN	IOLOC	FY ON	
DR:	DS LG: SB Rig: 1C							+					THIS LOG			
·		1	1			1		1								

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AET	AET No: 20-23155									Log of Boring No. B-20 (p. 1 of 1)									
Proje	ect: 2022 and 2023 In	frastructu	ire Impro	vemen	t Projects; V	Vaco	nia, l	MN											
DEPTH	Surface Elevation	1047.1			GEOLOGY	N	MC	SA	MPLE	REC	FIELI) & LA	BORA	FORY 7	FESTS				
FEET	MATERIAL	DESCRIPTIO	ON			1	IVIC	1	YPE	IN.	WC	DEN	LL	PL	%- #200				
1 -	$-\frac{2^{1/2''}}{-}$ Bituminous pavement	t and and silt	v sand, a			-		1	SU		7								
2-	little gravel, dark brown, A	A-2-6	ania danlı		TOPSOIL OR FILL	2	Μ	Д	SS	6	28								
	grayish brown, A-6 (possil	ble fill) (CI	L)		TILL	12	м	М	55	10	22								
	SANDY LEAN CLAY, a stiff. A-6 (CL)	little grave	l, brown,			12	101	Μ	33	10									
4 -	SANDY LEAN CLAY a	little grave	l brown a					R											
5 -	little gray and light brown,	stiff, lamin	nations of			11	М	X	SS	20	22								
6 -	sandy silt, A-6 (CL)							\square											
7 -						-		ł											
8 -	LEAN CLAY, brown, a lit laminations of silt, A-6 (C	ttle gray, st L)	111,		FINE ALLUVIUM	11	м	M	SS	24	33								
9 -		-				11	101	\square	55	27	55								
-WELL_20181012_JG.GDI_12/15/20																			
DE	DEPTH: DRILLING METHOD		WAT	ER LEVEL MEA	SURE	EMEN	TS		I	I		I NOTE:	REFE	R TO					
	0-7½' 3 25" HSA		TIME	SAMPI DEPT	ED CASING H DEPTH	CAV	/E-IN PTH	FL	ORILLIN UID LE	NG VEL	WATH LEVE	ER	THE A	TTAC	HED				
3155.6		10/8/20	10:50	9.5	7.5	9	.5				Non	e	SHEET	IS FOR	R AN				
20-20-20-20-20-20-20-20-20-20-20-20-20-2												I	EXPLA	NATIC	ON OF				
BORI COMF	NG PLETED: 10/8/20											T	ERMIN	IOLOC	FY ON				
DR: I	DS LG: SB Rig: 1C												THIS LOG						



AMERICAN ENGINEERING TESTING, INC.

AE	Г No: 20-23155				Log of Boring No. B-21 (p. 1 of 1)										
Proj	ject: 2022 and 2023 Ir	nfrastructu	ire Impro	vemen	t Projects; V	Vaco	nia, I	MN	[
DEPTI IN FEET	H Surface Elevation	1043.2 DESCRIPTIO			GEOLOGY	N	MC	SA 1	MPLE YPE	REC IN.	FIELI WC	D & LA	BORA	FORY T	FESTS
1	5" Bituminous pavement FILL, mostly silty sand, a	little grave	, brown,		FILL	25	м	P	SU SS	17					
2	A-2-4 FILL, mostly silty sand w bituminous, dark brown, A	ith gravel, p A-1-b	vieces of	_			101	$\left \right\rangle$	55	17					
3	SANDY LEAN CLAY, a	little grave	l, brown,		TILL	11	M	Å	SS	19	23				
5	- SANDY LEAN CLAY, a little light brown, stiff, lar	little grave ninations of	l, brown, a f sandy silt			11	М	\mathbb{N}	SS	22	22				
7	- A-6 (CL)							/\ {}							
8	SANDY LEAN CLAY, a mottled, very stiff, A-6 (C	little grave CL)	l, brown			18	М	\mathbb{N}	SS	18	19				
	END OF BORING														
DT 12/15/20															
1012_JG.G															
VELL_2018															
T 4Cb1+	EPTH: DRILLING METHOD			WAT	ER LEVEL MEA	 .SURF	EMEN'	L TS						DEFF	
2) AET			TIME	SAMPI	ED CASING	CAV	/E-IN PTH	FI		NG VFI	WATE	ER	THE A	TTAC	HED
155.GF	0-7½' 3.25" HSA		9:35	9.5	7.5	9	.5				Non	e	SHEET	IS FOR	AN
20-23												I	EXPLA	NATIO	N OF
BOR CON	ING APLETED: 10/8/20											Т	TERMINOLOGY		
DR:	DS LG: SB Rig: 1C												TH	IS LOO	ĩ



AET	No: 20-23155		Log of Boring No. B-22 (p. 1 of 1)													
Proje	ct: 2022 and 2023 In	frastructu	ıre Impro	vemen	t Projects; V	Vaco	nia, I	MN	[
DEPTH	Surface Elevation	1047.8			GEOLOGY	N	MC	SA	MPLE	REC	FIELI) & LA	BORA	FORY	FESTS	
FEET	MATERIAL	DESCRIPTIO	ESCRIPTION			1	wie		TYPE	IN.	WC	DEN	LL	PL	%- #200	
1 -	-> FILL, mostly silty sand wi	th gravel, b	prown,		FILL	15	м	Μ	50	17						
2 -	A-1-b FILL mixutra of loop alow	clightly or	rannia and			15	101	Д	55	1/	26					
3 -	silty sand, a little gravel, p	ieces of bit	uminous,		FINE ALLUVIUM	17	м	М	22	14	30					
	LEAN CLAY, brown, a lit) ttle gray, ve	ery stiff,			1/	101	\mathbb{N}	55	17	50					
	A-7-6 SILTV SAND a little gray	vel brown	medium		TILL			R								
5 -	dense, laminations of claye	ey sand, A-	2-4 (SM)			11	M	X	SS	20	10					
6 -	SANDY LEAN CLAY, a and gray mottled, a little li	little gravel ght brown,	l, brown stiff to					Б								
7 -	very stiff, laminations of s	andy silt ar	nd silty					ł								
8 -						23	М	M	SS	22	19					
9 -	END OF PODINC															
VELL_20181012_JG.GDI 12/19/20																
DE	DEPTH: DRILLING METHOD				ER LEVEL MEA	SURE	EMEN'	TS		I	I		NOTE:	REFE	R TO	
n P	0-7%' 3.25" HSA		TIME	SAMPI DEPT	LED CASING H DEPTH	CAV	'E-IN PTH	FL	ORILLIN UID LE	NG VEL	WATH LEVF	ER	THE A	TTAC	HED	
0. 0. 0.	172 3.2 3 H3A	10/8/20	10:20	9.5	7.5	9	.5	\downarrow			Non	e	SHEET	FS FOF	R AN	
													EXPLA	ON OF		
BORI COMI	NG PLETED: 10/8/20											1	TERMIN	BY ON		
DR: I	DS LG: SB Rig: 1C												THIS LOG			





(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

AMERICAN ENGINEERING TESTING, INC.

Appendix B

Geotechnical Report Limitations and Guidelines for Use

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 GBA¹, 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
Appendix B Geotechnical Report Limitations and Guidelines for Use Report No. 20-23155

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.