Central Avenues Phase 2

Project Scoping Study Report

City of Hopkins

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Certification

Project Scoping Study Report

for

Central Avenues Phase 2

City of Hopkins

August 2024

PROFESSIONAL ENGINEER

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

Signature: _____

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Date: 8/20/2024 License Number: 53639

Table of Contents

Tables

Appendix

I. Executive Summary

A. Background Information

The Hopkins City Council ordered the preparation of this project scoping study report at its May 7, 2024 meeting. The scoping study has been completed to better identify the infrastructure improvements that are still needed within the Central Avenues neighborhood after the completion of the 2024 Central Avenues Improvements project, to define costs associated with the improvements, and to evaluate different project phasing scenarios knowing that the remaining improvements will span over at least two constructions seasons.

B. Proposed Improvements

This report examines potential street and utility construction of several streets in the Central Avenues Neighborhood in the City of Hopkins. These areas are depicted in Figure 1 of Appendix A. The proposed improvements are described in the body of this report and are graphically illustrated in Appendix A. In brief, the proposed improvements consist of:

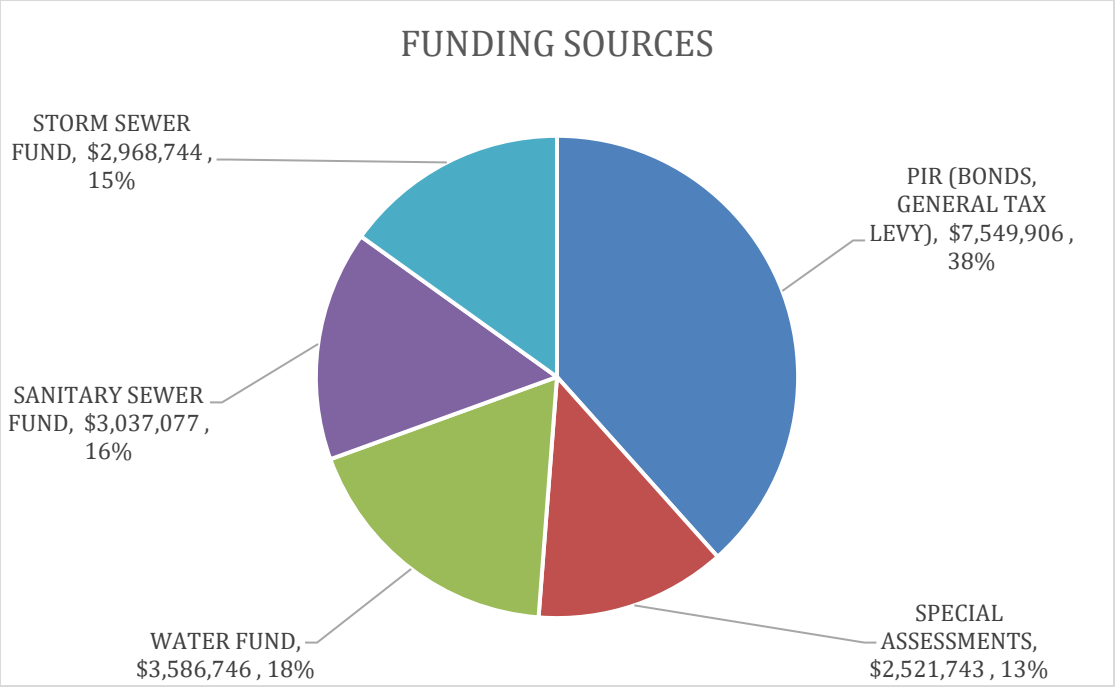
- Full reconstruction of the following street sections in the Central Avenues Neighborhood with replacement of concrete curb and gutter and concrete sidewalk, and replacement or rehabilitation of watermain, sanitary sewer, and storm sewer utilities.
    - 9th Ave N from 1st St N to 3rd St N
    - 10th Ave N from 1st St N to 4th St N
    - 11th Ave N from 1st St N to Minnetonka Mills Rd
    - 12th Ave N from 1st St N to Highway 7
    - 13th Ave N from the dead-end north of Maetzold Field to South Service Dr
    - 3rd St N from 9th Ave N to 11th Ave N
    - 4th St N from 9th Ave N to 10th Ave N and from 11th Ave N to 12th Ave N
- Reclamation and resurfacing of 3rd St N from 11th Ave N to 15th Ave N.
- Mill and overlay of 2nd St N from 8th Ave N to 12th Ave N.

C. Estimated Costs and Proposed Funding

Cost estimates have been prepared to address the varying needs of all areas reviewed. Detailed cost estimates are provided in Appendix B and summarized below in Table 1.

Table ES-1 – Estimated Cost of Proposed Central Avenues Phase 2 Improvements	
Streets	$5,013,000
Pedestrian Facilities	$1,440,000
Sanitary Sewer	$2,356,000
Watermain	$2,785,000
Storm Sewer	$2,062,000
Construction Cost with Contingencies (20%)	**$16,387,000**
Engineering & Administration (20%)	$3,277,000
Total Estimated Project Costs	**$19,664,000**

These improvements would be funded with general obligation bonds, utility funds, and assessments to individual properties. The chart below illustrates proposed funding sources inclusive of contingencies, engineering, and administration.



II. Scoping Study Introduction

This scoping study report examines future street and utility improvements including storm sewer replacement, water main replacement, sanitary sewer replacement, and street reconstruction or resurfacing throughout the Central Avenues Neighborhood. The following streets that will be included in this study are shown on Figure 1 in Appendix A and listed below:

- 9th Ave N from 1st St N to 3rd St N
- 10th Ave N from 1st St N to 4th St N
- 11th Ave N from 1st St N to Minnetonka Mills Rd
- 12th Ave N from 1st St N to Highway 7
- 13th Ave N from the dead-end north of Maetzold Field to South Service Dr
- 2nd St N from 8th Ave N to 12th Ave N
- 3rd St N from 9th Ave N to 15th Ave N
- 4th St N from 9th Ave N to 10th Ave N and from 11th Ave N to 12th Ave N

The improvements on these streets will include some or all of the following proposed work:

- Addition/replacement of storm sewer
- Watermain replacement
- Water service replacement
- Sanitary sewer replacement
- Sanitary sewer rehabilitation
- Sanitary sewer service replacement
- Concrete curb & gutter replacement
- Bituminous street removal and reconstruction
- Bituminous street resurfacing
- Concrete sidewalk replacement

III. Background

The Central Avenues Neighborhood has been included in the City's Capital Improvement Plan in some capacity for the several years. The Hopkins City Council ordered the preparation of this project scoping study report at its May 7, 2024 meeting. The scoping study has been completed to better identify the infrastructure improvements that are still needed within the Central Avenues neighborhood after the completion of the 2024 Central Avenues Improvements project, to define costs associated with the improvements, and to evaluate different project phasing scenarios knowing that the remaining improvements will span over at least two constructions seasons. This report will be used as the basis for City Staff recommendations to Council, which may include the request to order a feasibility report for a defined project area and scope to be constructed in 2025 or later.

IV. Existing Conditions

A. Streets

The bituminous streets within the project areas are aged and exhibit various levels of wear and distress. This is evident on the surface by transverse, block, and alligator cracking. There is evidence of previous additional street repairs and maintenance throughout the project area including numerous street patches. Examples of the existing pavement conditions are shown below (pictures were taken on 12th Ave N between 1st St N and 2nd St N).

Consistent with observations of the existing pavements made during preparation of this report, the City of Hopkins' Pavement Management System also indicates that the "Pavement Condition Index" (PCI) for several streets in the neighborhood are in fair or poor condition and beyond the pavement's life cycle.

The streets within the project area have varying widths (measured curb face to curb face). Table 1 below summarizes these and other existing conditions. Parking is typically allowed on both sides of the streets throughout the neighborhood. Large, mature trees can be found throughout the project within the City's ROW and near the back of curb.

Table 1: Summary of Existing Corridor Conditions			
Roadway	**Existing Street Width**	**Existing Curb Type**	**Existing ROW Width**
9th Ave N	35 feet	Concrete B618 Curb & Gutter	66 feet
10th Ave N	36 feet	Concrete B618 Curb & Gutter north of the regional trail; some Curb w/ no gutter south of the regional trail	66 feet
11th Ave N	31 feet – 35 feet	Concrete B618 Curb & Gutter	66 feet
12th Ave N	36 feet	Concrete B618 Curb & Gutter north of the regional trail; mostly Curb w/ no gutter south of the regional trail	66 feet
13th Ave N	36 feet	Concrete B618 Curb & Gutter south of 4th St N; Curb w/ no gutter north of 4th St	66 feet
2nd St N	36 feet	Concrete B618 Curb & Gutter	66 feet
3rd St N	30 feet	Concrete B618 Curb & Gutter west of 11th Ave N; mixture of Concrete B618 Curb & Gutter and Curb w/ no gutter between 11th Ave N and 9th Ave N	60 feet
4th St N	36 feet	Curb w/ no gutter	66 feet

Subgrade soil sampling was completed throughout the neighborhood by Braun Intertec in the Summer of 2024. A copy of Braun Intertec's Geotechnical Evaluation Report is included in Appendix C of this report. Twenty-two soil borings and five pavement cores were taken throughout the area and summarized in Table 2 below.

Table 2: Summary of Geotechnical Evaluation		
Street	**Bituminous Thickness**	**Subgrade Material**
9th Ave N	4 inches – 5.5 inches	Mixture of silty and clayey sand
10th Ave N	4 inches – 9 inches	Mixture of silty, clayey, and poorly graded sand
11th Ave N	4.5 inches – 8 inches	Mixture of silty, clayey, and poorly graded sand; gravel with silt; sandy silt; and sandy lean clay
12th Ave N	4.5 inches – 6.5 inches	Mixture of silty, clayey, and poorly graded sand; and sandy lean clay
13th Ave N	4 inches – 6.5 inches	Mixture of silty, clayey, and poorly graded sand with silt; and lean and sandy lean clay
2nd St N	3.5 inches – 5.5 inches	Aggregate base material
3rd St N	2 inches – 6.5 inches	Mixture of silty, clayey, and poorly graded sand with silt; lean clay; sandy silt; and possible buried asphalt
4th St N	4.5 inches to 6.5 inches	Mixture of silty, clayey, and poorly graded sand; and sandy lean clay

The soils found just beneath pavements in the neighborhood were most commonly fill soils classified as poorly graded sand, silty sand, clayey sand, sandy silt, or lean clay. At least one of the borings in the neighborhood found slightly organic clay (buried topsoil). Buried topsoil is an undesirable material for roadway construction as it's unable to adequately support heavy vehicles, leading to earlier failure of overlying pavements.

B. Storm Sewer

The existing storm sewer systems serving the neighborhood are mostly comprised of reinforced concrete pipe (RCP), varying in size from 12-inch diameter to 60-inch diameter, with some 12-inch diameter clay pipes as well. The storm sewer catch basins and manholes are a mixture of precast concrete and block structures.

The neighborhood generally drains south through an existing 60-inch trunk storm sewer main along the alley between 11th Ave N and 10th Ave N, south of 3rd St N, then turns down 11th Ave N, west on Mainstreet over to 13th Ave S ultimately discharging to Nine Mile Creek near south of Excelsior Blvd. Some of the neighborhood drains to the east and south before turning west south of Mainstreet, but ultimately connects to the same trunk storm sewer system as the rest of the neighborhood that discharges to Nine Mile Creek south of Excelsior Blvd.

Drainage issues have been identified throughout the neighborhood through evaluation of site grades and elevations by the project team and visual inspections from site visits. These drainage issues can be generalized as:

1. Due to the flat grades of some of the streets, especially from 2nd St N to 3rd St N on

9th Ave N, 10th Ave N, and 11th Ave N, localized drainage problems are prevalent.

2. There is a lack of catch basin inlets at a few of the intersections in the project area, and these limited catch basins can be overloaded during heavier rain events which causes ponding in the street.
3. There is a lack of gutters along several of the streets to adequately direct water through areas of flat topography to drainage inlets.
4. Many of the sidewalks throughout the neighborhood have isolated low spots and do not drain well after rain events or during snow melt.

Proposed storm sewer improvements are discussed later in this report.

C. Sanitary Sewer

The existing sanitary sewer system throughout the neighborhood primarily consists of 8-inch diameter clay pipe, except for the following blocks that differ in either material or size:

- 11th Ave N from 2nd St N to 3rd St N and 2nd St N from 10th Ave N to 11th Ave N consists of 12-inch diameter clay sewer pipe.
- 11th Ave N from 1st St N to 2nd St N consists of 15-inch diameter clay sewer pipe.
    - The sewer pipe on this block is also deeper than the rest of the sanitary sewer system in the neighborhood at over 20 feet in depth with tall risers off the main for each sanitary sewer service.
- 2nd St N from 8th Ave N to 10th Ave N consists of 10-inch diameter clay sewer pipe.
- An 8-inch PVC (plastic) sewer pipe runs up the alley between 9th Ave N and 10th Ave N from 2nd St N to 4th St N, which serves Alice Smith Elementary School and Eisenhower Elementary School across Highway 7.
    - While this pipe consists of newer material than the rest of the neighborhood, the pipe is in somewhat poor condition with sags, deflections, and dents in the interior of the pipe based on televising in the last 10 years.
    - It is also not ideal to have a sanitary sewer with a larger flow run down an alley with limited right-of-way for access, maintenance, and repairs.

Clay pipe is susceptible to infiltration and root intrusion over time due to the large number of joints and the deterioration of the gasket material originally used to seal the joints.

The project's sanitary manholes are made of a mixture of brick, concrete block, and precast concrete structures. Brick and block structures were typically built around the 1950's/1960's or earlier, whereas precast structures indicate these structures were replaced at some point after initial construction of the other infrastructure, likely in response to some deficiency with the original structure while some were replaced as part of an adjacent reconstruction project in the past 15 years. Brick and block manholes are susceptible to infiltration over time due to cracks and deterioration of the mortared joints. Precast concrete manholes continue to be used in modern construction and are generally acceptable provided proper gaskets were provided with the initial construction and remain in good working order.

Service lines in the neighborhood are typically 4-inch or 6-inch and their material may be clay, cast iron, orangeburg, transite, or PVC. Clay and orangeburg sanitary sewer pipes are highly susceptible to infiltration by groundwater, causing groundwater to be treated by the Met Council at its treatment facilities downstream at a cost to the public. The vast majority

of sanitary sewer mains and service lines in the neighborhood are made of clay material. Based on observations of sewer service replacements to individual properties performed recently in nearby neighborhoods, potential exists for encountering orangeburg sewer service pipes during construction of the project. Orangeburg pipe, which can generally be described as layered tar paper wrapped in a round manner to create a pipe, was commonly installed around the time several neighborhoods in Hopkins originally developed. Orangeburg pipe is widely known to 'rot' where exposed to water, generally on the bottom of the pipe, and ultimately collapse as it ages and is unable to support the surrounding soil.

Proposed sanitary sewer improvements are discussed later in this report.

D. Watermain

The water main throughout the neighborhood is primarily 6-inch cast iron pipe (CIP). CIP is a common watermain material, however upon reaching its useful life tends to fail. Because it is so brittle, as the soils around the pipe move slowly over decades, CIP cannot support shearing forces and ultimately breaks. These portions of the watermain system were installed in the 1950s and 1960s. CIP installed around this time period was also occasionally installed with lead-packed fittings.

Service lines for single family homes in the project area are typically ¾-inch or 1-inch and their material may be copper, galvanized steel, or lead. However, lead service material (outside of fittings) have not been found on recent reconstruction projects on adjacent streets in the Central Avenues neighborhood.

Proposed watermain improvements are discussed later in this report.

V. Proposed Improvements

A. Streets

Several of the streets within the neighborhood have reached a point where maintenance procedures such as seal coating or milling and overlaying are no longer cost-effective strategies. In addition, the age and material of the underground sewer and water throughout the neighborhood requires that most of the streets are fully reconstructed after the replacement of these utility mains and services nearing the end of their life expectancy. The streets that would be recommended for full reconstruction include:

- 9th Ave N from 1st St N to 3rd St N
- 10th Ave N from 1st St N to 4th St N
- 11th Ave N from 1st St N to Minnetonka Mills Rd
- 12th Ave N from 1st St N to Highway 7
- 13th Ave N from the dead-end north of Maetzold Field to South Service Dr
- 3rd St N from 9th Ave N to 11th Ave N
- 4th St N from 9th Ave N to 10th Ave N and from 11th Ave N to 12th Ave N

Proposed reconstruction improvements include replacement of concrete curb and gutter and replacement of the full depth of the pavement section with underlying aggregate base. It is also recommended to install a sand section under the aggregate base for additional roadway stability and pavement longevity. Concrete curb will be replaced per City Policy 8.02 with B618 concrete curb and gutter, which will help extend the life of the pavement by keeping water out of the subgrade and will provide a solid edge for the asphalt pavement.

Some of the streets within the neighborhood, including blocks of 10th Ave N, 12th Ave N, 13th Ave N, 3rd St N, and 4th St N, do not have an existing concrete gutter, just a curb back which does not convey stormwater effectively. Existing drainage patterns will be maintained and the elevation of the existing roadways at their edge is proposed to approximate the existing elevations. Attempts at lowering the road will be made (during final design) where appropriate to improve drainage within and toward the street where beneficial and practical.

Proposed street widths from face of curb to face of curb will vary from street to street throughout the neighborhood but will generally be narrowed on reconstructed streets to the City's standard width for residential streets (28 feet wide from curb face to face) where feasible. Using a proposed street width of 28 feet will provide a consistent street width along each roadway's length, reduce impervious area to reduce costs and stormwater management needs, and create a wider turf boulevard for healthier trees, additional snow storage, and increased pedestrian safety.

The following specific improvements are proposed for each unique roadway corridor:

- 9th Ave N is proposed to be reconstructed, including the replacement of concrete curb and gutter, at 28 feet wide from curb face to face. This will narrow the road by approximately 7 feet. Parking regulations will remain consistent with existing conditions throughout this area.
- 10th Ave N is proposed to be reconstructed, including the replacement of concrete curb and gutter, at 28 feet wide from curb face to face. This will narrow the road by approximately 8 feet. Parking regulations will remain consistent with existing conditions throughout this area.
- 11th Ave N is proposed to be reconstructed, including the replacement of concrete curb and gutter, at 28 feet wide from curb face to face. This will narrow the road by approximately 3 feet on the north end of 11th Ave, and up to 7 feet near 1st St N. Parking regulations will remain consistent with existing conditions throughout this area.
- 12th Ave N is proposed to be reconstructed, including the replacement of concrete curb and gutter, at 36 feet wide from curb face to face. This road is proposed to remain the same width at 36 feet due to it being a state aid route, truck route, and corridor that is used for additional parking, especially along Maetzold Field south of 2nd St N. Parking regulations will remain consistent with existing conditions throughout this area.
- 13th Ave N is proposed to be reconstructed, including the replacement of concrete curb and gutter, at 28 feet wide from curb face to face. This will narrow the road by approximately 8 feet. Parking regulations will remain consistent with existing conditions throughout this area.
- 3rd St N from 9th Ave N to 11th Ave N is proposed to be reconstructed, including the replacement of concrete curb and gutter, at 28 feet wide from curb face to face. This will narrow the road by approximately 2 feet. Parking regulations will be consistent with existing conditions throughout this area.

- 4th St N is proposed to be reconstructed, including the replacement of concrete curb and gutter, at 36 feet wide from curb face to face. This road is proposed to remain the same width at 36 feet because the two blocks that are proposed for reconstruction are not adjacent to each other and this will maintain a consistent street width along the 4th St N corridor. Parking regulations will remain consistent with existing conditions throughout this area.

The minimum proposed street grade is 0.50% consistent with City standards. Street grades flatter than 0.50% are undesirable for drainage. In some areas, new low-points with adequate storm sewer will need to be created to increase roadway longitudinal slope for proper drainage. These locations will be confirmed during the final design process, but a few locations have been identified based on a review of the existing topography and site conditions including 9th Ave N, 10th Ave N, and 11th Ave N between 2nd St N and 3rd St N. Overall drainage patterns/directions throughout the project area are not proposed to change.

The preliminary proposed typical pavement section for all reconstructed streets consists of 2-inches wearing course bituminous pavement, 2-inches non-wear course bituminous pavement, 8-inches aggregate base class 5, 12-inches select granular, and spot subgrade soil corrections. The exception to this pavement section is on 12th Ave N, where a 3-inch non-wear course bituminous pavement section would be proposed due to the higher traffic levels, including truck traffic.

Pavement maintenance is proposed for the following streets in the project area:

- 2nd St N from 8th Ave N to 12th Ave N
    - A 2-inch mill and overlay is recommended based on the PCI rating and a geotechnical investigation of the existing pavement conditions, confirming this to be a feasible maintenance operation for the pavement. This will extend the life of the pavement at a significantly lower cost than full reconstruction.
    - The existing B618 curb and gutter is in relatively good condition, requiring minimal spot concrete repairs.
    - The original underground sanitary sewer from 8th Ave N to 11th Ave N can be rehabilitated without excavation using a CIPP (cured in place pipe) liner since there are no confirmed sewer services to replace along the corridor. This is discussed further in the proposed sanitary sewer improvements section later in this report.
    - There is no watermain along 2nd St N and the storm sewer is not in need of replacement except for the catch basin inlets at the intersections, which would be reconstructed with the improvements to 9th Ave N, 10th Ave N, 11th Ave N, and 12th Ave N.
- 3rd St N from 11th Ave N to 15th Ave N
    - Reclamation and resurfacing with 2-inches wearing course and 2-inches non-wearing course bituminous pavement is recommended based on the PCI rating and a geotechnical investigation of the existing pavement conditions, confirming this to be a feasible maintenance operation for the pavement. While the

pavement is not in good enough condition for a cheaper mill and overlay operation, reclaiming the existing bituminous pavement and underlying aggregate base to pave a new bituminous pavement section overtop will extend the life of the pavement longer than a mill and overlay and still at a significantly lower cost than full reconstruction.

- The existing B618 curb and gutter is in relatively good condition, requiring only spot concrete repairs.
- The original underground sanitary sewer can be rehabilitated without excavation using a CIPP (cured in place pipe) liner since there are no confirmed sewer services to replace along the corridor. This is discussed further in the proposed sanitary sewer improvements section later in this report.
- The original watermain from 11th Ave N and 13th Ave N has no confirmed services and is not needed for the water distribution system, so this watermain does not need to be replaced and can be abandoned without excavation. This is discussed further in the proposed watermain improvements section later in this report.
- The storm sewer is not in need of replacement except for the catch basin inlets at some of the intersections, which would be reconstructed with the improvements to 13th Ave N, 12th Ave N, 11th Ave N, and 10th Ave N.

B. Storm Sewer

Most of the smaller 12-inch diameter storm sewer in the neighborhood would be reconstructed for constructability of other utilities, changing curb alignment, replacing aging materials, or increasing the storm water pipe capacities to meet City standards for a 10-year rainfall event. Storm sewer will generally be replaced in the same location as the existing system, other than some additional catch basin inlets and storm sewer pipe as needed for drainage. Most of the larger diameter storm sewer (27-inches and larger) is in good condition and would not be replaced as part of the proposed improvements. The following is a summary of the most significant improvements proposed to the storm sewer system, and proposed stormwater improvements are also shown on Figure 2 in Appendix A.

- 12-inch diameter storm sewer along 12th Ave N (south of 3rd St N), 11th Ave N (north of 4th St N), and 4th St N would be replaced with 15-inch diameter storm sewer.
- Storm sewer along 12th Ave N (north of 1st St N) would be replaced with a minimum pipe size of 24-inch diameter storm sewer.
- Storm sewer would likely be extended down 9th Ave N, 10th Ave N, and 11th Ave N between 2nd St N and 3rd St N to mid-block, with additional catch basin inlets to create a new low point on this block with flat grades. This will improve drainage on this block by providing a location for the water to flow in the curb line. While other blocks in the project area are not as flat as these 3 blocks, they will also be evaluated further during final design to determine if additional storm sewer pipe and catch basins will be necessary for proper drainage.
- Storm sewer catch basin inlets will be added and reconfigured at intersections to improve the efficiency of stormwater runoff collection during larger rain events, and to provide appropriate pedestrian ramp access.

C. Stormwater Management

The proposed improvements will result in more than 1 acre of land disturbance; therefore, stormwater management will be required by the Municipal Separate Storm Sewer System (MS4) General Permit and Nine Mile Creek Watershed District (NMCWD) with their updated rules to align with MS4 permit requirements.

The water quality volume was calculated as one-half (0.5) inch times the sum of the new and fully reconstructed impervious surface (currently estimated to be 10.36 acres), equaling approximately 18,800 cubic feet of required water quality volume to be treated with the improvements for Central Avenues Phase 2. During preliminary and final design, the actual treatment volume will be verified, but feasible treatment options have been investigated to maximize the treatment of the water quality volume prior to discharge from the MS4:

1. Reduction in Impervious Surface
    - If determined to be an accepted treatment option by NMCWD, the reduction in impervious surface from narrowing the roads (a reduction of 1.23 acres) could provide up to 3,750 cubic feet of required water quality volume.
    - This would be at no additional cost to the project since it is already planned to be included in the improvements and is a cost savings due to the reduction in pavement area.
2. Perforated Infiltration Pipes along the west side of 12th Ave N by Maetzold Field
    - With no houses along this stretch of road and more boulevard space, underground large, perforated pipes could be installed to provide approximately 2,500 cubic feet of required water quality volume.
    - This treatment option is only viable if the soil types are favorable for infiltration which would be verified with preliminary design.
    - This treatment option would cost approximately $100,000.
3. Underground Chambers in the Parking Lot at 10th Ave N & 1st St N
    - A large City owned lot such as this parking lot is an ideal location for stormwater management.
    - Large chambers would be installed under the parking lot in a series of rows to provide up to 27,500 cubic feet of water quality volume, which would be in excess of the required treatment volume for the Central Avenues improvements area, but credits could be banked for future projects with the watershed.
    - This treatment option would cost approximately $800,000.
        - This cost includes the removal and replacement of the parking lot (new paved and striped surface) and assumes a drain tile system which may not be needed if soil types are favorable for infiltration (to be verified with preliminary design).
4. Stormwater Wet Pond at Valley Park
    - This would be a backup treatment option if the above options become infeasible and would act as regional stormwater treatment downstream of the project area and within the Nine Mile Creek Watershed.

- The pond would be about 10 to 12 feet deep to treat 2 feet of water that sits above the normal water level, and the pond could be located on the east edge of the park near the wooded area adjacent to Nine Mile Cove.
- Additional site investigations, staff coordination, and community outreach would be necessary if this option is considered, but it could provide up to 34,000 cubic feet of water quality volume (nearly double the required treatment volume for the Central Avenues improvements area).
- This treatment option would cost approximately $1,000,000 at the proposed size and assumed soil conditions/groundwater depths.

A combination of the above treatment options will be proposed to meet the requirements of MS4 and NMCWD. Option 1 is already proposed as part of the improvements. Option 2 will be proposed as part of the improvements if soil conditions verify that infiltration is feasible. Option 3 will also be proposed as part of the improvements, pending direction from City Staff to allow an underground chamber system to be constructed under the public parking lot. Option 4 would only be considered as part of these improvements if the first three options are determined infeasible or do not provide enough water quality volume as required by MS4 and NMWCD. However, Option 4 or similar could be considered again in the future as part of the Parks Master Plan if not included with these improvements.

D. Sanitary Sewer

As summarized in the existing conditions section of this report discussing sanitary sewer, most of the existing system in the reconstruction area is relatively old, made of an outdated (clay) material, and in poor condition. Given these conditions, the opportunity to excavate to this utility given removal of overlying roadway pavement for street reconstruction, and the City of Hopkins policy to replace clay sewers during street projects, the existing clay gravity sanitary sewer system throughout the neighborhood is proposed to be replaced with PVC pipe or rehabilitated with a trenchless CIPP liner.

An 8-inch PVC pipe was installed underneath the alley between 9th Ave N and 10th Ave N from 2nd St N to 4th St N to service the Alice Smith and Eisenhower Elementary schools. While this sewer is made from a current and acceptable pipe material, it has several significant defects and is located in an undesirable location (narrow alley right-of-way) for maintenance or future repairs. The proposed reconstruction of 10th Ave N and its sanitary sewer main provides an opportunity to replace and relocate the existing PVC sewer pipe beneath the alley. The 8-inch PVC pipe is proposed to be extended down 4th St N from 9th Ave N and connect to the existing sewer on 10th Ave N instead of turning down the alley between 9th Ave N and 10th Ave N. The sanitary sewer main along 10th Ave N between 4th St N and 2nd St N would be upsized to at least a 10-inch PVC sewer pipe to accommodate the additional flow from the elementary schools before connecting to the larger 12-inch sewer main along 2nd St N. After this sewer main in the alley is redirected to 10th Ave N, the deficient pipe in the alley can be abandoned in place with a grout or sand material without any excavation outside of the roadway.

The clay sanitary sewer along 2nd St N and 3rd St N can be rehabilitated with a trenchless CIPP liner since there are no confirmed services that need to be replaced along these corridors and the sewer can remain its existing location.

While most of the clay sewer mains along the avenues will be excavated and replaced with 8-inch to 12-inch diameter PVC pipe, the deep 15-inch diameter clay sewer main along 15th Ave N between 1st St N and 2nd St N would be proposed for rehabilitation using a CIPP liner. While this rehabilitation method is not typically used on streets designated for

reconstruction with many service laterals, the overly deep sewer main (20-feet below ground) makes open cut excavation costly and infeasible on a residential street. Not only would replacing a 20-foot-deep sanitary sewer main be expensive, but it would also be nearly impossible to maintain daily access to residents with slower progress and larger trenches. Due to the additional complexity and cost of full replacement of the sewer on this block, trenchless CIPP rehabilitation would be proposed. Existing sewer service wyes and laterals may also be lined from inside the main and/or from the right-of-way (ROW) line if found to be feasible and cost effective during the final design and bidding process.

Where gravity mains are to be excavated and replaced, new service wyes will be provided to each home. Per City policy, sanitary services which are not PVC are proposed to be replaced with PVC pipe to the ROW line. New precast concrete manholes will be installed and will incorporate the City standard 27-inch diameter cover utilizing concealed pick-holes to minimize inflow and infiltration. The proposed sanitary sewer mainline improvements are summarized in Table 3 below and shown on Figure 3 in Appendix A.

The exact age of the existing pipes listed in Table 3 could not be verified. Ages were reasonably estimated based on the existing pipe material and the known age of other utilities in the area.

Table 3: Proposed Sanitary Sewer Improvements

Roadway	From/To	Existing Pipe			Proposed Improvements
		Dia.	Matl.	Age	
9th Ave N	1st St N to 3rd St N	8”	VCP (Clay)	1950	8” PVC
10th Ave N	1st St N to 2nd St N	8”	VCP	1950	8” PVC
10th Ave N	2nd St N to 4th St N	8”	VCP	1950	10” PVC
11th Ave N	1st St N to 2nd St N	15”	VCP	1950	15” CIPP Liner
11th Ave N	2nd St N to 3rd St N	12”	VCP	1950	12” PVC
11th Ave N	3rd St N to Minnetonka Mills Rd	8”	VCP	1950	8” PVC
12th Ave N	1st St N to Highway 7	8”	VCP	1950	8” PVC
13th Ave N	Dead-End by Maetzold Field to South Service Dr	8”	VCP	1950	8” PVC
2nd St N	8th Ave N to 10th Ave N	10”	VCP	1950	10” CIPP Liner
2nd St N	10th Ave N to 11th Ave N	12”	VCP	1950	12” CIPP Liner
2nd St N	11th Ave N to 12th Ave N	N/A	N/A	N/A	None/No Sewer
3rd St N	9th Ave N to 11th Ave N	N/A	N/A	N/A	None/No Sewer
3rd St N	11th Ave N to 15th Ave N	8”	VCP	1950	8” CIPP Liner
4th St N	9th Ave N to 10th Ave N	8”	PVC	1970	8” PVC Extension
4th St N	11th Ave N to 12th Ave N	N/A	N/A	N/A	None/No Sewer
Alley b/w 9th Ave N & 10th Ave N	2nd St N to 4th St N	8”	PVC	1970	Abandon Sewer

E. Watermain

All existing cast iron pipe (CIP) watermain along the Avenues in the neighborhood is proposed to be replaced with new ductile iron pipe (DIP). An 8-inch pipe is proposed on all the roadways to most cost effectively achieve adequate fire flows and water distribution. Fire Hydrants will also be replaced along the new watermain, and gate valves will be added at each intersection for more efficient operations and maintenance.

The only east-west street with existing watermain is 3rd St N from 11th Ave N to 13th Ave N. This watermain has no confirmed services and is not necessary to achieve adequate fire flows and water distribution in the area. Due to the redundancy of this watermain, and to avoid additional costs from excavation and full street reconstruction on these two blocks of 3rd St N, it is recommended that this watermain along 3rd St N is abandoned in place with grout or sand material. The City's standard flushing and sampling station would be installed at the dead-end of 13th Ave N to ensure water quality in the system.

Per City policy all water service lines to single family homes are proposed to be replaced to the right-of-way with a new 1" diameter copper service line. A new curb stop valve and box will be provided on each service, approximately on the right-of-way line. Multi-family residential properties and commercial properties will receive a new 6" service line or a service line matching their existing service diameter, whichever is greater. The proposed watermain mainline improvements are summarized in Table 4 below and shown on Figure 4 in Appendix A.

The exact age of the existing pipes listed in Table 4 could not be verified. Ages were reasonably estimated based on the existing pipe material and the known age of other utilities in the area.

Table 4: Proposed Watermain Improvements

Roadway	From/To	Existing Pipe			Proposed Improvements
		Dia.	Matl.	Age	
9th Ave N	1st St N to 3rd St N	6"	CIP	1950	8" DIP
10th Ave N	1st St N to 4th St N	6"	CIP	1950	8" DIP
11th Ave N	1st St N to Minnetonka Mills Rd	6"	CIP	1950	8" DIP
12th Ave N	1st St N to Highway 7	6"	CIP	1950	8" DIP
13th Ave N	Dead-End to South Service Dr	6"	CIP	1950	8" DIP
2nd St N	8th Ave N to 12th Ave N	N/A	N/A	N/A	None/No Watermain
3rd St N	9th Ave N to 11th Ave N	N/A	N/A	N/A	None/No Watermain
3rd St N	11th Ave N to 13th Ave N	6"	CIP	1950	Abandon Watermain
3rd St N	13th Ave N to 15th Ave N	N/A	N/A	N/A	None/No Watermain
4th St N	9th Ave N to 10th Ave N	N/A	N/A	N/A	None/No Watermain
4th St N	11th Ave N to 12th Ave N	N/A	N/A	N/A	None/No Watermain

F. Pedestrian Facilities

Replacement of existing concrete sidewalks is proposed on all Avenues to be fully reconstructed. This will be necessary due to the proposed street and utility construction and because the existing sidewalks are in poor condition and/or do not drain properly. The sidewalks are proposed to be constructed at 6 feet width, and the proposed turf boulevard width will vary but will be somewhat consistent and generally wider than existing since most roadways are being narrowed. The preliminary proposed typical sidewalk section consists of 4" concrete, 4" aggregate base class 5, and spot subgrade soil corrections.

The existing concrete sidewalk on 13th Ave N from 4th St N to South Service Dr will need to be removed due to the proposed street and utility construction. However, the sidewalk on both sides of this block does not connect to any existing pedestrian facilities to the north, south, east, or west. Due to the lack of existing pedestrian connectivity and lower pedestrian use, it could be considered to not replace this sidewalk and instead replace the area with additional turf (sod). Not replacing the sidewalk would be a cost saving measure if desired by Council and the residents/property owners on this block.

There are no sidewalks along 13th Ave N south of 4th St N, and it would not be proposed to add sidewalks along these blocks unless desired by Council and the residents/property owners due to the lack of other pedestrian facilities to connect to in the area and the relatively lower pedestrian use with 13th Ave N being a dead-end to the south of 3rd St N.

Spot sidewalk replacements are proposed along 2nd St N and 4th St N as determined by the engineer in the field for areas with poor drainage, cracked sidewalk, or settled sidewalk which could become a tripping hazard.

There are no sidewalks along 3rd St N, and it would not be proposed to add sidewalks along these blocks unless desired by Council and the residents/property owners. There are no existing sidewalks along 3rd St to the east of the proposed street improvements (9th Ave N) or to the west of the proposed street improvements (15th Ave N), and there are existing east-west sidewalks along 1st St N, 2nd St N, 4th St N, and Minnetonka Mills Rd. There is also neighborhood access to the Lake Minnetonka Regional Trail at the intersection of 3rd St N & 15th Ave N and every other Avenue within the neighborhood.

The proposed improvements to pedestrian facilities are shown on Figure 5 in Appendix A.

G. Boulevard Trees

As with all street and utility improvements being considered by the City of Hopkins, it is a goal of Staff and the project team to protect healthy boulevard trees and/or make improvements to the urban tree canopy where feasible. Design and construction of improvements, including appropriate selection of street widths and utility main placement, are proposed to be completed in a manner to achieve the City's goals to save healthy trees. An evaluation of boulevard tree species and condition throughout the neighborhood will be completed with City Staff in consideration of the adjacent street and utility improvements to facilitate design and construction and meet these criteria.

Due to their susceptibility to the emerald ash borer, green ash trees are generally considered undesirable trees. Similarly, silver maple trees are more susceptible to storm damage than other species, create more litter because of their soft wood and weak, brittle branches, and thus are not desirable trees to Public Works staff and local residents. Silver maples are also known to have an intrusive root system that can damage sidewalks and curbs and penetrate sewer joints. Finally, American Elm are still susceptible to Dutch Elm disease. These three undesirable species, as well as other trees that are either dead or in poor health, should either be removed or otherwise not protected through the design/construction process.

An inventory of the trees located in the right of way would be performed during the preliminary design process by City public works staff and the project design and construction team. Consistent with all City of Hopkins annual street and utility improvement projects, trees that are dead or in very poor condition, and "undesirable" species in fair or poor condition, would be proposed for removal and replacement. Trees may be identified for removal due to conflicts with utilities or street grading and will be further evaluated during preliminary and final design to see if reasonable measures can be taken to preserve them. Options to preserve highly desirable trees in harm's way include small retaining walls or moving service lines around trees but these practices are not always feasible. Unfortunately, there is always the possibility that additional trees will need to be removed and replaced during the construction process that were not planned for removal during design due to various unforeseen circumstances. The project team and field representatives would communicate and coordinate tree replacement with the property owner for each of these occurrences.

This project provides an opportunity to increase the health of the neighborhood forest by replacing some of the undesirable species with trees better suited for boulevard areas. One tree is proposed to be installed per each tree removed. New 2-inch balled and burlapped trees are typically planted in replacement of those removed. The City will communicate with the property owners to replace trees as part of the project in the event tree removal is necessary. The species of trees to be planted will be a wide variety and coordinated with the City's public works staff.

Properties located adjacent to boulevard tree removals will be contacted and allowed to provide input on their desire for a particular tree species to be planted based on the list provided.

VI. Estimated Costs and Funding

Estimated construction costs presented in this report are based on anticipated 2025 unit bid prices and include a 20 percent contingency factor. Overhead costs, estimated at 20 percent, include legal, engineering, administrative and fiscal costs. Final costs and any assessments would be determined by using low-bid construction costs of the proposed work.

Proposed construction costs for the Central Avenues Phase 2 improvements (including curb and gutter, bituminous street, pedestrian facilities, storm sewer, sanitary sewer, water main, and turf restoration) are itemized in Appendix B and are summarized in Table 5 below.

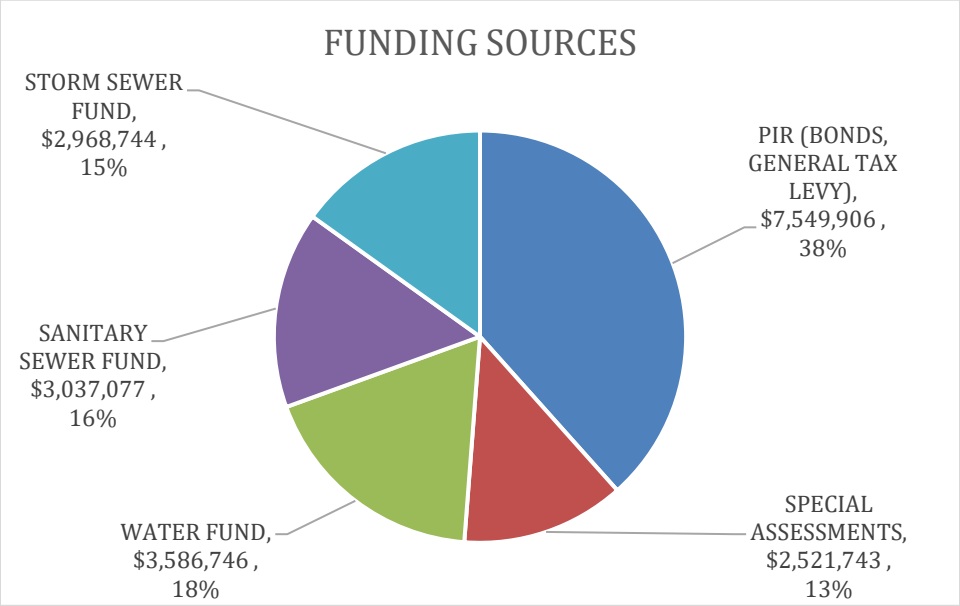
These cost estimates are based upon public construction cost information. Because the consultant has no control over the cost of labor, materials, competitive bidding process, weather conditions and other factors affecting the cost of construction, all cost estimates are opinions for general information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

Table 5: Estimated Cost of Proposed Central Avenues Phase 2 Improvements

Proposed Street Improvements	$5,013,000
Proposed Pedestrian Facility Improvements	$1,440,000
Proposed Sanitary Sewer Improvements	$2,356,000
Proposed Watermain Improvements	$2,785,000
Proposed Storm Sewer Improvements	$2,062,000
Construction Cost Subtotal	**$13,656,000**
Construction Cost with Contingencies (20%)	**$16,387,000**
Engineering & Administration (20%)	$3,277,000
Total Estimated Project Costs	**$19,664,000**

The improvements would be funded using the following sources:

PIR (BONDS, GENERAL TAX LEVY)	$	7,549,906
SPECIAL ASSESSMENTS	$	2,521,743
WATER FUND	$	3,586,746
SANITARY SEWER FUND	$	3,037,077
STORM SEWER FUND	$	2,968,744
Total	**$**	**19,664,216**



Special assessment funding was estimated using the 2025 cap amount per front foot of each parcel and multiplying it by the sum of the parcel lengths along all Avenues to be reconstructed. The 2025 cap amount for residential properties was determined to be $109.32 per front foot by adding 3% to the 2024 assessment cap according to City policy. There is no cap amount for commercial properties but there is only one commercial property in the neighborhood, which an estimated additional $22,500 was accounted for in the assessment funds.

Assessments for side street assessments are calculated on a unit basis for each parcel one block to the north and south of the reconstructed street, but this does not apply to parcels already hitting the cap amount for reconstruction on the Avenues. It was assumed that there would be minimal to zero assessments from side street reconstruction in this neighborhood due to the configuration of streets proposed for reconstruction.

There are no assessments for maintenance work, including milling or reclaiming and street resurfacing, per City policy.

There are no assessments for storm sewer mains, sanitary sewer mains, or watermain improvements, but there are assessments for utility service lines owned by the property owner for sewer and water. Per City policy, each residential property owner receiving a new utility service from the main to the property line as part of the improvements is assessed for 50% of the actual costs. These costs were estimated using unit prices for each item of work to construct the service and divided in half for the property owner's share. The City would pay the remaining 50% of the costs through their water and sanitary sewer funds.

A preliminary assessment roll is not included in this report but would be included in a feasibility report if ordered by Council.

Potential outside funding opportunities include MPCA grants for Stormwater Resilience Planning and Stormwater Resilience Implementation, both expected to be available for applications in Fall 2024. The City could consider applying for one or both grants to assist in funding some of the costs for planning and construction of the storm sewer improvements that will improve flood resiliency throughout the neighborhood. Available funds from the MPCA are expected to be about $750,000 for the planning grant and about $35,000,000 for the implementation grant to be awarded to approved applications throughout the State.

VII. Right-of-Way/Easements/Permits

The majority of the proposed improvements would be limited to the existing street ROW along all corridors. Temporary construction easements may be needed for work outside the street ROW such as driveway apron replacement, grading and turf restoration, but is not anticipated. It is also not anticipated that any permanent easements would be required for the proposed improvements. Therefore, there are no anticipated costs for easement acquisition.

Permits would be required from the Minnesota Pollution Control Agency for grading (National Pollutant Discharge Elimination System permit), Minnesota Department of Health for Water Main Replacement, and the Nine Mile Creek Watershed District for Erosion Control and Stormwater Management.

VIII. Project Phasing

The Central Avenues Phase 2 improvements area includes too much work to be constructed during one construction season. Therefore, the proposed improvements need to be split into separate phases and constructed over multiple years. Construction sequencing and scope of work were considered when evaluating different project phasing options, and three phasing options were considered for the proposed improvements.

Phasing Option A, shown on Figure 6 in Appendix A, divides the streets to be reconstructed or resurfaced into two equally sized phases to be constructed over two years. This option could be constructed under two separate construction contracts (one phase/project for each year) or one construction contract/project to be constructed over two years. There are several benefits to one construction contract versus two including one Contractor to complete all the work resulting in fewer chances for overlap of work and conflicts, one plan and specifications resulting more efficient engineering, and larger quantities of work which typically equates to cheaper unit prices and an ultimate cost savings. It was considered to delay the project by one year to start two years/phases in 2026, but this is not recommended due to anticipated inflation in construction costs, additional street maintenance costs to patch potholes and cracks, and increased risk of underground utility failure of the sanitary sewer or watermain.

Phasing Option B, shown on Figure 7 in Appendix A, divides the streets to be reconstructed or resurfaced into two unequally sized phases to be constructed over three years. This option could be constructed under two separate construction contracts (one smaller one-year phase/project and one larger two-year phase/project) or three separate construction contracts (one smaller one-year phase/project and two medium sized one-year phases/projects). This option was evaluated to provide the City with an option for a more budget friendly project in 2025 before completing a larger project(s) in 2026 and 2027. However, while there would be cost savings in 2025, costs would increase in 2026 and 2027 due to inflation, additional contracts, and larger quantities of

work that are pushed back by at least one year, making this less desirable than Option A.

Phasing Option C, shown on Figure 8 in Appendix A, divides the streets to be reconstructed or resurfaced into three equally sized phases to be constructed over three years. This option could be constructed under three separate construction contracts (one phase/project for each year) or one construction contract/project to be constructed over three years. This option is similar to Option A but would spread the costs out over three years instead of two years. While the cost per year would be lower, the total cost would be anticipated to be higher due to inflation of construction costs and more risks with either splitting this up into three sperate projects or constructing one project over three years. Three separate projects could cause complications and additional overlap of efforts at the project limits. One project over three years is a risk to the Contractor when bidding due to the unknowns of material and labor costs two to three years out, resulting in Contractors inflating their bid to compensate for these unknown cost increases regardless of the quantity of work. There is also no reason from a constructability standpoint to split the improvements into three phases/years when the improvements can feasibly be constructed in two phases/years, making this option less desirable than Option A

The estimated costs for the proposed improvements were evaluated for each phasing option and each contract/project scenario (one, two, or three contracts/projects). It was determined that the phasing option did not affect the total cost of the improvements as much as the number of contracts/projects did. The fewer contracts/projects, the lower total costs for the proposed improvements. One contract/project is anticipated to be about $1 million and up to $2.5 million cheaper in total project costs than three separate contracts/projects for the same improvements throughout the Central Avenues Neighborhood.

One construction contract for a two-year project (Phasing Option A) is recommended with construction starting in Spring 2025 and concluding in Fall 2026. Construction in 2025 would be completed in Fall 2025, work would be suspended during the winter of 2025 to 2026, and construction would begin again in Spring 2026 to be completed later that year.

IX. Conclusion and Recommendations

From an engineering standpoint, these improvements are feasible, cost effective, and necessary and can best be accomplished by letting competitive bids for the work. It is recommended that a feasibility report is ordered for a project to start the Minnesota Statutes Chapter 429 assessment process since special assessments would be proposed for the streets to be fully reconstructed. A feasibility report should be ordered and completed in Fall 2024 if it is desired to order final plans and specifications for contractors to bid and start construction on the proposed improvements in 2025. It is also recommended that the work be done under one contract, for all street and utility improvements described in this report, to complete the work in an orderly and efficient manner over two construction seasons. This is anticipated to provide the City with the best quality product at the lowest cost, but the City, its financial consultant, and any persons assessed will have to determine the economic feasibility of the proposed improvements.

X. Project Schedule

If a Feasibility Report is ordered by the City Council for a project to start construction in 2025, the following tentative schedule is proposed:

Present Project Scoping Report and Staff Recommendations /

Order Feasibility Report ..... September 3, 2024

Mail Questionnaires & Neighborhood Meeting Invites .....September 4 – 6, 2024

Neighborhood Meeting 1 ..... October 2, 2024

Council Set Public Hearing Date / Present Feasibility Report ..... October 15, 2024

Neighborhood Meeting 2 ..... November 6, 2024

Present Feasibility Report / Conduct Public Hearing /

Order Final Plans/Specifications ..... November 12, 2024

Approve Final Plans & Specifications /

Authorize Advertisement for Bids ..... Late January/Early February 2025

Bid Opening ..... Late February/Early March 2025

Council Sets Public Assessment Hearing Date .....March 2025

Neighborhood Meeting 3..... Late March/Early April 2025

Council Accepts Bids / Conduct Public Assessment Hearing /

Adopt Assessment Roll / Award Bid .....April 2025

Start of Construction ..... May 2025

Appendix A: Figures

CENTRAL AVENUES IMPROVEMENTS PHASE 2
CITY OF HOPKINS

FIGURE 1: PROJECT SCOPE & STREET WIDTHS
AUGUST 2024

BOLTON & MENK

LEGEND

PROPOSED RECONSTRUCTION

PROPOSED STREET RESURFACING

XX' F-F — EXISTING STREET WIDTH (FACE OF CURB TO FACE OF CURB)

XX' F-F — PROPOSED STREET WIDTH (FACE OF CURB TO FACE OF CURB)

HORZ. SCALE 0 125 250 FEET

HWY 7
SOUTH SERVICE DR
4TH ST N
MINNETONKA MILLS RD
3RD ST N
2ND ST N
1ST ST N
MAETZOLD FIELD
MAINSTREET

15TH AVE N
14TH AVE N
13TH AVE N
12TH AVE N
11TH AVE N
10TH AVE N
9TH AVE N
8TH AVE N

36' F-F
28' F-F
31' F-F
32' F-F
35' F-F
30' F-F

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CENTRAL AVENUES IMPROVEMENTS PHASE 2

CITY OF HOPKINS

FIGURE 2: STORM SEWER

AUGUST 2024

BOLTON & MENK

LEGEND

PROPOSED STORM SEWER

- REPLACE 12" PIPE WITH 15" PIPE
- EXTEND 15" PIPE
- REPLACE 24" PIPE
- POTENTIAL STORMWATER MANAGEMENT INFILTRATION PIPE
- POTENTIAL STORMWATER MANAGEMENT UNDERGROUND CHAMBERS

EXISTING STORM SEWER

- SMALL STORM SEWER (12" - 15")
- MEDIUM STORM SEWER (18" - 24")
- LARGE STORM SEWER (27" - 36")
- TRUNK STORM SEWER (42"+)
- EXISTING CATCH BASIN INLETS
- PROPOSED CATCH BASIN INLETS

HORZ. SCALE 0 125 250 FEET

HWY 7
SOUTH SERVICE DR
4TH ST N
MINNETONKA MILLS RD
15TH AVE N
14TH AVE N
13TH AVE N
12TH AVE N
11TH AVE N
10TH AVE N
9TH AVE N
8TH AVE N
42" STORM SEWER
3RD ST N
2ND ST N
8" STORM SEWER
42" STORM SEWER
60" STORM SEWER
MAETZOLD FIELD
1ST ST N
60" STORM SEWER
MAINSTREET
60" STORM SEWER
MAINSTREET

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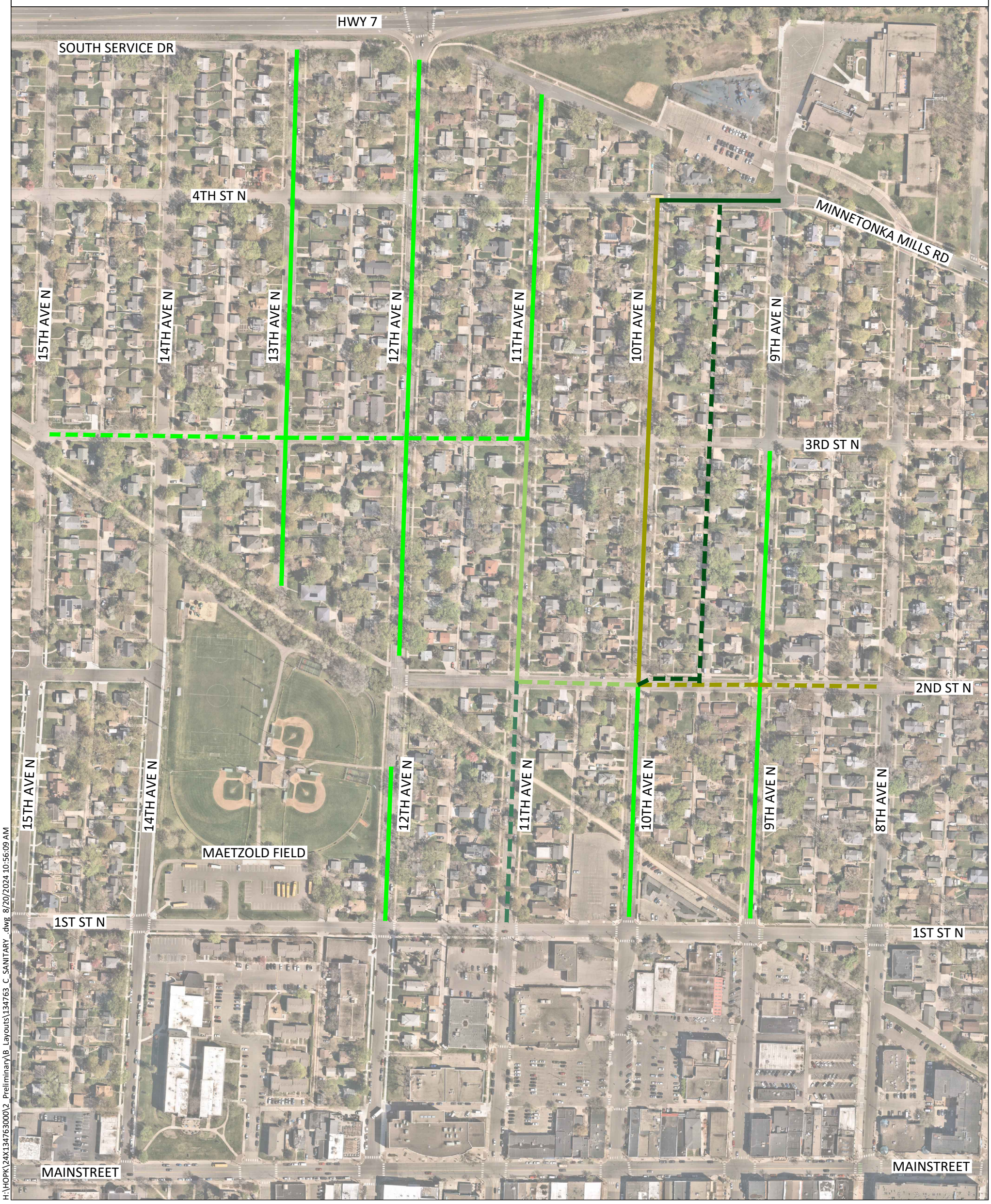
LEGEND

- EXISTING 8" VCP SANITARY SEWER (REPLACE WITH 8" PVC AND NEW SERVICES)
- EXISTING 8" VCP SANITARY SEWER (CIPP LINING)
- EXISTING 8" PVC SANITARY SEWER (REPLACE & RELOCATE WITH 8" PVC)
- EXISTING 8" PVC SANITARY SEWER (ABANDON IN PLACE)
- EXISTING 15" VCP SANITARY SEWER (CIPP LINING AND LATERAL LINING)
- EXISTING 8" VCP SANITARY SEWER (REPLACE WITH 10" PVC AND NEW SERVICES)
- EXISTING 10" VCP SANITARY SEWER (CIPP LINING)
- EXISTING 12" VCP SANITARY SEWER (REPLACE WITH 12" PVC AND NEW SERVICES)
- EXISTING 12" VCP SANITARY SEWER (CIPP LINING)

N

HORZ. SCALE 0 125 250 FEET



LEGEND

- EXISTING 6" CIP WATERMAIN REPLACE WITH 8" DIP & NEW SERVICES
- ABANDON EXISTING 6"CIP WATERMAIN
- EXISTING 6" CIP WATERMAIN
- EXISTING 8" DIP/HDPE WATERMAIN
- EXISTING 12" DIP/HDPE WATERMAIN
- EXISTING 16" TRUNK WATERMAIN

HORZ. SCALE 0 125 250 FEET

HWY 7
SOUTH SERVICE DR
4TH ST N
MINNETONKA MILLS RD
15TH AVE N
14TH AVE N
13TH AVE N
12TH AVE N
11TH AVE N
10TH AVE N
9TH AVE N
8TH AVE N
3RD ST N
2ND ST N
1ST ST N
MAETZOLD FIELD
INSTALL FLUSHING AND SAMPLING STATION
8" CIP
MAINSTREET

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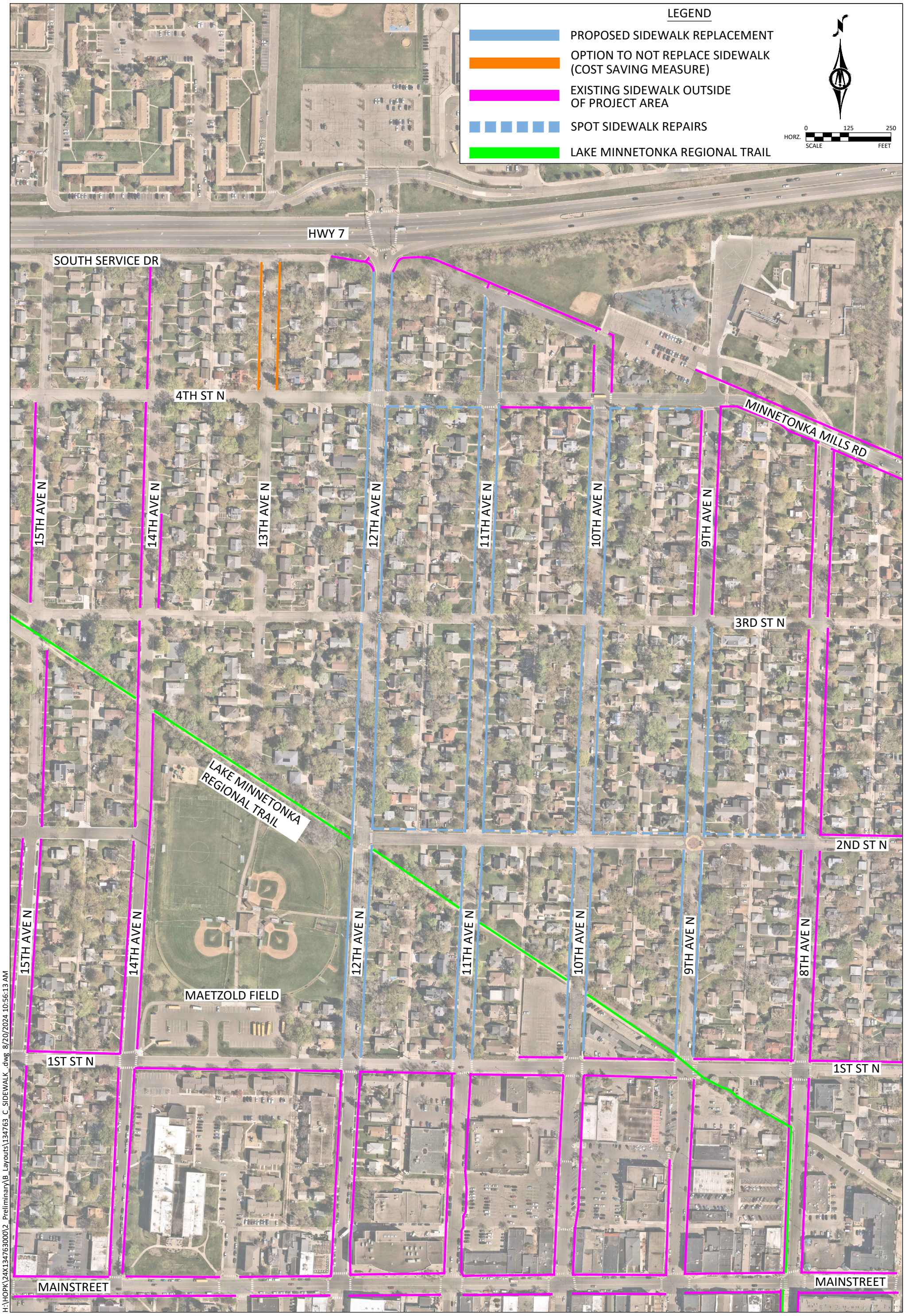

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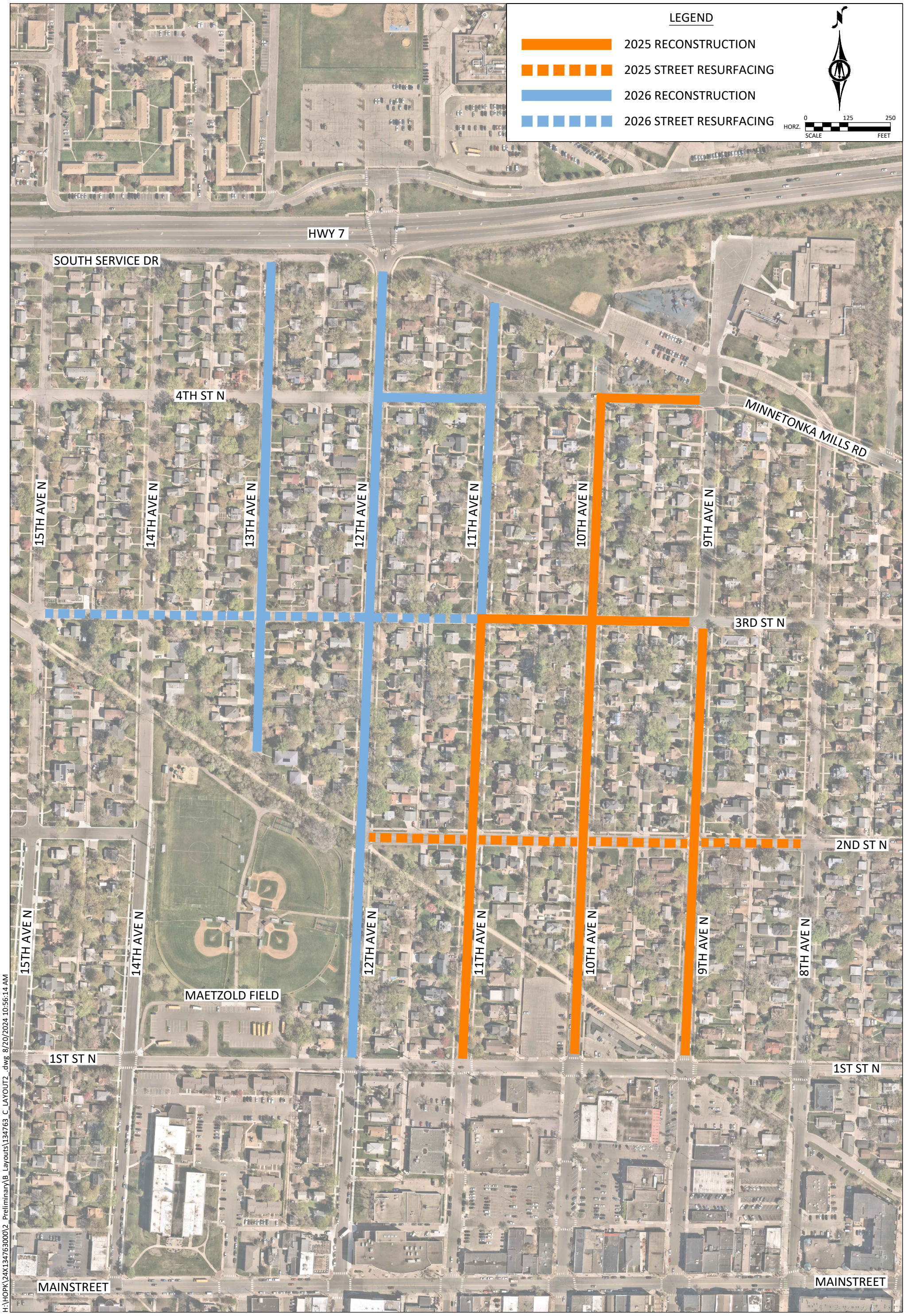

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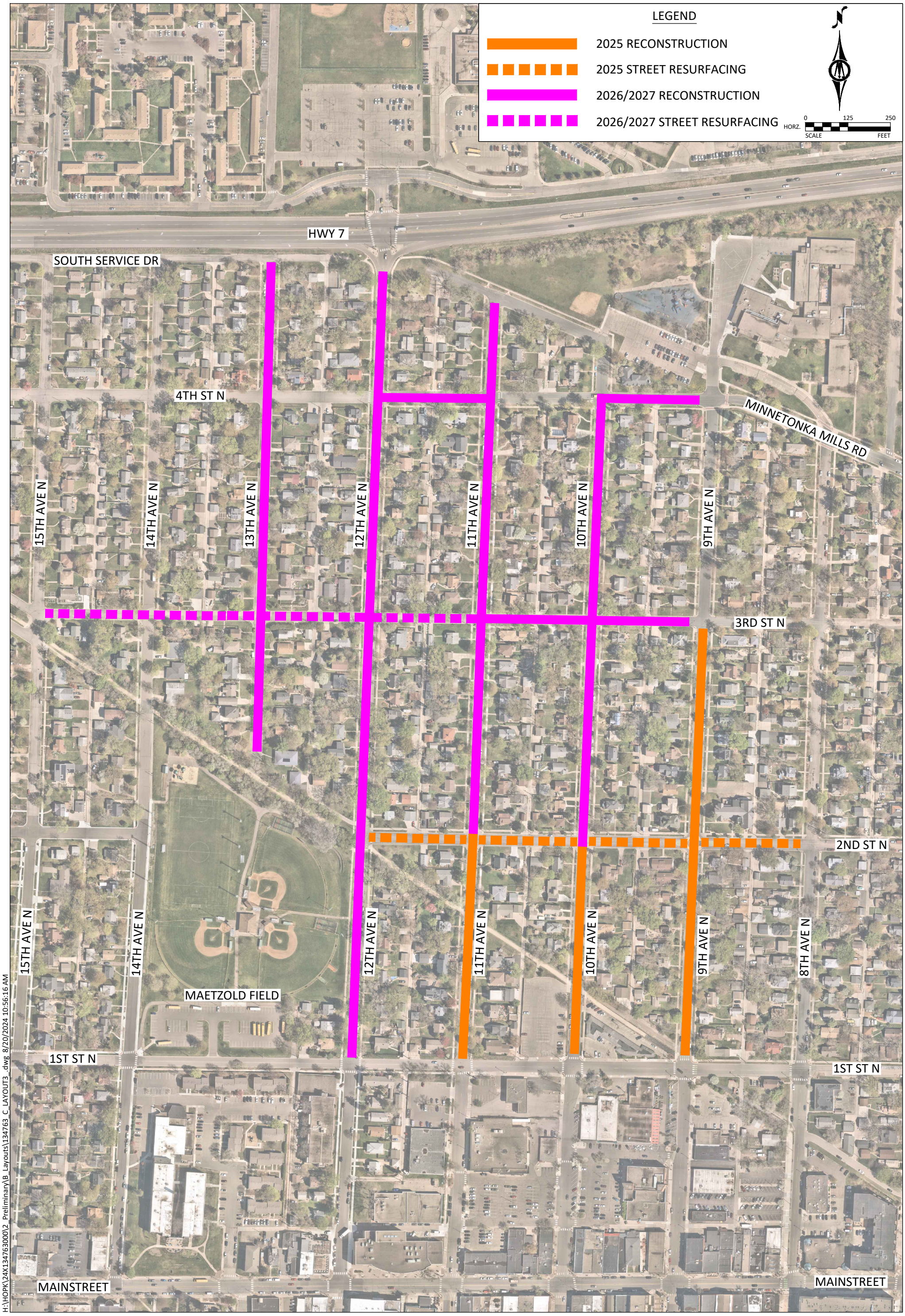
CENTRAL AVENUES IMPROVEMENTS PHASE 2
CITY OF HOPKINS

FIGURE 7: PROJECT PHASING OPTION B
AUGUST 2024

BOLTON & MENK



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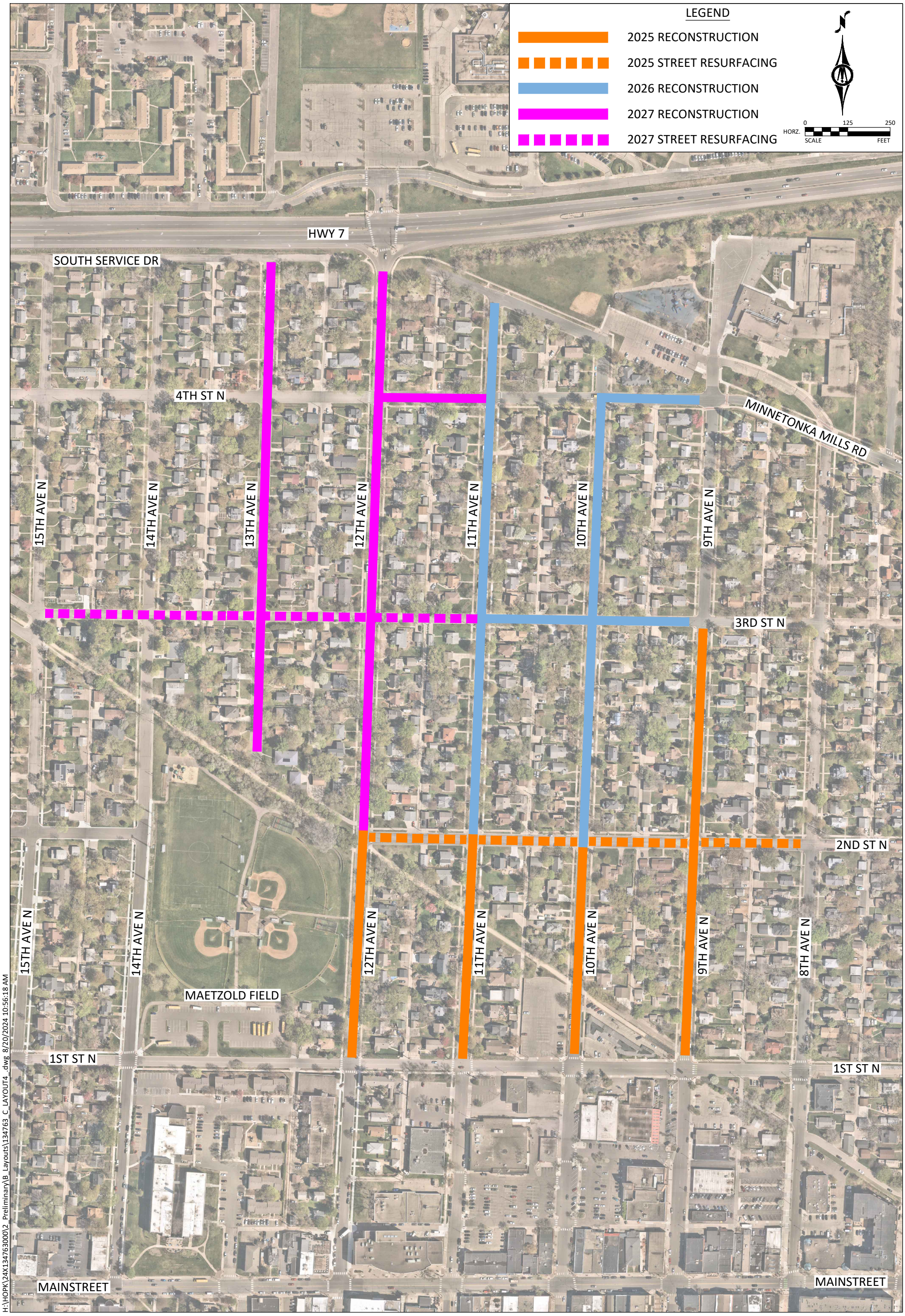

Appendix B: Preliminary Cost Estimates

PRELIMINARY ENGINEER'S ESTIMATE

CENTRAL AVENUES PHASE 2

ESTIMATED UNIT PRICES FOR 2025 CONSTRUCTION

CITY OF HOPKINS, MN

BOLTON & MENK
Real People. Real Solutions.

ITEM NO.	ITEM	UNIT	UNIT PRICE	ESTIMATED QUANTITIES					ESTIMATED COSTS					TOTAL QUANTITY	TOTAL COST
				SIDEWALK TOTAL	STREET TOTAL	SANITARY TOTAL	STORM TOTAL	WATER TOTAL	SIDEWALK TOTAL	STREET TOTAL	SANITARY TOTAL	STORM TOTAL	WATER TOTAL		
1	MOBILIZATION	LUMP SUM	$750,000.00	0.10	0.40	0.20	0.10	0.20	$75,000.00	$300,000.00	$150,000.00	$75,000.00	$150,000.00	1.00	$750,000.00
2	CLEARING	TREE	$450.00		161					$72,450.00				161	$72,450.00
3	GRUBBING	TREE	$250.00		161					$40,250.00				161	$40,250.00
4	DECIDUOUS TREE 2" CAL B&B	EACH	$550.00		161					$88,550.00				161	$88,550.00
5	REMOVE SIGN POST	EACH	$75.00		200					$15,000.00				200	$15,000.00
6	REMOVE SIGN PANEL	EACH	$50.00		200					$10,000.00				200	$10,000.00
7	REMOVE CURB AND GUTTER	LIN FT	$5.00		20700					$103,500.00				20700	$103,500.00
8	REMOVE CURB AND GUTTER (SPOT)	LIN FT	$10.00		1183					$11,830.00				1183	$11,830.00
9	REMOVE BITUMINOUS DRIVEWAY PAVEMENT	SQ YD	$9.00		520					$4,680.00				520	$4,680.00
10	REMOVE BITUMINOUS STREET PAVEMENT	SQ YD	$4.50		36945					$166,252.50				36945	$166,252.50
11	REMOVE CONCRETE WALK	SQ FT	$1.25	105630					$132,037.50					105630	$132,037.50
12	REMOVE CONCRETE WALK (SPOT)	SQ FT	$3.00		1765					$5,295.00				1765	$5,295.00
13	REMOVE CONCRETE STEP	EACH	$110.00	360					$39,600.00					360	$39,600.00
14	REMOVE CONCRETE ALLEY/DRIVEWAY PAVEMENT	SQ YD	$12.00		2795					$33,540.00				2795	$33,540.00
15	SALVAGE & REINSTALL SIGN PANEL	EACH	$225.00		40					$9,000.00				40	$9,000.00
16	SALVAGE & REINSTALL PAVERS	SQ FT	$25.00	120					$3,000.00					120	$3,000.00
17	REMOVE RAILING	LIN FT	$35.00	240					$8,400.00					240	$8,400.00
18	SAWING CONCRETE PAVEMENT (FULL DEPTH)	LIN FT	$5.50	1007					$5,538.50					1007	$5,538.50
19	SAWING BITUMINOUS PAVEMENT (FULL DEPTH)	LIN FT	$3.50		1150					$4,025.00				1150	$4,025.00
20	SALVAGE & REINSTALL FENCE	LIN FT	$120.00	275					$33,000.00					275	$33,000.00
21	REMOVE RETAINING WALL	LIN FT	$22.00	950					$20,900.00					950	$20,900.00
22	SALVAGE & REINSTALL BLOCK RETAINING WALL	LIN FT	$100.00	150					$15,000.00					150	$15,000.00
23	REMOVE HYDRANT	EACH	$500.00					16					$8,000.00	16	$8,000.00
24	REMOVE WATERMAIN	LIN FT	$6.00					9860					$59,160.00	9860	$59,160.00
25	REMOVE DRAINAGE STRUCTURE (STORM)	EACH	$600.00				63					$37,800.00		63	$37,800.00
26	REMOVE STORM SEWER PIPE	LIN FT	$16.00				2450					$39,200.00		2450	$39,200.00
27	REMOVE SANITARY SEWER PIPE	LIN FT	$5.00			10285					$51,425.00			10285	$51,425.00
28	REMOVE SANITARY MANHOLE	EACH	$725.00			32					$23,200.00			32	$23,200.00
29	EXPLORATORY EXCAVATION	HOUR	$1,000.00			15	15	15			$15,000.00	$15,000.00	$15,000.00	45	$45,000.00
30	COMMON EXCAVATION	CU YD	$30.00		34656					$1,039,680.00				34656	$1,039,680.00
31	SUBGRADE EXCAVATION	CU YD	$30.00		1517					$45,510.00				1517	$45,510.00
32	RECLAIM BITUMINOUS SURFACE (IN PLACE)	SQ YD	$3.50		3585					$12,547.50				3585	$12,547.50
33	SUBGRADE PREPARATION	SQ YD	$3.00		3585					$10,755.00				3585	$10,755.00
34	GEOTEXTILE FABRIC TYPE V	SQ YD	$2.00		41576					$83,152.00				41576	$83,152.00
35	STABILIZING AGGREGATE	CU YD	$45.00		1395					$62,775.00				1395	$62,775.00
36	SELECT GRANULAR BORROW	TON	$18.00		25269					$454,842.00				25269	$454,842.00
37	CLASS 5 AGGREGATE BASE	TON	$20.00		17155					$343,100.00				17155	$343,100.00
38	CLASS 2 AGGREGATE SURFACING (GRAVEL DRIVEWAY)	TON	$60.00		5					$300.00				5	$300.00
39	BITUMINOUS WEARING COURSE (SPWEA240C)	TON	$95.00		3714					$352,830.00				3714	$352,830.00
40	BITUMINOUS -NON-WEARING COURSE (SPNWB230C)	TON	$90.00		3203					$288,270.00				3203	$288,270.00
41	BITUMINOUS WEARING COURSE (SPWEA340C)	TON	$100.00		1034					$103,400.00				1034	$103,400.00
42	BITUMINOUS -NON-WEARING COURSE (SPNWB330C)	TON	$95.00		1553					$147,535.00				1553	$147,535.00
43	BITUMINOUS MATERIAL FOR TACK COAT	GAL	$3.50		2297					$8,039.50				2297	$8,039.50
44	2" BITUMINOUS STREET PATCH	SQ YD	$30.00		633					$18,990.00				633	$18,990.00
45	MILL BITUMINOUS SURFACE (2")	SQ YD	$3.25		4217					$13,705.25				4217	$13,705.25
46	3" BITUMINOUS DRIVEWAY	SQ YD	$55.00		520					$28,600.00				520	$28,600.00
47	JOINT ADHESIVE (MASTIC)	LIN FT	$0.75		20700					$15,525.00				20700	$15,525.00
48	MODULAR BLOCK RETAINING WALL	SQ FT	$55.00		1500					$82,500.00				1500	$82,500.00
49	TIMBER RETAINING WALL	LIN FT	$120.00		350					$42,000.00				350	$42,000.00
50	6" PERF PVC UNDERDRAIN	LIN FT	$22.50				5179					$116,527.50		5179	$116,527.50
51	6" PERF PVC UNDERDRAIN CLEANOUT	EACH	$375.00				76					$28,500.00		76	$28,500.00
52	15" RC STORM PIPE	LIN FT	$72.00				3075					$221,400.00		3075	$221,400.00
53	24" RC STORM PIPE	LIN FT	$110.00				250					$27,500.00		250	$27,500.00
54	STORM MANHOLE (48-4020)	EACH	$3,000.00				6					$18,000.00		6	$18,000.00
55	STORM MANHOLE (60-4020)	EACH	$6,000.00				2					$12,000.00		2	$12,000.00
56	STORM MANHOLE (72-4020)	EACH	$8,000.00				1					$8,000.00		1	$8,000.00
57	STORM MANHOLE (84-4022)	EACH	$10,000.00				1					$10,000.00		1	$10,000.00
58	STORM CATCH BASIN	EACH	$2,250.00				60					$135,000.00		60	$135,000.00
59	SAFL BAFFLE	SQ FT	$530.00				30					$15,900.00		30	$15,900.00
60	INSTALL CASTING (R-3067)(STORM)	EACH	$1,000.00				55					$55,000.00		55	$55,000.00
61	INSTALL CASTING (R-3067-C)(STORM)	EACH	$1,050.00				5					$5,250.00		5	$5,250.00

PRELIMINARY ENGINEER'S ESTIMATE

CENTRAL AVENUES PHASE 2

ESTIMATED UNIT PRICES FOR 2025 CONSTRUCTION

CITY OF HOPKINS, MN

BOLTON & MENK
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ITEM NO.	ITEM	UNIT	UNIT PRICE	ESTIMATED QUANTITIES					ESTIMATED COSTS					TOTAL QUANTITY	TOTAL COST
				SIDEWALK TOTAL	STREET TOTAL	SANITARY TOTAL	STORM TOTAL	WATER TOTAL	SIDEWALK TOTAL	STREET TOTAL	SANITARY TOTAL	STORM TOTAL	WATER TOTAL		
62	INSTALL CASTING (R-1733)(STORM)	EACH	$1,200.00				8					$9,600.00		8	$9,600.00
63	INSTALL CASTING (R-1733 - SLOTTED GRATE)(STORM)	EACH	$1,250.00				2					$2,500.00		2	$2,500.00
64	ADJUST FRAME & RING CASTINGS (STORM)	EACH	$875.00				14					$12,250.00		14	$12,250.00
65	CONNECT TO EXISTING STORM PIPE	EACH	$1,600.00				20					$32,000.00		20	$32,000.00
66	CONNECT TO EXISTING STORM STRUCTURE	EACH	$2,100.00				27					$56,700.00		27	$56,700.00
67	STORMWATER MANAGEMENT - PERFORATED PIPES	LIN FT	$350.00				200					$70,000.00		200	$70,000.00
68	STORMWATER MANAGEMENT - UNDERGROUND CHAMBERS	LUMP SUM	$325,000.00				1					$325,000.00		1	$325,000.00
69	STORMWATER MANAGEMENT - PARKING LOT	LUMP SUM	$275,000.00				1					$275,000.00		1	$275,000.00
70	8" PVC SDR 35 SANITARY SEWER PIPE	LIN FT	$65.00			7075					$459,875.00			7075	$459,875.00
71	10" PVC SDR 35 SANITARY SEWER PIPE	LIN FT	$75.00			1305					$97,875.00			1305	$97,875.00
72	12" PVC SDR 35 SANITARY SEWER PIPE	LIN FT	$85.00			650					$55,250.00			650	$55,250.00
73	COARSE AGGREGATE BEDDING (TYPE B)	LIN FT	$10.00			775					$7,750.00			775	$7,750.00
74	8" CIPP LINING	LIN FT	$55.00			1195					$65,725.00			1195	$65,725.00
75	10" CIPP LINING	LIN FT	$65.00			675					$43,875.00			675	$43,875.00
76	12" CIPP LINING	LIN FT	$75.00			320					$24,000.00			320	$24,000.00
77	15" CIPP LINING	LIN FT	$90.00			650					$58,500.00			650	$58,500.00
78	CIPP LATERAL LINING	LIN FT	$25.00			216					$5,400.00			216	$5,400.00
79	CIPP TAP LINER	EACH	$5,000.00			18					$90,000.00			18	$90,000.00
80	SEAL SANITARY MANHOLE	EACH	$4,500.00			9					$40,500.00			9	$40,500.00
81	TRIM PROTRUDING TAP	EACH	$550.00			4					$2,200.00			4	$2,200.00
82	6" PVC SDR 26 SANITARY SEWER SERVICE PIPE	LIN FT	$45.00			9372					$421,740.00			9372	$421,740.00
83	8" X 6" SDR 26 PVC SERVICE WYE	EACH	$675.00			203					$137,025.00			203	$137,025.00
84	10" X 6" SDR 26 PVC SERVICE WYE	EACH	$750.00			41					$30,750.00			41	$30,750.00
85	12" X 6" SDR 26 PVC SERVICE WYE	EACH	$850.00			22					$18,700.00			22	$18,700.00
86	INSTALL CASTING (R-1733)(SANITARY)	EACH	$1,250.00			39					$48,750.00			39	$48,750.00
87	SANITARY MANHOLE	EACH	$6,000.00			35					$210,000.00			35	$210,000.00
88	RECONNECT SANITARY SEWER SERVICE	EACH	$450.00			284					$127,800.00			284	$127,800.00
89	SANITARY SERVICE REPAIR	EACH	$3,000.00			12					$36,000.00			12	$36,000.00
90	CONNECT TO EXISTING SANITARY SEWER PIPE	EACH	$3,500.00			10					$35,000.00			10	$35,000.00
91	CONNECT TO EXISTING SANITARY MANHOLE	EACH	$4,500.00			11					$49,500.00			11	$49,500.00
92	HYDRANT	EACH	$7,500.00					16					$120,000.00	16	$120,000.00
93	DUCTILE IRON FITTINGS	POUND	$15.00					4950					$74,250.00	4950	$74,250.00
94	6" GATE VALVE & BOX	EACH	$2,750.00					17					$46,750.00	17	$46,750.00
95	8" GATE VALVE & BOX	EACH	$3,750.00					80					$300,000.00	80	$300,000.00
96	6" DIP WATERMAIN	LIN FT	$80.00					240					$19,200.00	240	$19,200.00
97	8" DIP WATERMAIN	LIN FT	$85.00					9280					$788,800.00	9280	$788,800.00
98	1" TYPE K COPPER SERVICE PIPE	LIN FT	$45.00					9372					$421,740.00	9372	$421,740.00
99	1" CURB STOP & BOX	EACH	$650.00					284					$184,600.00	284	$184,600.00
100	1" CORPORATION STOP	EACH	$425.00					284					$120,700.00	284	$120,700.00
101	INSTALL FLUSHING STATION	EACH	$5,000.00					1					$5,000.00	1	$5,000.00
102	INSTALL SAMPLING STATION	EACH	$5,000.00					1					$5,000.00	1	$5,000.00
103	GROUNDING ANODE	EACH	$150.00					309					$46,350.00	309	$46,350.00
104	TRACER WIRE ACCESS BOX (NON ROADWAY)	EACH	$150.00					284					$42,600.00	284	$42,600.00
105	TRACER WIRE TEST STATION (HYDRANT)	EACH	$175.00					16					$2,800.00	16	$2,800.00
106	HYDRANT EXTENSION	LIN FT	$1,800.00					6					$10,800.00	6	$10,800.00
107	RECONNECT WATER SERVICE	EACH	$425.00					284					$120,700.00	284	$120,700.00
108	CONNECT TO EXISTING WATERMAIN	EACH	$2,500.00					9					$22,500.00	9	$22,500.00
109	4" POLYSTYRENE INSULATION	SQ YD	$50.00					320					$16,000.00	320	$16,000.00
110	FORD TYPE A-1 CURB BOX COVER	EACH	$300.00					44					$13,200.00	44	$13,200.00
111	TEMPORARY WATER SERVICE	EACH	$500.00					284					$142,000.00	284	$142,000.00
112	4" CONCRETE WALK	SQ FT	$7.25	105630					$765,817.50					105630	$765,817.50
113	4" CONCRETE WALK (SPOT)	SQ FT	$10.50		1765					$18,532.50				1765	$18,532.50
114	CONCRETE STEP	EACH	$320.00	360					$115,200.00					360	$115,200.00
115	CONCRETE CURB & GUTTER DESIGN B618	LIN FT	$20.00				20700					$414,000.00		20700	$414,000.00
116	CONCRETE CURB & GUTTER DESIGN B618 (SPOT)	LIN FT	$37.50		1183					$44,362.50				1183	$44,362.50
117	6" CONCRETE WALKS (PED RAMPS)	SQ YD	$140.00	790					$110,600.00					790	$110,600.00
118	6" CONCRETE DRIVEWAY	SQ YD	$90.00		1370					$123,300.00				1370	$123,300.00
119	8" CONCRETE DRIVEWAY/ALLEY	SQ YD	$115.00		1275					$146,625.00				1275	$146,625.00
120	TRUNCATED DOMES	SQ FT	$60.00	309					$18,540.00					309	$18,540.00
121	TRAFFIC CONTROL	LUMP SUM	$100,000.00	0.10	0.40	0.20	0.10	0.20	$10,000.00	$40,000.00	$20,000.00	$10,000.00	$20,000.00	1.00	$100,000.00
122	SIGN POST U CHANNEL	EACH	$160.00		180					$28,800.00				180	$28,800.00

PRELIMINARY ENGINEER'S ESTIMATE

CENTRAL AVENUES PHASE 2

ESTIMATED UNIT PRICES FOR 2025 CONSTRUCTION

CITY OF HOPKINS, MN

BOLTON & MENK
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ITEM NO.	ITEM	UNIT	UNIT PRICE	ESTIMATED QUANTITIES					ESTIMATED COSTS					TOTAL QUANTITY	TOTAL COST
				SIDEWALK TOTAL	STREET TOTAL	SANITARY TOTAL	STORM TOTAL	WATER TOTAL	SIDEWALK TOTAL	STREET TOTAL	SANITARY TOTAL	STORM TOTAL	WATER TOTAL		
123	SIGN POST W/ FOUNDATION	EACH	$450.00		20					$9,000.00				20	$9,000.00
124	SIGN PANELS TYPE C	SQ FT	$35.00		160					$5,600.00				160	$5,600.00
125	SIGN PANELS TYPE D	SQ FT	$45.00		40					$1,800.00				40	$1,800.00
126	STREET SWEEPER WITH OPERATOR	HOUR	$175.00		120					$21,000.00				120	$21,000.00
127	STABILIZED CONSTRUCTION EXIT	EACH	$2,000.00		8					$16,000.00				8	$16,000.00
128	STORM DRAIN INLET PROTECTION	EACH	$250.00				78					$19,500.00		78	$19,500.00
129	TOPSOIL BORROW (SPECIAL)	CU YD	$40.00		4340					$173,600.00				4340	$173,600.00
130	HYDROSEEDING	SQ YD	$4.00		405					$1,620.00				405	$1,620.00
131	SODDING, TYPE LAWN	SQ YD	$11.00		24919					$274,109.00				24919	$274,109.00
132	SILT FENCE	LIN FT	$4.50		987					$4,441.50				987	$4,441.50
133	BIOROLL	LIN FT	$4.00		498					$1,992.00				498	$1,992.00
134	FABRICATED RAILING	LIN FT	$300.00	240					$72,000.00					240	$72,000.00
135	LANDSCAPE ALLOWANCE	LUMP SUM	$150,000.00	0.10	0.40	0.20	0.10	0.20	$15,000.00	$60,000.00	$30,000.00	$15,000.00	$30,000.00	1.00	$150,000.00
136	4" SKIP YELLOW STRIPING - MULTI COMPONENT LIQUID	LIN FT	$1.50		699					$1,048.50				699	$1,048.50
137	24" SOLID WHITE STOP BAR - THERMOPLASTIC	LIN FT	$27.50		58					$1,595.00				58	$1,595.00
138	CROSSWALK WHITE - THERMOPLASTIC	SQ FT	$13.50		1600					$21,600.00				1600	$21,600.00
SUBTOTAL									$ 1,439,633.50	$ 5,013,454.75	$ 2,355,840.00	$ 2,061,627.50	$ 2,785,150.00		$13,655,705.75
CONTINGENCIES (20%)									$ 287,926.70	$ 1,002,690.95	$ 471,168.00	$ 412,325.50	$ 557,030.00		$ 2,731,141.15
ENGINEERING AND ADMINISTRATION (20%)									$ 345,512.04	$ 1,203,229.14	$ 565,401.60	$ 494,790.60	$ 668,436.00		$ 3,277,369.38
TOTAL ESTIMATED PROJECT COST									**$ 2,073,072.24**	**$ 7,219,374.84**	**$ 3,392,409.60**	**$ 2,968,743.60**	**$ 4,010,616.00**		**$ 19,664,216.28**

Appendix C: Geotechnical Evaluation

Revised Geotechnical Evaluation Report

Central Avenue Improvements
Various Streets
Hopkins, Minnesota

Prepared for

Bolton & Menk, Inc.

Professional Certification:
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.

Bradley J. McCarter, PE
Director, Senior Engineer
License Number: 48748
August 21, 2024

Project B2404209

Braun Intertec Corporation

BRAUN INTERTEC
The Science You Build On.

Braun Intertec Corporation
11001 Hampshire Avenue S
Minneapolis, MN 55438

Phone: 952.995.2000
Fax: 952.995.2020
Web: braunintertec.com

August 21, 2024 Project B2404209

Nicholas Amatuccio, PE
Bolton & Menk, Inc.
12224 Nicollet Avenue
Burnsville, MN 55337

Re: Revised Geotechnical Evaluation
Central Avenue Improvements
Various Streets
Hopkins, Minnesota

Dear Mr. Amatuccio:

We are pleased to present this Revised Geotechnical Evaluation Report for the Hopkins Central Avenue Improvements project in Hopkins, Minnesota. This report has been revised from its original version to reflect some changes to the planned pavement rehabilitation approaches along 3rd Street.

Thank you for making Braun Intertec your geotechnical consultant for this project. If you have questions about this report, or if there are other services that we can provide in support of our work to date, please contact Zach Semlak at 651.788.5071 (zsemlak@braunintertec.com) or Brad McCarter at 952.995.2268 (bmccarter@braunintertec.com).

Sincerely,

BRAUN INTERTEC CORPORATION

Zachary T. Semlak
Staff Engineer

Bradley J. McCarter, PE
Director, Senior Engineer

Table of Contents

Description **Page**

Table of Contents (continued)

Description **Page**

Appendix

A. Introduction

A.1. Project Description

This Geotechnical Evaluation Report addresses the design and construction for the proposed roadway rehabilitation in Hopkins, Minnesota. Figure 1 shows the streets being addressed in this report. The project is proposing to perform spot or full utility repairs, along with performing a mill & overlay (two streets proposed), and either a full depth reclamation (FDR) or full reconstruction. Table 1 provides additional project details.

Table 1. Central Avenue Improvements - Project Details

Project Component	Description	Source
Pavement type	Bituminous	Bolton & Menk, Inc. (BMI)
Pavement rehabilitation method	▪ Full Reconstruction or FDR ▪ Mill & Overlay	BMI/City of Hopkins (City)
Pavement loads	**12th Avenue North:** 216,000 Bituminous ESALs (BESALs)	MnDOT traffic mapping data and State Aid ESAL Calculator. Assumed the most recent 2021 count for design with a growth rate of 0.50 percent based on recent declining historical AADTs.
	11th Avenue North (and all other streets highlighted and depicted in Figure 1): Less than 150,000 BESALs	MnDOT traffic mapping data and State Aid ESAL Calculator. Assumed the most recent 2021 count for design with a growth rate of 2 percent based on averaging traffic counts from previous years.
Grade changes	Street grades will generally remain within 1 foot of existing.	BMI
Utilities	Pipes with invert elevations of up to about 8 feet below grade in most cases and up to 15 feet near Boring ST-6.	Assumed

*Equivalent 18,000-lb single axle loads based on 20-year design.

The figure below shows an illustration of the proposed site layout from the provided Request for Proposal.

Figure 1. Proposed Pavement Rehabilitation

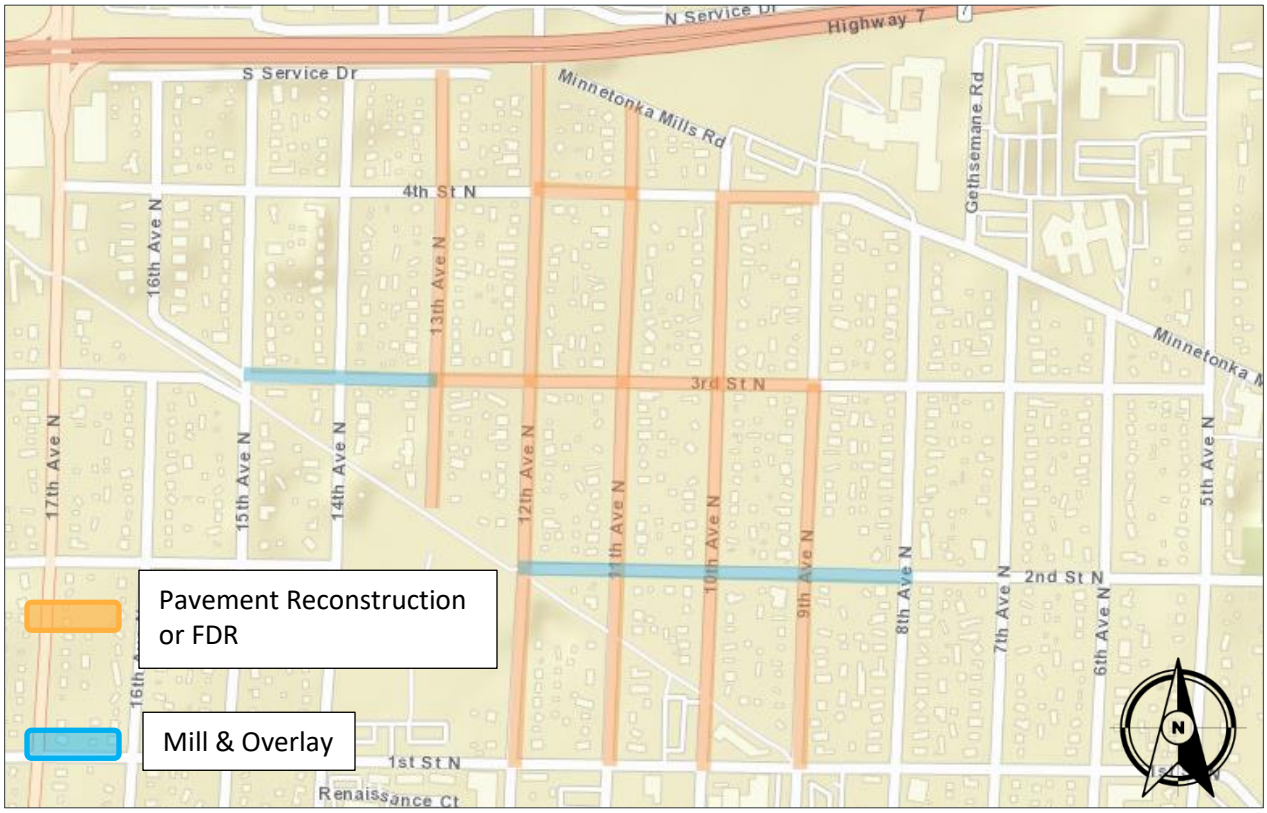


Figure annotated and extracted from Enterprise MnDOT Mapping Application (EMMA).

We have described our understanding of the proposed construction and site to the extent others reported it to us. Depending on the extent of available information, we may have made assumptions based on our experience with similar projects. If we have not correctly recorded or interpreted the project details, the project team should notify us. New or changed information could require additional evaluation, analyses and/or recommendations.

A.2. Site Conditions

This site currently exists as developed residential roadways. This site is bounded by 8th Avenue North to the east, 1st Street North to the south, 15th Avenue North to the west and Highway 7 to the north. Existing grades currently range from about 921 feet at Boring PC-1 to about 949 feet at Boring ST-16 with

grades generally sloping downward to the south from Boring ST-16 to Boring ST-6 and generally sloping downward from Boring PC-5 to Boring PC-1.

A.3. Purpose

The purpose of our geotechnical evaluation was to characterize subsurface geologic conditions at selected exploration locations, evaluate their impact on the project, and provide geotechnical recommendations for use in the design and construction of the planned roadway improvement project.

A.4. Background Information and Reference Documents

We reviewed the following information:

- Request for Proposal from BMI and the City for Pavement Rehabilitation.
- Geologic Map M-178, Surficial Geology of the Twin Cities Metropolitan Area.
- Aerial images collected through Enterprise MnDOT MnDOT Mapping Application (EMMA), https://dotapp9.dot.state.mn.us/emma/.
- Topography maps from MNTOPO, an online web service of the Minnesota Department of Natural Resources, http://arcgis.dnr.state.mn.us/maps/mntopo/.

A.5. Scope of Services

We performed our scope of services for the project in accordance with our Proposal for a Geotechnical Evaluation (Proposal QTB195683), dated April 25, 2024. The following list describes the geotechnical tasks completed in accordance with our authorized scope of services.

- Reviewing the background information and reference documents previously cited.
- Staking and coordinating the clearing of exploration locations of underground utilities. We selected and staked the new exploration locations. We acquired the surface elevations and locations with GPS technology using the State of Minnesota's permanent GPS base station network. The Soil Boring Location Sketch included in the Appendix shows the approximate locations of the borings and pavement cores.

- Performing the requested 22 standard penetration test (SPT) borings, denoted as ST-1 to ST-22, to nominal depths of 15 to 25 feet below grade across the site.

- Performing the requested five pavement core and shallow hand auger borings, denoted as PC-1 through PC-5, through the existing pavement section at select locations.

- Performing laboratory testing on select samples to aid in soil classification and engineering analysis.

- Preparing this report containing a boring location sketch, logs of soil borings, a summary of the soils encountered, results of laboratory tests, and recommendations for pavement subgrade preparation and the use in design and construction of utilities and pavement rehabilitation.

Our scope of services did not include environmental services or testing and our geotechnical personnel performing this evaluation are not trained to provide environmental services or testing. We can provide environmental services or testing at your request.

B. Results

B.1. Geologic Overview

We based the geologic origins used in this report on the soil types, laboratory testing, and available common knowledge of the geological history of the site. Because of the complex depositional history, geologic origins can be difficult to ascertain. We did not perform a detailed investigation of the geologic history for the site.

B.2. Pavement Core Results

Table 2 provides a summary of the existing bituminous section thicknesses as measured at each of the pavement core locations. Note that aggregate base was observed and measured in the field by the coring crew to the nearest inch. Physical cores that were brought back for review, were measured to the nearest 1/4 inch.

We did not perform gradation analysis on the apparent aggregate base material encountered on the pavement section and cannot conclusively determine if the encountered material satisfies a particular specification. The aggregate base thicknesses should also be considered approximate, as the transitions between the aggregate base and the underlying subgrade are often difficult to accurately discern at depth.

Table 2. Summary of Pavement Section Thicknesses by Core Location

Roadway	Boring Location	Bituminous Thickness (inches)	Apparent Aggregate Base Thickness (inches)	Core Condition
2nd Street North	PC-1	5	5	Good condition
	PC-2	4 1/2	4	Good condition
	PC-3	3	4	Low severity stripping throughout.
	PC-4	5	5	Upper 2 inches in good condition, lower 3 inches experiencing low severity stripping.
3rd Street North	PC-5	2	7	Low to medium severity stripping throughout.

B.3. Boring Results

Table 3 provides a summary of the soil boring results, in the general order we encountered the strata. Please refer to the Log of Boring sheets in the Appendix for additional details. The Descriptive Terminology sheet in the Appendix include definitions of abbreviations used in Table 3.

Table 3. Subsurface Profile Summary

Strata	Soil Type - ASTM Classification	Range of N-Values	Commentary and Details
Pavement section	---	---	▪ Overall pavement thickness ranges about 1/2-foot to about 1 1/2 feet. ▪ Bituminous thicknesses range from about 2 inches to about 9 inches. ▪ Apparent aggregate base thicknesses range from about 3 inches to about 9 inches.

Strata	Soil Type - ASTM Classification	Range of N-Values	Commentary and Details
Fill	SP, SP-SM, SM, SC, CL	2 to 32	▪ Extended to depths of about 4 1/2 feet to about 13 feet below grade surface. ▪ Highly variable, soils intermixed with granular and cohesive materials. ▪ Black organic layer encountered at Boring ST-17 at a depth of about 2 feet below grade surface extending to a depth of about 4 1/2 feet below grade surface. ▪ Variable amounts of gravel; may contain cobbles and boulders. ▪ Possible buried asphalt at a depth of about 10 feet below grade surface at Boring ST-18. ▪ Moisture condition generally moist.
Glacial deposits	SP, SP-SM	6 to 44	▪ Intermixed layers of glacial outwash and till. ▪ Variable amounts of gravel; may contain cobbles and boulders. ▪ Moisture condition generally moist.
	SM, SC, CL, ML	12 to 33	

For simplicity in this report, we define fill to mean existing, uncontrolled or undocumented.

B.4. Groundwater

Table 4 summarizes the depths where we observed groundwater; the attached Log of Boring sheets in the Appendix also include this information and additional details.

Table 4. Groundwater Summary

Boring Location	Surface Elevation	Measured or Estimated Depth to Groundwater (feet)	Approximate Corresponding Groundwater Elevation (feet)
ST-1	926.0	13 1/2	912 1/2
ST-2	924.0	11	913
ST-4	927.6	13	914 1/2
ST-6	930.0	19	911
ST-10	925.7	13	913
ST-13	946.6	13	933 1/2
ST-17	925.0	12	913
ST-21	933.5	7 1/2	926

At the time of our observation, the groundwater surface elevation appeared to range from about elevation 911 feet at Boring ST-6 to about an elevation of 933 1/2 feet at Boring ST-13. We anticipate hydrostatic groundwater generally below elevation 915 feet. Where Borings ST-13 and ST-21 encountered groundwater at higher elevations, we anticipate this to be more perched conditions based on the soil's condition (found within cohesive layers or silty layers).

Project planning should expect groundwater will fluctuate due to seasonal and annual fluctuations.

B.5. Laboratory Test Results

We performed laboratory testing on select soil samples to further classify them and help determine their engineering properties. The boring logs attached show the results of the laboratory testing we performed, next to the sample depth either in the moisture content column, "MC", or in the "Tests or Remarks" column.

C. Recommendations

C.1. Design and Construction Discussion

C.1.a. Reuse of On-Site Soils

Much of the existing fill and native soils encountered in the borings appear suitable for reuse as engineered fill, although some moisture conditioning (drying or wetting of materials) and removal of unsuitable materials may be required. However, soils encountered noted as organic (like Boring ST-17, greater than 5 percent organic content) may need to be subcut if encountered within the upper 3 feet of the pavement subgrade or at utility invert elevations.

Topsoil and soils containing organics greater than 5 percent by weight should not be reused as pavement subgrade or utility trench backfill anywhere on the project. Topsoil or organic soils can be stockpiled for use as a component in topsoil dressing, pond side slopes, or in other areas where loads are not supported.

C.1.b. Pavement Rehabilitation Options

Based on the RFP provided to us, Figure 1 depicts the original proposed FDR and mill & overlay streets for this project. Based on the results of our field exploration, the existing pavement sections generally across the project area appear suitable for the requested rehabilitation methods, as outlined in Figure 1, with the exception of 3rd Street North between 13th Avenue North and 15th Avenue North.

Where 3rd Street North between 13th Avenue North and 15th Avenue North, was originally proposed as a mill & overlay, we encountered a thinner pavement section where mill & overlay may be difficult to perform and may have more value performing a full-depth reclamation. Refer to Section C.4 for additional information.

Figure 2 provides a map outlining the updated pavement rehabilitation options for the project area.

Figure 2. Recommended Pavement Rehabilitation

Figure annotated and extracted from Enterprise MnDOT Mapping Application (EMMA).

C.1.c. Reuse of Pavement Materials

From a materials perspective, reclamation of the bituminous pavement materials for reuse as recycled aggregate base or as a component to new pavements is generally acceptable assuming the produced products meet the applicable project specifications, and these practices are acceptable to the City. Prior to reuse, the project should implement thorough quality control practices, including frequent sieve

analyses, asphalt contents and other tests, to achieve desirable characteristics for any reclaimed material processed on site.

C.1.d. Groundwater Control

Excavations for utility trenches at depth have the potential to encounter hydrostatic groundwater near elevation 915 feet. Areas in clayey and fine-grained soils should anticipate having temporary sumps and pumps to remove accumulated groundwater during construction activities. Groundwater or perched groundwater encountered, should be removed from the excavations to facilitate proper fill placement and compaction of backfill.

Sumps and pumps would likely be suitable for short-term groundwater control in shallow excavations or trenches near or slightly below groundwater levels or within excavations terminating in clayey and fine-grained soils. For excavations further below observed groundwater levels or in areas where cleaner sands (SP, SP-SM) are encountered, the excavations would likely require more extensive dewatering methods, such as well points, and the contractor should provide a dewatering plan for review.

C.1.e. Construction Disturbance

The contractor should note the encountered on-site silty and clayey soils are highly susceptible to disturbance, due to repeated vehicle traffic. Disturbances of these soils may cause areas that were previously prepared, or that were suitable for pavement or structure support, to become unstable and require moisture conditioning and compaction. Subcutting and replacing the disturbed material with crushed, coarse gravel, free of fines is also an alternative. The contractor should use means and methods to limit disturbance to these types of soils.

C.1.f. Potential Impacts on Adjacent Utility Lines

Excavations to remove and install the utilities may be wide if open cut methods are used due to sloughing of the granular soils, where encountered. The contractor should be aware of these conditions and take precautions to support any in-place utilities throughout construction.

C.1.g. Vibrations during Construction

Although low, construction and backfill operations may induce vibrations on neighboring structures. Long sustained or excessive ground vibration levels can cause cosmetic damage to structures, or in rare cases structural damage. We recommend precondition surveys of adjacent structures as well as monitoring of ground vibrations during construction.

C.2. Site Grading and Subgrade Preparation

The following sections provide our recommendations for the replacement of utilities (where applicable), and where subgrade preparation is performed. Please see the sections below for more details.

C.2.a. Subgrade Stabilization

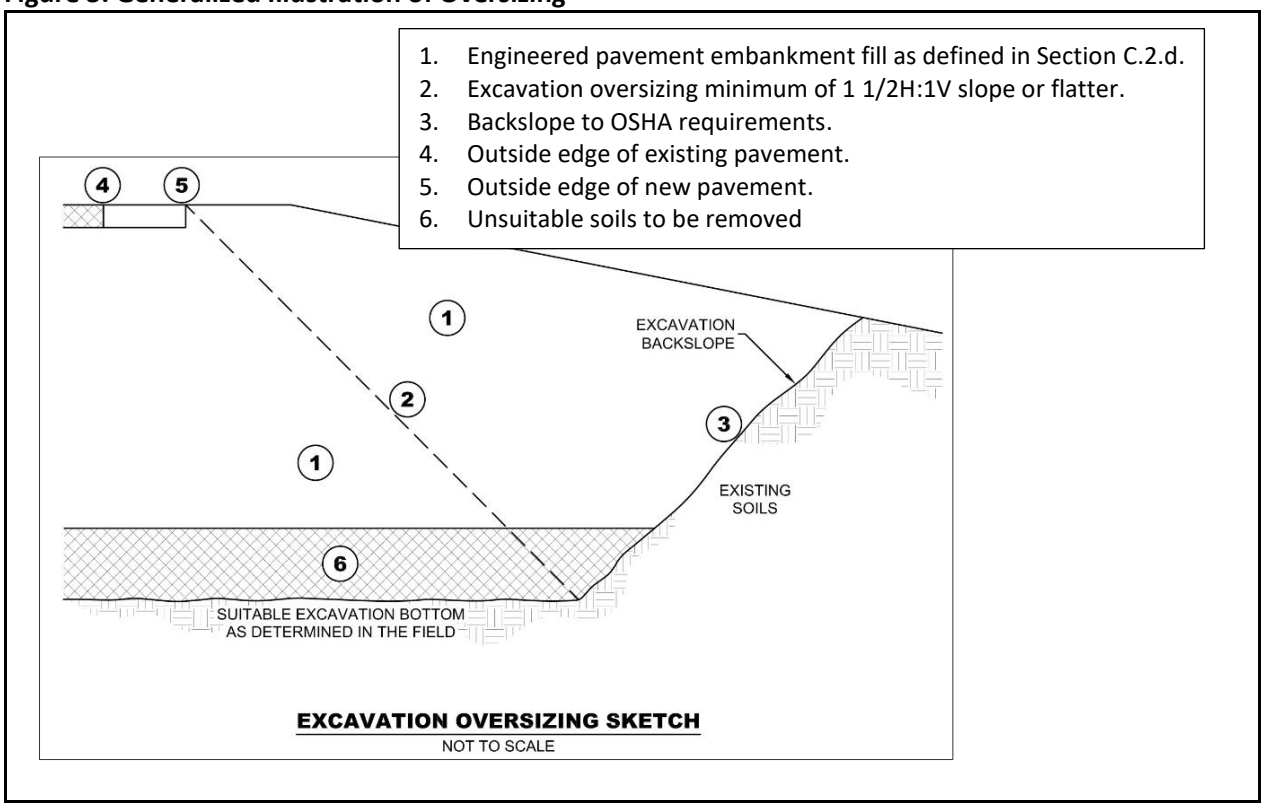
Most onsite soils appear suitable for reuse as engineered fill within pavement subgrades and utility trenches, except where Boring ST-17 encountered organic lean clay with an organic content greater than 5 percent by weight. We recommend removing soils with organic contents greater than 5 percent by weight from below subgrade support of pavements and within a minimum of 2 feet below utility invert support. If organic soils, soft clays or water is encountered at invert grades, the project team may consider subcutting and replacement of these unsuitable soils with sand or crushed rock to prepare a proper subgrade for pipe support.

We anticipate some moisture conditioning of clays may be required (drying or wetting of materials). If imported material is needed, we recommend importing soils of a similar composition to those in-place to reduce the potential for water to become perched between differing soil types. Importing different soil types (clay in sand areas and vice versa) for backfill may create impermeable lenses that could trap water and soften the soils over time.

C.2.b. Excavation Oversizing

When removing unsuitable materials below structures or pavements, we recommend the excavation extend outward and downward at a slope of 1H:1V (horizontal:vertical) or flatter. See Figure 3 for an illustration of excavation oversizing.

Figure 3. Generalized Illustration of Oversizing



C.2.c. Excavated Slopes

Based on the borings, we anticipate on-site soils in excavations will consist of fill soils and native granular soils at depth. These soils are typically considered Type C Soil under OSHA (Occupational Safety and Health Administration) guidelines. OSHA guidelines indicate unsupported excavations in Type C soils should have a gradient no steeper than 1 1/2H:1V. Slopes constructed in this manner may still exhibit surface sloughing. Should perched water conditions be encountered, flatter inclinations would be warranted for stability.

An OSHA-approved qualified person should review the soil classification in the field. Excavations must comply with the requirements of OSHA 29 CFR, Part 1926, Subpart P, “Excavations and Trenches.” This document states excavation safety is the responsibility of the contractor. The project specifications should reference these OSHA requirements.

C.2.d. Utility Trench Backfill/Subgrade Fill Materials and Compaction

We recommend that materials used as utility trench backfill and subgrade fill meet the requirements of the MnDOT specifications presented below in Table 5. We recommend spreading engineered fill in loose lifts of approximately 8 to 12 inches thick. We recommend performing density tests in engineered fill to evaluate if the contractors are effectively compacting the soil and meeting project requirements.

Topsoil and soils with organic contents of greater than 5 percent by weight should not be reused as pavement subgrade or utility trench backfill within the roadway core on the project. Organic soils can be stockpiled for use as a component in topsoil dressing, side slopes or in other areas where loads are not supported.

Any materials to be reused as engineered fill should be tested and approved by the engineer prior to reuse. The project documents should not allow the contractor to use frozen material as engineered fill or to place engineered fill on frozen material. Frost should not penetrate under road core or structures during construction.

Table 5. Engineered Fill Materials and Compaction Specifications

Material	Material Specification	Compaction Specification
Embankment fill, Utility trench backfill	Common Embankment, MnDOT 2106.2B.1	MnDOT 2106.3.G.1
Below landscaped surfaces, where subsidence is not a concern	Non-Structural Embankment, MnDOT 2106.2B.8	MnDOT 2106.3.G.2

C.2.e. Corrosion Potential

Based on our experience, the clay soils encountered by the borings are moderately corrosive to metallic conduits, but only marginally corrosive to concrete. We recommend specifying non-corrosive materials or providing corrosion protection, unless project planning chooses to perform additional tests to demonstrate the soils are not corrosive.

C.3. New Pavements

C.3.a. Full-Depth Reclamation (FDR)

For the proposed streets to be rehabilitated via FDR processes, reuse of pavement materials by reclamation, we recommend a 9-inch FDR. Based on the measurements from the borings, we anticipate near Borings ST-2, ST-5, ST-6 and ST-13, will encounter granular silty sand soils within the 9-inch FDR.

We anticipate near Boring ST-18 will encounter clay soils due to a thinner pavement section, and we recommend reducing the mill depth to the top of the subgrade and then excavating to the design depth of the pavement section. If there are other areas where similar conditions are encountered outside of our boring/pavement core locations, we recommend following the methods noted for Boring ST-18.

We recommend implementing through quality control practices, including frequent sieve analyses, to achieve a desirable gradation of the reclaimed material. The gradation requirements of MnDOT Specification 2215 (Reclamation) or Specification 3138 (Aggregate for Surface and Base Courses) can be used for the aggregate base; the latter specification's controls on gradation and asphalt content are stricter and will generally be more difficult to meet. We suggest the contractor assume some contingency for importing clean, crushed rock that can be blended with the reclaimed material to improve the uniformity of the resulting gradation prior to reuse as an aggregate base.

C.3.b. Pavement Subgrade Preparation

We recommend the following steps for pavement subgrade preparation for the Reconstruction/FDR areas, understanding the reconstruction/FDR will generally match existing grades. Note that project planning may need to require additional subcuts to limit frost heave or remove unsuitable materials.

- Remove or reclaim pavements (See Section C.3.a), and stockpile/windrow the existing pavement.
- Have a geotechnical representative observe the excavated subgrade to evaluate if additional subgrade improvements are necessary.
- Surface compact subgrade soils.
- Place pavement engineered fill to grade where required and compact in accordance with Section C.2.d. to bottom of pavement section.
- Proofroll the pavement subgrade as described in Section C.3.c. It may be necessary to place a portion of the aggregate base to facilitate truck traffic.

Note, we recommend sloping subgrade soils to promote drainage and removal of accumulated water.

C.3.c. Pavement Subgrade Proofroll

After preparing the subgrade as described above and prior to the placement of the aggregate base, we recommend proofrolling the subgrade soils with a fully loaded tandem-axle truck. We also recommend having a geotechnical representative observe the proofroll. Areas that fail the proofroll likely indicate soft or weak areas that will require additional soil correction work to support pavements.

The contractor should correct areas that display excessive yielding or rutting (typically more than 1 inch) during the proofroll, and as determined by the geotechnical representative. Possible options for subgrade correction include moisture conditioning and recompaction, and/or subcutting and replacement with soil or crushed aggregate.

C.3.d. Reconstruction and FDR Design

Our scope of services for this project did not include laboratory tests on subgrade soils to determine an R-value for pavement design. Based on our experience with the mix of soils similar to the silty, clayey and sandy material that are anticipated at the pavement subgrade elevation, we recommend pavement design assume an R-value of 20. Note the contractor may need to perform limited removal of unsuitable or less suitable soils to achieve this value.

Based on our assumed R-value and anticipated traffic counts, the provided section in Table 6 appears to meet and/or exceed the minimum requirements for 12th Avenue North. We have also provided the City of Hopkins typical residential pavement section in Table 7, which also appears to meet and/or exceed the minimum requirements based on MnPAVE-Flexible and its monte carlo simulation.

Table 6. Proposed Bituminous Pavement Section – 12th Ave N

Material	Thickness (inches)	Designation	Material Specification
Bituminous wear course	2	SPWEA340C	MnDOT 2360
Bituminous non-wear course	3	SPNWB330C	MnDOT 2360
Aggregate base/Reclaim	8	Class 5 or 6; FDR	MnDOT 2215
Approved subgrade	---	---	---

Table 7. Proposed Bituminous Pavement Section – Residential Streets

Material	Thickness (inches)	Designation	Material Specification
Bituminous wear course	2	SPWEA240C	MnDOT 2360
Bituminous non-wear course	2	SPNWB230C	MnDOT 2360
Aggregate base/Reclaim	8	Class 5 or 6; FDR	MnDOT 2215
Approved subgrade	---	---	---

We understand that sand subbase sections have been used on previous projects and may be required by the City. If desired and elected, a 12-inch-thick sand subbase could be incorporated following requirements of MnDOT specification 2112, to aid in prolonging the life of the pavement. A layer of separator fabric placed below the sand and drain tile placed throughout the sand section will be necessary for long term pavement performance.

C.3.e. Subgrade Drainage

Given the layered granular and cohesive soil layers, we recommend installing perforated drainpipes throughout pavement areas at low points, around catch basins, and behind curb in landscaped areas. We also recommend installing drainpipes along pavement edges where exterior grades promote drainage toward those edge areas. The contractor should place drainpipes in small trenches, extended below the granular subbase layer, or below the aggregate base material where no sand subbase is present.

C.3.f. Performance and Maintenance

We based the above pavement designs on a 20-year performance life for bituminous. This is the amount of time before we anticipate the pavement will require reconstruction. This performance life assumes routine maintenance, such as seal coating and crack sealing. The actual pavement life will vary depending on variations in weather, traffic conditions and maintenance.

Many conditions affect the overall performance of the exterior slabs and pavements. Some of these conditions include the environment, loading conditions and the level of ongoing maintenance. With regard to bituminous pavements in particular, it is common to have thermal cracking develop within the first few years of placement, and continue throughout the life of the pavement. We recommend developing a regular maintenance plan for filling cracks in exterior slabs and pavements to lessen the potential impacts for cold weather distress due to frost heave or warm weather distress due to wetting and softening of the subgrade.

C.4. Mill-and-Overlay

We recommend milling the pavements, for the streets depicted in Figure 1 in accordance with MnDOT Specification 2232. The mill depth will vary based on conditions encountered but should be a minimum depth of 2 inches, meeting recommended mixes noted above in Table 7. Pavement depth can vary between the boring and core locations. The contractor may need to adjust the mill depth to account for unexpected conditions such as areas of thin pavement.

For 3rd Street between 13th and 15th Avenue North, which was originally proposed as a mill & overlay location, we recommend this section of the street be either reconstructed or via FDR. See Section C.3. for recommendations via these two methods.

The surface condition prior to milling can indicate where deeper repairs to the milled surface may be necessary to improve the life of the overlay. This includes distresses such as severe longitudinal and transverse cracking, alligator/fatigue cracking of any severity, potholes, edge cracking, and similar failures. MnDOT defines these distresses in their surface rating procedure as follows:

- High-severity transverse cracking: Any crack running transverse to the centerline of the roadway with significant adjacent random cracking (12 inches or more apart), have large areas of spalling, missing material and/or potholes.

- High-severity longitudinal cracking: Any crack running parallel to the centerline of the roadway with significant adjacent random cracking (12 inches or more apart), large areas of spalling, missing material and/or potholes.

- Alligator cracking: A series of interconnected cracks forming many-sided, sharp-angled pieces, 6 inches or less in size, typically located in the wheel paths and under concentrated traffic loads.

We recommend an experienced engineer walk the milled surface to delineate areas for these repairs based on conditions exposed by the milling process. We recommend performing the full-depth mill to at least 1 foot beyond the edge of the visible distresses where present.

Preservation of these segments via mill and overlay will result in a service life of 12 to 18 years before similar rehabilitation is required. Additional work, such as repairing damaged curb edges or patching large distresses, could help prolong the service life.

D. Procedures

D.1. Penetration Test Borings

We drilled the penetration test borings with a truck-mounted core and auger drill equipped with hollow-stem auger. We performed the borings in general accordance with ASTM D6151 taking penetration test

samples at 2 1/2- or 5-foot intervals in general accordance to ASTM D1586. The boring logs show the actual sample intervals and corresponding depths.

We sealed penetration test boreholes meeting the Minnesota Department of Health (MDH) Environmental Borehole criteria with an MDH-approved grout.

D.2. Manual Exploration

D.2.a. Hand Auger Borings

We drilled hand auger borings with a 1 1/4-inch-diameter screw auger. We advanced the borings in 2- to 4-inch increments to depths of 2 to 3 feet below bottom of pavement apparent aggregate base elevations. We then withdrew the auger from the borehole to obtain cuttings. We made preliminary estimates of soil consistency and density based on resistance to penetration of the hand auger and the turning resistance.

D.3. Exploration Logs

D.3.a. Log of Boring Sheets

The Appendix includes Log of Boring sheets for our penetration test borings. The logs identify and describe the penetrated geologic materials, and present the results of penetration resistance performed. The logs also present the results of laboratory tests performed on penetration test samples, and groundwater measurements.

We inferred strata boundaries from changes in the penetration test samples and the auger cuttings. Because we did not perform continuous sampling, the strata boundary depths are only approximate. The boundary depths likely vary away from the boring locations, and the boundaries themselves may occur as gradual rather than abrupt transitions.

D.3.b. Geologic Origins

We assigned geologic origins to the materials shown on the logs and referenced within this report, based on: (1) a review of the background information and reference documents cited above, (2) visual classification of the various geologic material samples retrieved during the course of our subsurface exploration, (3) penetration resistance performed for the project, (4) laboratory test results, and (5) available common knowledge of the geologic processes and environments that have impacted the site and surrounding area in the past.

D.4. Material Classification and Testing

D.4.a. Visual and Manual Classification

We visually and manually classified the geologic materials encountered based on ASTM D2488. When we performed laboratory classification tests, we used the results to classify the geologic materials in accordance with ASTM D2487. The Appendix includes a chart explaining the classification system we used.

D.4.b. Laboratory Testing

The exploration logs in the Appendix note the results of the laboratory tests performed on geologic material samples. We performed the tests in general accordance with ASTM procedures.

D.5. Groundwater Measurements

The drillers checked for groundwater while advancing the penetration test borings, and again after auger withdrawal. We then filled the boreholes or allowed them to remain open for an extended period of observation, as noted on the boring logs.

E. Qualifications

E.1. Variations in Subsurface Conditions

E.1.a. Material Strata

We developed our evaluation, analyses and recommendations from a limited amount of site and subsurface information. It is not standard engineering practice to retrieve material samples from exploration locations continuously with depth. Therefore, we must infer strata boundaries and thicknesses to some extent. Strata boundaries may also be gradual transitions, and project planning should expect the strata to vary in depth, elevation and thickness, away from the exploration locations.

Variations in subsurface conditions present between exploration locations may not be revealed until performing additional exploration work, or starting construction. If future activity for this project reveals any such variations, you should notify us so that we may reevaluate our recommendations. Such variations could increase construction costs, and we recommend including a contingency to accommodate them.

E.1.b. Groundwater Levels

We made groundwater measurements under the conditions reported herein and shown on the exploration logs, and interpreted in the text of this report. Note that the observation periods were relatively short, and project planning can expect groundwater levels to fluctuate in response to rainfall, flooding, irrigation, seasonal freezing and thawing, surface drainage modifications and other seasonal and annual factors.

E.2. Continuity of Professional Responsibility

E.2.a. Plan Review

We based this report on a limited amount of information, and we made a number of assumptions to help us develop our recommendations. We should be retained to review the geotechnical aspects of the designs and specifications. This review will allow us to evaluate whether we anticipated the design correctly, if any design changes affect the validity of our recommendations, and if the design and specifications correctly interpret and implement our recommendations.

E.2.b. Construction Observations and Testing

We recommend retaining us to perform the required observations and testing during construction as part of the ongoing geotechnical evaluation. This will allow us to correlate the subsurface conditions exposed during construction with those encountered by the borings and provide professional continuity from the design phase to the construction phase. If we do not perform observations and testing during construction, it becomes the responsibility of others to validate the assumption made during the preparation of this report and to accept the construction-related geotechnical engineer-of-record responsibilities.

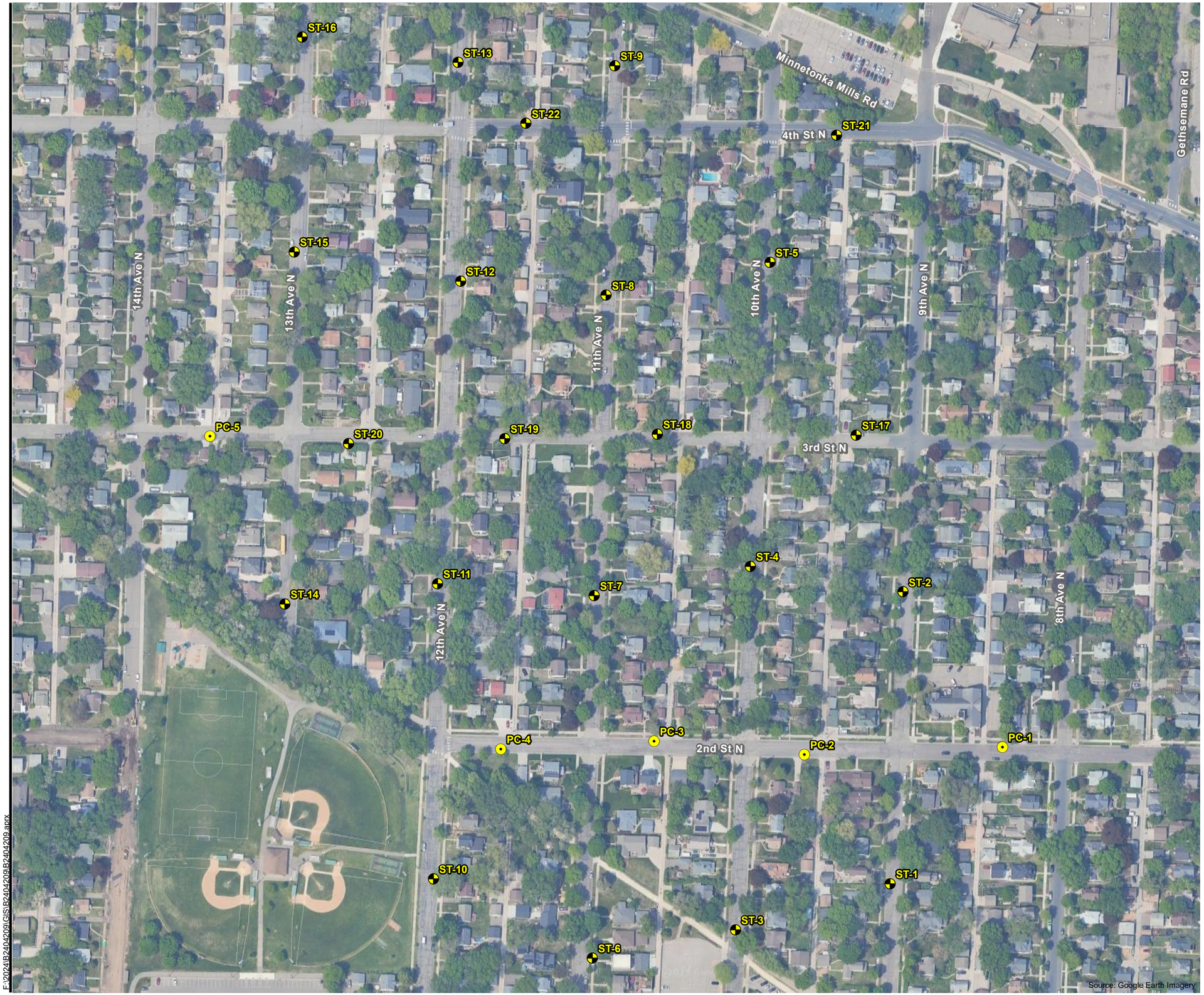
E.3. Use of Report

This report is for the exclusive use of the addressed parties. Without written approval, we assume no responsibility to other parties regarding this report. Our evaluation, analyses and recommendations may not be appropriate for other parties or projects.

E.4. Standard of Care

In performing its services, Braun Intertec used that degree of care and skill ordinarily exercised under similar circumstances by reputable members of its profession currently practicing in the same locality. No warranty, express or implied, is made.

Appendix



Boring Location
Pavement Core and HAB

N

0 100 200 Feet

1" = 200 Feet

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Minneapolis, MN 55438
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Drawing Information

Project No: B2404209

Drawing No: Boring Location Sketch

Drawn By:	ZS
Date Drawn:	5/14/2024
Checked By:	ZTS
Last Modified:	7/22/2024

Project Information

Hopkins - Central Avenue Improvements Project

Various Streets

Hopkins, Minnesota

Boring Location Sketch

Figure 1

LOG OF BORING

See Descriptive Terminology sheet for explanation of abbreviations

Project Number B2404209
Geotechnical Evaluation
Central Avenue Improvements Project
Various Streets
Hopkins, Minnesota

BORING: **ST-1**
LOCATION: Captured with RTK GPS.
DATUM: NAD 1983 HARN Adj MN Hennepin (US Feet)
NORTHING: 149614.7 EASTING: 492755.6
DRILLER: C McClain LOGGED BY: Z Semlak START DATE: 06/24/24 END DATE: 06/24/24
SURFACE ELEVATION: 926.0 ft RIG: 7514 METHOD: 3 1/4" HSA SURFACING: Bituminous WEATHER: Clear

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q_p tsf	MC %	Tests or Remarks
925.2		PAVEMENT, 5 1/2 inches of bituminous over 5 inches of apparent aggregate base					
0.8		FILL: CLAYEY SAND (SC), trace Gravel, black, moist		1-1-1 (2) 10"		18	
921.5						12	
4.5	▽	POORLY GRADED SAND (SP), fine to coarse-grained, trace to with Gravel, brown, moist, medium dense (GLACIAL OUTWASH)	5	4-8-11 (19) 16"			
				6-9-11 (20) 14"			
			10	6-6-10 (16) 14"			
				7-6-10 (16) 16"			
911.5							
14.5		END OF BORING Boring then backfilled with auger cuttings	15				Water observed at 13.5 feet while drilling.
			20				
			25				
			30				

LOG OF BORING

See Descriptive Terminology sheet for explanation of abbreviations

Project Number B2404209
Geotechnical Evaluation
Central Avenue Improvements Project
Various Streets
Hopkins, Minnesota

BORING: **ST-2**
LOCATION: Estimated.
DATUM: NAD 1983 HARN Adj MN Hennepin (US Feet)
NORTHING: 150230 EASTING: 492780
DRILLER: C McClain LOGGED BY: Z Semlak START DATE: 06/24/24 END DATE: 06/24/24
SURFACE ELEVATION: 924.0 ft RIG: 7514 METHOD: 3 1/4" HSA SURFACING: Bituminous WEATHER: Clear

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q_p tsf	MC %	Tests or Remarks
923.2		PAVEMENT, 4 inches of bituminous over 5 inches of apparent aggregate base					
0.8		FILL: SILTY SAND (SM), fine to coarse-grained, trace Gravel, dark brown, moist				6	P200=21%
921.5		FILL: CLAYEY SAND (SC), trace Gravel, brown to dark brown, moist		1-4-3 (7) 12"		15	
2.5							
919.5		FILL: CLAYEY SAND (SC), trace Gravel, black to dark gray, moist	5	2-2-3 (5) 14"			
4.5							
917.0		FILL: CLAYEY SAND (SC), trace Gravel, brown, moist		2-2-4 (6) 16"		16	
7.0							
914.5		FILL: SILTY SAND (SM), fine to coarse-grained, trace Gravel, brown, moist	10	1-2-5 (7) 12"			
9.5	▽						
911.0		POORLY GRADED GRAVEL with SILT (SP-SM), fine to coarse-grained, with Gravel, wet, loose (GLACIAL OUTWASH)		2-3-3 (6) 10"			Water observed at 11.0 feet while drilling.
13.0							
909.5		END OF BORING	15				
14.5		Boring then backfilled with auger cuttings					
			20				
			25				
			30				

LOG OF BORING

See Descriptive Terminology sheet for explanation of abbreviations

Project Number B2404209
Geotechnical Evaluation
Central Avenue Improvements Project
Various Streets
Hopkins, Minnesota

BORING: **ST-3**
LOCATION: Captured with RTK GPS.
DATUM: NAD 1983 HARN Adj MN Hennepin (US Feet)
NORTHING: 149517.3 EASTING: 492430.0
DRILLER: C McClain LOGGED BY: Z Semlak START DATE: 06/24/24 END DATE: 06/24/24
SURFACE ELEVATION: 931.7 ft RIG: 7514 METHOD: 3 1/4" HSA SURFACING: Bituminous WEATHER: Clear

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q_p tsf	MC %	Tests or Remarks
930.4		PAVEMENT, 9 inches of bituminous over 6 inches of apparent aggregate base				4	
1.3 928.7		FILL: SILTY SAND (SM), fine to medium-grained, trace Gravel, dark brown, moist		2-3-5 (8) 10"		2	P200=4%
3.0 927.2		FILL: POORLY GRADED SAND (SP), fine to medium-grained, trace Gravel, light brown, moist		3-4-4 (8) 8"		4	P200=5%
4.5 924.7		FILL: POORLY GRADED SAND (SP), fine to coarse-grained, trace Gravel, light brown, moist	5				
7.0		POORLY GRADED SAND (SP), fine to medium-grained, light brown, moist, loose to dense (GLACIAL OUTWASH)		2-3-6 (9) 12"			
918.7			10	2-3-39 (42) 9"			
13.0 917.2		SILTY SAND (SM), fine to medium-grained, trace Gravel, brown, moist, medium dense (GLACIAL TILL)		9-12-13 (25) 10"			Water not observed while drilling.
14.5		END OF BORING Boring then backfilled with auger cuttings	15				
			20				
			25				
			30				

LOG OF BORING

See Descriptive Terminology sheet for explanation of abbreviations

Project Number B2404209
Geotechnical Evaluation
Central Avenue Improvements Project
Various Streets
Hopkins, Minnesota

BORING: **ST-4**
LOCATION: Captured with RTK GPS.
DATUM: NAD 1983 HARN Adj MN Hennepin (US Feet)
NORTHING: 150282.2 EASTING: 492461.6
DRILLER: C McClain LOGGED BY: Z Semlak START DATE: 06/24/24 END DATE: 06/24/24
SURFACE ELEVATION: 927.6 ft RIG: 7514 METHOD: 3 1/4" HSA SURFACING: Bituminous WEATHER: Clear

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q_p tsf	MC %	Tests or Remarks
926.6		PAVEMENT, 6 inches of bituminous over 5 inches of apparent aggregate base					
0.9 925.6		FILL: SILTY SAND (SM), fine to coarse-grained, trace Gravel, dark brown, moist		11-1-4 (5) 14"			
2.0 923.1		FILL: SILTY SAND (SM), fine to medium-grained, trace Gravel, brown, moist					
4.5 920.6		FILL: CLAYEY SAND (SC), trace Gravel, brown, moist	5	2-3-4 (7) 16"			
7.0 918.1		FILL: POORLY GRADED SAND (SP), fine to medium-grained, trace Gravel, brown to light brown, moist		5-7-11 (18) 6"		3	P200=5%
9.5 914.6		POORLY GRADED SAND (SP), fine to coarse-grained, trace Gravel, light brown, moist, medium dense (GLACIAL OUTWASH)	10	3-6-11 (17) 12"			
13.0 913.1	▽	POORLY GRADED SAND (SP), fine to medium-grained, trace Gravel, light brown, moist, medium dense (GLACIAL OUTWASH)		1-4-8 (12) 14"			Water observed at 13.0 feet while drilling.
14.5		END OF BORING Boring then backfilled with auger cuttings	15				
			20				
			25				
			30				

LOG OF BORING

See Descriptive Terminology sheet for explanation of abbreviations

Project Number B2404209
Geotechnical Evaluation
Central Avenue Improvements Project
Various Streets
Hopkins, Minnesota

BORING: **ST-5**
LOCATION: Estimated.
DATUM: NAD 1983 HARN Adj MN Hennepin (US Feet)
NORTHING: 150920 EASTING: 492505
DRILLER: C McClain LOGGED BY: Z Semlak START DATE: 06/24/24 END DATE: 06/24/24
SURFACE ELEVATION: 932.0 ft RIG: 7514 METHOD: 3 1/4" HSA SURFACING: Bituminous WEATHER: Clear

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q_p tsf	MC %	Tests or Remarks
931.2		PAVEMENT, 4 inches of bituminous over 5 inches of apparent aggregate base				6	
0.8							
930.0		FILL: SILTY SAND (SM), fine to medium-grained, trace Gravel, brown, moist		1-3-4 (7) 12"			
2.0		FILL: POORLY GRADED SAND (SP), fine to medium-grained, trace Gravel, light brown, moist				2	
		No recovery at 5 feet	5	5-9-12 (21) 0"			
925.0							
7.0		SILTY SAND (SM), fine to medium-grained, trace Gravel, brown, moist, dense to medium dense (GLACIAL TILL)		33-20-13 (33) 8"			
			10	5-8-9 (17) 17"			
				7-8-9 (17) 18"			
917.5							
14.5		END OF BORING	15				Water not observed while drilling.
		Boring then backfilled with auger cuttings					
			20				
			25				
			30				

LOG OF BORING

See Descriptive Terminology sheet for explanation of abbreviations

Project Number B2404209
Geotechnical Evaluation
Central Avenue Improvements Project
Various Streets
Hopkins, Minnesota

BORING: **ST-6**
LOCATION: Estimated.
DATUM: NAD 1983 HARN Adj MN Hennepin (US Feet)
NORTHING: 149460 EASTING: 492130
DRILLER: C McClain LOGGED BY: Z Semlak START DATE: 06/24/24 END DATE: 06/24/24
SURFACE ELEVATION: 930.0 ft RIG: 7514 METHOD: 3 1/4" HSA SURFACING: Bituminous WEATHER: Clear

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q_p tsf	MC %	Tests or Remarks
929.3		PAVEMENT, 8 inches of bituminous					
0.7 928.0		FILL: SILTY SAND (SM), fine to coarse-grained, contains seams of Clay, trace Gravel, black, moist				6	
2.0 926.0		FILL: POORLY GRADED GRAVEL with SILT (SP-SM), fine to coarse-grained, CLAY layers, trace Gravel, brown, moist		1-2-4 (6) 9"			
4.0 923.0		FILL: POORLY GRADED SAND (SP), fine to medium-grained, trace Gravel, light brown, moist	5	2-3-3 (6) 6"			
7.0		FILL: SANDY LEAN CLAY (CL), contains seams of Silt, grayish brown, moist		1-1-2 (3) 18"		24	
918.0			10	2-5-11 (16) 10"			
12.0		POORLY GRADED SAND (SP), fine to medium-grained, contains seams of Silt, trace Gravel, light brown, moist, medium dense (GLACIAL OUTWASH)		6-8-11 (19) 13"			
910.5	▽		15	5-9-10 (19) 14"			
19.5		POORLY GRADED SAND with GRAVEL (SP), fine to coarse-grained, brown, moist, medium dense to dense	20	9-9-8 (17) 12"		12	
904.0			25	25-26-18 (44) 14"			
26.0		END OF BORING Boring then backfilled with auger cuttings	30				Water observed at 19.0 feet while drilling.

LOG OF BORING

See Descriptive Terminology sheet for explanation of abbreviations

Project Number B2404209
Geotechnical Evaluation
Central Avenue Improvements Project
Various Streets
Hopkins, Minnesota

BORING: **ST-7**
LOCATION: Captured with RTK GPS.
DATUM: NAD 1983 HARN Adj MN Hennepin (US Feet)
NORTHING: 150220.5 EASTING: 492132.7
DRILLER: C McClain LOGGED BY: Z Semlak START DATE: 06/24/24 END DATE: 06/24/24
SURFACE ELEVATION: 929.6 ft RIG: 7514 METHOD: 3 1/4" HSA SURFACING: Bituminous WEATHER: Clear

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q_p tsf	MC %	Tests or Remarks
928.8		PAVEMENT, 4 1/2 inches of bituminous over 6 inches of apparent aggregate base					
0.8 927.6		FILL: SILTY SAND (SM), fine to medium-grained, trace Gravel, dark brown, moist					
2.0 925.1		FILL: SILTY SAND with GRAVEL (SM), fine to coarse-grained, brown, moist		1-4-8 (12) 14"		5	
4.5 920.1		FILL: POORLY GRADED SAND with GRAVEL (SP), fine to coarse-grained, light brown, moist, medium dense	5	9-8-10 (18) 10"		2	
				5-8-11 (19) 13"			
9.5 915.1			10	11-10-9 (19) 12"			
				7-10-12 (22) 13"			
14.5		END OF BORING Boring then backfilled with auger cuttings	15				Water not observed while drilling.
			20				
			25				
			30				

LOG OF BORING

See Descriptive Terminology sheet for explanation of abbreviations

Project Number B2404209
Geotechnical Evaluation
Central Avenue Improvements Project
Various Streets
Hopkins, Minnesota

BORING: **ST-8**
LOCATION: Estimated.
DATUM: NAD 1983 HARN Adj MN Hennepin (US Feet)
NORTHING: 150850 EASTING: 492160
DRILLER: C McClain LOGGED BY: Z Semlak START DATE: 06/25/24 END DATE: 06/25/24
SURFACE ELEVATION: 936.0 ft RIG: 7514 METHOD: 3 1/4" HSA SURFACING: Bituminous WEATHER: Clear

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q_p tsf	MC %	Tests or Remarks
935.2		PAVEMENT, 5 inches of bituminous over 5 inches of apparent aggregate base				7	
0.8 934.0		FILL: SILTY SAND (SM), fine to coarse-grained, trace Gravel, black, moist		3-8-9 (17) 13"			
2.0 931.5		FILL: POORLY GRADED SAND (SP), fine to coarse-grained, trace Gravel, light brown, moist				3	
4.5 929.0		SANDY SILT (ML), contains seams of Poorly Graded Sand, brown, moist, medium dense (GLACIAL OUTWASH)	5	4-5-8 (13) 18"		13	
7.0		POORLY GRADED SAND (SP), fine to coarse-grained, trace Gravel, light brown, moist, medium dense (GLACIAL OUTWASH)		9-12-11 (23) 3"			
			10	6-8-9 (17) 12"			
921.5				11-15-15 (30) 3"			
14.5		END OF BORING Boring then backfilled with auger cuttings	15				Water not observed while drilling.
			20				
			25				
			30				

LOG OF BORING

See Descriptive Terminology sheet for explanation of abbreviations

Project Number B2404209
Geotechnical Evaluation
Central Avenue Improvements Project
Various Streets
Hopkins, Minnesota

BORING: **ST-9**
LOCATION: Captured with RTK GPS.
DATUM: NAD 1983 HARN Adj MN Hennepin (US Feet)
NORTHING: 151335.1 EASTING: 492175.8
DRILLER: C McClain LOGGED BY: Z Semlak START DATE: 06/26/24 END DATE: 06/26/24
SURFACE ELEVATION: 939.6 ft RIG: 7514 METHOD: 3 1/4" HSA SURFACING: Bituminous WEATHER: Clear

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q_p tsf	MC %	Tests or Remarks
938.5		PAVEMENT, 7 1/2 inches of bituminous over 6 inches of apparent aggregate base					
1.1		FILL: SILTY SAND (SM), fine to medium-grained, trace Gravel, black, moist					
937.6				1-1-4 (5) 13"		11	
2.0		FILL: CLAYEY SAND (SC), trace Gravel, brown, moist					
935.1				6-5-7 (12) 15"		7	
4.5		SILTY SAND (SM), fine to medium-grained, trace Gravel, brown, moist, medium dense (GLACIAL TILL)		5-5-7 (12) 18"			
				4-7-6 (13) 15"			
				6-8-10 (18) 17"			
925.1							
14.5		END OF BORING Boring then backfilled with auger cuttings					Water not observed while drilling.

LOG OF BORING

See Descriptive Terminology sheet for explanation of abbreviations

Project Number B2404209
Geotechnical Evaluation
Central Avenue Improvements Project
Various Streets
Hopkins, Minnesota

BORING: **ST-10**
LOCATION: Captured with RTK GPS.
DATUM: NAD 1983 HARN Adj MN Hennepin (US Feet)
NORTHING: 149624.5 EASTING: 491794.3
DRILLER: C McClain LOGGED BY: Z Semlak START DATE: 06/25/24 END DATE: 06/25/24
SURFACE ELEVATION: 925.7 ft RIG: 7514 METHOD: 3 1/4" HSA SURFACING: Bituminous WEATHER: Clear

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q_p tsf	MC %	Tests or Remarks
924.4		PAVEMENT, 6 1/2 inches of bituminous over 9 inches of apparent aggregate base				5	
1.3		FILL: SILTY SAND (SM), fine to medium-grained, trace Gravel, little debris, brown, moist		1-4-4 (8) 14"			
923.7 2.0		FILL: SILTY SAND (SM), fine to coarse-grained, trace Gravel, CLAY layers, dark brown, moist				9	P200=31%
921.2 4.5		FILL: SILTY SAND (SM), fine to medium-grained, contains seams of Clay, light brown to black, moist	5	4-4-4 (8) 12"		11	
918.7 7.0		FILL: SILTY SAND (SM), fine to medium-grained, trace Gravel, brown, moist		1-3-2 (5) 16"			
916.2 9.5	▽	POORLY GRADED SAND (SP), fine to coarse-grained, trace Gravel, light brown, moist to wet, medium dense (GLACIAL OUTWASH)	10	6-10-12 (22) 13"			
				3-7-15 (22) 8"			
911.2 14.5		END OF BORING Boring then backfilled with auger cuttings	15				Water observed at 13.0 feet while drilling.
			20				
			25				
			30				

LOG OF BORING

See Descriptive Terminology sheet for explanation of abbreviations

Project Number B2404209
Geotechnical Evaluation
Central Avenue Improvements Project
Various Streets
Hopkins, Minnesota

BORING: **ST-11**
LOCATION: Captured with RTK GPS.
DATUM: NAD 1983 HARN Adj MN Hennepin (US Feet)
NORTHING: 150245.7 EASTING: 491803.0
DRILLER: C McClain LOGGED BY: Z Semlak START DATE: 06/25/24 END DATE: 06/25/24
SURFACE ELEVATION: 931.0 ft RIG: 7514 METHOD: 3 1/4" HSA SURFACING: Bituminous WEATHER: Clear

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q_p tsf	MC %	Tests or Remarks
930.2		PAVEMENT, 5 1/2 inches of bituminous over 5 inches of apparent aggregate base					
0.8						10	
929.0		FILL: CLAYEY SAND (SC), trace Gravel, little debris, dark brown to brown, moist		1-2-3 (5) 15"			
2.0		FILL: SANDY LEAN CLAY (CL), trace Gravel, dark brown, moist				22	
926.5				1-1-3 (4) 14"			
4.5		FILL: SANDY LEAN CLAY (CL), SILT layers, trace Gravel, light brown, moist	5				
				1-1-2 (3) 9"			
921.5							
9.5		POORLY GRADED SAND (SP), fine to coarse-grained, trace Gravel, light brown, moist, medium dense (GLACIAL OUTWASH)	10	6-12-15 (27) 13"			
				6-9-11 (20) 13"			
916.5							
14.5		END OF BORING	15				Water not observed while drilling.
		Boring then backfilled with auger cuttings					
			20				
			25				
			30				

LOG OF BORING

See Descriptive Terminology sheet for explanation of abbreviations

Project Number B2404209
Geotechnical Evaluation
Central Avenue Improvements Project
Various Streets
Hopkins, Minnesota

BORING: **ST-12**
LOCATION: Estimated.
DATUM: NAD 1983 HARN Adj MN Hennepin (US Feet)
NORTHING: 150880 EASTING: 491850
DRILLER: C McClain LOGGED BY: Z Semlak START DATE: 06/25/24 END DATE: 06/25/24
SURFACE ELEVATION: 941.0 ft RIG: 7514 METHOD: 3 1/4" HSA SURFACING: Bituminous WEATHER: Clear

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q_p tsf	MC %	Tests or Remarks
940.1		PAVEMENT, 4 1/2 inches of bituminous over 7 inches of apparent aggregate base				4	
0.9 939.0		FILL: SILTY SAND (SM), fine to medium-grained, trace Gravel, little debris, dark brown, moist		1-4-6 (10) 12"		6	P200=10%
2.0		FILL: POORLY GRADED SAND with SILT (SP-SM), fine to medium-grained, SILTY SAND layers, trace Gravel, light brown, moist	5	2-5-10 (15) 12"			
				6-8-9 (17) 16"			
931.5							
9.5		POORLY GRADED SAND (SP), fine to coarse-grained, contains seams of Silty Sand, trace Gravel, light brown, moist, medium dense (GLACIAL OUTWASH)	10	5-7-9 (16) 15"			
				4-8-11 (19) 16"			
926.5							
14.5		END OF BORING Boring then backfilled with auger cuttings	15				Water not observed while drilling.
			20				
			25				
			30				

LOG OF BORING

See Descriptive Terminology sheet for explanation of abbreviations

Project Number B2404209
Geotechnical Evaluation
Central Avenue Improvements Project
Various Streets
Hopkins, Minnesota

BORING: **ST-13**
LOCATION: Captured with RTK GPS.
DATUM: NAD 1983 HARN Adj MN Hennepin (US Feet)
NORTHING: 151341.9 EASTING: 491846.0
DRILLER: C McClain LOGGED BY: Z Semlak START DATE: 06/25/24 END DATE: 06/25/24
SURFACE ELEVATION: 946.6 ft RIG: 7514 METHOD: 3 1/4" HSA SURFACING: Bituminous WEATHER: Clear

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q_p tsf	MC %	Tests or Remarks
945.9		PAVEMENT, 5 1/2 inches of bituminous over 3 inches of apparent aggregate base				2	
0.7							
944.6		FILL: SILTY SAND (SM), fine to coarse-grained, trace Gravel, little debris, dark brown, wet		1-1-2 (3) 13"		26	LL=31, PL=22, PI=9
2.0							
942.1		FILL: SANDY LEAN CLAY (CL), dark brown, moist					
4.5		FILL: SANDY LEAN CLAY (CL), brownish gray, moist	5	1-1-3 (4) 14"			
		No recovery at 7 feet		3-6-6 (12) 0"			
937.1							
9.5		SILTY SAND (SM), fine to coarse-grained, trace Gravel, brown, moist to wet, loose (GLACIAL TILL)	10	4-4-6 (10) 17"			
	▽	*Wet at 13 feet*		2-2-4 (6) 15"			
932.1							
14.5		END OF BORING	15				Water observed at 13.0 feet while drilling.
		Boring then backfilled with auger cuttings					
			20				
			25				
			30				

LOG OF BORING

See Descriptive Terminology sheet for explanation of abbreviations

Project Number B2404209
Geotechnical Evaluation
Central Avenue Improvements Project
Various Streets
Hopkins, Minnesota

BORING: **ST-14**
LOCATION: Estimated.
DATUM: NAD 1983 HARN Adj MN Hennepin (US Feet)
NORTHING: 150205 EASTING: 491480
DRILLER: C McClain LOGGED BY: Z Semlak START DATE: 06/26/24 END DATE: 06/26/24
SURFACE ELEVATION: 928.0 ft RIG: 7514 METHOD: 3 1/4" HSA SURFACING: Bituminous WEATHER: Clear

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q_p tsf	MC %	Tests or Remarks
927.1		PAVEMENT, 4 inches of bituminous over 7 inches of apparent aggregate base					
0.9 926.0		FILL: SILTY SAND (SM), fine-grained, Gravel, brown, moist		1-2-2 (4) 13"		13	
2.0 923.5		FILL: CLAYEY SAND (SC), trace roots, brown, moist					
4.5 921.0		FILL: POORLY GRADED SAND with SILT (SP-SM), coarse-grained, trace Gravel, brown, moist	5	3-4-6 (10) 11"		4	
7.0 913.5		POORLY GRADED SAND (SP), fine to medium-grained, with Gravel, brown, moist, medium dense to loose (GLACIAL OUTWASH)	10	4-7-9 (16) 9"			
				4-9-9 (18) 12"			
				6-5-5 (10) 3"			
14.5		END OF BORING Boring then backfilled with auger cuttings	15				Water not observed while drilling.
			20				
			25				
			30				

LOG OF BORING

See Descriptive Terminology sheet for explanation of abbreviations

Project Number B2404209
Geotechnical Evaluation
Central Avenue Improvements Project
Various Streets
Hopkins, Minnesota

BORING: **ST-15**
LOCATION: Captured with RTK GPS.
DATUM: NAD 1983 HARN Adj MN Hennepin (US Feet)
NORTHING: 150943.9 EASTING: 491501.2
DRILLER: C McClain LOGGED BY: Z Semlak START DATE: 06/26/24 END DATE: 06/26/24
SURFACE ELEVATION: 939.7 ft RIG: 7514 METHOD: 3 1/4" HSA SURFACING: Bituminous WEATHER: Clear

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q_p tsf	MC %	Tests or Remarks
938.7		PAVEMENT, 6 1/2 inches of bituminous over 6 inches of apparent aggregate base				2	
1.0		FILL: LEAN CLAY (CL), dark brown to brown, moist		1-3-3 (6) 15"		27	LL=32, PL=23, PI=9
		Brown at 4 1/2 feet	5	1-3-3 (6) 14"			
932.7							
7.0		FILL: SANDY LEAN CLAY (CL), brown, moist		1-4-10 (14) 16"			
930.2							
9.5		SILTY SAND (SM), fine to medium-grained, trace Gravel, brown, moist, medium dense to loose (GLACIAL TILL)	10	6-5-7 (12) 8"			
				2-3-3 (6) 9"			
925.2							
14.5		END OF BORING	15				Water not observed while drilling.
		Boring then backfilled with auger cuttings					
			20				
			25				
			30				

LOG OF BORING

See Descriptive Terminology sheet for explanation of abbreviations

Project Number B2404209
Geotechnical Evaluation
Central Avenue Improvements Project
Various Streets
Hopkins, Minnesota

BORING: **ST-16**
LOCATION: Estimated.
DATUM: NAD 1983 HARN Adj MN Hennepin (US Feet)
NORTHING: 151395 EASTING: 491520
DRILLER: C McClain LOGGED BY: Z Semlak START DATE: 06/26/24 END DATE: 06/26/24
SURFACE ELEVATION: 949.0 ft RIG: 7514 METHOD: 3 1/4" HSA SURFACING: Bituminous WEATHER: Clear

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q_p tsf	MC %	Tests or Remarks
947.9		PAVEMENT, 6 inches of bituminous over 7 inches of apparent aggregate base					
1.1		FILL: SILTY SAND (SM), fine to medium-grained, with Gravel, dark brown, moist					
947.0				1-3-4			
2.0		FILL: SANDY LEAN CLAY (CL), brown, moist		(7)		24	LL=31, PL=22, PI=9
944.5				10"			
4.5		FILL: SILTY SAND (SM), fine to medium-grained, trace Gravel, dark brown, moist	5	8-13-19 (32) 6"			
942.0							
7.0		SILTY SAND (SM), fine to medium-grained, trace Gravel, brown, moist, medium dense to very dense (GLACIAL TILL)		28-19-13 (32) 15"		6	
			10	9-10-13 (23) 17"			
				13-20-22 (42) 13"			
934.5							
14.5		END OF BORING	15				Water not observed while drilling.
		Boring then grouted					
			20				
			25				
			30				

LOG OF BORING

See Descriptive Terminology sheet for explanation of abbreviations

Project Number B2404209
Geotechnical Evaluation
Central Avenue Improvements Project
Various Streets
Hopkins, Minnesota

BORING: **ST-17**
LOCATION: Estimated.
DATUM: NAD 1983 HARN Adj MN Hennepin (US Feet)
NORTHING: 150560 EASTING: 492685
START DATE: 06/26/24 END DATE: 06/26/24
SURFACE ELEVATION: 925.0 ft
DRILLER: C McClain LOGGED BY: Z Semlak
RIG: 7514 METHOD: 3 1/4" HSA
SURFACING: Btuminous WEATHER: Clear

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q_p tsf	MC %	Tests or Remarks
924.2		PAVEMENT, 5 inches of bituminous over 5 inches of apparent aggregate base				7	
0.8 923.0		FILL: CLAYEY SAND (SC), trace Gravel, dark brown, moist		1-1-3 (4) 16"			
2.0 920.5		FILL: LEAN CLAY (CL), organic, black, moist				34	OC=7%
4.5		FILL: SANDY LEAN CLAY (CL), brown, moist	5	1-2-3 (5) 14"		24	LL=32, PL=21, PI=11
918.0 7.0 915.5		FILL: CLAYEY SAND (SC), with layer of SAND, trace Gravel, brown, moist		1-3-5 (8) 15"			
9.5	▽	POORLY GRADED SAND with SILT (SP-SM), fine to medium-grained, brown, moist to wet (GLACIAL OUTWASH)	10	1-2-2 (4) 13"			
		Wet at 12 feet		1-1-1 (2) 18"			
910.5 14.5		END OF BORING	15				Water observed at 12.0 feet while drilling.
		Boring then backfilled with auger cuttings	20				
			25				
			30				

LOG OF BORING

See Descriptive Terminology sheet for explanation of abbreviations

Project Number B2404209
Geotechnical Evaluation
Central Avenue Improvements Project
Various Streets
Hopkins, Minnesota

BORING: **ST-18**
LOCATION: Estimated.
DATUM: NAD 1983 HARN Adj MN Hennepin (US Feet)
NORTHING: 150560 EASTING: 492265
DRILLER: C McClain LOGGED BY: Z Semlak START DATE: 06/26/24 END DATE: 06/26/24
SURFACE ELEVATION: 930.0 ft RIG: 7514 METHOD: 3 1/4" HSA SURFACING: Bituminous WEATHER: Clear

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q_p tsf	MC %	Tests or Remarks
929.5		PAVEMENT, 2 inches of bituminous over 4 inches of apparent aggregate base					
0.5						10	
928.0		FILL: CLAYEY SAND (SC), dark brown, moist					
2.0		FILL: POORLY GRADED SAND with SILT (SP-SM), fine to medium-grained, with to trace Gravel, brown, moist		1-5-4 (9) 2"			
			5	2-2-4 (6) 4"		3	P200=11%
923.0							
7.0		FILL: SILTY SAND (SM), fine to medium-grained, contains seams of Clayey Sand, brown, moist		2-1-3 (4) 15"			
919.5		*Possible buried Asphalt at 10 feet*	10	2-3-3 (6) 15"			
10.5		POORLY GRADED SAND (SP), fine to medium-grained, brown, moist, medium dense (GLACIAL OUTWASH)					
				5-7-12 (19) 14"			
915.5							
14.5		END OF BORING	15				Water not observed while drilling.
		Boring then backfilled with auger cuttings					
			20				
			25				
			30				

LOG OF BORING

See Descriptive Terminology sheet for explanation of abbreviations

Project Number B2404209
Geotechnical Evaluation
Central Avenue Improvements Project
Various Streets
Hopkins, Minnesota

BORING: **ST-19**
LOCATION: Estimated.
DATUM: NAD 1983 HARN Adj MN Hennepin (US Feet)
NORTHING: 150550 EASTING: 491945
DRILLER: C McClain LOGGED BY: Z Semlak START DATE: 06/26/24 END DATE: 06/26/24
SURFACE ELEVATION: 933.0 ft RIG: 7514 METHOD: 3 1/4" HSA SURFACING: Bitumionus WEATHER: Clear

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q_p tsf	MC %	Tests or Remarks
931.9		PAVEMENT, 6 1/2 inches of bituminous over 7 inches of apparent aggregate base				3	
1.1		FILL: SILTY SAND (SM), fine-grained, with to trace Gravel, brown, moist		1-2-4 (6) 13"			
931.0		FILL: LEAN CLAY (CL), dark brown, moist				19	
2.0							
			5	1-3-4 (7) 15"			
926.0							
7.0		FILL: SILTY SAND (SM), fine-grained, brown, moist		2-2-2 (4) 15"			
923.5							
9.5		POORLY GRADED SAND with SILT (SP-SM), fine to medium-grained, trace Gravel, brown, moist, loose (GLACIAL OUTWASH)	10	3-4-6 (10) 16"			
921.0							
12.0		POORLY GRADED SAND (SP), fine to medium-grained, with Gravel, brown, moist, medium dense (GLACIAL OUTWASH)		4-7-11 (18) 14"			
918.5							
14.5		END OF BORING	15				Water not observed while drilling.
		Boring then grouted					
			20				
			25				
			30				

LOG OF BORING

See Descriptive Terminology sheet for explanation of abbreviations

Project Number B2404209
Geotechnical Evaluation
Central Avenue Improvements Project
Various Streets
Hopkins, Minnesota

BORING: **ST-20**
LOCATION: Estimated.
DATUM: NAD 1983 HARN Adj MN Hennepin (US Feet)
NORTHING: 150540 EASTING: 491615
DRILLER: C McClain LOGGED BY: Z Semlak START DATE: 06/26/24 END DATE: 06/26/24
SURFACE ELEVATION: 933.0 ft RIG: 7514 METHOD: 3 1/4" HSA SURFACING: Bituminous WEATHER: Clear

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q_p tsf	MC %	Tests or Remarks
932.0		PAVEMENT, 4 1/2 inches of bituminous over 8 inches of apparent aggregate base					
1.0		FILL: SILTY SAND (SM), fine-grained, trace Gravel, dark brown, moist *Trace Asphalt at 2 1/2 feet*		3-6-8 (14) 14"		4	
928.5							
4.5		FILL: POORLY GRADED SAND with SILT (SP-SM), fine to medium-grained, with Gravel, brown, moist	5	3-3-4 (7) 12"		4	P200=11%
926.0							
7.0		POORLY GRADED SAND (SP), fine to medium-grained, with Gravel, brown, moist, medium dense (GLACIAL OUTWASH)		6-6-5 (11) 14"			
			10	4-9-10 (19) 4"		3	P200=4%
				5-6-9 (15) 13"			
918.5							
14.5		END OF BORING Boring then backfilled with auger cuttings	15				Water not observed while drilling.
			20				
			25				
			30				

LOG OF BORING

See Descriptive Terminology sheet for explanation of abbreviations

Project Number B2404209
Geotechnical Evaluation
Central Avenue Improvements Project
Various Streets
Hopkins, Minnesota

BORING: **ST-21**
LOCATION: Captured with RTK GPS.
DATUM: NAD 1983 HARN Adj MN Hennepin (US Feet)
NORTHING: 151189.5 EASTING: 492642.7
DRILLER: C McClain LOGGED BY: Z Semlak START DATE: 06/24/24 END DATE: 06/24/24
SURFACE ELEVATION: 933.5 ft RIG: 7514 METHOD: 3 1/4" HSA SURFACING: Bituminous WEATHER: Clear

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q_p tsf	MC %	Tests or Remarks
932.8		PAVEMENT, 6 1/2 inches of bituminous over 3 inches of apparent aggregate base				4	
0.8							
931.5		FILL: SILTY SAND (SM), fine to coarse-grained, trace Gravel, little debris, dark brown, moist		4-5-3 (8) 12"			
2.0							
929.0		FILL: POORLY GRADED SAND (SP), fine to coarse-grained, trace Gravel, light brown, moist					
4.5		FILL: SANDY LEAN CLAY (CL), trace Gravel, brown, moist	5	1-1-4 (5) 10"		20	
925.5	▽			2-6-5 (11) 12"		31	
8.0		POORLY GRADED SAND with SILT (SP-SM), fine to coarse-grained, trace Gravel, brown, moist, loose to medium dense (GLACIAL OUTWASH)	10	4-5-5 (10) 16"			
919.0				2-5-6 (11)			
14.5		END OF BORING Boring then backfilled with auger cuttings	15				Water observed at 7.5 feet while drilling.
			20				
			25				
			30				

LOG OF BORING

See Descriptive Terminology sheet for explanation of abbreviations

Project Number B2404209
Geotechnical Evaluation
Central Avenue Improvements Project
Various Streets
Hopkins, Minnesota

BORING: **ST-22**
LOCATION: Estimated.
DATUM: NAD 1983 HARN Adj MN Hennepin (US Feet)
NORTHING: 151215 EASTING: 491990
START DATE: 06/25/24 END DATE: 06/25/24
SURFACE ELEVATION: 941.0 ft RIG: 7514 METHOD: 3 1/4" HSA
SURFACING: Bituminous WEATHER: Clear
DRILLER: C McClain LOGGED BY: Z Semlak

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q_p tsf	MC %	Tests or Remarks
940.2		PAVEMENT, 4 1/2 inches of bituminous over 6 inches of apparent aggregate base					
0.8						4	
939.0		FILL: SILTY SAND (SM), fine to coarse-grained, trace Gravel, little debris, brown, moist		1-3-4 (7) 15"			
2.0		FILL: SANDY LEAN CLAY (CL), slightly organic, trace Gravel, dark gray to brown, moist				17	
936.5							
4.5		CLAYEY SAND (SC), trace Gravel, brown, wet, medium (GLACIAL TILL)	5	1-3-4 (7) 13"		13	
934.0							
7.0		SILTY SAND (SC-SM), fine to medium-grained, trace Gravel, brown, moist, medium dense (GLACIAL TILL)		7-11-13 (24) 15"			
931.5							
9.5		POORLY GRADED SAND (SP), fine to coarse-grained, trace Gravel, light brown, moist, dense (GLACIAL OUTWASH)	10	6-18-18 (36) 8"			
928.0							
13.0		SILTY SAND (SM), fine to medium-grained, trace Gravel, brown, moist, medium dense (GLACIAL TILL)		13-12-13 (25) 16"			
926.5							
14.5		END OF BORING	15				Water not observed while drilling.
		Boring then backfilled with auger cuttings					
			20				
			25				
			30				

BRAUN INTERTEC	**Hopkins - Central Avenue Improvements Project**	**Core and Aggregate Base Photo Log**
11001 Hampshire Avenue S Minneapolis, MN 55438 952.995.2000 Braunintertec.com	**B2404209**	**PC-1**

BRAUN INTERTEC	**Hopkins - Central Avenue Improvements Project**	**Core and Aggregate Base Photo Log**
11001 Hampshire Avenue S Minneapolis, MN 55438 952.995.2000 Braunintertec.com	**B2404209**	**PC-2**

BRAUN INTERTEC	**Hopkins - Central Avenue Improvements Project**	**Core and Aggregate Base Photo Log**
11001 Hampshire Avenue S Minneapolis, MN 55438 952.995.2000 Braunintertec.com	**B2404209**	**PC-3**

BRAUN INTERTEC	**Hopkins - Central Avenue Improvements Project**	**Core and Aggregate Base Photo Log**
11001 Hampshire Avenue S Minneapolis, MN 55438 952.995.2000 Braunintertec.com	**B2404209**	**PC-4**

BRAUN INTERTEC	**Hopkins - Central Avenue Improvements Project**	**Core and Aggregate Base Photo Log**
11001 Hampshire Avenue S Minneapolis, MN 55438 952.995.2000 Braunintertec.com	**B2404209**	**PC-5**

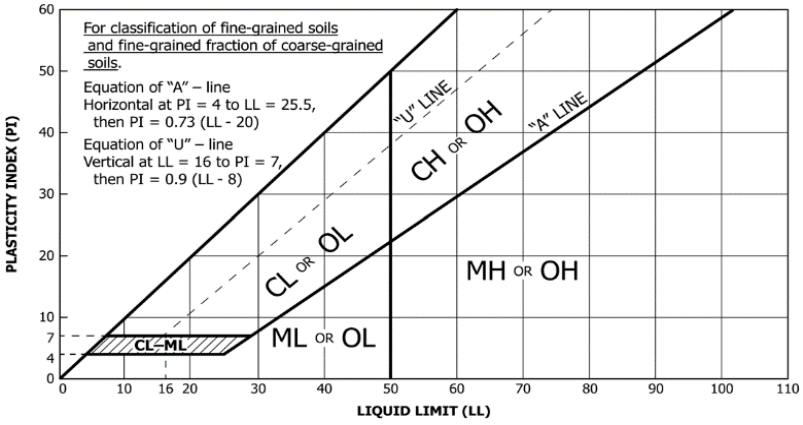
BRAUN INTERTEC
The Science You Build On.

Descriptive Terminology of Soil

Based on Standards ASTM D2487/2488
(Unified Soil Classification System)

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

A. Based on the material passing the 3-inch (75-mm) sieve.
B. If field sample contained cobbles or boulders, or both, add "with cobbles or boulders, or both" to group name.
C. Gravels with 5 to 12% fines require dual symbols:
   GW-GM well-graded gravel with silt
   GW-GC well-graded gravel with clay
   GP-GM poorly graded gravel with silt
   GP-GC poorly graded gravel with clay
D. $C_u = D_{60} / D_{10}$ $C_c = (D_{30})^2 / (D_{10} \times D_{60})$
E. If soil contains ≥ 15% sand, add "with sand" to group name.
F. If fines classify as CL-ML, use dual symbol GC-GM or SC-SM.
G. If fines are organic, add "with organic fines" to group name.
H. Sands with 5 to 12% fines require dual symbols:
   SW-SM well-graded sand with silt
   SW-SC well-graded sand with clay
   SP-SM poorly graded sand with silt
   SP-SC poorly graded sand with clay
I. If soil contains ≥ 15% gravel, add "with gravel" to group name.
J. If Atterberg limits plot in hatched area, soil is CL-ML, silty clay.
K. If soil contains 15 to < 30% plus No. 200, add "with sand" or "with gravel", whichever is predominant.
L. If soil contains ≥ 30% plus No. 200, predominantly sand, add "sandy" to group name.
M. If soil contains ≥ 30% plus No. 200 predominantly gravel, add "gravelly" to group name.
N. PI ≥ 4 and plots on or above "A" line.
O. PI < 4 or plots below "A" line.
P. PI plots on or above "A" line.
Q. PI plots below "A" line.



Laboratory Tests

DD	Dry density, pcf	**q_p**	Pocket penetrometer strength, tsf
WD	Wet density, pcf	**q_U**	Unconfined compression test, tsf
P200	% Passing #200 sieve	**LL**	Liquid limit
MC	Moisture content, %	**PL**	Plastic limit
OC	Organic content, %	**PI**	Plasticity index

Particle Size Identification

Boulders..... over 12"
Cobbles..... 3" to 12"
Gravel
  Coarse..... 3/4" to 3" (19.00 mm to 75.00 mm)
  Fine..... No. 4 to 3/4" (4.75 mm to 19.00 mm)
Sand
  Coarse..... No. 10 to No. 4 (2.00 mm to 4.75 mm)
  Medium..... No. 40 to No. 10 (0.425 mm to 2.00 mm)
  Fine..... No. 200 to No. 40 (0.075 mm to 0.425 mm)
Silt..... No. 200 (0.075 mm) to .005 mm
Clay..... < .005 mm

Relative Proportions[L, M]

trace..... 0 to 5%
little..... 6 to 14%
with..... ≥ 15%

Inclusion Thicknesses

lens..... 0 to 1/8"
seam..... 1/8" to 1"
layer..... over 1"

Apparent Relative Density of Cohesionless Soils

Very loose ..... 0 to 4 BPF
Loose ..... 5 to 10 BPF
Medium dense..... 11 to 30 BPF
Dense..... 31 to 50 BPF
Very dense..... over 50 BPF

Consistency of Cohesive Soils	Blows Per Foot	Approximate Unconfined Compressive Strength
Very soft	0 to 1 BPF	< 0.25 tsf
Soft	2 to 4 BPF	0.25 to 0.5 tsf
Medium	5 to 8 BPF	0.5 to 1 tsf
Stiff	9 to 15 BPF	1 to 2 tsf
Very Stiff	16 to 30 BPF	2 to 4 tsf
Hard	over 30 BPF	> 4 tsf

Moisture Content:

Dry: Absence of moisture, dusty, dry to the touch.
Moist: Damp but no visible water.
Wet: Visible free water, usually soil is below water table.

Drilling Notes:

Blows/N-value: Blows indicate the driving resistance recorded for each 6-inch interval. The reported N-value is the blows per foot recorded by summing the second and third interval in accordance with the Standard Penetration Test, ASTM D1586.

Partial Penetration: If the sampler could not be driven through a full 6-inch interval, the number of blows for that partial penetration is shown as #/x" (i.e. 50/2"). The N-value is reported as "REF" indicating refusal.

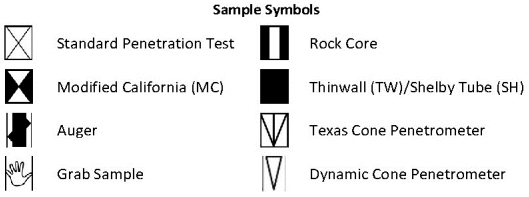
Recovery: Indicates the inches of sample recovered from the sampled interval. For a standard penetration test, full recovery is 18", and is 24" for a thinwall/shelby tube sample.

WOH: Indicates the sampler penetrated soil under weight of hammer and rods alone; driving not required.

WOR: Indicates the sampler penetrated soil under weight of rods alone; hammer weight and driving not required.

Water Level: Indicates the water level measured by the drillers either while drilling (▽), at the end of drilling (▼), or at some time after drilling (▼).

Sample Symbols



5/2021

State Aid 10 Ton ESAL Traffic Forecast Calculator

This ESAL calculator is for use with default Heavy Commerical Traffic values; click "User Defined Traffic Values" sheet below if you wish to enter your own Heavy Commercial Traffic values.

Instructions: All yellow boxes require an input value.
Dropdown choices are provided for Base Year (C18), Number of Lanes (C19), and Urban or Rural (C21).
You must click on cells C18, C19, and C21 to access the dropdown choices.

General Information

Date	8-5-2024	
Forecast Performed by	Braun Intertec	
Name of County or City	City of Hopkins (Hennepin County)	
Project Number	B2404209	
Project Description	Pavement Rehabilitation	
Route Number	11th Ave N (MSAS 343)	
Base Year (i.e. opening to traffic)	2026	
Number of Lanes (total both directions)	2 = typical 2 lane	
Current AADT	465	
Urban or Rural	Urban	
Historical AADT (enter a minimum of two years)	**Year**	**AADT**
Enter oldest traffic data here	2012	540
Enter second oldest traffic data here	2016	630
Enter third oldest traffic data here		
Enter fourth oldest traffic data here		
Base Year AADT	2026	860
20-Year AADT	2046	1,310
35-Year AADT	2061	1,640
Growth Rate	2.62%	

Vehicle Type	Vehicle Class %	ESAL Factors Flexible	ESAL Factors Rigid
2AX-6TIRE SU	1.37%	0.25	0.24
3AX+SU	0.06%	0.58	0.85
3AX TST	0.09%	0.39	0.37
4AX TST	0.19%	0.51	0.53
5AX+TST	1.47%	1.13	1.89
TR TR, BUSES	0.67%	0.57	0.74
TWIN TRAILERS	0.00%	2.40	2.33
Total	**3.85%**	**NA**	**NA**

20-Year Flexible Forecast (10 Ton) = 119,000
20-Year Rigid Forecast (10 Ton) = 176,000
35-Year Flexible Forecast (10 Ton) = 234,000
35-Year Rigid Forecast (10 Ton) = 348,000

Note: This ESAL Calculator provides reasonable estimation of ESAL's based on accurate AADT values. It is limited to an AADT value of 20,000. For roadways exceeding an AADT of 20,000, it is recommended to use the MnDOT ESAL Forecasting Tool found on MnDOT's Pavement Design web page at:
http://www.dot.state.mn.us/materials/pvmtdesign/software.html

Revised: 5/6/2020

State Aid 10 Ton ESAL Traffic Forecast Calculator

This ESAL calculator is for use with default Heavy Commerical Traffic values; click "User Defined Traffic Values" sheet below if you wish to enter your own Heavy Commercial Traffic values.

Instructions: All yellow boxes require an input value.
Dropdown choices are provided for Base Year (C18), Number of Lanes (C19), and Urban or Rural (C21).
You must click on cells C18, C19, and C21 to access the dropdown choices.

General Information

Date	8-5-2024	
Forecast Performed by	Braun Intertec	
Name of County or City	City of Hopkins (Hennepin County)	
Project Number	B2404209	
Project Description	Pavement Rehabilitation	
Route Number	12th Ave N (MSAS 344)	
Base Year (i.e. opening to traffic)	2026	
Number of Lanes (total both directions)	2 = typical 2 lane	
Current AADT	1,752	
Urban or Rural	Urban	
Historical AADT (enter a minimum of two years)	**Year**	**AADT**
Enter oldest traffic data here	1997	2,300
Enter second oldest traffic data here	2001	2,450
Enter third oldest traffic data here	2008	2,200
Enter fourth oldest traffic data here	2016	2,000
Base Year AADT	2026	1,840
20-Year AADT	2046	2,024
35-Year AADT	2061	2,162
Growth Rate	0.50%	

Vehicle Type	Vehicle Class %	ESAL Factors Flexible	Rigid
2AX-6TIRE SU	1.39%	0.25	0.24
3AX+SU	0.06%	0.58	0.85
3AX TST	0.10%	0.39	0.37
4AX TST	0.19%	0.51	0.53
5AX+TST	1.51%	1.13	1.89
TR TR, BUSES	0.66%	0.57	0.74
TWIN TRAILERS	0.00%	2.40	2.33
Total	**3.91%**	**NA**	**NA**

20-Year Flexible Forecast (10 Ton) = 216,000
20-Year Rigid Forecast (10 Ton) = 321,000
35-Year Flexible Forecast (10 Ton) = 383,000
35-Year Rigid Forecast (10 Ton) = 569,000

Note: This ESAL Calculator provides reasonable estimation of ESAL's based on accurate AADT values. It is limited to an AADT value of 20,000. For roadways exceeding an AADT of 20,000, it is recommended to use the MnDOT ESAL Forecasting Tool found on MnDOT's Pavement Design web page at:
http://www.dot.state.mn.us/materials/pvmtdesign/software.html

Revised: 5/6/2020

MnPAVE Design Summary

MnPAVE 6.502 Simulation Input File: MnPAVE - 12th Ave

Confidence Level for Preliminary Life Estimate = 70%

Confidence and Reliability may not agree. Thickness and modulus are reduced when Confidence > 50%.

Monte Carlo Reliability randomly selects values for each layer. Use Reliability for final design.

Preliminary Life Estimate		20-Year Reliability (5,000 cycles)	
Fatigue	**Rutting**	**Fatigue**	**Rutting**
>50 years	**47 years**	**100%**	**99.9%**

Project Information

District	County	City
Metro	Hennepin	Hopkins

Project Number	Route	Reference Post
B2404209	12th Avenue	from 1st St N to Hwy 7

Letting Date	Construction Type
08/08/24	Reconstruction/FDR

Designer	Soils Engineer
Bolton & Menk, Inc.	Braun Intertec

Climate Information

Seasons	Location
5	44˚ 59’ Latitude, 93˚ 27’ Longitude

Structural Information (Design Level: Intermediate)

Layer	Type	Subtype	Height (in.)
1a	Hot-Mix Asphalt (Pb = 5.0%)	PG58-34 (2360F 3/8")	2.00
1b	Hot-Mix Asphalt (Pb = 5.0%)	PG58-34 (2360F 1/2")	3.00
2	Aggregate Base	FDR	8.00
3	Engineered Soil	R-Value = 15 (CL)	12.00
4	Undisturbed Soil	Engineered Soil Modulus/2	

Traffic Information (Speed = 30 mph)

Load Type	First Year ESAL	Growth Rate	Axle Repetitions
ESAL	10,270	1.0% (simple)	225,000

Notes

Without Sand Subbase

Printed Thursday, August 15, 2024 at 16:17:01

MnPAVE Design Summary

MnPAVE 6.502 Simulation Input File: MnPAVE - Residential

Confidence Level for Preliminary Life Estimate = 70%

Confidence and Reliability may not agree. Thickness and modulus are reduced when Confidence > 50%.

Monte Carlo Reliability randomly selects values for each layer. Use Reliability for final design.

Preliminary Life Estimate		20-Year Reliability (5,000 cycles)	
Fatigue	**Rutting**	**Fatigue**	**Rutting**
>50 years	**45 years**	**100%**	**99.8%**

Project Information

District	County	City
Metro	Hennepin	Hopkins

Project Number	Route	Reference Post
B2404209	Residential Streets	from --- to ---

Letting Date	Construction Type
08/08/24	Reconstruction/FDR

Designer	Soils Engineer
Bolton & Menk, Inc.	Braun Intertec

Climate Information

Seasons	Location
5	44˚ 59’ Latitude, 93˚ 27’ Longitude

Structural Information (Design Level: Intermediate)

Layer	Type	Subtype	Height (in.)
1a	Hot-Mix Asphalt (Pb = 5.0%)	PG58-34 (2360F 3/8")	2.00
1b	Hot-Mix Asphalt (Pb = 5.0%)	PG58-34 (2360F 1/2")	2.00
2	Aggregate Base	FDR	8.00
3	Engineered Soil	R-Value = 15 (CL)	12.00
4	Undisturbed Soil	Engineered Soil Modulus/2	

Traffic Information (Speed = 30 mph)

Load Type	First Year ESAL	Growth Rate	Axle Repetitions
ESAL	6,303	2.0% (simple)	150,000

Notes

Without Sand Subbase

Printed Thursday, August 15, 2024 at 16:20:32

Services Provided:

Civil and Municipal Engineering

Water and Wastewater Engineering

Traffic and Transportation Engineering

Aviation Planning and Engineering

Water Resources Engineering

Coatings Inspection Services

Landscape Architecture Services

Surveying and Mapping

Geographic Information System Services

Funding Assistance

www.bolton-menk.com