FEASIBILITY REPORT

GARNET STREET AND 168th AVENUE RECONSTRUCTION

CITY OF RAMSEY
PROJECT NO. 13-10

January 8, 2015

Prepared By:

City of Ramsey
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January 8, 2015

Honorable Mayor and City Council
City of Ramsey
7550 Sunwood Drive
Ramsey, MN 55303

Re: Feasibility Report for City of Ramsey Project No. 13-10
Garnet Street and 168th Avenue Reconstruction

Dear Mayor and City Council Members:

Transmitted herewith is a Feasibility Report for the proposed Garnet Street and 168th Avenue Reconstruction project. This report examines the feasibility of reconstructing the bituminous street sections and completing other appurtenant improvements to the following two urban street segments:

- Garnet Street (approx. 1,350 linear feet) - 167th Street to north plat line Now & Then Estates
- 168th Avenue (approx. 670 linear feet) - Garnet Street to west cul-de-sac

This Feasibility Report examines the scope of the proposed improvements, explores estimated costs and available funding sources, defines a preliminary project schedule, and provides a determination for the necessity, feasibility and cost-effectiveness of the proposed improvements.

I would be happy to discuss this report with you at your convenience. Please feel free to call me at 763-433-9825 with any questions.

Sincerely,
City of Ramsey

Bruce Westby, PE
City Engineer

Enclosure

C: Kurt Ulrich, City Administrator, City of Ramsey
Diana Lund, Finance Director, City of Ramsey
Grant Reimer, Public Works Superintendent, City of Ramsey
Leonard Linton, Civil Engineer II, City of Ramsey

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.

Bruce Westby, PE

Date: January 8, 2015 License No. 40116

I hereby certify that this plan, specification or report was reviewed for Quality Control and Quality Assurance purposes and that I am a duly Licensed Professional Engineer under the laws of the State of Minnesota.

Leonard Linton, PE

Date: January 8, 2015 License No. 21112

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1. EXECUTIVE SUMMARY

City of Ramsey Improvement Project 13-10 proposes to reconstruct the pavement sections on two urban street segments located just north of the center of the City. The urban street segments proposed to be reconstructed are approximately 2,020 linear feet, or 0.38 miles, in length and include:

- Garnet Street (approx. 1,350 linear feet) - 167th Street to north plat line Now & Then Estates
- 168th Avenue (approx. 670 linear feet) - Garnet Street to west cul-de-sac

A map showing the location and scope of the proposed improvements on these two streets is included as ***Figure 1 in Appendix A***.

City staff typically evaluates and rates the pavement sections of all city streets on an annual basis using the Pavement and Surface Evaluation Rating (PASER) system. The pavement sections of both street segments have PASER ratings of 1 which ranks them among the worst paved street segments within the City.

The pavement sections of these two street segments were originally constructed in1988 and are in such poor condition that City staff must patch the streets multiple times a year, particularly right before winter, just so the streets can be plowed without ripping chunks of pavement up in the process. Overall, PASER ratings indicate that both street segments should be reconstructed. Pictures showing the condition of these two streets are included at the end of ***Appendix A***.

On April 23, 2013, the City Council adopted Resolution #13-04-074 authorizing the preparation of a Feasibility Report for the reconstruction of Garnet Street and 168th Avenue to address their deteriorated pavement sections. At the time, the City was in the process of exploring options for adopting a reliable, long-term funding source for street reconstruction projects, but a reliable funding source was not identified at the time so the Feasibility Report was never completed.

On February 25, 2014, the City Council adopted Resolution #14-02-034 again authorizing the preparation of a Feasibility Report for the reconstruction of Garnet Street and 168th Avenue. Since then, the City Council has adopted a Special Assessments Policy that has the potential to fund up to 25% of the applicable project costs. The funding section of this report includes more detail on proposed assessments.

During the preparation of this Report, staff was contacted by several residents of Now and Then Estates. In general, the residents questioned whether utilities would be installed with the project, whether they would be required to connect to utilities, and what cost they would be required to pay, if any, for the proposed improvements. Most of the residents who called said they would like the streets to be reconstructed, and some callers questioned the need for utilities and new sidewalks along these streets.

The engineer's opinion of probable costs for each street segment, including streets, drainage, and public sewer and water utilities, is as follows:

- Garnet Street = $1,125,000
- 168th Avenue = $ 550,000

Estimated costs include 10% contingency costs plus 25% indirect costs for administrative, engineering, finance and legal costs. ***Appendix B*** includes a detailed cost summary.

Costs for constructing public utilities during this project were considered for the following reasons. First, the City would benefit by constructing watermain as previously noted and recommended by staff. Second, the proposed improvements have an estimated design life of 60-years and considering that adjacent properties were developed over 20 years ago, they could soon begin to experience failing septic systems or wells meaning residents may want to connect to utilities before the end of the project design life, which would require the street to be reconstructed before its useful life is over. And third, residents may request to connect to City utilities as part of this project to capitalize on significant cost savings offered per the recently adopted Special Assessments Policy.

Staff will be seeking Council input on whether plans should be bid with any or all public utilities included in the base bid, whether the plans should be bid with any or all of the public utilities included as an alternate bid, or whether public utilities should be omitted from the plans altogether. Input will be solicited from impacted property owners during the neighborhood information meeting regarding their potential to connect to public utilities. Staff will also make sure that everyone is aware that costs for connecting to utilities during street reconstruction projects will be significantly reduced per the recently adopted Special Assessments Policy.

This improvement project, which is listed in the City's current 5-year Capital Improvement Plan, can be funded using a combination of special assessments to benefiting properties and street reconstruction bond proceeds. Sewer and Water Utility Funds would be used to pay for any of the public utility improvements.

Preliminary assessments in the amount of $6,500 per lot are proposed for the 12 single-family residential property owners with direct access onto the improved street segments. Both the method and rate are reflective of the newly adopted Special Assessments Policy, including the fact that assessments are not proposed to be levied for the new sidewalks or any of the subgrade corrections.

To ensure that all special assessments levied with this project are commensurate with the benefit received, staff will request Council authorization to order a benefit appraisal consultation based on the current property use at the time the improvements are made.

This project is necessary, feasible, and cost-effective from an engineering standpoint, and can be constructed as proposed herein.

2. INTRODUCTION

2.1 Authorization

The preparation of this report was authorized by the Ramsey City Council on February 25, 2014. This project has been designated as City Improvement Project No. 13-10.

2.2 Program Overview

This Feasibility Report explores proposed improvements to two urban street segments totaling approximately 2,020 linear feet (0.38 miles) in length as follows:

- Garnet Street (approx. 1,350 linear feet) - 167th Street to north plat line Now & Then Estates
- 168th Avenue (approx. 670 linear feet) - Garnet Street to west cul-de-sac

A map showing the location and scope of these two streets is attached as ***Figure 1 in Appendix A***.

The pavement sections of both Garnet Street and 168th Avenue have been deteriorating for years and are in need of total reconstruction. In the fall of 2014, City staff evaluated and rated these pavement sections at a Pavement and Surface Evaluation Rating (PASER) rating of 1.

On April 23, 2013 staff requested City Council authorization to prepare a Feasibility Report for the purpose of exploring and identifying the required improvements on each of these two urban street segments. The City Council adopted Resolution #13-04-074 authorizing the preparation of a Feasibility Report for the reconstruction of Garnet Street and 168th Avenue. However, at the time the City was in the process of exploring options for adopting a reliable, long-term funding source for street reconstruction projects and because a reliable funding source was not identified at the time, the Feasibility Report was never completed.

On February 25, 2014, the City Council adopted Resolution #14-02-034 again authorizing the preparation of a Feasibility Report for the reconstruction of Garnet Street and 168th Avenue. On December 9, 2014, the City Council adopted a Special Assessments Policy that allows assessing up to 25% of eligible project costs for street reconstruction projects, thereby allowing this Report to be completed.

2.3 Scope

The scope of this Report addresses two urban street segments totaling approximately 2,020 linear feet, or 0.38 miles, in length. These two segments include Garnet Street from 167th Street to the north plat line Now & Then Estates, and 168th Avenue from Garnet Street to the west cul-de-sac.

Staff recently rated the pavement sections for these two urban street segments and assigned a Pavement and Surface Evaluation Rating (PASER) of 1 to each segment. PASER ratings are a numerical index between 1 and 10 that indicate the condition of a pavement based on the various pavement distresses recorded during visual observations. A PASER value of 10 represents a brand new pavement section, while a PASER rating of 1 represents a pavement section that has fallen into total disrepair and requires complete reconstruction.

The pavement evaluation process requires someone to visually evaluate each pavement surface throughout the City based on the type, extent and severity of each pavement distresses observed. The types and severities of each pavement distress are then used to determine the PASER rating for each street.

Numerous types of pavement distresses may exist within a pavement section including, but not limited to, alligator cracking, block cracking, longitudinal cracking, transverse cracking, rutting, raveling, shoving, potholes and patches.

Once staff gathers the updated field data, it is then recorded in a Microsoft Excel pavement management database. This database is then used by staff to determine the most cost-effective pavement rehabilitation method for each street segment, and to schedule upcoming long-term Street Maintenance Program projects.

3. EXISTING CONDITIONS

3.1 Existing Pavement and Soil Conditions

In May of 2014, Northern Technologies, Inc. (NTI) was employed to complete a Geotechnical Evaluation Report for this proposed project. This included completing four (4) soil borings along Garnet Street and 168th Avenue, which included two (2) borings along Garnet Street, and two (2) borings along 168th Avenue. The locations of these borings are shown in the Boring Location Diagram in Appendix C of NTI's Geotechnical Evaluation Report, which is attached in ***Appendix D.***

Information obtained from the soil borings was needed to determine existing bituminous pavement and aggregate base thicknesses, subsurface soil conditions, and potential difficulties anticipated during construction, as well as for providing recommendations for excavations, site preparation, engineered fill and compaction, depths of unsuitable soils to be removed, ground water management, and pavement design parameters. The borings terminated at nominal depths of 10 to 20 feet below the existing ground surface.

Groundwater was observed in soil borings SB-1 and SB-2 at depths ranging from 17 to 19 feet below existing grade, respectively, corresponding to elevations of 867.4 and 870.0 feet. Based on these recorded water level depths, groundwater is not anticipated to be a significant issue for any work completed with this proposed project, regardless of whether utilities work is included with the project or not. However, excavations extending into sand layers over clay or silt-based soils may encounter perched groundwater which can be effectively controlled by excavating sump pits and removing water from the trenches with pumps. This report therefore assumes that dewatering will not be an issue during construction, and that sump pumps will be sufficient for any necessary dewatering.

The soil borings generally indicate that existing bituminous pavement thicknesses along both streets range from 1½ to 2 inches, that the existing aggregate base thicknesses range from 2 to 3 inches, and that the existing subgrade soils below the pavement sections generally consist of sand (SP), silty sand (SM), clayey sand (SC), and sandy clay (CL). It was also observed that the relative density of the granular fill throughout the project area was generally very loose to medium dense, and that the clay-based fill generally had a medium consistency.

Several non-typical conditions were also observed. Fill consisting of sandy clay with trace organics was encountered in soil boring SB-1 ranging from 0 to 2 feet below the pavement section. The silty sand fill was also wet from 2 to 4 feet below the ground surface in boring SB-2. The underlying native clay below the silty sand fill was generally soft, and soft to medium high plasticity clay (CH) layers were encountered below the previously placed fill in soil boring SB-2 from 11.5 feet to 17 feet below existing grade. The consistency of this material was soft.

NTI's report states that the stable non-organic fill and native alluvial soils are generally suitable for supporting utilities construction. However, NTI recommends removing any organic soils and/or unstable clays if encountered below the inverts of any utilities that may be installed with the project. NTI also recommends that the Geotechnical Engineer of Record (NTI) or their designated representative observe all project excavations to determine that any unsuitable soils have been properly removed and that proper bearing support is provided by the exposed soils.

NTI further recommends that compaction of the supporting soils be completed and tested to ensure it meets 95 percent standard Proctor dry density, which would require observation and testing to be performed both prior to and during backfilling operations. Lastly, NTI recommends that all import fill be approved by NTI or the City's representative.

NTI also provides new bituminous pavement construction recommendations in their report. NTI concurs the existing pavement is too thin and deteriorated to mill or overlay and that it would be more practical to reconstruct these streets. NTI recommends reconstructing the pavement section using 6" of class 5 aggregate base, 2" of bituminous base course, and 1½" of bituminous wear course. NTI also recommends that stripping of the existing pavement and aggregate base course should occur immediately prior to subgrade preparation and base aggregate installation to minimize weather-induced instability due to prolonged exposure to the elements.

NTI recommends correcting the subgrade soils by scarifying and re-compacting a minimum of 12" of subgrade soils, then proof rolling the soils using a tandem axle dump truck loaded to gross capacity (20 tons minimum) prior to placing aggregate base class 5 and bituminous pavement. NTI also recommends that if any rutting or localized unstable subgrade areas are observed during proof rolling, those areas should be subcut, moisture-conditioned, and re-compacted or removed to a stable depth.

NTI also noted that subgrade corrections should be anticipated based on the slightly organic, soft and wet conditions observed in borings SB-1 and SB-2, both of which were taken along Garnet Street. NTI also states that areas with conditions similar to these borings are less likely to pass proof roll tests, and therefore recommend that provisions be provided for additional excavations, and that excavations for soil corrections in paved areas should extend 2 feet beyond the edges of the pavement. NTI estimates that a properly prepared subgrade for Garnet Street and 168th Avenue will have an average stabilometer R-value of 30.

NTI's pavement recommendations assume the subgrade soils and aggregate sections below paved surfaces drain to subsurface piping for eventual discharge into storm sewer. In addition, due to the relatively thick layer of soft and potentially compressible clay soil observed in the borings, long term secondary settlement may continue to occur near soil boring SB-2 and other areas with similar subsurface conditions. NTI's report also presumes that soil correction excavations to remove soft fat clay layers (CH) are likely not a practical option so additional maintenance may be required to fill cracks or build up settled areas. As such, NTI states the City should anticipate some minor road maintenance and repairs will be required in these areas in the future.

3.2 Watermain

Watermain does not currently exist under Garnet Street. However, 8" DIP watermain stubs exist at both ends of the project termini on Garnet Street. Staff recommends extending 8" DIP main under Garnet Street with this project to provide a looped watermain system. This will allow for better maintenance of the water supply system, as well as allowing for smaller areas of isolation when parts of the main need to be shut down for maintenance.

Watermain does not currently exist under 168th Avenue. However, 8" DIP watermain is planned to be extended to the west end of 168th Avenue through the Brookfield residential development. Therefore, if 8" DIP watermain is extended under Garnet Street per staff's recommendation, staff would also recommend extending 8" watermain under 168th Avenue to connect to the Garnet Street watermain, thereby providing a fully integrated watermain system to allow for better maintenance of the water supply system, as well as allowing for smaller areas of isolation when parts of the main need to be shut down for maintenance.

If water main is constructed with this project, field observations and soil compaction testing would need to be completed during soils excavation work.

As previously noted, groundwater is not anticipated to be an issue during water main work.

3.3 Sanitary Sewer

Sanitary sewer does not currently exist under Garnet Street. However, 8" PVC gravity sanitary sewer stubs do exist at both ends of the project termini on Garnet Street therefore trunk sanitary sewer could be installed with this project.

Sanitary sewer does not currently exist under 168th Avenue. However, 8" PVC gravity sanitary is planned to be extended to the west end of 168th Avenue through the Brookfield residential development. Therefore, 8" PVC sanitary sewer will be available in the future at the west end of 168th Avenue.

If sanitary sewer is constructed with this project, field observations and soil compaction testing would need to be completed during soils excavation work.

As previously noted, groundwater is not anticipated to be an issue during sanitary sewer work.

3.4 Storm Sewer/Drainage

Stormwater drainage on both Garnet Street and 168th Avenue is currently conveyed along the existing urban street using bituminous curbs which direct the runoff to two curb-cuts located on either side of Garnet Street, north of 168th Avenue.

An existing CMP culvert extends under Garnet Street in the general location of the curb-cuts to convey stormwater runoff from the west side of Garnet Street to the east side, where it then flows to a low-lying area on private property encumbered by a drainage and utility easement. In the event Council orders these improvements, staff will ensure that this overland flow path remains unobstructed following completion of the project.

Stormwater ponding will not be required for this project since pavement widths and paving limits are proposed to remain the same.

3.5 Streets

3.5.1 Existing Typical Sections

Garnet Street is centered in a 66 foot right-of-way. The pavement is 31 feet wide from back-of-curb to back-of-curb, is unstriped, and parking is allowed on both sides of the street.

168th Avenue is centered in a 66 foot right-of-way. The pavement is 31 feet wide from back-of-curb to back-of-curb, is unstriped, and parking is allowed on both sides of the street.

Garnet Street and 168th Avenue are not part of the City's Municipal State Aid System (MSAS) and are therefore ineligible for state aid funding.

3.5.2 Maintenance History

The bituminous pavement sections for both segments of Garnet Street and 168th Avenue were originally constructed in 1988, received one sealcoat in 2006, and have underwent extensive pavement patching over recent years to keep the streets passable.

3.6 Land Use

The two urban street segments proposed for improvements provide direct access to 12 single-family residential properties, all of which are within City limits. A total of 8 residential properties have their primary access on Garnet Street, while 4 residential properties have their primary access on 168th Avenue.

4. PROPOSED IMPROVEMENTS

4.1 Street and Stormwater Improvements

4.1.1 Garnet Street

Garnet Street is proposed to be reconstructed with bituminous pavement and concrete curb and gutter which will better facilitate drainage over time. Numerous streets exist throughout the City with bituminous curbing and almost all of them are deteriorating more rapidly than streets with concrete curb and gutter due to their inability to rapidly convey drainage off of the pavement surface, particularly along edges of streets.

The proposed surface improvements are shown on ***Figure 1 in Appendix A***.

Pathway/Sidewalk:
New sidewalk segments are proposed to be constructed along the east side of Garnet Street to connect to existing concrete sidewalks located along the north side of 167th Avenue at the south end of the project, and along the east side of Garnet Street at the north end of the project, both of which are immediately available at the project termini.

Existing pedestrian facilities are shown on ***Figure 2 in Appendix A.***

Street Design:
Garnet Street is currently an urban residential street with bituminous curb and pavement 31 feet in width from back-of-curb to back-of-curb. Existing and proposed traffic counts are consistent with typical residential streets.

Garnet Street is proposed to be reconstructed maintaining its current width of 31 feet from back-of-curb to back-of-curb.

NTI recommends a pavement section of 6" class 5 aggregate base, 2" bituminous base course, and 1½" bituminous wear course. However, the City's standard residential street pavement section is 4" class 5 aggregate base, 2" bituminous base course, and 1½" bituminous wear course. Based on the low traffic volumes on these streets, staff recommends using the City's standard residential street pavement section.

NTI recommends completing a 12" minimum subgrade correction by scarifying and re-compacting existing poor subgrade soils, then test rolling the corrected soils after and checking for poor or unsuitable areas and making spot corrections as needed. NTI recommends also adding sub-drain pipe along the outside bottom edges of subgrade on all streets and plugging the drain pipe into storm sewer catch basins. However, NTI also suggests there will be a long-term potential for differential settling of the streets if the existing subgrade soils are scarified and re-compacted as per their recommendation. Staff is therefore recommending to correct all poor subgrade soils by excavating 3 feet of existing poor soils and replacing it with clean imported select granular borrow. This will provide a uniform subgrade section that will not be prone to differential settling over time and will therefore require less maintenance over time to reduce the City's long-term maintenance costs, and will maximize the life of the street.

Stormwater Improvements:
Stormwater improvements are proposed to include new concrete curb and gutter and new storm sewer infrastructure including concrete catch basins and pipe sewers. Some 6" pipe drain will also be added along the outside edges of subgrade corrections at the low point to ensure adequate subgrade drainage.

No stormwater ponding improvements are currently proposed with the project but the opinion of probable costs includes a contingency cost of $40,000 for stormwater ponding in case the Lower Rum River Watershed Management Organization requires ponding with the project.

4.1.2 168th Avenue

Similar to Garnet Street, 168th Avenue will be reconstructed with bituminous pavement and concrete curb and gutter to maintain its current width of 31 feet from back-of-curb to back-of-curb.

The proposed surface improvements are shown on ***Figure 1 in Appendix A***.

Pathway/Sidewalk:
A new sidewalk segment is proposed to be constructed along the north side of 168th Avenue to connect to the new concrete sidewalk located along the east side of Garnet Street.

Existing pedestrian facilities are shown on ***Figure 2 in Appendix A.***

Street Design:
168th Avenue is currently an urban residential street with bituminous curb and pavement 31 feet in width from back-of-curb to back-of-curb. Existing and proposed traffic counts are consistent with typical residential streets.

168th Avenue is proposed to be reconstructed maintaining its current width of 31 feet from back-of-curb to back-of-curb.

NTI recommends a pavement section of 6" class 5 aggregate base, 2" bituminous base course, and 1½" bituminous wear course. However, the City's standard residential street pavement section is 4" class 5 aggregate base, 2" bituminous base course, and 1½" bituminous wear course. Based on the low traffic volumes on these streets, staff recommends using the City's standard residential street pavement section.

NTI recommends completing a 12" minimum subgrade correction by scarifying and re-compacting existing poor subgrade soils, then test rolling the corrected soils after and checking for poor or unsuitable areas and making spot corrections as needed. NTI recommends also adding sub-drain pipe along the outside bottom edges of subgrade on all streets and plugging the drain pipe into storm sewer catch basins. However, NTI also suggests there will be a long-term potential for differential settling of the streets if the existing subgrade soils are scarified and re-compacted as per their recommendation.

Staff is therefore recommending to correct all poor subgrade soils by excavating 3 feet of existing poor soils and replacing it with clean imported select granular borrow. This will provide a uniform subgrade section that will not be prone to differential settling over time and will therefore require less maintenance over time to reduce the City's long-term maintenance costs, and will maximize the life of the street.

Stormwater Improvements:
Stormwater improvements are proposed to include new concrete curb and gutter and new storm sewer infrastructure including concrete catch basins and pipe sewers. Some 6" pipe drain will also be added along the outside edges of subgrade corrections at the low point to ensure adequate subgrade drainage.

No stormwater ponding improvements are currently proposed with the project but the opinion of probable costs do include a contingency cost of $40,000 for stormwater ponding if the Lower Rum River Watershed Management Organization requires some level of ponding with the project.

4.1.3 Geotechnical Considerations

This project involves reconstructing two street segments that have been in service for over 26 years. Based on NTI's Geotechnical Evaluation Report, the existing poor subgrade soils likely contributed to the pavement sections deterioration and must be corrected to some extent before constructing a new bituminous pavement section on top of the soils. Subgrade soils can be corrected in numerous ways.

The easiest and most effective method to correct poor subgrade soils is to excavate and replace the poor soils with clean fill material, such as select granular borrow (sand). The clean fill material is then compacted to provide a stable and uniform subgrade. This method can be the most expensive means to correct subgrade soils, but it also provides an extremely stable subgrade section that will help ensure that the maximum pavement life can be achieved.

Another way to correct poor subgrade soils is to "scarify" or "farm" the existing subgrade soils. This simply consists of excavating the subgrade soils to a depth determined by the engineer, mixing the poor subgrade soils together and allowing them to dry as needed, then replacing and re-compacting the soils. This method is relatively inexpensive, but the results are also not as stable as the "excavate and replace" method previously discussed.

Geotextile fabric can also be placed between different layers of soils to separate poor soils from clean soils and prevent them from mixing. The City has used this method before with some success, although installing such fabric is not much cheaper than installing 2 or 3 feet of clean fill, plus the City runs the risk of having someone, typically a private utility contractor, cut through the fabric which then removes any benefit it was intended to provide.

NTI's Geotechnical Evaluation Report is included in ***Appendix D.***

4.1.4 Other Considerations

Driveways:
Residential driveway aprons will need to be reconstructed with this project. The limits of construction will vary with each driveway based on the elevation of the street abutting the driveway apron, the pavement type, and the locations of existing pavement joints. During design, staff will evaluate the construction limits for each driveway and will incorporate this into the plans. But as with all street reconstruction projects, the exact limits of construction will be determined in the field during construction. Right-of-entry forms will also be needed from each residential property owner to complete any work outside City right-of-ways and easements.

Aggregate Base Class 5 (modified):
The City owns a stockpile of aggregate base class 5 modified which is located on the future Public Works campus property. This material meets the City's aggregate base class 5 modified specifications and is therefore proposed to be used for all street construction with this project to reduce costs.

Parking Restrictions:
Parking is not currently restricted along either street segment, and parking restrictions are not being proposed at this time.

4.2 Stormwater Treatment

Stormwater runoff will be conveyed from Garnet Street and 168th Avenue via the concrete curb and gutter into the proposed storm sewer system. Runoff in the storm sewer system will then be discharged into the existing drainage swale north of 168th Avenue which drains to the low point east of Garnet Street on private property. This low point is encumbered by an existing drainage easement.

The existing CMP culvert that crosses under Garnet Street to convey stormwater runoff from the west to the east is proposed to be replaced with a concrete culvert.

Since the street is being replaced at its current width there will be no net increase in connected impervious area or stormwater runoff volumes due to this project, though runoff will discharge more quickly due to the use of storm sewer pipes. But as previously mentioned, no stormwater ponding improvements are proposed with the project but the opinion of probable costs includes a contingency cost of $40,000 for stormwater ponding in case the Lower Rum River Watershed Management Organization requires ponding with the project.

4.3 Water Main Improvements

Staff recommends constructing trunk water main improvements with this project due to the maintenance benefits realized by looping watermain. Service requests may also be received from residents who wish to connect to City water to address concerns about failing wells, or if they simply wish to take advantage of the cost savings that can be realized by connecting to City utilities during street reconstruction projects.

The option to connect to watermain will be discussed in detail in both the letter that will be mailed to residents inviting them to the neighborhood information meeting, as well as at the neighborhood meeting itself.

As previously noted, watermain can be incorporated into the bidding documents as either a base bid or an alternate bid item should Council wish to see what the actual cost would be to construct watermain during this project prior to making a decision.

4.4 Sanitary Sewer Improvements

Trunk sanitary sewer improvements are not currently proposed with this project, but could be constructed if sufficient interest is voiced by residents wishing to connect to City sewer to address concerns about failing septic systems, or if they simply wish to take advantage of the cost savings that can be realized by connecting to City utilities during street reconstruction projects.

The option to connect to sanitary sewer will be discussed in detail both in the informational letter to be mailed to residents inviting them to the neighborhood information meeting, as well as at the neighborhood meeting itself.

As previously noted, sanitary sewer can be incorporated into the bidding documents as either a base bid or an alternate bid item should Council wish to see what the actual cost would be to construct sanitary sewer during this project prior to making a decision.

4.5 Construction Methods

The existing pavement will be reconstructed by first removing the existing bituminous curb, pavement, and class 5 aggregate base. Then, the existing subgrade will be corrected by excavating 3 feet of subgrade soils and replacing them with 3 feet of select granular borrow. However, if during construction it is determined that the subgrade soils are suitable enough to allow one or both street segments to be constructed by scarifying 1 or more feet of subgrade soils, this method will then be utilized with concurrence from NTI or their representative.

Paving will be completed in two separate lifts upon acceptance of the aggregate base grading. It is anticipated that the final lift of the bituminous wear course will be placed on both streets in the same year as the bituminous base course, as long as the weather cooperates and no deep utilities work was completed under the streets. If deep utilities are installed under any streets, the wear course will then be left off until the following year to allow the soils under the street sufficient time to settle.

If utilities construction is completed, manhole and catch basin castings will be removed and the structures will be covered with metal plates to prevent materials from dropping into the facilities.

4.6 Private Utilities

Staff has not yet met with the telephone, gas, and cable utilities regarding this project. If the City Council approves the preparation of Plans and Specifications, staff will meet with the private utility companies to discuss the proposed improvements as noted in the project schedule within this Report. The alignment of streets, sidewalks and pathways will be considered to minimize impacts to private utilities. No impacts to power poles are anticipated with this project.

Should any of the utility companies indicate that they wish to upgrade, replace and/or otherwise modify their services during this project, any such upgrades, replacements and/or modifications will be at the sole discretion and cost of the private utility.

City staff will contact Xcel Energy to see if they would like to bury any of their overhead lines with this project.

4.7 Permits

Permits that are anticipated to be required as part of the proposed improvements include:

- MPCA General Stormwater Permit (NPDES)..... Grading and Storm Water
- LRRWMO Permit..... WMO Stormwater Permit
- Met Council .....Sanitary Sewer Extension Permit

4.8 Right-of-Ways/Easements

It is anticipated that all improvements will occur within existing City right-of-ways and/or easements, with the exception of tying into private driveways. However, it is not anticipated that the City will need to acquire any additional right-of-way or easements for this project. Therefore, potential costs for any right-of-way or easements are not included in the probable project costs.

Rights of entries from individual property owners may need to be obtained prior to construction commencing for grading, driveway removals and paving, utility construction, and restoration activities.

5. FINANCING

5.1 Opinion of Cost

A detailed opinion of probable costs for the proposed improvements can be found in ***Appendix B*** of this report.

The opinion of probable costs incorporates anticipated 2015 construction costs for the proposed street improvements and associated grading, curb and gutter, driveway, storm sewer, sidewalk, turf establishment, erosion control, mailbox, and signing and striping improvements, as well as a 10% construction contingency and 25% indirect costs for administrative, engineering, financing and legal costs. Costs for public utilities (watermain and sanitary sewer) are also included in the opinion of probable costs, but are tabulated separately. Summary tables of the estimated project costs for Garnet Street and 168th Avenue are shown below in ***Tables 1 and 2***.

City staff prepared the Feasibility Report in-house as part of staff's normal duties. NTI prepared the attached Geotechnical Evaluation Report at a cost of $.

TABLE 1
Estimated Project Costs - Garnet Street

SCHEDULE	TOTAL
Schedule A – Surface Improvements	$682,000
Schedule B – Storm Sewer Improvements	$146,000
Schedule C – Water Main Improvements	$173,000
Schedule D – Sanitary Sewer Improvements	$124,000
TOTAL PROJECT COST – GARNET STREET	**$1,125,000**

TABLE 2
Estimated Project Costs – 168th Avenue

SCHEDULE	TOTAL
Schedule A – Surface Improvements	$354,000
Schedule B – Storm Sewer Improvements	$52,000
Schedule C – Water Main Improvements	$98,000
Schedule D – Sanitary Sewer Improvements	$46,000
TOTAL PROJECT COST – 168TH AVENUE	**$550,000**

5.2 Funding

5.2.1 Assessments

A portion of the project costs is proposed to be recovered through special assessments levied against the 12 identified benefiting properties; 8 along Garnet Street and 4 along 168th Avenue. Assessments are proposed to be collected for eligible improvements benefiting residential properties with direct access to the improved segments of Garnet Street and 168th Avenue as described below. A preliminary assessment summary is included below in ***Table 3***.

Residential Assessments

Residential assessments are proposed to be levied against residential properties having direct access to both improved streets. To be consistent with the newly adopted Special Assessments Policy, each residential property is proposed to be assessed using the "per lot" method as allowed for in the recently adopted Special Assessments Policy.

Assessments are not levied for public utilities improvements. These costs are paid 100% through the City's sewer and water utility funds.

Single-family residential property owners are preliminarily proposed to be assessed at the rate of $6,500 per lot. However, since special assessments have not been utilized widely for street reconstruction projects in Ramsey, and since State Statute and the City Charter does not allow for assessments to exceed the benefit to the property, staff wants to ensure that the assessment used with this project will not exceed the benefit to the assessed properties. Staff is therefore requesting Council authorization to order a benefit appraisal consultation for this project in accordance with the City's Special Assessments Policy.

The Preliminary Assessment Map and Roll are included in ***Appendix C.***

Sewer and Water Service Assessments

No assessments are currently proposed for sewer or water services. However, if any property owners request to connect to City sewer and/or water with this project they can request that these costs be assessed.

TABLE 3
Preliminary Assessments – Garnet Street and 168th Avenue

TYPICAL ASSESSMENT	RATE	NO. OF LOTS	TOTAL
Garnet Street Residential Assessment	$6,500/Lot	8	$52,000
168th Avenue Residential Assessment	$6,500/Lot	4	$26,000
TOTAL PROJECT ASSESSMENTS			**$78,000.00**

5.2.2 City Contribution

The City contribution to the project would include all funding in excess of the amount collected through special assessments to benefiting properties. No funds were budgeted for this project.

The City would bond for the City's contribution for project costs related to surface (street) improvements using Street Reconstruction Bonds. Water, Sewer and Stormwater Utility Funds would be utilized strictly for these improvements.

Other funds that could fund a portion of the City's contribution would include the Public Improvement Revolving fund, though this fund is not proposed to be used for this project.

Table 4 illustrates the proposed project funding. This table assumes a 1-year construction schedule.

TABLE 4
Proposed Project Funding

	ASSESSMENTS	CITY FUNDS	TOTAL
Surface	$78,000	$958,000	$1,036,000
Storm Sewer	–	$198,000	$198,000
Water Main	–	$271,000	$271,000
Sanitary Sewer	–	$170,000	$170,000
TOTALS	**$78,000**	**$1,597,000**	**$1,675,000**

Total Project Cost		**$1,675,000**
Less Special Assessments	-	$78,000
Subtotal	**=**	**$1,597,000**
Less City Bonding Funds	-	$958,000
Subtotal	**=**	**$639,000**
Less Utility Funds (Storm, Water, Sewer)	-	$639,000
Subtotal	**=**	**$0**
Less Public Improvement Revolving Funds	-	$0
TOTAL Remaining Cost	**=**	**$0**

6. PROJECT SCHEDULE

The proposed project schedule is as follows:

Council Orders Feasibility Report ..... February 25, 2014

Council Accepts Feasibility Report/Orders Public Hearing ..... January 13, 2015

Staff Conducts Neighborhood Information Meeting ..... January 29, 2015

Council Conducts Public Hearing Authorizes Plans and Specifications ..... February 10, 2015

Staff Conducts Private Utility Coordination Meeting ..... February 25, 2015

Council Approves Plans and Specifications/Authorizes Ad for Bids ..... April 14, 2015

Staff Receives Bids ..... May 19, 2015

Council Awards Contract ..... May 26, 2015

Contractor Begins Construction ..... June 2015

Contractor Completes Construction ..... September 2015

Council Conducts Assessment Hearing ..... October 27, 2015

7. CONCLUSIONS AND RECOMMENDATIONS

City Project No. 13-10 is proposed to consist of reconstructing the bituminous pavement sections and completing other appurtenant work on the following street segments:

- Garnet Street (approx. 1,350 linear feet) - 167th Street to north plat line Now & Then Estates
- 168th Avenue (approx. 670 linear feet) - Garnet Street to west cul-de-sac

It is the recommendation of City staff that City Project No. 13-10 is feasible, necessary, and cost-effective from an engineering standpoint.

The following staff recommendations related to the proposed project are presented for Council consideration and concurrence:

1. Staff recommends constructing new sidewalks within City right-of-ways along the east side of Garnet Street and the north side of 168th Avenue at 100% city cost.
2. Staff recommends correcting the subgrade soils by excavating 3 feet of existing subgrade and replacing it with clean imported select granular material at 100% city cost.
3. Staff recommends constructing new bituminous pavement per the City's standard residential pavement section of 4" aggregate base class 5, 2" bituminous base course, and 1½" bituminous wear course.
4. Staff recommends constructing 8" DIP watermain under both street segments at 100% city cost.
5. Staff recommends ordering an assessment appraisal consultation to ensure that special assessments do not exceed the benefit received as a result of the improvements.
6. Staff recommends holding a neighborhood information meeting on January 29, 2015.

The City Council is asked to act on the following items related to the proposed project:

1. Accept the preliminary residential special assessment rate of $6,500 per lot.
2. Authorize an assessment appraisal consultation to ensure that all special assessments are commensurate with benefit received from the proposed improvements.
3. Adopt Resolution #15-01-018 approving this Feasibility Report and ordering the Public Hearing for February 10, 2015.

APPENDIX A

Figure 1 – Project Scope
Figure 2 – Existing Pedestrian Facilities
Project Site Pictures

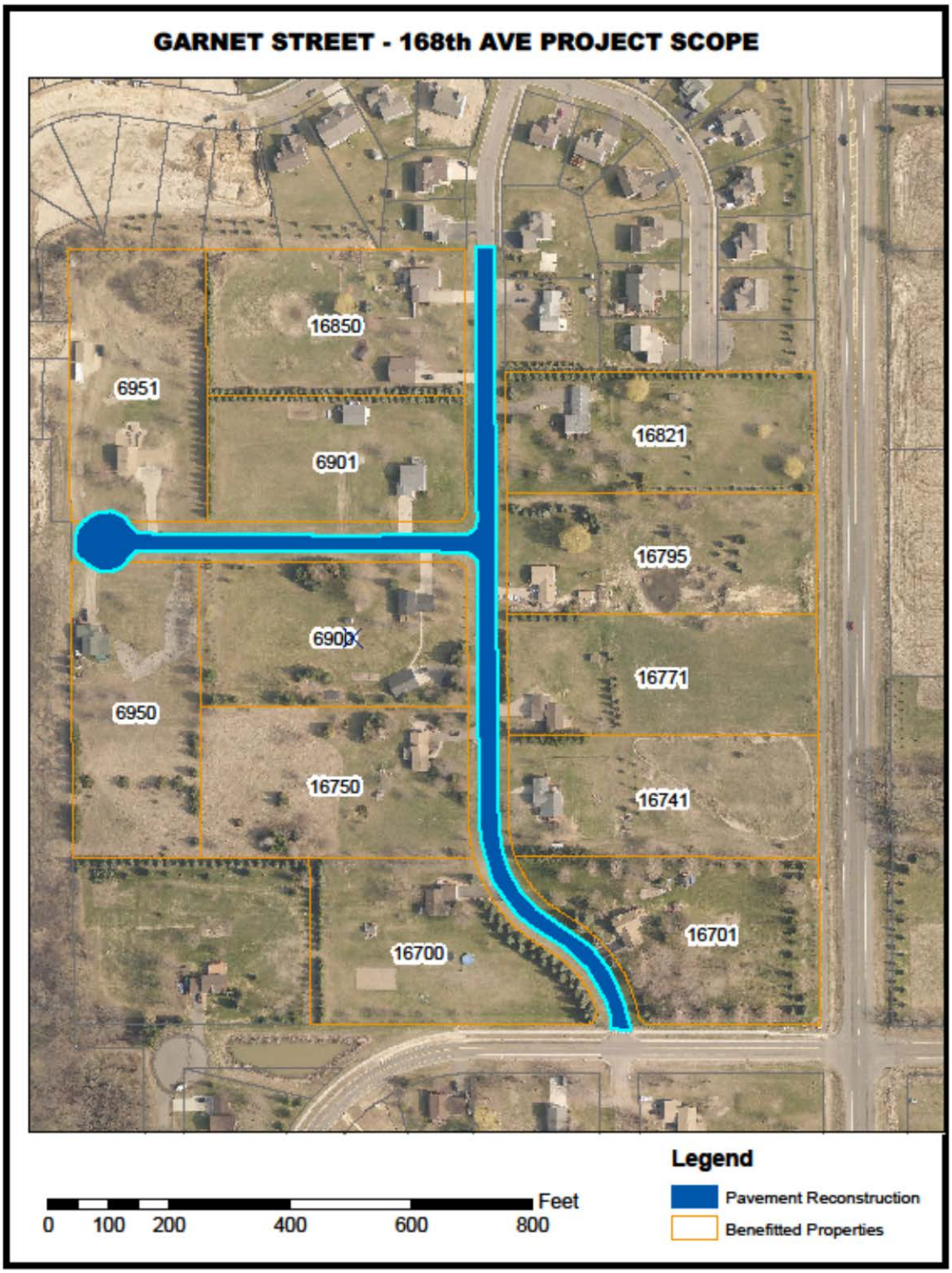


FIGURE 1
PROJECT SCOPE

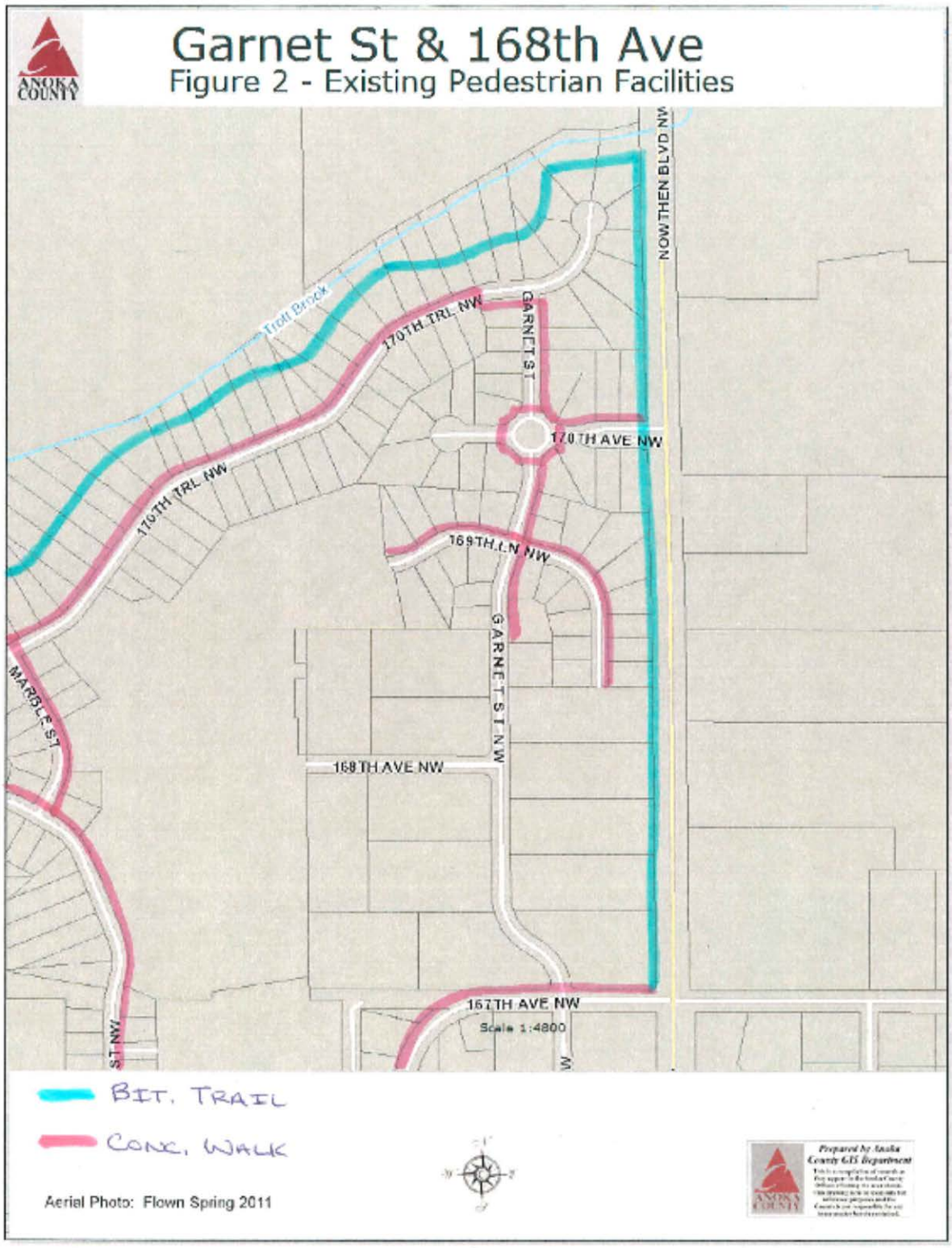
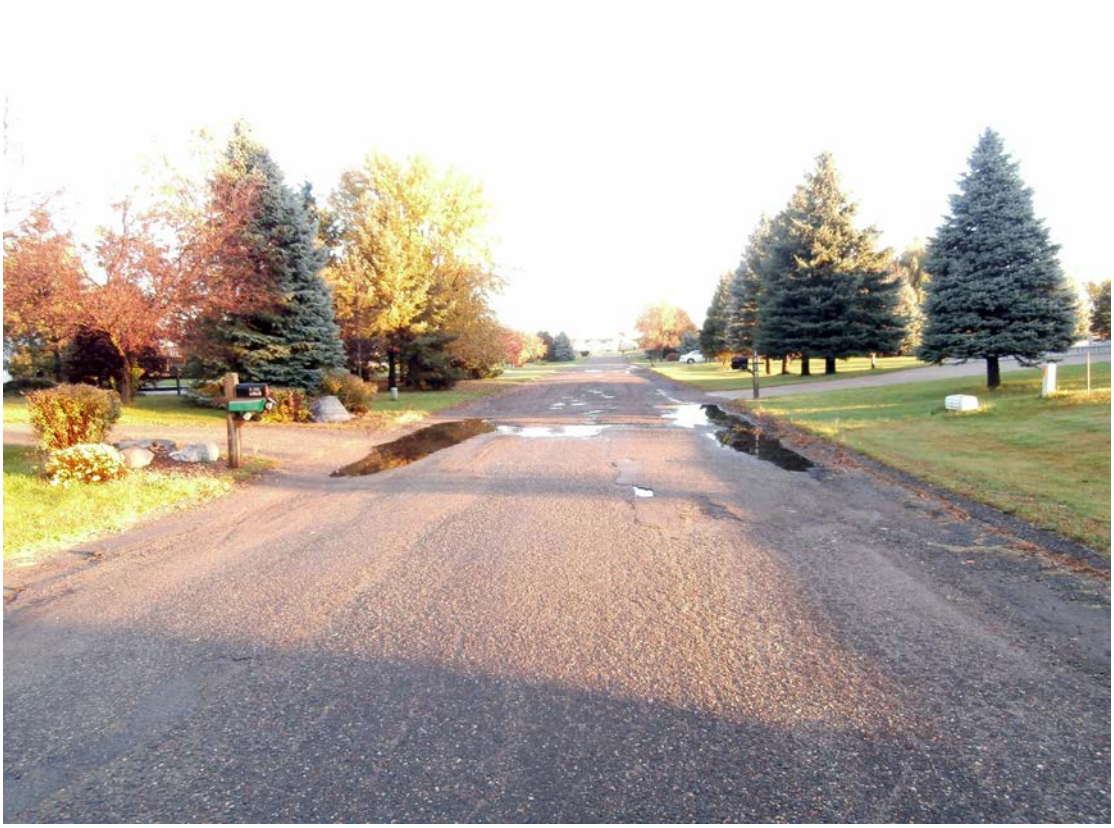


FIGURE 2
EXISTING PEDESTRIAN FACILITIES



APPENDIX B

Opinion of Probable Costs

PRELIMINARY ENGINEER'S ESTIMATE
GARNET STREET RECONSTRUCTION (1,350 LF)
NOW THEN ESTATES
CITY OF RAMSEY
JANUARY 8, 2015

Prepared by: Bruce Westby, P.E.
Proposed Construction Year: 2015

SCHEDULE A: STREET CONSTRUCTION

DESCRIPTION	ESTIMATED QUANTITY	CONTINGENT QUANTITY	UNIT	EST. UNIT PRICE	PREV EST QTY	ESTIMATED AMOUNT
MOBILIZATION	0.67	0	LS	$25,000.00	0.67	$16,750.00
REMOVE CURB AND GUTTER	20	0	LF	$10.00	NEW	$200.00
REMOVE BIT. CURB & PAVEMENT	4,950	0	SY	$8.00	7,200	$39,600.00
REMOVE 15" CMP	40	0	LF	$15.00	30	$600.00
SAWCUT BIT. PAVEMENT	204	0	LF	$6.00	240	$1,224.00
SAWCUT CONCRETE PAVEMENT	80	0	LF	$8.00	140	$640.00
REMOVE BIT. DRIVEWAY	370	59	SY	$7.00	400	$2,590.78
REMOVE CONCRETE DRIVEWAY/APRON	1,760	160	SF	$2.00	370	$3,520.00
COMMON EXCAVATION (CV)	1,900	194	CY	$8.00	880	$15,202.00
SUBGRADE EXCAVATION, REMOVE UNSUITABLE MATL (CV)	6,100	550	CY	$9.00	8,400	$54,900.00
HAUL AND DISPOSE EXCESS MATERIAL (CV)	6,100	550	CY	$10.00	8,400	$61,000.00
SELECT TOPSOIL BORROW (4") (CV)	360	60	CY	$30.00	1,850	$10,800.00
SELECT GRANULAR BORROW (36") (CV)	6,750	1,100	CY	$12.00	10,500	$81,000.00
AGGREGATE BASE - CLASS 5 MOD. (4") (CV)	720	104	CY	$7.00	2,891	$5,036.89
BITUMINOUS TACK COAT	260	42.5	GAL	$4.00	335	$1,040.00
BITUMINOUS BASE COURSE (LVNW35030B) (2")	575	96	TON	$68.00	810	$39,066.00
BITUMINOUS WEAR COURSE(MVWE35035C) (1.5")	415	56	TON	$75.00	605	$31,115.63
BIT. DRIVEWAY REPAIR/PATCH	370	59	SY	$8.00	600	$2,960.89
6" CONCRETE DRIVEWAY/APRON	1,760	160	SF	$6.00	700	$10,560.00
CONCRETE SIDEWALK (6')	8,100	0	SF	$4.00	NEW	$32,400.00
PEDESTRIAN CURB RAMP	1	0	EA	$1,500.00	NEW	$1,500.00
CONCRETE CURB AND GUTTER DESIGN - TYPE B618	2,900	200	LF	$18.00	4,200	$52,200.00
RELOCATE MAIL BOX/SUPPORT	9	1	EA	$450.00	NEW	$4,050.00
ADJUST MH	14	0	EA	$500.00	9	$7,000.00
ADJUST VALVE CASTING	2	0	EA	$250.00	5	$500.00
SILT FENCE, TYPE MACHINE SLICED	2,025	0	LF	$2.50	1,500	$5,062.50
SOD	3,000	300	SY	$3.50	7,933	$10,500.00
TRAFFIC CONTROL	0.67	0	LS	$8,000.00	0.67	$5,360.00
			TOTAL STREET CONSTRUCTION:			***$496,378.68***

SCHEDULE B: STORM SEWER

6" DRAIN TILE	600	0	LF	$6.00	600	$3,600.00
15" RCP STORM SEWER	1,200	0	LF	$28.00	1,040	$33,600.00
21" RCP STORM SEWER	230	0	LF	$40.00	140	$9,200.00
21" RCP APRON	2	0	EACH	$1,200.00	1	$2,400.00
2' x 3' CATCHBASIN (INCL CASTING)	4	0	EACH	$2,000.00	4	$8,000.00
48" CATCHBASIN (INCL CASTING)	9	0	EACH	$2,500.00	5	$22,500.00
DRAINAGE IMPROVEMENTS (DITCH/POND)	0.67	0	LS	$40,000.00	NEW	$26,800.00
			TOTAL STORM SEWER CONSTRUCTION			***$106,100.00***

PRELIMINARY ENGINEER'S ESTIMATE
GARNET STREET RECONSTRUCTION (1,350 LF)
NOW THEN ESTATES
CITY OF RAMSEY
JANUARY 8, 2015

Prepared by: Bruce Westby, P.E.
Proposed Construction Year: 2015

SUMMARY OF STREET CONSTRUCTION COST

TOTAL STREET CONSTRUCTION	$496,378.68
TOTAL STORM SEWER CONSTRUCTION	$106,100.00
10% CONTINGENCY	$60,247.87
ENGINEERING (18%) AND ADMINISTRATIVE AND LEGAL (7%)	$165,681.64
TOTAL ESTIMATED STREET PROJECT COST	**$828,408.19**

SCHEDULE C: SANITARY SEWER

UTILITY DEWATERING	1	0	LS	$5,000.00	1	$5,000.00
8" PVC SDR 35	1,160	0	LF	$45.00	2,000	$52,200.00
4" PVC SDR 26	300	3	LF	$30.00	400	$9,000.00
SANITARY MANHOLE W/ FRAME AND CASTING	5	0	EA	$3,500.00	9	$17,500.00
CONNECT TO EXISTING	2	0	EA	$1,200.00	2	$2,400.00
8" X 4" WYE	10	0	EA	$250.00	11	$2,500.00
TELEVISE COMPLETED SANITARY PIPE	1,460	0	LF	$1.00	2,400	$1,460.00
			TOTAL SANITARY SEWER CONSTRUCTION			***$90,060.00***

SCHEDULE D: WATERMAIN

6" WATERMAIN DUCTILE IRON CLASS 53	160	0	LF	$50.00	700	$8,000.00
8" WATERMAIN DUCTILE IRON CLASS 52	1,140	0	LF	$65.00	1,400	$74,100.00
1" TYPE K COPPER WATERMAIN	300	3	LF	$25.00	500	$7,500.00
1" SERVICE GROUP	10	0	EACH	$250.00	11	$2,500.00
6" GATE VALVE & BOX	3	0	EACH	$1,500.00	1	$4,500.00
8" GATE VALVE & BOX	4	0	EACH	$1,800.00	4	$7,200.00
FURNISH & INSTALL HYDRANT	3	0	EACH	$4,000.00	6	$12,000.00
WATERMAIN FITTINGS	1,050	0	POUND	$6.00	1,500	$6,300.00
4" INSULATION	25	0	SY	$35.00	25	$875.00
CONNECT TO EXISTING WM	2	0	EACH	$1,250.00	2	$2,500.00
			TOTAL WATERMAIN CONSTRUCTION			***$125,475.00***

PRELIMINARY ENGINEER'S ESTIMATE
GARNET STREET RECONSTRUCTION (1,350 LF)
NOW THEN ESTATES
CITY OF RAMSEY
JANUARY 8, 2015

Prepared by: Bruce Westby, P.E.
Proposed Construction Year: 2015

SUMMARY OF STREET RECONSTRUCTION WITH UTILITIES

TOTAL STREET CONSTRUCTION	$496,378.68
TOTAL STORM SEWER CONSTRUCTION	$106,100.00
TOTAL SANITARY SEWER CONSTRUCTION	$90,060.00
TOTAL WATERMAIN CONSTRUCTION	$125,475.00
10% CONTINGENCY	$81,801.37
ENGINEERING (18%) ADMINISTRATIVE AND LEGAL (7%)	$224,953.76
TOTAL ESTIMATED PROJECT COST	**$1,124,768.81**

PRELIMINARY ENGINEER'S ESTIMATE
168th AVENUE RECONSTRUCTION (670 LF)
NOW THEN ESTATES
CITY OF RAMSEY
JANUARY 8, 2015

Prepared by: Bruce Westby, P.E.
Proposed Construction Year: 2015

SCHEDULE A: STREET CONSTRUCTION

DESCRIPTION	ESTIMATED QUANTITY	CONTINGENT QUANTITY	UNIT	EST. UNIT PRICE		ESTIMATED AMOUNT
MOBILIZATION	0.33	0	LS	$25,000.00		$8,250.00
REMOVE CURB AND GUTTER	0	0	LF	$10.00	NEW	$0.00
REMOVE BIT. CURB & PAVEMENT	2,457	0	SY	$8.00		$19,653.33
REMOVE 15" CMP	0	0	LF	$15.00		$0.00
SAWCUT BIT. PAVEMENT	0	0	LF	$6.00		$0.00
SAWCUT CONCRETE PAVEMENT	60	0	LF	$8.00		$480.00
REMOVE BIT. DRIVEWAY	0	0	SY	$7.00		$0.00
REMOVE CONCRETE DRIVEWAY/APRON	1,320	120	SF	$12.00		$15,840.00
COMMON EXCAVATION (CV)	900	53	CY	$8.00		$7,198.44
SUBGRADE EXCAVATION, REMOVE UNSUITABLE MATL (CV)	3,050	296	CY	$9.00		$27,454.00
HAUL AND DISPOSE EXCESS MATERIAL (CV)	3,050	296	CY	$10.00		$30,504.44
SELECT TOPSOIL BORROW (4") (CV)	170	21	CY	$30.00		$5,096.67
SELECT GRANULAR BORROW (36") (CV)	3,225	421	CY	$12.00		$38,700.89
AGGREGATE BASE - CLASS 5 MOD. (4") (CV)	350	47	CY	$7.00		$2,449.74
BITUMINOUS TACK COAT	130	22	GAL	$4.00		$519.78
BITUMINOUS BASE COURSE (LVNW35030B) (2")	285	48	TON	$68.00		$19,412.49
BITUMINOUS WEAR COURSE(MVWE35035C) (1.5")	215	37	TON	$75.00		$16,133.13
BIT. DRIVEWAY REPAIR/PATCH	0	0	SY	$8.00		$0.00
6" CONCRETE DRIVEWAY/APRON	1,320	120	SF	$6.00		$7,920.00
CONCRETE SIDEWALK (6')	4,020	0	SF	$4.00	NEW	$16,080.00
PEDESTRIAN CURB RAMP	1	0	EA	$1,500.00	NEW	$1,500.00
CONCRETE CURB AND GUTTER DESIGN - TYPE B618	1,450	110	LF	$18.00		$26,100.00
RELOCATE MAIL BOX/SUPPORT	4	0	EA	$450.00	NEW	$1,800.00
ADJUST MH	2	0	EA	$500.00		$1,000.00
ADJUST VALVE CASTING	2	0	EA	$250.00		$500.00
SILT FENCE, TYPE MACHINE SLICED	1,005	0	LF	$2.50		$2,512.50
SOD	1,475	135	SY	$3.50		$5,162.50
TRAFFIC CONTROL	0.33	0	LS	$8,000.00		$2,640.00
			TOTAL STREET CONSTRUCTION:			***$256,907.91***

SCHEDULE B: STORM SEWER

6" DRAIN TILE	400	0	LF	$6.00		$2,400.00
15" RCP STORM SEWER	460	0	LF	$28.00		$12,880.00
21" RCP STORM SEWER	0	0	LF	$40.00		$0.00
21" RCP APRON	0	0	EACH	$1,200.00		$0.00
2' x 3' CATCHBASIN (INCL CASTING)	2	0	EACH	$2,000.00		$4,000.00
48" CATCHBASIN (INCL CASTING)	2	0	EACH	$2,500.00		$5,000.00
DRAINAGE IMPROVEMENTS (DITCH/POND)	0.33	0	LS	$40,000.00	NEW	$13,200.00
			TOTAL STORM SEWER CONSTRUCTION			***$37,480.00***

PRELIMINARY ENGINEER'S ESTIMATE
168th AVENUE RECONSTRUCTION (670 LF)
NOW THEN ESTATES
CITY OF RAMSEY
JANUARY 8, 2015

Prepared by: Bruce Westby, P.E.
Proposed Construction Year: 2015

SUMMARY OF STREET CONSTRUCTION COST

TOTAL STREET CONSTRUCTION	$256,907.91
TOTAL STORM SEWER CONSTRUCTION	$37,480.00
10% CONTINGENCY	$29,438.79
ENGINEERING (18%) AND ADMINISTRATIVE AND LEGAL (7%)	$80,956.68
TOTAL ESTIMATED STREET PROJECT COST	**$404,783.38**

SCHEDULE C: SANITARY SEWER

UTILITY DEWATERING	1	0	LS	$3,000.00	$3,000.00
8" PVC SDR 35	370	0	LF	$45.00	$16,650.00
4" PVC SDR 26	135	3	LF	$30.00	$4,050.00
SANITARY MANHOLE W/ FRAME AND CASTING	2	0	EA	$3,500.00	$7,000.00
CONNECT TO EXISTING	1	0	EA	$1,200.00	$1,200.00
8" X 4" WYE	4	0	EA	$250.00	$1,000.00
TELEVISE COMPLETED SANITARY PIPE	505	0	LF	$1.00	$505.00
		TOTAL SANITARY SEWER CONSTRUCTION			***$33,405.00***

SCHEDULE D: WATERMAIN

6" WATERMAIN DUCTILE IRON CLASS 53	80	0	LF	$50.00	$4,000.00
8" WATERMAIN DUCTILE IRON CLASS 52	670	0	LF	$65.00	$43,550.00
1" TYPE K COPPER WATERMAIN	132	0	LF	$25.00	$3,300.00
1" SERVICE GROUP	4	0	EACH	$250.00	$1,000.00
6" GATE VALVE & BOX	2	0	EACH	$1,500.00	$3,000.00
8" GATE VALVE & BOX	2	0	EACH	$1,800.00	$3,600.00
FURNISH & INSTALL HYDRANT	2	0	EACH	$4,000.00	$8,000.00
WATERMAIN FITTINGS	450	0	POUND	$6.00	$2,700.00
4" INSULATION	10	0	SY	$35.00	$350.00

CONNECT TO EXISTING WM	1	0	EACH	$1,250.00	$1,250.00
			TOTAL WATERMAIN CONSTRUCTION		***$70,750.00***

SUMMARY OF STREET RECONSTRUCTION WITH UTILITIES

TOTAL STREET CONSTRUCTION	$256,907.91
TOTAL STORM SEWER CONSTRUCTION	$37,480.00
TOTAL SANITARY SEWER CONSTRUCTION	$33,405.00
TOTAL WATERMAIN CONSTRUCTION	$70,750.00
10% CONTINGENCY	$39,854.29
ENGINEERING (18%) ADMINISTRATIVE AND LEGAL (7%)	$109,599.30
TOTAL ESTIMATED PROJECT COST	**$547,996.50**

APPENDIX C

Preliminary Assessment Map
Preliminary Assessment Roll

PRELIMINARY ASSESSMENT MAP

Preliminary Assessment Roll Garnet Street & 168th Avenue Reconstruction City Improvement Project #13-10				
No.	PID No.	Property Owner	Property Address	Proposed Assessment
1	103225310002	COLE BRYON C & LYNN M	6951 168TH AVE NW, RAMSEY, MN 55303	$6,500
2	103225310003	LACHNER PAUL R	16850 GARNET ST NW, RAMSEY, MN 55303	$6,500
3	103225310004	RUMPCA STEVEN	6901 168TH AVE NW, RAMSEY, MN 55303	$6,500
4	103225310005	BRINKMAN-SCHILL MARYJO	6950 168TH AVE NW, RAMSEY, MN 55303	$6,500
5	103225310006	CHURCH RICHARD A & JEAN A	6900 168TH AVE NW, RAMSEY, MN 55303	$6,500
6	103225310007	HOEKE KRISTIN A	16750 GARNET ST NW, RAMSEY, MN 55303	$6,500
7	103225310008	MONSON MICHAEL L & TARA L	16700 GARNET ST NW, RAMSEY, MN 55303	$6,500
8	103225310011	SMITH GARY R & RHONDA L	16821 GARNET ST NW, RAMSEY, MN 55303	$6,500
9	103225310012	MOONEY KENDRA	16795 GARNET ST NW, RAMSEY, MN 55303	$6,500
10	103225310013	KERN DALORES	16771 GARNET ST NW, RAMSEY, MN 55303	$6,500
11	103225310014	REICHOW MATTHEW	16741 GARNET ST NW, RAMSEY, MN 55303	$6,500
12	103225310015	STRANTZ MICHAEL R & LAURIE	16701 GARNET ST NW, RAMSEY, MN 55303	$6,500
TOTAL PROJECT ASSESSMENTS				$78,000

PRELIMINARY ASSESSMENT ROLL

APPENDIX D

Geotechnical Evaluation Report (NTI)

Geotechnical Exploration and Review

Garnet Street & 168th Ave Reconstruction Project

Prepared for:

City of Ramsey

Attn: Mr. Michael McDowall
7550 Sunwood Drive
Ramsey, MN 55303
NTI Project No. 14.60582.100

NORTHERN TECHNOLOGIES, INC.

June 19, 2014

City of Ramsey
Attention: Mike McDowall
7550 Sunwood Drive
Ramsey, MN 55303

Subject: Garnet Street & 168th Avenue Reconstruction Project
Geotechnical Exploration and Engineering Review
NTI Project No. 14.60582.100

Northern Technologies, Inc. (NTI) has completed 4 soil borings for the proposed Garnet Street and 168th Avenue Reconstruction project in the City of Ramsey, Minnesota.

The scope of services included determining existing bituminous and aggregate base thicknesses, subsurface conditions, and providing recommendations for excavations, site preparation, engineered fill and compaction, depths of unsuitable soils to be removed, ground water management, potential difficulties anticipated during construction, and pavement design parameters associated with the proposed street reconstruction project.

Our services were performed in accordance with our proposal dated May 2, 2014.

Project and Site Description

We understand the proposed project will consist of replacing underground utilities and street improvements for Garnet Street Northwest and 168th Avenue Northwest located between 167th Avenue Northwest and 169th Lane Northwest in Ramsey, Minnesota. The existing low-volume, rural residential streets are bituminous paved. Invert elevations or other design details of the proposed utilities were not provided at the time this report was prepared.

The proposed pavement section will be designed for a 20-year design pavement life. Average Daily Traffic (ADT) information was not provided to NTI. The assumed ADT for the project streets are summarized in Table 1.

Table 1: Assumed ADT Information for Garnet Street & 168th Avenue

Project Area	Assumed ADT
Garnet Street Northwest	500
168th Avenue Northwest	500

Subsurface Exploration Summary

NTI performed the subsurface exploration program on May 22, 2014 with a two-person crew and a truck-mounted CME-55 drill rig. Samples were generally collected in accordance with ASTM D1586 "Standard Test Method for Standard Penetration Testing (SPT) and Split-Barrel Sampling of Soils."

The boring locations and depths were determined by NTI. Boring locations were staked in the field by a representative of NTI. The borings terminated at a nominal depths of 10 to 20 feet below the existing ground surface. The City of Ramsey provided ground surface elevations at each of the soil boring locations.

Soil Conditions

Bituminous pavement thickness along the existing roadways ranged from 1 ½ to 2 inches in the soil borings. Aggregate base thickness ranged from 2 to 3 inches. Previously placed fill soils generally consisting of sand (SP), silty sand (SM), clayey sand (SC), and sandy clay (CL) were encountered below the pavement section. The relative density of the granular fill throughout the project area was generally very loose to medium dense. The clay-based fill generally had a medium consistency.

Native alluvial sand (SP) and clay (CL) were observed at boring termination depths.

Several non-typical conditions were also observed in several borings. Fill consisting of sandy clay with trace organics was encountered in SB-1 ranging from 0 to 2 feet below pavement section. The silty sand (SM) fill soil was wet from 2 to 4 feet below the ground surface boring SB-2. The underlying native clay (CL) below the silty sand fill was generally soft.

Soft to medium high plasticity clay (CH) layers were encountered below the previously placed fill in soil boring SB-2 from 11.5 feet to as much as 17 feet below existing grade. The consistency of this material was soft. Table 2 summarizes the subsurface conditions for the borings in the existing paved roadways.

Table 2: Subsurface Summary: Garnet Street & 168th Avenue

Boring No.	Bituminous Pavement Thickness (inches)	Aggregate Base Thickness (inches)	Fill Subgrade Material	Native Subgrade Material	Depth of Unsuitable Soil (feet)
1	1 ½	2	CL, SP	SP	2
2	2	2	SM	CL, CH, SP	N/E
3	2	2	SC	SM, CL	N/E
4	2	3	SC, SM	SP-SM, CL	N/E

*N/E = Not Encountered

More detailed subsurface information is illustrated on the attached boring logs. The attached diagram illustrates the approximate boring locations at the respective project area.

Attached are fence diagrams (cross sections) that illustrate the soil types encountered in the soil borings within the alignment of the proposed Center Street. The intent of this fence diagram is to provide a general summary of the site soil conditions encountered at each specific boring location. Use of the fence diagram to determine earthwork quantities or to extrapolate soil conditions between the soil boring locations for any purpose is prohibited.

Groundwater and Groundwater Control

Our drill crew observed free groundwater during or at the completion of the borings. Groundwater was observed in borings SB-1 and SB-2 at depths ranging from 17 to 19 feet below existing grade, respectively, corresponding to elevations of 867.4 and 870.0 feet. Due to the depth to water levels measured in the soil borings, groundwater is not expected to be a significant issue for the proposed utility and street reconstruction. However, excavations extending into sand layers over clay or silt-based soil may encounter inflows of perched groundwater. These inflows are expected to be effectively controlled by excavating sump pits and removing water from the trenches with pumps.

Recommendations and further discussion for groundwater control are described in greater detail in Appendix B should they be required during construction.

Utilities

The stable non-organic fill and native alluvial soils observed in soil borings were generally suitable for utility support. If encountered, removal of organic soils and unstable clay is recommended if they are encountered below proposed utility inverts during construction. If left in place, organic soils will likely biodegrade and settle with time, thus requiring the utility to support the load of the overlying soil. Excess stress may subsequently cause damage to the pipes if the pipes are supported by compressible or organic soils. The underlying soft alluvial clay in boring SB-2 likely has completed primary consolidation and is not considered to be highly compressible if grades and subsurface conditions do not change. However, additional effort may be required to stabilize the soft soils at the base of the trench during construction in areas with similar conditions.

The Geotechnical Engineer of Record or their designated representative should observe the project excavations to determine that unsuitable materials have been properly removed and adequate bearing support is provided by the exposed soils. The exposed soil at the base should be compacted to 95 percent standard Proctor dry density (ASTM D698). Such observations and testing should be performed prior to and during backfilling.

The onsite, non-organic soils are anticipated to be suitable for reuse if properly moisture conditioned and compacted. Replacement backfill required in utility trenches should consist of non-organic material similar to the surrounding soil. All import fill should be approved by NTI or the City's representative.

It is especially important that trench backfill for utility construction within paved areas be thoroughly compacted to minimize future pavement damage. We recommend that such soils be compacted to those included in general compaction criteria guidelines described in Appendix B.

The stability of embankments along utility excavations is dependent on soil strength, site geometry, moisture content, and any surcharge load for excavated soils and equipment. We present cautionary remarks concerning stability of excavation side slopes in the "Excavation Stability" section of this report.

The Contractor is solely responsible for assessing the stability of and executing underground utility and project excavations using safe methods. The contractor is also responsible for naming the "competent individual" as per Subpart P of 29 CFR 1926.6 (Federal Register - OSHA).

Site Preparation

The Contractor must realize that the silty and clayey subgrade soils will be moisture-sensitive, and protecting them from inclement weather will aid in maintaining stability. Stripping of the existing pavement and aggregate base course should occur immediately prior to subgrade preparation and base aggregate installation to minimize weather-induced instability.

Pavement Recommendations

Due to the relatively thin section of existing bituminous pavement, milling and overlaying is not a practical option. Reclaiming the existing bituminous pavement and aggregate base or completely reconstructing the streets would be more practical alternatives to repair the streets. For either alternative that is selected, prior to installing the aggregate base, the prepared subgrade should be scarified and re-compacted to a depth of at least 12 inches.

After scarification is complete, a proofroll test should be performed to determine soft or unstable subgrade areas. If rutting or localized unstable subgrade areas are observed, those areas should be subcut, moisture-conditioned, and re-compacted or removed to a stable depth. Subgrade corrections should be anticipated based on slightly organic, soft and wet conditions that were observed in borings SB-1 and SB-2. Areas with conditions similar to these borings are less likely to pass proof roll tests, therefore we recommend provisions be provided for additional excavations. Excavations for soil corrections in paved areas should allow for a 2 foot oversize beyond the edges of the pavement.

If imported fill is required in paved areas it should consist of debris free granular soils, and should have 100 percent passing the 1 ½ inch sieve, and less than 20 percent passing the U.S. Number 200 Sieve. Individual lifts of engineered fill should be tempered for moisture content, placed and compacted as listed the guidelines and table in Appendix B.

The proof roll should be performed with a tandem axle dump truck loaded to gross capacity (at least 20 tons). Acceptance criteria of the proof roll shall be limited to rut formation no more than one inch (1") depth (front or rear axles) and no pumping (rolling) observed during the visual inspection. Proof roll tests should be observed by an experienced technician or geotechnical engineer prior to placement of the aggregate base course to verify the subgrade will provide adequate pavement support.

We estimate that a properly prepared subgrade for Garnet Street Northwest and 168th Avenue Northwest will have an average stabilometer R-value of 30. For a 20-year design pavement life, Table 3 presents our thickness recommendations for flexible (bituminous) pavement. These recommendations were based upon subgrade conditions, the anticipated lightly loaded residential traffic described previously in this report, and the City of Ramsey's typical street section for low-volume residential streets.

Table 3: Flexible Pavement Thickness Design

Pavement Section	Garnet Street Northwest	168th Avenue Northwest
Bituminous Wear Course (in)	1 ½	1 ½
Bituminous Base Course (in)	2	2
Class 5 or 7 Aggregate Base (in)	6	6

Pavement recommendations assume the subgrade soils and aggregate section below paved surfaces will drain to subsurface piping for eventual discharge into storm sewer, or above grade to ditching, or similar acceptable systems. Lack of surface and subsurface drainage will significantly reduce the capacity and longevity of the pavement structures indicated above.

Due to the relatively thick layer of soft and potentially compressible clay soil, long term secondary settlement may continue to occur near boring SB-2 and other areas with similar subsurface conditions. Since a soil correction excavation to remove the soft fat CH clay layer is likely not a practical option, additional maintenance in this area to fill cracks or build up settled areas may be required. The City should anticipate minor road maintenance and repairs in this area.

We recommend pavements receive annual maintenance, as a minimum, to correct damages to the pavement structure, clean and infill cracks which develop, and repair or resurface areas which exhibit reduced subgrade performance. The lack of maintenance can lead to moisture infiltration of the pavement structure and softening of the subgrade soils. This, in turn, can degrade the performance of the pavement system and result in poorly performing pavements with shortened life expectancy.

Excavation Stability

Excavation depth and sidewall inclination should not exceed those specified in local, state or federal regulations. Excavations may need to be widened and sloped, or temporarily braced, to maintain or develop a safe work environment. Contractors must comply with local, state, and federal safety regulations including current OSHA excavation and trench safety standards. Temporary shoring must be designed in accordance with applicable regulatory requirements.

Engineered Fill & Winter Construction

The clay and silt-based soils on this site will be susceptible to frost heave action if not provided adequate drainage, insulation or coverage. Frozen soil should not be used as backfill. When the ambient air temperature falls below freezing for an extended period of time, frost forms and soil near the surface grade expands. Settlement of the fill may occur as the frozen soils thaw.

If frost penetrates the soil prior to paving, soils must be thawed, scarified, and re-compacted as recommended in this report. Subgrade soils should be inspected prior to paving to verify frozen conditions are not present.

Closure

The conclusions and recommendations in this report are predicated on observation and testing of the earthwork directed by Geotechnical Engineer of Record. Our opinions were based on data assumed representative of the site, as encountered from the four soil borings on site. For this and other reasons, we do not warrant conditions below the depth of our borings, or that the strata logged from our borings are necessarily typical across the site. Deviations from our recommendations by plans, written specifications, or field applications shall relieve us of responsibility unless our written concurrence with such deviations has been established.

This report has been prepared for the exclusive use of The City of Ramsey and its agents for specific application to the proposed street and utility reconstruction project located on Garnet Street Northwest and 168th Avenue Northwest in Ramsey, Minnesota. Northern Technologies, Inc. has endeavored to comply with generally accepted geotechnical engineering practice common to the local area. Northern Technologies, Inc. makes no other warranty, express or implied.

Northern Technologies, Inc.

Rachel Litfin
Staff Engineer

Ryan T. Menter, P.E.
Project Engineer

RLL:rtm

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.

Ryan T. Menter
Date: 06-19-2014 Reg. No. 47631

Attachments
Appendix A - General Notes
Appendix B - Groundwater Issues, Compaction and Placement of Fill
Appendix C - Boring Location Diagram (1), Soil Boring Logs (4), Fence Diagrams (2)

APPENDIX A

GEOTECHNICAL EVALUATION OF RECOVERED SOIL SAMPLES

We visually examined recovered soil samples to estimate distribution of grain sizes, plasticity, consistency, moisture condition, color, presence of lenses and seams, and apparent geologic origin. We then classified the soils according using the Unified Soil Classification System (ASTM D2488). A chart describing this classification system and general notes explaining soil sampling procedures are presented within appendices attachments.

The stratification depth lines between soil types on the logs are estimated based on the available data. Insitu, the transition between type(s) may be distinct or gradual in either the horizontal or vertical directions. The soil conditions have been established at our specific boring locations only. Variations in the soil stratigraphy may occur between and around the borings, with the nature and extent of such change not readily evident until exposed by excavation. These variations must be properly assessed when utilizing information presented on the boring logs.

We request that you, your design team or contractors contact NTI immediately if local conditions differ from those assumed by this report, as we would need to review how such changes impact our recommendations. Such contact would also allow us to revise our recommendations as necessary to account for the changed site conditions.

FIELD EXPLORATION PROCEDURES

Soil Sampling – Standard Penetration Boring:

Soil sampling was performed according to the procedures described by ASTM D-1586. Using this procedure, a 2 inch O.D. split barrel sampler is driven into the soil by a 140 pound weight falling 30 inches. After an initial set of six inches, the number of blows required to drive the sampler an additional 12 inches is recorded (known as the penetration resistance (i.e. "N-value") of the soil at the point of sampling. The N-value is an index of the relative density of cohesionless soils and an approximation of the consistency of cohesive soils.

Soil Sampling – Power Auger Boring:

The boring(s) was/were advanced with a 6 inch nominal diameter continuous flight auger. As a result, samples recovered from the boring are disturbed, and our determination of the depth, extend of various stratum and layers, and relative density or consistency of the soils is approximate.

Soil Classification:

Soil samples were visually and manually classified in general conformance with ASTM D-2488 as they were removed from the sampler(s). Representative fractions of soil samples were then sealed within respective containers and returned to the laboratory for further examination and verification of the field classification. In addition, select samples were submitted for laboratory tests. Individual sample information, identification of sampling methods, method of advancement of the samples and other pertinent information concerning the soil samples are presented on boring logs and related report attachments.

General Notes

DRILLING & SAMPLING SYMBOLS		LABORATORY TEST SYMBOLS	
SYMBOL	**DEFINITION**	**SYMBOL**	**DEFINITION**
C.S.	Continuous Sampling	W	Moisture content-percent of dry weight
P.D.	2-3/8" Pipe Drill	D	Dry Density-pounds per cubic foot
C.O.	Cleanout Tube	LL, PL	Liquid and plastic limits determined in accordance with ASTM D 423 and D 424
3 HSA	3 ¼" I.D. Hollow Stem Auger	Q_u	Unconfined compressive strength-pounds per square foot in accordance with ASTM D 2166-66
4 FA	4" Diameter Flight Auger		
6 FA	6" Diameter Flight Auger		
2 ½ C	2 ½" Casing		
4 C	4" Casing		**Additional insertions in Qu Column**
D.M.	Drilling Mud	Qp	Penetrometer reading-tons/square foot
J.W.	Jet Water	S	Torvane reading-tons/square foot
H.A.	Hand Auger	G	Specific Gravity – ASTM D 854-58
NXC	Size NX Casing	SL	Shrinkage limit – ASTM 427-61
BXC	Size BX Casing	pH	Hydrogen ion content-meter method
AXC	Size AX casing	O	Organic content-combustion method
SS	2" O.D. Split Spoon Sample	M.A.*	Grain size analysis
2T	2" Thin Wall Tube Sample	C*	One dimensional consolidation
3T	3" Thin Wall Tube Sample	Q_c*	Triaxial Compression
			* See attached data Sheet and/or graph

Water Level Symbol

Water levels shown on the boring logs are the levels measured in the borings at the time and under the conditions indicated. In sand, the indicated levels can be considered reliable ground water levels. In clay soils, it is not possible to determine the ground water level within the normal scope of a test boring investigation, except where lenses or layers of more pervious water bearing soil is present and then a long period of time may be necessary to reach equilibrium. Therefore, the position of the water level symbol for cohesive or mixed soils may not indicate the true level of the ground water table. The available water level information is given at the bottom of the log sheet.

Descriptive Terminology

DENSITY		CONSISTENCY	
TERM	**"N" VALUE**	**TERM**	**"N" VALUE**
Very Loose	0-4	Soft	0-4
Loose	5-8	Medium	5-8
Medium Dense	9 – 15	Rather Stiff	9 – 15
Dense	16 – 30	Stiff	16 – 30
Very Dense	Over 30	Very Stiff	Over 30

Standard "N" Penetration: Blows per foot of a 140 pound hammer falling 30 inches on a 2 inch OD split spoon.

Relative Proportions

TERMS	**RANGE**
Trace	0-5%
A little	5-15%
Some	15-30%
With	30-50%

Particle Sizes

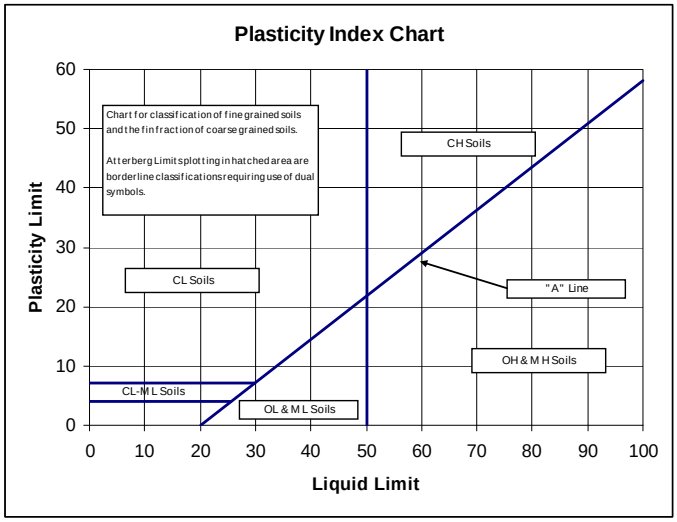
Boulders		Over 3"
Gravel -	Coarse	¾" – 3"
	Medium	#4 – ¾"
Sand -	Coarse	#4 - #10
	Medium	#10 - #40
	Fine	#40 - #200
Silt and Clay		Determined by plasticity characteristics.

***Note*:** Sieve sizes are U.S. Standard.

Classification of Soils for Engineering Purposes

ASTM Designation D-2487 and D 2488 (Unified Soil Classification System)

Major Divisions			Group Symbols	Typical Names	Classification Criteria	
Course Grained Soils More than 50% retained on No. 200 sieve *	***Gravels*** 50% or more of coarse fraction retained on No. 4 sieve.	Clean Gravels	**GW**	Well –graded gravels and gravel-sand mixtures, little or no fines.	***Classification on basis of percentage of fines.*** Less than 5% passing No. 200 Sieve: GW, GP, SW, SP More than 12% passing No. 200 Sieve: GM, GC, SM, SC From 5% to 12% passing No. 200 Sieve: Borderline Classification requiring use of duel symbols.	$C_u = D_{60} / D_{10}$ greater than 4. $C_z = (D_{30})^2 / (D_{10} \times D_{60})$ between 1 & 3.
			GP	Poorly graded gravels and gravel-sand mixtures, little or no fines.		Not meeting both criteria for GW materials.
		Gravels with Fines	**GM**	Silty gravels, gravel-sand-silt mixtures.		Atterberg limits below "A" line, or P.I. less than 4. / Atterberg limits above "A" line with P.I. greater than 7. — Atterberg limits plotting in hatched area are *borderline* classifications requiring use of dual symbols.
			GC	Clayey gravels, gravel-sand-clay mixtures.		
	Sands More than 50% of coarse fraction passes No 4 sieve.	Clean Sands	**SW**	Well-graded sands and gravelly sands, little or no fines.		$C_u = D_{60} / D_{10}$ greater than 6. $C_z = (D_{30})^2 / (D_{10} \times D_{60})$ between 1 & 3.
			SP	Poorly-graded sands and gravelly sands, little or no fines.		Not meeting both criteria for SW materials.
		Sands with Fines	**SM**	Silty sands, sand-silt mixtures.		Atterberg limits below "A" line, or P.I. less than 4. / Atterberg limits above "A" line with P.I. greater than 7. — Atterberg limits plotting in hatched area are *borderline* classifications requiring use of dual symbols.
			SC	Clayey sands, sand-clay mixtures.		
Fine Grained Soils More than 50% passes No. 200 sieve *	***Silts and Clays*** Liquid Limit of 50% or less		**ML**	Inorganic silts, very fine sands, rock flour, silty or clayey fine sands.		
			CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays.		
			OL	Organic silts and organic silty clays of low plasticity.		
	Silts and Clays Liquid Limit greater than 50%.		**MH**	Inorganic silts, micaceous or diatomaceous fine sands or silts, elastic silts.		
			CH	Inorganic clays of high plasticity, fat clays.		
			OH	Organic clays of medium to high plasticity.		
	Highly Organic Soils		**Pt**	Peat, muck and other highly organic soils.		



APPENDIX B

GROUND WATER ISSUES

The following presents additional comment and soil specific issues related to measurement of ground water conditions at your project site.

Note that our ground water measurements, or lack thereof, will vary depending on the time allowed for equilibrium to occur in the borings. Extended observation time was not available during the scope of the field exploration program and, therefore, ground water measurements as noted on the borings logs may or may not accurately reflect actual conditions at your site.

Seasonal and yearly fluctuations of the ground water level, if any, occur. Perched ground water may be present within sand and silt lenses bedded within cohesive soil formations.

If minor seepage into project excavations occurs, dewatering with sumps and pumps within excavations will be adequate. For project excavations that extend below the static groundwater level, a well point system will be a suitable method to control excess water.

PLACEMENT and COMPACTION OF ENGINEERED FILL

Unless otherwise superseded within the body of the Geotechnical Exploration Report, the following criteria shall be utilized for placement of engineered fill on project. This includes, but is not limited to earthen fill placement to improve site grades, fill placed below structural footings, fill placed interior of structure, and fill placed as backfill of foundations.

Engineered fill placed for construction, if necessary should consist of natural, non-organic, competent soils native to the project area. Such soils may include, but are not limited to gravel, sand, or clays with Unified Soil Classification System (ASTM D2488) classifications of GW, SP, SM, CL or CH. Use of silt or clayey silt as project fill will require additional review and approval of project Geotechnical Engineer of Record. Such soils have USCS classifications of ML, MH, ML-CL, MH-CH. Use of topsoil, marl, peat, other organic soils construction debris and/or other unsuitable materials as fill is not allowed. Such soils have USCS classifications of OL, OH, Pt.

Engineered fill, classified as clay, should be tempered such that the moisture content at the time of placement is equal to and no more than 3 percent above the optimum content for as defined by the appropriate proctor test. Likewise, engineered fill classified as gravel or sand should be tempered such that the moisture content at the time of placement is within 3 percent of the optimum content.

All engineered fill for construction should be placed in individual 8 inch maximum depth lifts. Each lift of fill should be compacted by large vibratory equipment until the in-place soil density is equal to or greater than the criteria established within the following tabulation.

	Compaction Criteria (% respective Proctor) [1]	
Type of Construction	**Clay**	**Sand or Gravel**
Engineered Fill placed as Pavement Subgrade (more than 3 feet below bottom of final grade)	Min. 95	Min. 95
Engineered Fill placed as Pavement Subgrade (less than 3 feet below bottom of final grade)	NA	Min. 100
Engineered Fill placed as Pavement Aggregate Base	NA	Min. 100

Note 1Unless otherwise required, compaction criteria shall be based on the Standard Proctor Test (ASTM D698).

Density tests should be taken during engineered fill placement to document earthwork has achieved necessary compaction of the material(s).

APPENDIX C

Boring Location Diagram
Garnet St & 168th Ave Reconstruction Project
Ramsey, Minnesota
NTI Project #: 14.60582.100

N

NOTE: Boring locations are approximate.

NORTHERN TECHNOLOGIES, INC.

BORING NUMBER SB-1

CLIENT City of Ramsey
PROJECT NAME Garnet Street & 168th Ave Reconstruction Project
PROJECT NUMBER 14.60582.100
PROJECT LOCATION Ramsey, MN
DATE STARTED 5/22/14 **COMPLETED** 5/22/14
GROUND ELEVATION 888.93 ft **HOLE SIZE** 6 inches
DRILLING CONTRACTOR NTI
GROUND WATER LEVELS:
DRILLING METHOD 3 1/4 in. H.S.A.
AT TIME OF DRILLING 20.00 ft / Elev 868.93 ft
LOGGED BY RL **CHECKED BY** RTM
AT END OF DRILLING ---
NOTES Elevations provided by the City of Ramsey
0.25hrs AFTER DRILLING 19.00 ft / Elev 869.93 ft

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0		1.5" bituminous pavement over 2" aggregate base										
		FILL: SANDY CLAY - (CL), trace organics, trace gravel, brown and gray, moist, medium (Fill)	SS 1	56	1-2-4 (6)			16				
			HS HS									
		FILL: POORLY GRADED SAND - (SP), fine to medium grained, trace gravel, brown with iron oxide stains, moist, loose to medium dense (Fill)	SS 2	44	2-4-5 (9)							
		NOTE: Occasional clay (CL) layers.	HS HS									
5			SS 3	67	3-4-4 (8)			2				
			HS HS									
		POORLY GRADED SAND - (SP), fine to medium grained, trace gravel, brown, moist to waterbearing at 19 feet, medium dense (Alluvial)	SS 4	44	4-6-7 (13)							
			HS HS									
10			SS 5	67	3-4-5 (9)			3				3
			HS HS									
			SS 6	56	3-6-7 (13)							
			HS HS									
15			SS 7	78	4-4-6 (10)							
			HS HS									
		▼										
20		▽	SS 8	89	4-4-6 (10)							

Borehole backfilled with soil cuttings.
Boring terminated at 21.0 feet.

BORING NUMBER SB-2

CLIENT City of Ramsey
PROJECT NAME Garnet Street & 168th Ave Reconstruction Project
PROJECT NUMBER 14.60582.100
PROJECT LOCATION Ramsey, MN
DATE STARTED 5/22/14 **COMPLETED** 5/22/14
GROUND ELEVATION 884.43 ft **HOLE SIZE** 6 inches
DRILLING CONTRACTOR NTI
GROUND WATER LEVELS:
DRILLING METHOD 3 1/4 in. H.S.A.
AT TIME OF DRILLING 17.00 ft / Elev 867.43 ft
LOGGED BY RL **CHECKED BY** RTM
AT END OF DRILLING ---
NOTES Elevations provided by the City of Ramsey
0.25hrs AFTER DRILLING 17.00 ft / Elev 867.43 ft

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0		2" bituminous pavement over 2" aggregate base										
		FILL: SILTY SAND - (SM), fine to medium grained, trace gravel, moist to wet at 2 feet, very loose to loose (Fill)	SS 1	56	2-2-2 (4)							
			HS									
			SS 2	67	1-3-2 (5)			24				
			HS									
5		CLAY - (CL), with silty sand layers, gray with iron oxide stains to dark gray at 7 feet, moist, soft to medium (Alluvial)	SS 3	78	4-3-2 (5)	1.00		44				
			HS									
			SS 4	100	1-1-2 (3)	0.50						
			HS									
10		NOTE: Occasional fat clay (CH) seams at 10 feet.	SS 5	100	1-1-3 (4)	0.25						
		FAT CLAY - (CH), dark gray with iron oxide stains, moist, soft (Alluvial)	HS									
			SS 6	100	0-1-1 (2)	0.25						
			HS									
15			SS 7	100	0-1-3 (4)	0.25		89				
		POORLY GRADED SAND - (SP), fine to coarse grained, trace gravel, brown and gray, waterbearing, medium dense (Alluvial)	HS									
20			SS 8	100	4-4-8 (12)							

Borehole backfilled with soil cuttings.
Boring terminated at 21.0 feet.

BORING NUMBER SB-3

CLIENT City of Ramsey
PROJECT NAME Garnet Street & 168th Ave Reconstruction Project
PROJECT NUMBER 14.60582.100
PROJECT LOCATION Ramsey, MN
DATE STARTED 5/22/14 **COMPLETED** 5/22/14
GROUND ELEVATION 884.52 ft **HOLE SIZE** 6 inches
DRILLING CONTRACTOR NTI
GROUND WATER LEVELS:
DRILLING METHOD 3 1/4 in. H.S.A.
AT TIME OF DRILLING --- No groundwater observed.
LOGGED BY RL **CHECKED BY** RTM
AT END OF DRILLING ---
NOTES Elevations provided by the City of Ramsey
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0		2" bituminous pavement over 2" aggregate base										
		FILL: CLAYEY SAND - (SC), fine to medium grained, trace gravel, dark brown, moist, loose (Fill)	SS 1	56	2-2-3 (5)			8				
			HS HS									
		SILTY SAND - (SM), fine grained, brown, moist, very loose to loose (Alluvial)	SS 2	67	2-3-2 (5)			12				36
		NOTE: Occasional sand (SP) layers below 4 feet.	HS HS									
5			SS 3	78	2-2-2 (4)							
			HS HS									
		CLAY - (CL), with silt seams, brown to gray at 9 feet, moist, medium (Alluvial)	SS 4	89	2-3-5 (8)							
			HS HS									
10			SS 5	100	3-3-3 (6)	1.50		34				

Borehole backfilled with soil cuttings.
Boring terminated at 11.0 feet.

BORING NUMBER SB-4

CLIENT City of Ramsey
PROJECT NAME Garnet Street & 168th Ave Reconstruction Project
PROJECT NUMBER 14.60582.100
PROJECT LOCATION Ramsey, MN
DATE STARTED 5/22/14 **COMPLETED** 5/22/14
GROUND ELEVATION 888.21 ft **HOLE SIZE** 6 inches
DRILLING CONTRACTOR NTI
GROUND WATER LEVELS:
DRILLING METHOD 3 1/4 in. H.S.A.
AT TIME OF DRILLING --- No groundwater observed.
LOGGED BY RL **CHECKED BY** RTM
AT END OF DRILLING ---
NOTES Elevations provided by the City of Ramsey
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0		2" bituminous pavement over 3" aggregate base										
		FILL: CLAYEY SAND - (SC), fine to medium grained, trace gravel, brown, moist, loose (Fill)	SS 1	33	1-2-3 (5)							
			HS HS									
		FILL: SILTY SAND - (SM), fine to medium grained, trace gravel, brown, moist, loose (Fill)	SS 2	44	3-2-3 (5)			9				
			HS HS									
5		POORLY GRADED SAND WITH SILT - (SP-SM), fine to coarse grained, trace gravel, brown, wet, loose (Alluvial)	SS 3	67	2-2-3 (5)							
			HS HS									
		CLAY - (CL), with silt seams, brown and gray, moist, medium (Alluvial)	SS 4	78	2-3-4 (7)	1.00		39				
			HS HS									
10			SS 5	89	3-3-4 (7)	1.50						

Borehole backfilled with soil cuttings.
Boring terminated at 11.0 feet.

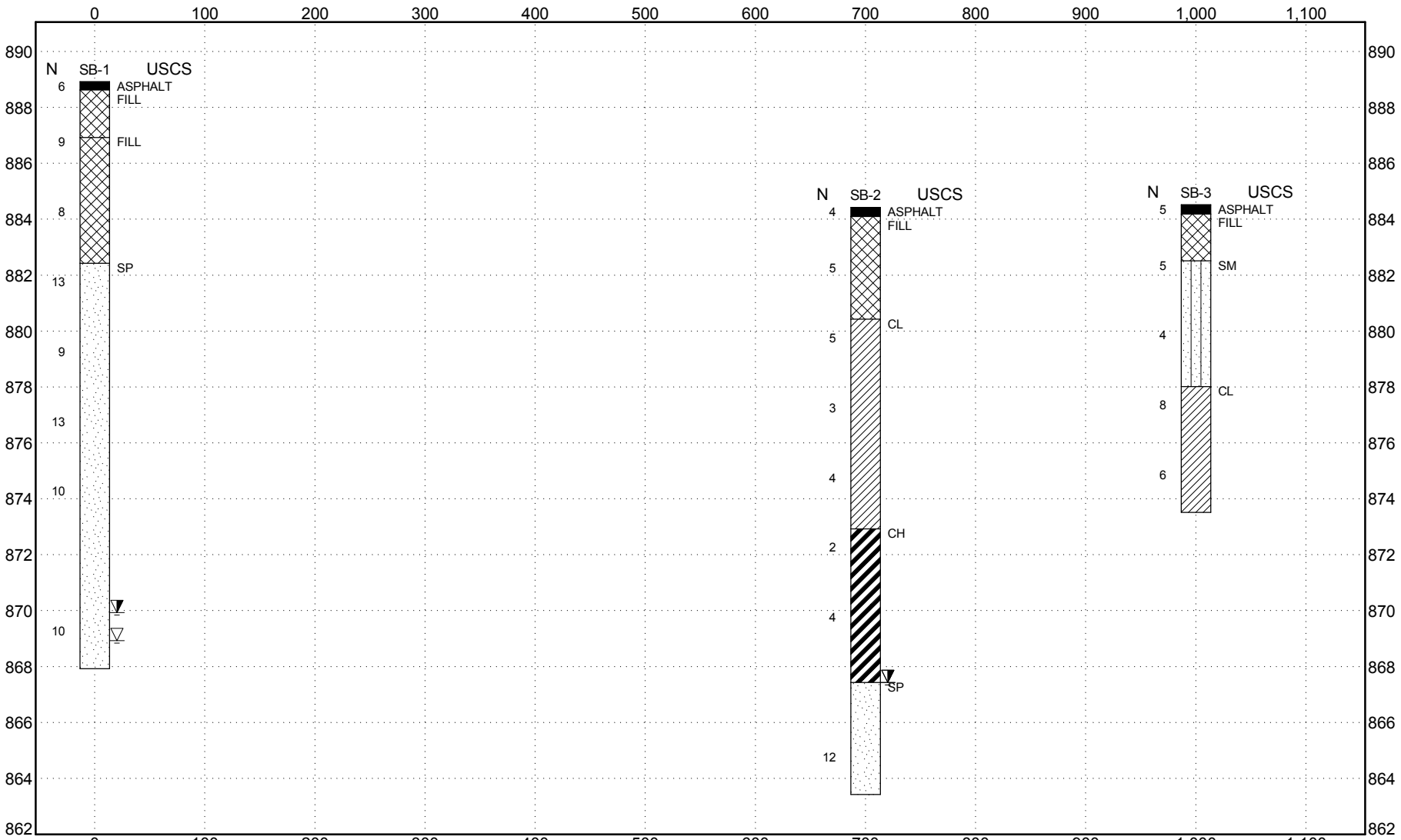
SUBSURFACE DIAGRAM

CLIENT City of Ramsey

PROJECT NAME Garnet Street & 168th Ave Reconstruction Project

PROJECT NUMBER 14.60582.100

PROJECT LOCATION Ramsey, MN



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