City of Blaine

FEASIBILITY REPORT

PAVEMENT MANAGEMENT PROGRAM LEVER AREA STREET RECONSTRUCTION

BLAINE, MN

February 7, 2019

Prepared for:
City of Blaine
10801 Town Square Drive NE
Blaine, MN 55449

WSB PROJECT NO. 12837-000

wsb

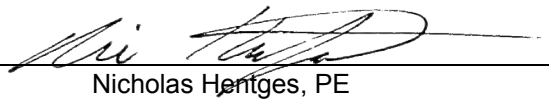
CERTIFICATION

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.

Eric M. Eckman, PE

Date: February 7, 2019 Lic. No. 49954

Quality Control Review By:



Nicholas Hentges, PE

Date: February 7, 2019 Lic. No. 44620

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EXECUTIVE SUMMARY

The proposed project will reconstruct Ball Road from 104th Avenue alignment to Lever Street, Lever Street from Ball Road to North Road, 103rd Lane from Lever Street to Sunset Avenue, National Street from 103rd Lane to 105th Lane, 104th Avenue from National Street to Sunset Avenue, 104th Lane from National Street to Rockney Street, Rockney Street from 104th Avenue to 104th Lane, 101st Lane from Quito Street to Sunset Avenue and Quito Street from North Road to 101st Lane. Proposed improvements include reclaiming existing bituminous pavement and adding curb and gutter, and additional storm sewer catch basins and piping along 103rd Lane, National Street, 104th Avenue, 104th Lane, Rockney Street, Quito Street and 101st Lane. Lever Street improvements will include reclaiming of existing bituminous pavement and curb and gutter replacement as necessary for storm sewer installation, spot curb and gutter replacement, and spot sidewalk replacement in all other locations. Ball Road will include reclaiming existing bituminous pavement and adding ribbon curb. All streets listed will have appropriate traffic control signage and appurtenant construction. Improvements to the storm sewer system include replacing the current storm sewer within the streets and adding additional catch basins and pipe (as mentioned above) to better accommodate storm water runoff. Sanitary sewer castings will be replaced and watermain gate valves will be adjusted within the roadway improvement area.

The estimated cost of improvements is $5,082,071 with $1,350,666 proposed to be assessed over a fifteen-year period. Replacement of existing sanitary sewer castings/rings at a cost of $27,918 is proposed to be paid for by the City Sanitary Sewer Utility Fund and the storm sewer trunk line at an estimated cost of $299,100 is proposed to be paid for by City Storm Sewer Utility Funds. The remaining portion of $3,404,387 is proposed to be paid from the City's Pavement Management Program Fund and City Municipal State Aid Funds.

The project is necessary, cost-effective and feasible and will result in a benefit to the properties proposed to be assessed.

1. PROJECT HISTORY

The Blaine City Council initiated the project and ordered the preparation of a feasibility report on August 2, 2018, with Resolution No. 18-150.

This report is based on field observations, record drawing information, 2017 aerial photography, and a 2018 topographic survey.

2. PROJECT AREA CHARACTERISTICS

The project area includes the following streets:

- Ball Road from 104th Avenue alignment to Lever Street
- Lever Street from Ball Road to North Road
- 103rd Lane from Lever Street to Sunset Avenue
- National Street from 103rd Lane to 105th Lane
- 104th Avenue from National Street to Sunset Avenue
- 104th Lane from National Street to Rockney Street
- Rockney Street from 104th Avenue to 104th Lane
- 101st Lane from Quito Street to Sunset Avenue
- Quito Street from North Road to 101st Lane

No records were found as to when Ball Road was constructed or what the bituminous and gravel sections consisted of. The road is a rural section with gravel shoulders and ditches. The

pavement has reached the point of failure with significant block, transverse and longitudinal cracking and has failed to a point where an overlay is not feasible.

Lever Street from Ball Road to North Road was constructed in 1986 with a section consisting of 3 inches of bituminous pavement on 4 inches of aggregate base and an urban section with concrete curb and gutter. No overlays have been done on this road. The pavement has reached the point of failure with significant block, transverse and longitudinal cracking and has failed to a point where an overlay is not feasible. The curb and gutter are still in fair condition along Lever Street, but there are several areas along the roadway with flat grades, which are recommended to be adjusted in order to facilitate better drainage along the roadway.

103rd Lane from Lever Street to Sunset Avenue, National Street from 103rd Lane to 105th Lane, 104th Avenue from National Street to Sunset Avenue, 104th Lane from National Street to Rockney Street, Rockney Street from 104th Avenue to 104th Lane, 101st Lane from Quito Street to Sunset Avenue and Quito Street from North Road to 101st Lane were all constructed in 1968 with a section consisting of 3-1/2 inches of bituminous pavement on 4 inches of aggregate base and no curb and gutter is present. No records of pavement maintenance activities on these roads were found. The pavement has reached the point of failure with significant block, transverse and longitudinal cracking and has failed to a point where an overlay is not feasible. In addition, there is currently limited bituminous curb along these roadways that has been overgrown by the vegetation adjacent properties.

The Anoka County Soil Survey indicates the predominant soil types in the project area to be Hydrologic Soil Group (HSG) A or A/D. Based on past projects in the area, the project is not anticipating groundwater to be present in the excavations at the assumed depths of the proposed storm sewer. If ground water is encountered during construction, it is our opinion that it can be drawn down with sumps dug alongside the trench. Deeper excavations below the groundwater table, in sand soils, will likely require a sand point dewatering system.

The proposed project is located in the Rice Creek Watershed District. Drainage from Ball road will discharge from existing ditches into County Ditch ACD 53-62. The rest of the project area discharges either into Sunset Avenue which enters North Road or directly into North Road. Storm Sewer along North Road discharges out of the city and into the City of Circle Pines. No portion of the project will impact wetlands as identified on the City's wetland inventory map.

See Exhibit No. 1 for the project location.

See below for existing condition photos.

Ball Road – Existing Conditions

Lever Street – Existing Conditions

103rd Lane – Existing Conditions

National Street – Existing Conditions

104th Avenue – Existing Conditions

101st Lane/Quito Street – Existing Conditions

3. PROPOSED IMPROVEMENTS

The proposed improvements will include reconstruction of the existing street section, additional storm sewer and replacement of water main and sanitary sewer castings and rings. The improvements are necessary, cost-effective, and feasible. Each improvement is further described as follows:

A. Sanitary Sewer

Public Works and Engineering staff has reviewed the existing sanitary sewer along the project corridor and concur that there are no issues with the existing mains. All sanitary sewer lines on the project are PVC. The project will also include the removal of the existing manhole castings/rings and installation of new castings/rings on all sanitary manholes.

B. Water Main

Public Works and engineering staff have reviewed the water main installation dates and water main break data along the project corridor and concur that the existing ductile iron water main installed in the early 1980's has no issues indicating the need for replacement or repair. The project will include adjusting existing gate valve boxes located within the street typical sections.

C. **Street Construction**

The proposed project will partially reconstruct the existing typical section. The street typical section will be reconstructed with a section composed of 3-1/2 to 6 inches of bituminous pavement on 4 to 7 inches of reclaimed gravel base over a compacted subgrade. In addition, the following specific items pertain to the listed street:

- **Ball Road** – Ball Road is currently a rural section road with gravel shoulders and adjacent drainage ditches. reconstructing the streets as urban sectioned streets with concrete curb and gutter and storm sewer was investigated. It was determined that the existing ditches along both streets serve to drain the adjacent properties and that the significant additional expense and complexity to eliminate the ditches and convert the roads to a standard urban section is not feasible.

  As an alternative, it is proposed to construct the roadway as a hybrid rural/urban section by installing concrete ribbon curb along each street instead of gravel shoulders while retaining the existing ditches. The ribbon curb will help to maintain the pavement edge while allowing stormwater runoff from the road to drain to the ditches.

- **Lever Street** – Lever Street is an urban section road with concrete curb and gutter. After inspection the existing curb and gutter is in overall fair condition and only needs minor spot replacement. However, there are several areas along the roadway with flat grade and the proposed design recommends that they be adjusted in order to facilitate better drainage along the roadway. This adjustment will result in removal and replacing of curb and gutter in the adjusted areas, as well as in areas where new storm sewer is being proposed. This work will be in addition to the reconstruction of the bituminous pavement section.

- **103rd Lane, National Street, 104th Avenue, 104th Lane, Rockney Street, Quito Street and 101st Lane** – These streets are all rural road sections, and will be reconstructed to the City Standard urban sectioned streets with concrete curb and gutter.

It is not anticipated that additional right-of-way will be needed for the project.

D. **Storm Drainage**

Due to the existing primarily rural section and limited storm sewer present on the site, stormwater runoff is typically conveyed along the edge of the road or is allowed to freely drain through residential properties adjacent to the rural streets. Several portions of the existing storm sewer are undersized and do not have adequate inlets to meet spread requirements. The City conducted inspections to determine which structures within the project area required replacement.

A new storm sewer system is proposed within the project area in order to meet spread requirements for a 5-year storm event. Based on a hydrologic analysis, it is necessary to install additional catch basins and storm sewer to transition from a rural section to an urban section. Sump catch basin structures will be utilized where appropriate to aid in the removal of sediments.

New storm sewer is proposed along Lever Street, which is a State Aid road. Most of the drainage along Lever Street will be directed to the storm sewer along 103rd Lane NE. The drainage from southern portion of Lever Street will be directed south and tie into the existing storm sewer along North Road.

A replacement of the storm sewer along 103rd Lane NE between Lever Street and the storm sewer intersection on the eastern end is proposed. The storm sewer between National Street and the storm sewer intersection on the eastern side will be upsized with

arch pipes at existing inverts in order to avoid conflict with the existing sanitary sewer. The existing 42-inch storm sewer on the eastern end is over 20 feet deep and its replacement is cost prohibitive. This storm sewer connects to 48-inch storm sewer along Sunset Ave which is not being replaced and will maintain existing capacity.

No new storm sewer is proposed along National Street because proposed storm sewer will be tying in at existing elevations at this intersection due to sanitary sewer conflicts. The existing structures are too shallow to provide enough depth to extend the storm sewer along National Street. Additional catch basins are proposed at the intersection of 103rd and National. The inlet capacity of these four inlets reduces the design flow rate from 16 cfs to 8 cfs and surface ponding is likely to occur in in this area.

Existing storm sewer on 104th Lane NE and 104th Avenue NE, and Rockney Street NE will be replaced. However, the storm sewer in the backyards of this area will not be replaced and will maintain existing capacity. Along 101st Lane NE existing storm sewer will be extended and upsized.

Additional catch basins are also proposed on the North end of Lever Street which would discharge into the ditch along Ball Road. Along Ball Road storm water runoff from the streets will still be directed to the existing storm sewer or ditches and storm sewer culvert system. The project is proposing to remove all damaged or undersized (12" diameter or less) corrugated metal driveway culverts and replace them with a minimum of 15" diameter culverts where feasible. Any corrugated metal roadway culverts will be replaced with concrete pipe culverts. All other undamaged driveway and roadway culverts will remain in place and be cleaned of sediments to restore full flow capacity. The existing ditches will be cleaned and regraded where sedimentation over time has resulted in poor flows or standing water.

The project will result in a net increase of less than 10,000 SF of impervious surface, therefore Rice Creek Watershed District storm water management permit requirements will not be triggered.

4. IMPACT OF PROPOSED IMPROVEMENTS

The proposed street improvements will not create any new maintenance issues for the Public Works staff other than the annual cleaning of the sump manholes. The City will work with affected property owners and the Contractor to resolve any situation that may arise during construction. Short term traffic delays, construction dust and noise and erosion will occur. Efforts to minimize these impacts include the restriction of work hours and dust and erosion control measures included in the project. Any disruptions that occur to existing yards, sprinkler systems and driveways will be restored.

5. SUMMARY OF ESTIMATED PROJECT COSTS AND FUNDING

Project: 18-16

Description: Lever Area Street Reconstructions

Cost Item	Percent	Amount	
Construction Costs			
Local Street Construction		$ 2,444,552	
Local Storm Sewer		417,833	
Ball Rd Street Construction Assessable		208,346	
Ball Rd Street Construction Non-Assessable		96,778	
Ball Rd Storm Sewer		8,260	
Lever St Street Construction		451,774	
Lever St Storm Sewer		124,534	
Sanitary Sewer		20,680	
Total Construction Costs			**$** 3,764,497
Administrative Costs			
Engineering	18%	$ 677,609	
Assessment	1%	37,645	
Legal	2%	75,290	
Administration	4%	150,580	
Capitalized Interest	8%	301,160	
Bonding	2%	75,290	
Total Administrative Costs			**$** 1,317,574
TOTAL ESTIMATED PROJECT COSTS			**$ 5,082,071**

Temporary Funding Source	City Internal Funds
Permanent Funding Source	Assessments, Pavement Management Program Funds (PMP Funds), MSAS Funds and Public Utility Funds,
Funding	
Total Paid from Public Sanitary Utility Funds	$ 27,918
Total Paid from Public Trunk Storm Utility Funds	$ 299,100
Total Generation from Assessments	$ 1,350,666
Total Paid from PMP Funds	$ 2,404,387
Total Paid from MSAS Funds	$1,000,000

6. ASSESSMENT METHODOLOGY

It is proposed that the project be assessed over 15 years in accordance with the City's Assessment Policy. It is proposed to assess this project using the linear foot method for the commercial/industrial/high density residential properties and unit method for the residential properties. Proposed assessments are based on 35% of the entire cost of the improved street section for residential properties and 50% of the entire cost of the improved street section for commercial/industrial/high density residential properties, and do not include costs for water main or sanitary sewer work.

See Exhibit Nos. 1,4 and 7 in Appendix C for the parcels proposed to be assessed and Exhibit Nos. 2, 3, 5, 6, 8, 9 and 10 in Appendix C for the proposed assessment rolls.

7. FINANCE

The proposed project will be temporarily financed by the City. Permanent funding will be provided by the Pavement Management Program Funds, city water and sewer utility funds, and the costs assessed to the benefiting parcels in accordance with current City Assessment Policy and Minnesota Statutes Chapter 429, Special Assessment Laws.

A. Finance Director Statement

With reference to this Feasibility Report for Improvement Project 18-16 as prepared by the City of Blaine Engineering Department dated February 7, 2019, I find the following:

1. The project will be temporarily funded through existing City internal funds whereupon permanent financing will be obtained through the City's Municipal State Aid Street Funds, Pavement Management Program Funds, Public Utility Funds, and assessments.

2. Sufficient moneys are currently available from the City's internal funds to temporarily fund the special assessment portion of the project. It is estimated that $1,350,666 will be assessed.

3. Sufficient moneys are currently available from the City's Public Utility Funds to pay for proposed utility improvements for street reconstruction at an estimated cost of $327,018.

Joseph Huss, Finance Director

8. PROJECTED SCHEDULE

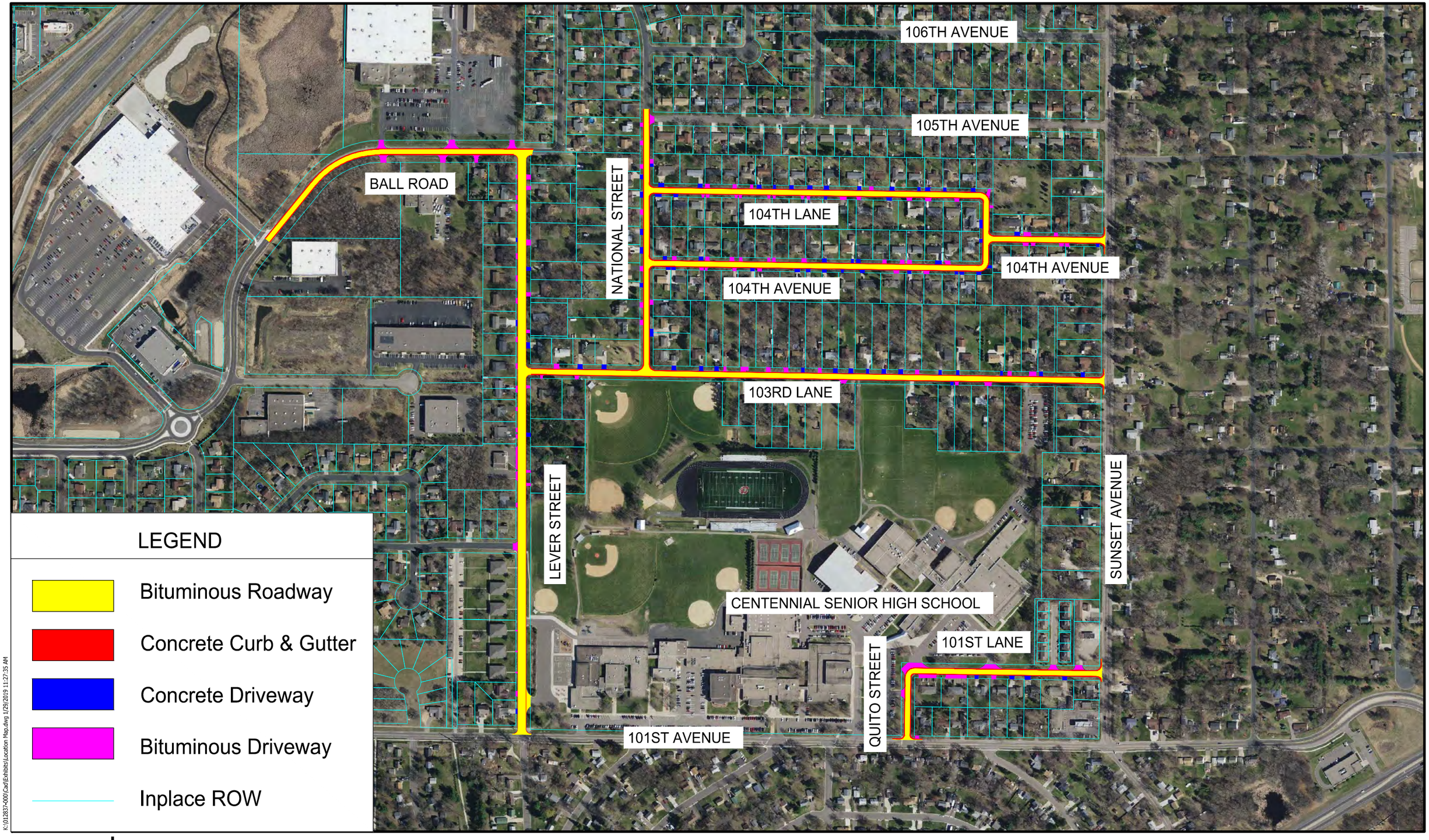
February 4, 2019	Public Information Meeting to discuss project and proposed assessments
February 7, 2019	Receive Feasibility Report Order Public Hearing
February 21, 2019	Hold Public Hearing Order Improvements and Order Preparation of Plans and Specifications
March 21, 2019	Approve Plans and Specifications Order Advertisement for Bids
April 23, 2019	Open Bids
April 29, 2019	Award Contract
May – September 2019	Construct Improvements
October 2019	Assess Project
2020	First assessment payment due with real estate taxes

9. PROJECT FEASIBILITY AND RECOMMENDATION

The project as proposed is technically and financially feasible, cost effective and will result in a benefit to the properties proposed to be assessed. It is recommended that the Council accept this report, hold the public hearing and order the improvements.

APPENDIX A

Exhibit 1: Project Location
Exhibit 2: Roadway Typical Sections
Exhibit 3 - 6: Storm Sewer Design



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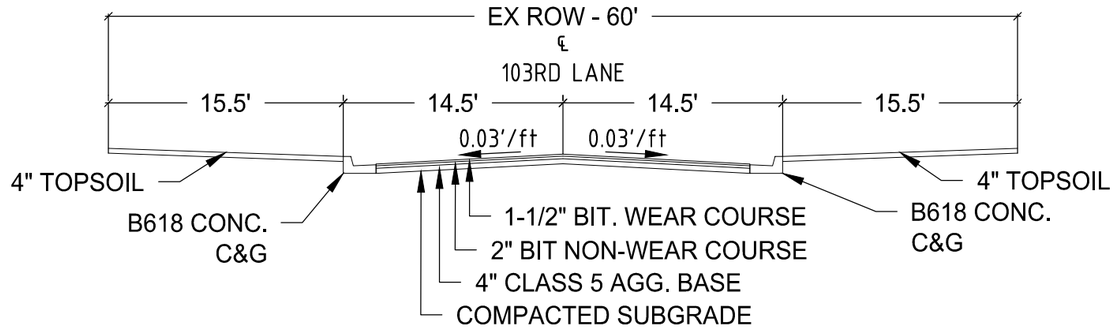
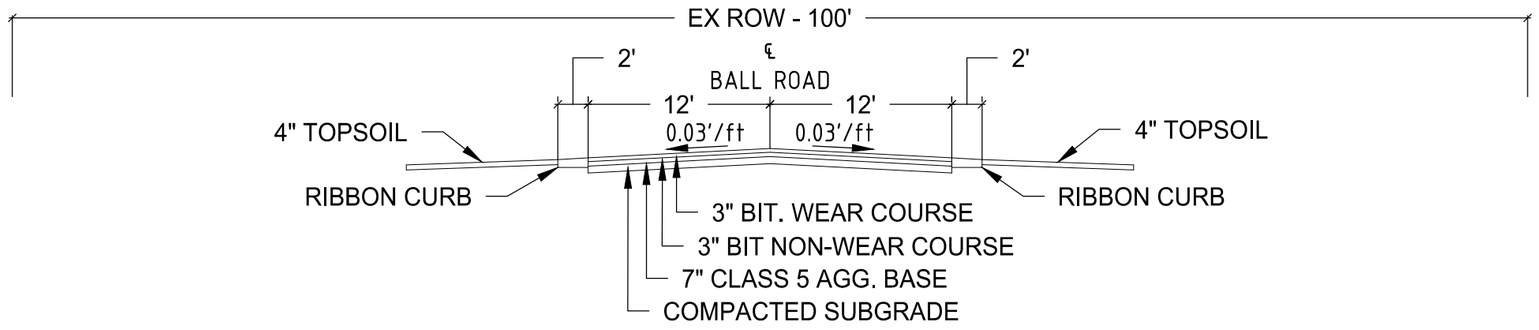
WSB PROJECT NO.: 012837-000

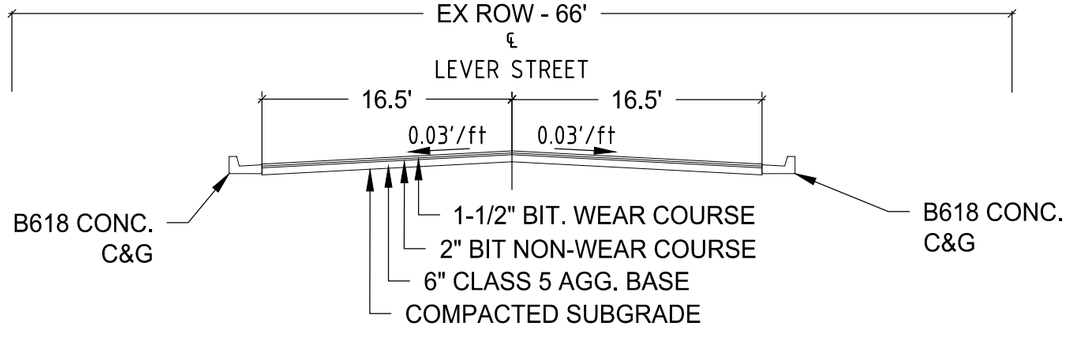
Exhibit 1: Project Area Map
Lever Street Area Street Reconstruction
City of Blaine

N

0 200 400
H: SCALE IN FEET







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WSB PROJECT NO.:
012837-000

Exhibit 2: Roadway Typical Sections
Lever Street Area Street Reconstruction
City of Blaine

BlaineMN.gov

Exhibit 3 - Storm Sewer Design

Lever Street Area Street Reconstruction
City of Blaine

N

0 250 Feet

1 in =250 ft

wsb

BlaineMN.gov

Exhibit 4 - Storm Sewer Design

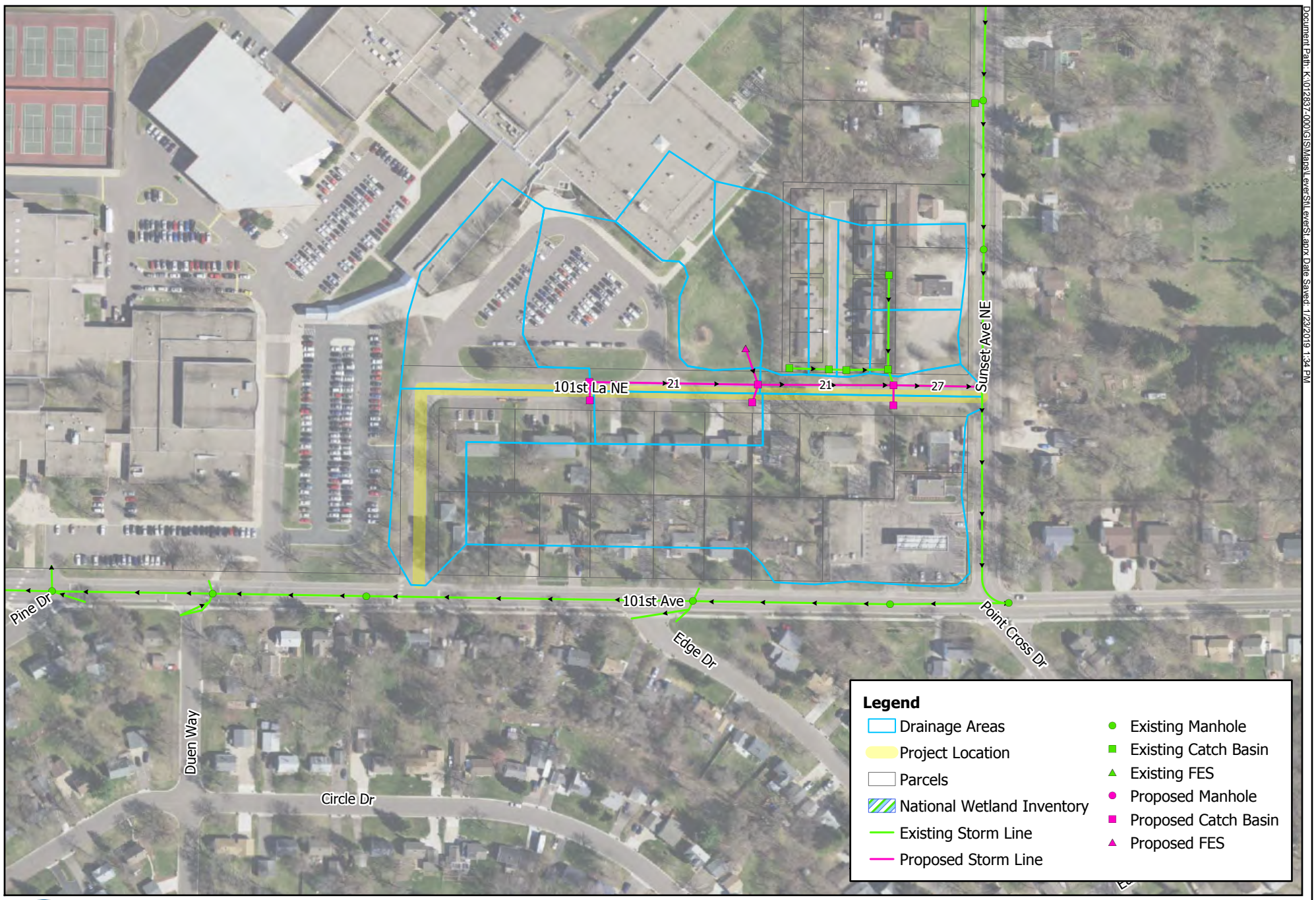
Lever Street Area Street Reconstruction
City of Blaine

N

0 200 Feet

1 in =200 ft

wsb



BlaineMN.gov

Exhibit 5 - Storm Sewer Design

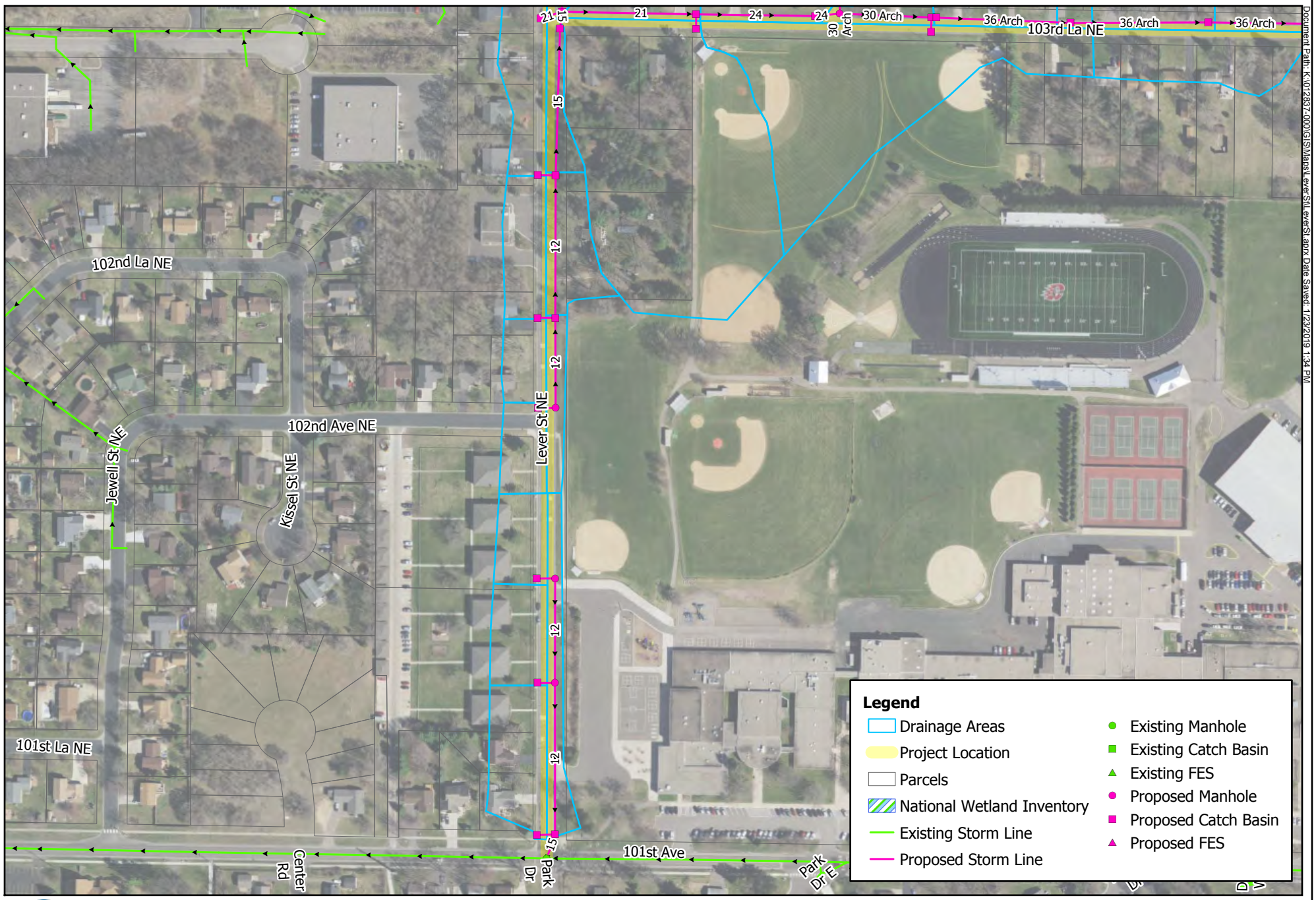
Lever Street Area Street Reconstruction
City of Blaine

N

0 200 Feet

1 in =200 ft

wsb



BlaineMN.gov

Exhibit 6 - Storm Sewer Design

Lever Street Area Street Reconstruction
City of Blaine

N

0 250 Feet

1 in =250 ft

wsb

APPENDIX B

Opinion of Probable Cost

OPINION OF PROBABLE COST

WSB Project: Lever Street Area Street Reconstruction | *Design By:* | *Design By:* | Estimater Initials: CJB
Project Location: City of Blaine | *Checked By:* | *Checked By:* | Project Manager Initials: NEH
City Project No.: 18-16
WSB Project No: 12837-000 | *Date:* | *Date:* | 1/29/2019

Item No.	MN/DOT Specification No.	Description	Unit	Estimated Unit Price	Ball Road - State Aid Estimated Total Quantity	Lever Street - State Aid Estimated Total Quantity	Local Estimated Total Quantity	Ball Road - State Aid Estimated Total Cost	Lever Street - State Aid Estimated Total Cost	Local Estimated Total Cost
A. Surface										
1	2021.501	MOBILIZATION	LS	$ 150,000.00	0.1	0.1	0.8	$ 15,000.00	$ 15,000.00	$ 120,000.00
2	2101.505	CLEARING	ACRE	$ 8,500.00	0.58	0.2	2.01	$ 4,930.00	$ 1,700.00	$ 17,085.00
3	2101.505	GRUBBING	ACRE	$ 8,500.00	0.58	0.2	2.01	$ 4,930.00	$ 1,700.00	$ 17,085.00
4	2101.524	CLEARING	TREE	$ 300.00	0	0	23	$ -	$ -	$ 6,900.00
5	2101.524	GRUBBING	TREE	$ 300.00	0	0	23	$ -	$ -	$ 6,900.00
6	2104.502	REMOVE SIGN	EACH	$ 30.00	9	31	88	$ 270.00	$ 930.00	$ 2,640.00
7	2104.502	SALVAGE MAIL BOX SUPPORT	EACH	$ 35.00	1	31	133	$ 35.00	$ 1,085.00	$ 4,655.00
8	2104.503	SAWING CONCRETE PAVEMENT (FULL DEPTH)	L F	$ 5.00	0	120	1480	$ -	$ 600.00	$ 7,400.00
9	2104.503	SAWING BIT PAVEMENT (FULL DEPTH)	L F	$ 3.50	368	100	2699	$ 1,288.00	$ 350.00	$ 9,446.50
10	2104.503	REMOVE CURB & GUTTER	L F	$ 3.00	142	3025	513	$ 426.00	$ 9,075.00	$ 1,539.00
11	2104.503	REMOVE BITUMINOUS CURB	L F	$ 5.00	0	0	536	$ -	$ -	$ 2,680.00
12	2104.504	REMOVE CONCRETE DRIVEWAY PAVEMENT	S Y	$ 6.00	0	322	2338	$ -	$ 1,932.00	$ 14,028.00
13	2104.504	REMOVE CONCRETE PAVEMENT	S Y	$ 5.00	0	67	0	$ -	$ 335.00	$ -
14	2104.504	REMOVE BITUMINOUS DRIVEWAY PAVEMENT	S Y	$ 4.00	734	742	3165	$ 2,936.00	$ 2,968.00	$ 12,660.00
15	2104.504	REMOVE BITUMINOUS PAVEMENT	S Y	$ 3.50	3793	9944	29613	$ 13,275.50	$ 34,804.00	$ 103,645.50
16	2104.601	SALVAGE AND REINSTALL LANDSCAPE STRUCTURES	LS	$ 20,000.00	0	0.11	0.89	$ -	$ 2,200.00	$ 17,800.00
17	2105.507	COMMON EXCAVATION	C Y	$ 16.00	2139	1469	9717	$ 34,224.00	$ 23,504.00	$ 155,472.00
18	2105.507	SELECT GRANULAR BORROW (CV)	C Y	$ 11.00	504	20	581	$ 5,544.00	$ 220.00	$ 6,391.00
19	2112.519	SUBGRADE PREPARATION	RDST	$ 200.00	14	26	90	$ 2,800.00	$ 5,200.00	$ 18,000.00
20	2123.610	STREET SWEEPER (WITH PICKUP BROOM)	HOUR	$ 150.00	5	5	40	$ 750.00	$ 750.00	$ 6,000.00
21	2130.523	WATER	MGAL	$ 60.00	5	5	40	$ 300.00	$ 300.00	$ 2,400.00
22	2211.507	AGGREGATE BASE (CV) CLASS 5	C Y	$ 15.00	857	1744	7130	$ 12,855.00	$ 26,160.00	$ 106,950.00
23	2357.506	BITUMINOUS MATERIAL FOR TACK COAT	GAL	$ 3.50	231	563	2864	$ 808.50	$ 1,970.50	$ 10,024.00
24	2360.509	TYPE SP 12.5 NON WEAR COURSE MIX (3;B)	TON	$ 60.00	619	1127	4769	$ 37,140.00	$ 67,620.00	$ 286,140.00
25	2360.509	TYPE SP 12.5 WEARING COURSE MIX (3;C)	TON	$ 77.00	702	929	5532	$ 54,054.00	$ 71,533.00	$ 425,964.00
26	2502.601	IRRIGATION SYSTEM PROVISION	LS	$ 20,000.00	0	1	1	$ -	$ 20,000.00	$ 20,000.00
27	2504.602	ADJUST GATE VALVE & BOX	EACH	$ 650.00	2	2	10	$ 1,300.00	$ 1,300.00	$ 6,500.00
28	2506.502	ADJUST FRAME & RING CASTING	EACH	$ 500.00	4	9	34	$ 2,000.00	$ 4,500.00	$ 17,000.00
29	2531.503	CONCRETE CURB & GUTTER DESIGN B618	L F	$ 14.00	0	3050	37350	$ -	$ 42,700.00	$ 522,900.00
30	2531.603	SPOT CONCRETE CURB & GUTTER DESIGN B618	L F	$ 25.00	0	50	0	$ -	$ 1,250.00	$ -
30	2531.503	CONCRETE CURB DESIGN SPECIAL	L F	$ 10.00	2760	0	0	$ 27,600.00	$ -	$ -
31	2531.504	4" CONCRETE DRIVEWAY PAVEMENT	S Y	$ 50.00	0	322	2338	$ -	$ 16,100.00	$ 116,900.00
32	2531.602	RECONSTRUCT PEDESTRIAN CURB RAMP	EACH	$ 1,500.00	0	3	0	$ -	$ 4,500.00	$ -
32	2531.604	6" CONCRETE VALLEY GUTTER	S Y	$ 70.00	0	0	320	$ -	$ -	$ 22,400.00
33	2540.602	INSTALL MAIL BOX SUPPORT	EACH	$ 45.00	1	5	110	$ 45.00	$ 225.00	$ 4,950.00
34	2540.602	MAIL BOX	EACH	$ 40.00	1	5	28	$ 40.00	$ 200.00	$ 1,120.00
35	2540.602	MAIL BOX SUPPORT	EACH	$ 70.00	1	31	51	$ 70.00	$ 2,170.00	$ 3,570.00
36	2531.604	MAIL BOX (TEMPORARY)	EACH	$ 40.00	1	31	133	$ 40.00	$ 1,240.00	$ 5,320.00
37	2563.601	TRAFFIC CONTROL	LS	$ 10,000.00	1	1	1	$ 10,000.00	$ 10,000.00	$ 10,000.00
38	2564.518	SIGN PANELS TYPE C	S F	$ 35.00	9	31	88	$ 315.00	$ 1,085.00	$ 3,080.00
39	2564.602	SIGN PANELS TYPE SPECIAL	EACH	$ 350.00	2	3	15	$ 700.00	$ 1,050.00	$ 5,250.00
40	2573.501	STABILIZED CONSTRUCTION EXIT	LS	$ 4,000.00	1	1	1	$ 4,000.00	$ 4,000.00	$ 4,000.00
41	2573.502	STORM DRAIN INLET PROTECTION	EACH	$ 175.00	8	6	66	$ 1,400.00	$ 1,050.00	$ 11,550.00
42	2573.502	CULVERT END CONTROLS	EACH	$ 150.00	2	0	0	$ 300.00	$ -	$ -
43	2573.503	SILT FENCE; TYPE MS	L F	$ 3.00	700	1300	4550	$ 2,100.00	$ 3,900.00	$ 13,650.00
44	2573.503	SEDIMENT CONTROL LOG TYPE COMPOST	L F	$ 4.00	700	1300	4550	$ 2,800.00	$ 5,200.00	$ 18,200.00
45	2574.507	COMMON TOPSOIL BORROW	C Y	$ 25.00	205	108	990	$ 5,125.00	$ 2,700.00	$ 24,750.00
46	2575.504	SODDING TYPE LAWN	S Y	$ 5.00	2801	2588	9127	$ 14,005.00	$ 12,940.00	$ 45,635.00
47	2575.508	HYDROMULCH	ACRE	$ 2,000.00	1.18	0.6	1.87	$ 2,360.00	$ 1,200.00	$ 3,740.00
48	2582.503	4" SOLID LINE MULTI COMP	L F	$ 1.50	0	519	0	$ -	$ 778.50	$ -
49	2582.503	4" BROKEN LINE MULTI COMP	L F	$ 1.00	0	519	0	$ -	$ 519.00	$ -
50	2582.503	4" DBLE SOLID LINE MULTI COMP	L F	$ 3.00	1370	0	0	$ 4,110.00	$ -	$ -
51	2582.518	CROSSWALK MULTI COMP	S F	$ 10.00	0	216	0	$ -	$ 2,160.00	$ -
				CONSTRUCTION TOTAL				**$ 269,876.00**	**$ 410,704.00**	**$ 2,222,320.00**
				CONTINGENCY TOTAL (CONTINGENCY)				**$ 26,987.60**	**$ 41,070.40**	**$ 222,232.00**
				SUBTOTAL				**$ 296,863.60**	**$ 451,774.40**	**$ 2,444,552.00**
				INDIRECT COST TOTAL (INDIRECT)				**$ 103,902.26**	**$ 158,121.04**	**$ 855,593.20**
				TOTAL				**$ 400,765.86**	**$ 609,895.44**	**$ 3,300,145.20**

B. Storn Sewer											
1	2021.501	MOBILIZATION	LS	$ 30,000.00	0	0.18	0.82	$ -	$ 5,400.00	$ 24,600.00
2	2104.502	REMOVE CASTING	EACH	$ 200.00	0	13	34	$ -	$ 2,600.00	$ 6,800.00
3	2104.502	REMOVE MANHOLE OR CATCH BASIN	EACH	$ 450.00	0	1	27	$ -	$ 450.00	$ 12,150.00
4	2104.503	REMOVE SEWER PIPE (STORM)	L F	$ 10.00	0	65	3360	$ -	$ 650.00	$ 33,600.00
5	2501.502	15" RC PIPE APRON	EACH	$ 650.00	2	1	0	$ 1,300.00	$ 650.00	$ -
6	2501.502	18" RC PIPE APRON	EACH	$ 700.00	2	0	1	$ 1,400.00	$ -	$ 700.00
7	2503.503	12" RC PIPE SEWER DES 3006 CL V	L F	$ 35.00	58	1304	90	$ 2,030.00	$ 45,640.00	$ 3,150.00
8	2503.503	15" RC PIPE SEWER DES 3006 CL V	L F	$ 38.00	0	606	652	$ -	$ 23,028.00	$ 24,776.00
9	2503.503	18" RC PIPE SEWER DES 3006 CL III	L F	$ 41.00	46	0	326	$ 1,886.00	$ -	$ 13,366.00
10	2503.503	21" RC PIPE SEWER DES 3006 CL III	L F	$ 45.00	0	46	451	$ -	$ 2,070.00	$ 20,295.00
11	2503.503	24" RC PIPE SEWER DES 3006 CL III	L F	$ 48.00	0	0	472	$ -	$ -	$ 22,656.00
12	2503.503	30" RC PIPE SEWER DES 3006 CL III	L F	$ 65.00	0	0	180	$ -	$ -	$ 11,700.00
13	2503.503	42" RC PIPE SEWER DES 3006 CL III	L F	$ 120.00	0	0	150	$ -	$ -	$ 18,000.00
14	2503.503	36" SPAN RC PIPE-ARCH SEWER CL IIA	L F	$ 100.00	0	0	39	$ -	$ -	$ 3,900.00
15	2503.503	44" SPAN RC PIPE-ARCH SEWER CL IIA	L F	$ 115.00	0	0	827	$ -	$ -	$ 95,105.00
16	2506.502	CONST DRAINAGE STRUCTURE DES 48-4020	LF	$ 350.00	0	33	53	$ -	$ 11,550.00	$ 18,550.00
17	2506.502	CONST DRAINAGE STRUCTURE DES 60-4020	LF	$ 450.00	0	5	51	$ -	$ 2,250.00	$ 22,950.00
18	2506.502	CONST DRAINAGE STRUCTURE DES 72-4020	LF	$ 550.00	0	0	7	$ -	$ -	$ 3,850.00
19	2506.502	CONST DRAINAGE STRUCTURE DES 84-4020	LF	$ 900.00	0	0	10	$ -	$ -	$ 9,000.00
20	2506.502	CASTING ASSEMBLY	EACH	$ 700.00	0	17	35	$ -	$ 11,900.00	$ 24,500.00
21	2506.502	ADJUST FRAME & RING CASTING	EACH	$ 400.00	0	0	2	$ -	$ -	$ 800.00
22	2506.503	CONST DRAINAGE STRUCTURE DESIGN SD-48	L F	$ 450.00	0	4	0	$ -	$ 1,800.00	$ -
23	2506.503	CONST DRAINAGE STRUCTURE DESIGN SD-60	L F	$ 550.00	0	0	4	$ -	$ -	$ 2,200.00
24	2506.503	CONST DRAINAGE STRUCTURE DESIGN SPECIAL	EACH	$ 600.00	0	8	12	$ -	$ 4,800.00	$ 7,200.00
25	2511.504	GEOTEXTILE FILTER TYPE 4	SY	$ 3.00	46	20	0	$ 138.00	$ 60.00	$ -
26	2511.507	GRANULAR FILTER	CY	$ 40.00	1	1	0	$ 40.00	$ 40.00	$ -
27	2511.509	RANDOM RIPRAP CL III	CY	$ 65.00	11	5	0	$ 715.00	$ 325.00	$ -
				CONSTRUCTION TOTAL				**$ 7,509.00**	**$ 113,213.00**	**$ 379,848.00**
				CONTINGENCY TOTAL (CONTINGENCY)				**$ 750.90**	**$ 11,321.30**	**$ 37,984.80**
				SUBTOTAL				**$ 8,259.90**	**$ 124,534.30**	**$ 417,832.80**
				INDIRECT COST TOTAL (INDIRECT)				**$ 2,890.97**	**$ 43,587.01**	**$ 146,241.48**
				TOTAL				**$ 11,150.87**	**$ 168,121.31**	**$ 564,074.28**

APPENDIX C

Assessable Parcels

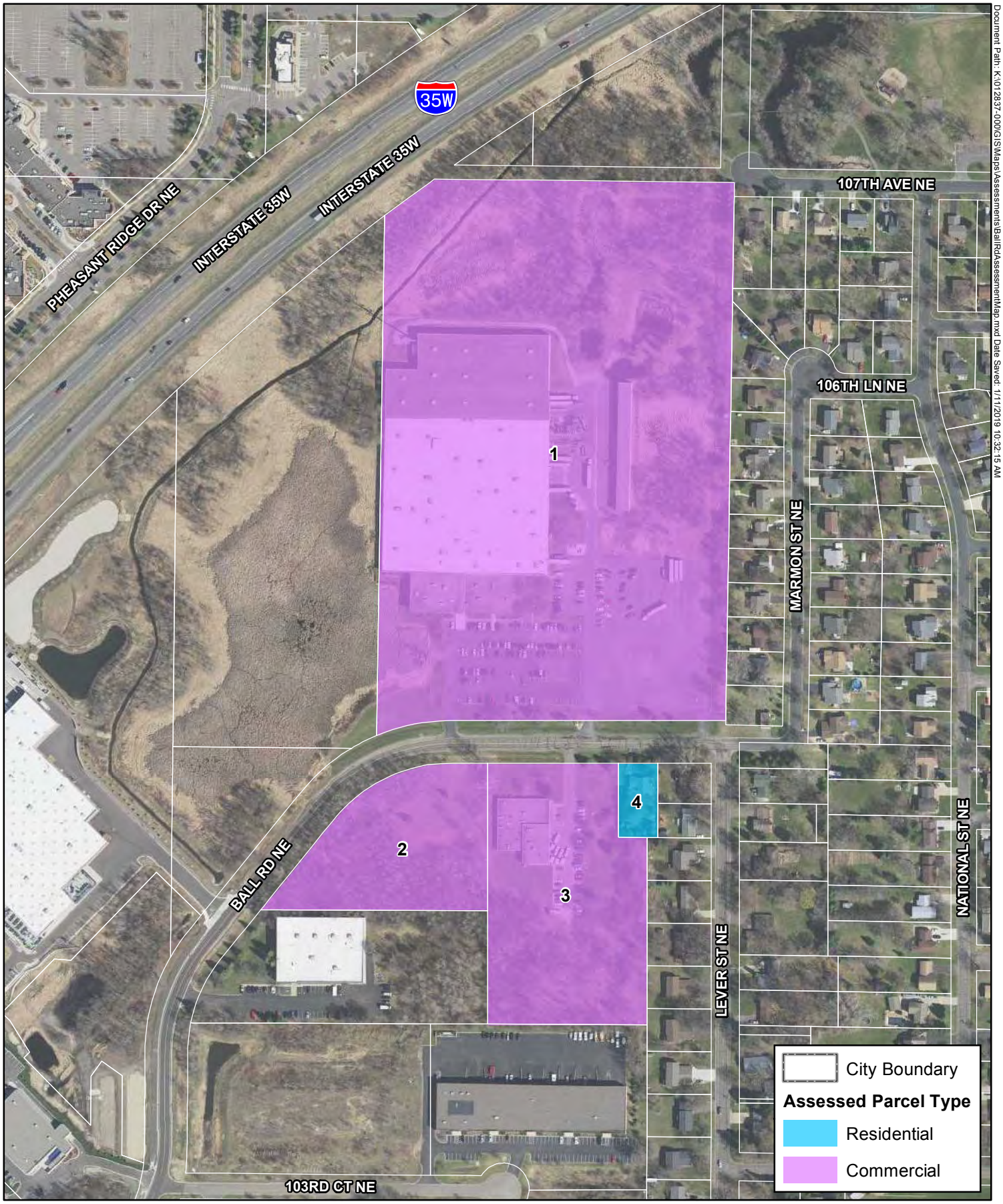


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Exhibit 1: Ball Road

Feasibility Assessment Report
Blaine, MN

N

0 300 Feet

1 inch = 300 feet

wsb

PROJECT 18-16

LEVER STREET AREA STREET RECONSTRUCTIONS PROJECT

BALL ROAD

CITY OF BLAINE

EXHIBIT NO. 2 - COMMERCIAL/INDUSTRIAL PROPERTY
PROPOSED ASSESSMENT ROLL

ASSESSMENT RATE BREAKDOWN

CONSTRUCTION COSTS	$208,345.97	(CONSTRUCTION COST DOES NOT INCLUDE WATER MAIN OR SANITARY SEWER COSTS)						COMMERCIAL/ INDUSTRIAL/HIGH DENSITY RESIDENTIAL ASSESSMENT PERCENTAGE		COMMERCIAL/ INDUSTRIAL/HIGH DENSITY RESIDENTIAL ASSESSMENT RATE PER FRONT FOOT
ADMINISTRATIVE COSTS	$72,921.09					TOTAL COST PER FRONT FOOT				
TOTAL COST	$281,267.05			TOTAL FRONT FOOTAGE						
ASSESSABLE COST	**$281,267.05**	**/**		**1735.80**	**=**	**$162.04**	*****	**50%**	**=**	**$81.02**

PROPERTY PIN	PROPERTY OWNER	PROPERTY ADDRESS	ASSESSABLE FRONT FOOTAGE		ASSESSMENT RATE PER FRONT FOOT	PROPOSED ASSESSMENT
243123240006	BERDASS PROPERTIES	4501 BALL RD NE	816.9		$81.02	$66,185.24
243123310020	I I DEVELOPMENT CO	4500 BALL RD NE	306.2		$81.02	$24,808.32
243123310024	TOLERANCE MASTERS PROP INC	UNADDRESSED	274.3		$81.02	$22,223.79
		TOTALS:	**1397.4**			**$113,217.35**

NOTES:

*150 FOOT CORNER LOT CREDIT APPLIED TO ASSESSABLE FRONT FOOTAGE

PROJECT 18-16

LEVER STREET AREA STREET RECONSTRUCTIONS PROJECT

BALL ROAD

CITY OF BLAINE

EXHIBIT NO. 3 - SINGLE FAMILY RESIDENTIAL PROPERTY
PROPOSED ASSESSMENT ROLL

ASSESSMENT RATE BREAKDOWN

CONSTRUCTION COSTS*		$171,629.98	*(CONSTRUCTION COST DOES NOT INCLUDE STREET OVERSIZING, WATER MAIN OR SANITARY SEWER COSTS)			
ADMINISTRATIVE COSTS		$72,921.09				
TOTAL COST		$244,551.07				ASSESSMENT RATE PER FRONT FOOT
	RESIDENTIAL RATE	x35%		TOTAL FRONT FOOTAGE		
ASSESSABLE COST		**$85,592.88**	**/**	**1735.8 LF**	**=**	**$49.31**

RESIDENTIAL PROPERTY

ASSESSMENT RATE		ASSESSABLE FOOTAGE		AMOUNT ASSESSED
$49.31	**X**	**92.0 LF**	**=**	**$4,536.52**

PROPERTY PIN	PROPERTY ADDRESS	PROPERTY OWNER	ASSESSABLE FOOTAGE	PROPOSED ASSESSMENT
243123310027	4539 BALL RD NE	TAYLOR JACQUELYN	92	$4,536.52

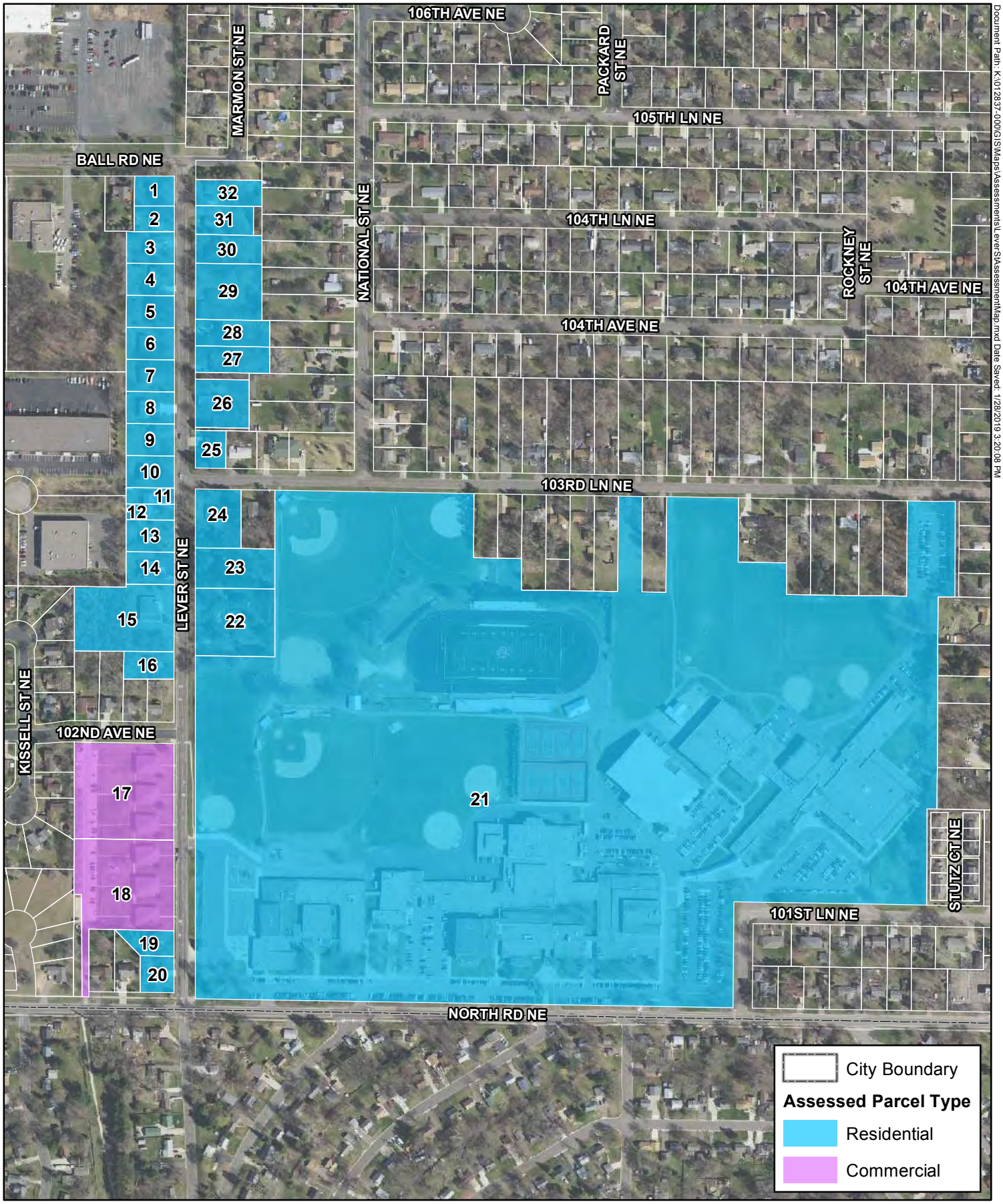

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Exhibit 4: Lever Street

Feasibility Assessment Report
Blaine, MN

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0 400 Feet

1 inch = 400 feet

wsb

PROJECT 18-16

LEVER STREET AREA STREET RECONSTRUCTIONS PROJECT

LEVER STREET

CITY OF BLAINE

EXHIBIT NO. 5 - COMMERCIAL/INDUSTRIAL/HIGH DENSITY RESIDENTIAL PROPERTY
PROPOSED ASSESSMENT ROLL

ASSESSMENT RATE BREAKDOWN

CONSTRUCTION COSTS	$576,308.70	(CONSTRUCTION COST DOES NOT INCLUDE WATER MAIN OR SANITARY SEWER COSTS)						COMMERCIAL/ INDUSTRIAL/HIGH DENSITY RESIDENTIAL ASSESSMENT PERCENTAGE		COMMERCIAL/ INDUSTRIAL/HIGH DENSITY RESIDENTIAL ASSESSMENT RATE PER FRONT FOOT
ADMINISTRATIVE COSTS	$201,708.05					TOTAL COST PER FRONT FOOT				
TOTAL COST	$778,016.75			TOTAL FRONT FOOTAGE						
ASSESSABLE COST	**$778,016.75**	**/**		**5086.00**	**=**	**$152.97**	*****	**50%**	**=**	**$76.49**

PROPERTY PIN	PROPERTY OWNER	PROPERTY ADDRESS	ASSESSABLE FRONT FOOTAGE		ASSESSMENT RATE PER FRONT FOOT	PROPOSED ASSESSMENT
243123340004	CENTENNIAL PLAZA LLC	10124 LEVER ST NE	282.0		$76.49	$21,570.18
243123340013	CENTENNIAL PLAZA LLC	10154 LEVER ST NE	302.0		$76.49	$23,099.98
		TOTALS:	**584.0**			**$44,670.16**

NOTES:

*150 FOOT CORNER LOT CREDIT APPLIED TO ASSESSABLE FRONT FOOTAGE

PROJECT 18-16

LEVER STREET AREA STREET RECONSTRUCTIONS PROJECT

LEVER STREET

CITY OF BLAINE

EXHIBIT NO. 6A - SINGLE FAMILY RESIDENTIAL ZONED PROPERTY - PER LINEAR FOOT
PROPOSED ASSESSMENT ROLL

ASSESSMENT RATE BREAKDOWN

CONSTRUCTION COSTS*		$408,811.70	*(CONSTRUCTION COST DOES NOT INCLUDE STREET OVERSIZING, WATER MAIN OR SANITARY SEWER COSTS)			
ADMINISTRATIVE COSTS		$158,121.04				
TOTAL COST		$566,932.74				ASSESSMENT RATE PER FRONT FOOT
	RESIDENTIAL RATE	x35%		TOTAL FRONT FOOTAGE		
ASSESSABLE COST		**$198,426.46**	**/**	**5086.0 LF**	**=**	**$39.01**

RESIDENTIAL PROPERTY

ASSESSMENT RATE		ASSESSABLE FOOTAGE		AMOUNT ASSESSED
$39.01	**X**	**4255.5 LF**	**=**	**$166,007.06**

PROPERTY PIN	PROPERTY ADDRESS	PROPERTY OWNER	ASSESSABLE FOOTAGE	PROPOSED ASSESSMENT
243123340003	10290 LEVER ST NE	SPRING LAKE PARK FIRE DEPT	210	$8,192.10
243123430008	4707 NORTH ROAD NE	IND SCHOOL DISTRICT #12	1070	$41,752.40
		TOTALS:	**1280**	**$49,944.50**

PROJECT 18-16

LEVER STREET AREA STREET RECONSTRUCTIONS PROJECT

LEVER STREET

CITY OF BLAINE

EXHIBIT NO. 6B - SINGLE FAMILY RESIDENTIAL PROPERTY - PER UNIT
PROPOSED ASSESSMENT ROLL

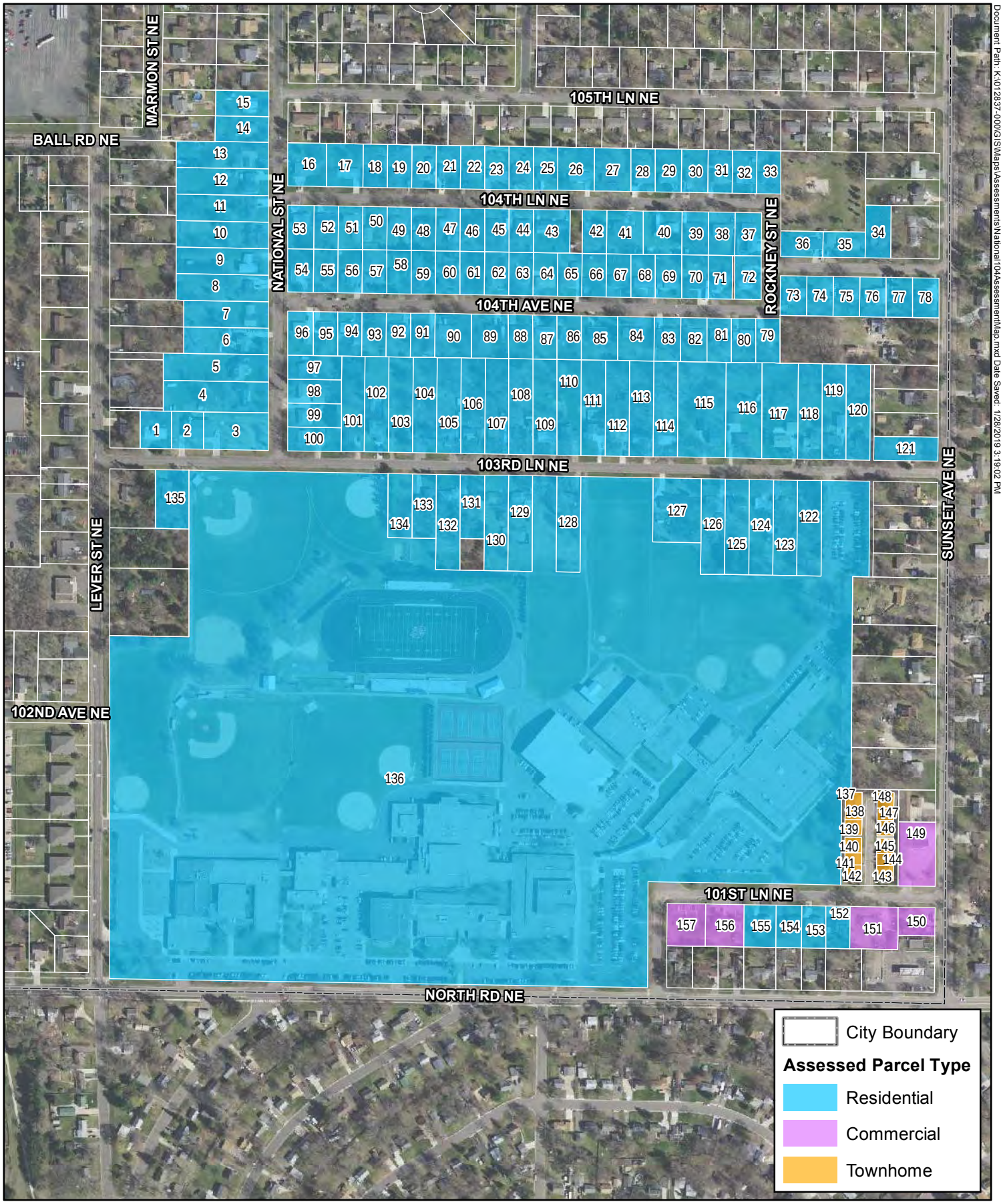
ASSESSMENT RATE BREAKDOWN

CONSTRUCTION COSTS*		$408,811.70	*(CONSTRUCTION COST DOES NOT INCLUDE WATER MAIN, SANITARY SEWER OR STREET OVERSIZE COSTS)			
ADMINISTRATIVE COSTS		$158,121.04				
TOTAL COST		$566,932.74				ASSESSMENT RATE PER FRONT FOOT
	RESIDENTIAL RATE	x35%		TOTAL FRONT FOOTAGE		
ASSESSABLE COST		**$198,426.46**	**/**	**5086.0 LF**	**=**	**$39.01**

RESIDENTIAL PROPERTY

ASSESSMENT RATE		SINGLE FAMILY RESIDENTIAL ASSESSABLE FOOTAGE		AMOUNT ASSESSED		ASSESSABLE RESIDENTIAL LOT UNITS		ASSESSMENT RATE PER RESIDENTIAL LOT UNIT
$39.01	**X**	**2975.2 LF**	**=**	**$116,062.55**	**/**	**28**	**=**	**$4,145.09**

PROPERTY PIN	PROPERTY ADDRESS	PROPERTY OWNER	ASSESSABLE RESIDENTIAL LOT UNITS	ASSESSMENT RATE PER RESIDENTIAL LOT UNIT	PROPOSED ASSESSMENT
243123310004	10420 LEVER ST NE	SCHANCHE BRIAN	1	$4,145.09	$4,145.09
243123310005	10410 LEVER ST NE	CAMPBELL MICHAEL H	1	$4,145.09	$4,145.09
243123310006	10400 LEVER ST NE	HYNES BRIAN	1	$4,145.09	$4,145.09
243123310007	10350 LEVER ST NE	GOULD DARRIN	1	$4,145.09	$4,145.09
243123310008	10340 LEVER ST NE	DONNAY ANNA	1	$4,145.09	$4,145.09
243123310009	10330 LEVER ST NE	DONNAY ANNA	1	$4,145.09	$4,145.09
243123310011	10310 LEVER ST NE	LARSON GRANT	1	$4,145.09	$4,145.09
243123310012	10300 LEVER ST NE	KALK TRUSTEE GERALD & KALK TRUSTEE JULIE	1	$4,145.09	$4,145.09
243123310014	10438 LEVER ST NE	BAUMAN MARGARET	1	$4,145.09	$4,145.09
243123310015	10430 LEVER ST NE	SCHMIDT BEVERLY	1	$4,145.09	$4,145.09
243123310016	10322 LEVER ST NE	NGUYEN DAT & XUAN T	1	$4,145.09	$4,145.09
243123310017	10320 LEVER ST NE	TIMOSHENKO YURIY	1	$4,145.09	$4,145.09
243123310025	10470 LEVER ST NE	RALEIGH DONALD W JR & MARNIE J	1	$4,145.09	$4,145.09
243123310026	10450 LEVER ST NE	SCHMALZER KRISTY	1	$4,145.09	$4,145.09
243123340088	4585 NORTH RD NE	POKRZYWA II MICHAEL & POKRZYWA TRACY	1	$4,145.09	$4,145.09
243123340089	10116 LEVER ST NE	CHATWANI CHETNA	1	$4,145.09	$4,145.09
243123340092	10250 LEVER ST NE	VAN HOUTEN JERRY & VAN HOUTEN SALLIE	1	$4,145.09	$4,145.09
243123420001	10461 LEVER ST NE	HARDEE CHHORIKA	1	$4,145.09	$4,145.09
243123420010	10443 LEVER ST NE	MESSERLI STEVEN R & F L	1	$4,145.09	$4,145.09
243123420012	10437 LEVER ST NE	BAUER JOHN P & SANDRA L	1	$4,145.09	$4,145.09
243123420013	10431 LEVER ST NE	WEISLER ELLIOT	1	$4,145.09	$4,145.09
243123420015	10375 LEVER ST NE	ROCKSTAD STEVEN R	1	$4,145.09	$4,145.09
243123420018	10355 LEVER ST NE	SWAN DALE A & BARBARA R	1	$4,145.09	$4,145.09
243123420019	10325 LEVER ST NE	BOONE BRIAN	1	$4,145.09	$4,145.09
243123420020	10305 LEVER ST NE	HUSS LESLEY	1	$4,145.09	$4,145.09
243123420023	10421 LEVER ST NE	LANGSETH SANDY M & I D	1	$4,145.09	$4,145.09
243123420026	10411 LEVER ST NE	POACH ALLAN A & L C	1	$4,145.09	$4,145.09
243123430010	10291 LEVER ST NE	LAWSON DANIEL	1	$4,145.09	$4,145.09
		TOTALS:	**28**		**$116,062.52**



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BlaineMN.gov

Exhibit 7:
National - 104th - 103rd - 101st Area

Feasibility Assessment Report
Blaine, MN

N

0 400 Feet

1 inch = 400 feet

wsb

PROJECT 18-16

LEVER STREET AREA STREET RECONSTRUCTIONS PROJECT

104TH LN / 104TH AVE / 103RD LN / 101ST LN / NATIONAL ST / ROCKNEY ST / QUITO ST

CITY OF BLAINE

EXHIBIT NO. 8 - COMMERCIAL/INDUSTRIAL PROPERTY
PROPOSED ASSESSMENT ROLL

ASSESSMENT RATE BREAKDOWN

CONSTRUCTION COSTS	$2,563,285.00	(CONSTRUCTION COST DOES NOT INCLUDE WATER MAIN OR SANITARY SEWER COSTS)								
ADMINISTRATIVE COSTS	$897,150.00									
TOTAL COST	$3,460,435.00			TOTAL COST PER FRONT FOOT		COMMERCIAL/ INDUSTRIAL/HIGH DENSITY RESIDENTIAL ASSESSMENT PERCENTAGE		COMMERCIAL/ INDUSTRIAL/HIGH DENSITY RESIDENTIAL ASSESSMENT RATE PER FRONT FOOT	
		TOTAL FRONT FOOTAGE								
ASSESSABLE COST	**$3,460,435.00**	**/**	**17211.90**	**=**	**$201.05**	*****	**50%**	**=**	**$100.52**	

PROPERTY PIN	PROPERTY OWNER	PROPERTY ADDRESS	ASSESSABLE FRONT FOOTAGE		ASSESSMENT RATE PER FRONT FOOT	PROPOSED ASSESSMENT
243123440011	BOURKE BROS. INC	10112 SUNSET AVE NE	0.0	*	$100.52	$0.00
243123440022	NCF PROPERTY MANAGEMENT LLC	4884 101ST LN NE	120.0		$100.52	$12,062.40
243123440023	NCF PROPERTY MANAGEMENT LLC	4864 101ST LN NE	120.0	*	$100.52	$12,062.40
243123440044	GUBASH NOHA	4940 101ST LN NE	150.0		$100.52	$15,078.00
243123440045	ZONGO PROPERTIES LLC	10130 SUNSET AVE NE	115.5		$100.52	$11,610.06
		TOTALS:	**505.5**			**$50,812.86**

NOTES:

*150 FOOT CORNER LOT CREDIT APPLIED TO ASSESSABLE FRONT FOOTAGE

PROJECT 18-16

LEVER STREET AREA STREET RECONSTRUCTIONS PROJECT

104TH LN / 104TH AVE / 103RD LN / 101ST LN / NATIONAL ST / ROCKNEY ST / QUITO ST

CITY OF BLAINE

EXHIBIT NO. 9 - HIGH DENSITY RESIDENTIAL PROPERTY
PROPOSED ASSESSMENT ROLL

ASSESSMENT RATE BREAKDOWN

CONSTRUCTION COSTS*		$2,563,285.00	*(CONSTRUCTION COST DOES NOT INCLUDE WATER MAIN OR SANITARY SEWER COSTS)		
ADMINISTRATIVE COSTS		$897,150.00			
TOTAL COST		$3,460,435.00			ASSESSMENT RATE PER FRONT FOOT
	HIGH DENSITY RATE	x50%	TOTAL FRONT FOOTAGE		
ASSESSABLE COST		**$1,730,217.50**	**/ 17211.9 LF**	**=**	**$100.52**

HIGH DENSITY RESIDENTIAL PROPERTY

ASSESSMENT RATE		HIGH DENSITY RESIDENTIAL ASSESSABLE FOOTAGE		AMOUNT ASSESSED		ASSESSABLE RESIDENTIAL UNITS		ASSESSMENT RATE PER RESIDENTIAL UNIT
$100.52	**X**	**178.5 LF**	**=**	**$17,942.82**	**/**	**12**	**=**	**$1,495.24**

PROPERTY PIN	PROPERTY ADDRESS	PROPERTY OWNER	ASSESSABLE RESIDENTIAL UNITS	ASSESSMENT RATE PER RESIDENTIAL UNIT	PROPOSED ASSESSMENT
243123440030	10163 STUTZ CT NE UNIT A	CHAN SHERMAN	1	$1,495.24	$1,495.24
243123440031	10163 STUTZ CT NE UNIT B	WILLIAM MALARK REALTY INC	1	$1,495.24	$1,495.24
243123440032	10163 STUTZ CT NE UNIT C	LI SUBIN	1	$1,495.24	$1,495.24
243123440033	10183 STUTZ CT NE UNIT A	WILLIAM MALARK REALTY INC	1	$1,495.24	$1,495.24
243123440034	10183 STUTZ CT NE UNIT B	JOHNSON ELIZABETH	1	$1,495.24	$1,495.24
243123440035	10183 STUTZ CT NE UNIT C	JOHNSON ELIZABETH	1	$1,495.24	$1,495.24
243123440036	10172 STUTZ CT NE UNIT C	YU YIM	1	$1,495.24	$1,495.24
243123440037	10172 STUTZ CT NE UNIT B	ZHOU SHAOHUA	1	$1,495.24	$1,495.24
243123440038	10172 STUTZ CT NE UNIT A	LE NGOC	1	$1,495.24	$1,495.24
243123440039	10152 STUTZ CT NE UNIT C	MALARK WILLIAM	1	$1,495.24	$1,495.24
243123440040	10152 STUTZ CT NE UNIT B	HOWMAN CHERYL	1	$1,495.24	$1,495.24
243123440041	10152 STUTZ CT NE UNIT A	OAN VINCENT	1	$1,495.24	$1,495.24
		TOTALS:	**12**		**$17,942.88**

PROJECT 18-16

LEVER STREET AREA STREET RECONSTRUCTIONS PROJECT

104TH LN / 104TH AVE / 103RD LN / 101ST LN / NATIONAL ST / ROCKNEY ST / QUITO ST

CITY OF BLAINE

EXHIBIT NO. 10A - SINGLE FAMILY RESIDENTIAL PROPERTY
PROPOSED ASSESSMENT ROLL

ASSESSMENT RATE BREAKDOWN

CONSTRUCTION COSTS*		$2,444,552.00	*(CONSTRUCTION COST DOES NOT INCLUDE WATER MAIN OR SANITARY SEWER COSTS)			
ADMINISTRATIVE COSTS		$855,593.20				
TOTAL COST		$3,300,145.20				
	RESIDENTIAL RATE	x35%	TOTAL FRONT FOOTAGE		ASSESSMENT RATE PER FRONT FOOT	
ASSESSABLE COST		**$1,155,050.82**	**/**	**17211.9 LF**	**=**	**$67.11**

RESIDENTIAL PROPERTY

ASSESSMENT RATE		ASSESSABLE SINGLE FAMILY RESIDENTIAL FOOTAGE		AMOUNT ASSESSED		ASSESSABLE RESIDENTIAL LOT UNITS		ASSESSMENT RATE PER RESIDENTIAL LOT UNIT
$67.11	**X**	**11784.2 LF**	**=**	**$790,837.66**	**/**	**137**	**=**	**$5,772.54**

PROPERTY PIN	PROPERTY ADDRESS	PROPERTY OWNER	ASSESSABLE RESIDENTIAL LOT UNITS	ASSESSMENT RATE PER RESIDENTIAL LOT UNIT	PROPOSED ASSESSMENT
243123130062	10538 NATIONAL ST NE	PETERSON DOUGLAS	1	$5,772.54	$5,772.54
243123130063	10526 NATIONAL ST NE	LAUER DYANN	1	$5,772.54	$5,772.54
243123410005	4931 104TH AVE NE	BISEK A M & KANAKARES H R	1	$5,772.54	$5,772.54
243123410006	4921 104TH AVE NE	EFFERTZ ANTHONY	1	$5,772.54	$5,772.54
243123410008	4911 104TH LN NE	PERREAULT KELSEY	1	$5,772.54	$5,772.54
243123410009	4901 104TH LN NE	PETERSON ERIK & CHERYL	1	$5,772.54	$5,772.54
243123410010	4871 104TH LN NE	HIER RUSSELL J & JANICE A	1	$5,772.54	$5,772.54
243123410011	4861 104TH LN NE	PETERSON MARIE	1	$5,772.54	$5,772.54
243123410012	4851 104TH LN NE	MONTAGUE PATRICIA	1	$5,772.54	$5,772.54
243123410013	4841 104TH LN NE	HALUPTZOK CEANN	1	$5,772.54	$5,772.54
243123410014	4831 104TH LN NE	OLSON JOHN P & RUTH J	1	$5,772.54	$5,772.54
243123410015	4811 104TH LN NE	ANDERSON EILEEN I	1	$5,772.54	$5,772.54
243123410016	4801 104TH LN NE	BURGER RICHARD D & MARTIN R L	1	$5,772.54	$5,772.54
243123410017	4880 104TH LN NE	SEIFERT LAURA M	1	$5,772.54	$5,772.54
243123410018	4870 104TH LN NE	POTTHOFF MICHAEL & CATHRYN	1	$5,772.54	$5,772.54
243123410019	4860 104TH LN NE	GOHL VALENTINE J & DORIS M	1	$5,772.54	$5,772.54
243123410022	4830 104TH LN NE	FORD DWAYNE L JR & DIANE M	1	$5,772.54	$5,772.54
243123410023	4820 104TH LN NE	HUSEBY KONRAD L & CYNTHIA K	1	$5,772.54	$5,772.54
243123410027	4803 104TH AVE NE	EBEL JENNIFER	1	$5,772.54	$5,772.54
243123410028	4813 104TH AVE NE	KALUZA TRUSTEE NORMA & THOMAS	1	$5,772.54	$5,772.54
243123410029	4823 104TH AVE NE	GOETTSCH TRUSTEE ARLAND & CAROL	1	$5,772.54	$5,772.54
243123410030	4833 104TH AVE NE	THOMAS FLYN PROPERTIES LLC	1	$5,772.54	$5,772.54
243123410031	4843 104TH AVE NE	VANDENBERG DEBORAH	1	$5,772.54	$5,772.54
243123410032	4853 104TH AVE NE	COON ANGELA	1	$5,772.54	$5,772.54
243123410033	4863 104TH AVE NE	ERICKSON GAYLORD R & G M	1	$5,772.54	$5,772.54
243123410034	4873 104TH AVE NE	RIGHTMIRE LAURA	1	$5,772.54	$5,772.54
243123410036	4883 104TH AVE NE	CALLANDER ANITA S	1	$5,772.54	$5,772.54

PROJECT 18-16

LEVER STREET AREA STREET RECONSTRUCTIONS PROJECT

104TH LN / 104TH AVE / 103RD LN / 101ST LN / NATIONAL ST / ROCKNEY ST / QUITO ST

CITY OF BLAINE

EXHIBIT NO. 10A - SINGLE FAMILY RESIDENTIAL PROPERTY
PROPOSED ASSESSMENT ROLL

ASSESSMENT RATE BREAKDOWN

CONSTRUCTION COSTS*		$2,444,552.00	*(CONSTRUCTION COST DOES NOT INCLUDE WATER MAIN OR SANITARY SEWER COSTS)		
ADMINISTRATIVE COSTS		$855,593.20			
TOTAL COST		$3,300,145.20			ASSESSMENT RATE PER FRONT FOOT
	RESIDENTIAL RATE	x35%	TOTAL FRONT FOOTAGE		
ASSESSABLE COST		**$1,155,050.82**	**/ 17211.9 LF**	**=**	**$67.11**

243123410037	4950 104TH AVE NE	SHEAREN JESSICA	1	$5,772.54	$5,772.54
243123410038	4940 104TH AVE NE	MAGSALIN CESAR L & SONYA R	1	$5,772.54	$5,772.54
243123410039	4930 104TH AVE NE	BRITO KIMBERLY	1	$5,772.54	$5,772.54
243123410040	4920 104TH AVE NE	POWERS WAYNE M & TAMARA L	1	$5,772.54	$5,772.54
243123410041	4910 104TH AVE NE	HUSOM GALE	1	$5,772.54	$5,772.54
243123410042	4900 104TH AVE NE	PRAZAK RONALD J & M L	1	$5,772.54	$5,772.54
243123410043	4892 104TH AVE NE	WAHL IRENE	1	$5,772.54	$5,772.54
243123410044	4882 104TH AVE NE	JENSEN BENJAMIN	1	$5,772.54	$5,772.54
243123410045	4872 104TH AVE NE	DAMMAR ELIZABETH	1	$5,772.54	$5,772.54
243123410046	4862 104TH AVE NE	HAMMOND GABRIELLE	1	$5,772.54	$5,772.54
243123410047	4852 104TH AVE NE	EVANS DEANNA	1	$5,772.54	$5,772.54
243123410048	4842 104TH AVE NE	LOSS SHAWN	1	$5,772.54	$5,772.54
243123410049	4822 104TH AVE NE	PAP JORDAN	1	$5,772.54	$5,772.54
243123410050	4812 104TH AVE NE	KROHNFELDT GREGORY & LORI	1	$5,772.54	$5,772.54
243123410051	4802 104TH AVE NE	DWELIS ALEC	1	$5,772.54	$5,772.54
243123410059	4900 103RD LN NE	CHAPMAN KEVIN J JR & JEAN M	1	$5,772.54	$5,772.54
243123410060	4896 103RD LN NE	HOLLANDER HAROLD T	1	$5,772.54	$5,772.54
243123410061	4886 103RD LN NE	INDEPENDENT SCHOOL DISTRICT #12	1	$5,772.54	$5,772.54
243123410062	4866 103RD LN NE	CENTENNIAL SCHOOL DIST #12	1	$5,772.54	$5,772.54
243123410067	4816 103RD LN NE	CENTENNIAL SCHOOL DISTRIC #12	1	$5,772.54	$5,772.54
243123410072	10324 SUNSET AVE NE	WAID KATHERINE	1	$5,772.54	$5,772.54
243123410073	4935 103RD LN NE	LEE AARON	1	$5,772.54	$5,772.54
243123410074	4925 103RD LN NE	QUIMBY DOREEN	1	$5,772.54	$5,772.54
243123410075	4919 103RD LN NE	DONAHOE NATHAN	1	$5,772.54	$5,772.54
243123410076	4915 103RD LN NE	HALSTEAD ALVIN & JULIANNE	1	$5,772.54	$5,772.54
243123410077	4895 103RD LN NE	BRUEN RONALD A & JODY L	1	$5,772.54	$5,772.54
243123410078	4885 103RD LN NE	SAND CHRISTOPHER C & JENNIFER	1	$5,772.54	$5,772.54
243123410079	4855 103RD LN NE	WANDMACHER FRANKLIN E & S K	1	$5,772.54	$5,772.54
243123410080	4845 103RD LN NE	COON TIMOTHY A & ROSEMARY C	1	$5,772.54	$5,772.54
243123410081	4835 103RD LN NE	MOORE ALICE	1	$5,772.54	$5,772.54
243123410082	4825 103RD LN NE	PEARSON ROBERT T & J L	1	$5,772.54	$5,772.54
243123410083	4815 103RD LN NE	PICKENS SARAH	1	$5,772.54	$5,772.54
243123410084	4805 103RD LN NE	WATTON RONALD J & L A	1	$5,772.54	$5,772.54
243123410085	4947 104TH AVE NE	LUND LYDIA	1	$5,772.54	$5,772.54
243123410087	UNADDRESSED	INDEPENDENT SCHOOL DISTRICT 12	1	$5,772.54	$5,772.54
243123410088	4906 103RD LN NE	MARSON BARBARA M	1	$5,772.54	$5,772.54
243123410089	4800 104TH LN NE	WELCH RICKEY P & JANE M	1	$5,772.54	$5,772.54
243123410109	4850 104TH LN NE	RAUNER ROBERT S & L K	1	$5,772.54	$5,772.54
243123420002	10470 NATIONAL ST NE	SCHUMACHER DONALD	1	$5,772.54	$5,772.54
243123420003	10456 NATIONAL ST NE	STRELAU CALVIN & REBECCA	1	$5,772.54	$5,772.54

PROJECT 18-16

LEVER STREET AREA STREET RECONSTRUCTIONS PROJECT

104TH LN / 104TH AVE / 103RD LN / 101ST LN / NATIONAL ST / ROCKNEY ST / QUITO ST

CITY OF BLAINE

EXHIBIT NO. 10A - SINGLE FAMILY RESIDENTIAL PROPERTY
PROPOSED ASSESSMENT ROLL

ASSESSMENT RATE BREAKDOWN

CONSTRUCTION COSTS*		$2,444,552.00	*(CONSTRUCTION COST DOES NOT INCLUDE WATER MAIN OR SANITARY SEWER COSTS)		
ADMINISTRATIVE COSTS		$855,593.20			
TOTAL COST		$3,300,145.20			ASSESSMENT RATE PER FRONT FOOT
	RESIDENTIAL RATE	x35%	TOTAL FRONT FOOTAGE		
ASSESSABLE COST		**$1,155,050.82**	**/ 17211.9 LF**	**=**	**$67.11**

243123420004	10442 NATIONAL ST NE	ENSIGN MARK	1	$5,772.54	$5,772.54
243123420005	10428 NATIONAL ST NE	MARSHIK FRANCIS W & P A	1	$5,772.54	$5,772.54
243123420006	10414 NATIONAL ST NE	GILLES LOREN R & E F	1	$5,772.54	$5,772.54
243123420007	10400 NATIONAL ST NE	ENRIQUEZ PANUCO JOSE & ENRIQUEZ THERESA	1	$5,772.54	$5,772.54
243123420014	4605 103RD LN NE	BLACKFORD DEJAUN	1	$5,772.54	$5,772.54
243123420021	4608 103RD LN NE	LACROIX REBECCA J	1	$5,772.54	$5,772.54
243123420024	10390 NATIONAL ST NE	WALSH ANTHONY R & TAMMI J	1	$5,772.54	$5,772.54
243123420025	10380 NATIONAL ST NE	HATCHNER PHILIP K & WENDY B	1	$5,772.54	$5,772.54
243123420027	4771 104TH LN NE	STROHMAYER III MATTHEW	1	$5,772.54	$5,772.54
243123420028	4755 104TH LN NE	HERRICK MARIANNE E	1	$5,772.54	$5,772.54
243123420029	4751 104TH LN NE	HORDYK DOUGLAS A & PATRICIA	1	$5,772.54	$5,772.54
243123420030	4741 104TH LN NE	OLSON KRISTINE M	1	$5,772.54	$5,772.54
243123420031	4731 104TH LN NE	WEHLAND AMANDA	1	$5,772.54	$5,772.54
243123420032	4721 104TH LN NE	SHOWALTER JENNIFER	1	$5,772.54	$5,772.54
243123420033	4711 104TH LN NE	SMITH STEVE	1	$5,772.54	$5,772.54
243123420034	4701 104TH LN NE	LANGE TRUSTEE EUGENE & LANGE TRUSTEE INEZ	1	$5,772.54	$5,772.54
243123420035	4661 104TH LN NE	JOYCE TRUSTEE GAIL & JOYCE TRUSTEE MICHAEL	1	$5,772.54	$5,772.54
243123420036	4770 104TH LN NE	DONNER JAY D & DEBRA L	1	$5,772.54	$5,772.54
243123420037	4760 104TH LN NE	TURNQUIST GERALD A	1	$5,772.54	$5,772.54
243123420038	4750 104TH LN NE	HOSNA DONALL M & BRAD E	1	$5,772.54	$5,772.54
243123420039	4740 104TH LN NE	DORSCHNER ERIC	1	$5,772.54	$5,772.54
243123420040	4730 104TH LN NE	PEARI ALYSSA	1	$5,772.54	$5,772.54
243123420041	4720 104TH LN NE	ROEHL THOMAS E & R J	1	$5,772.54	$5,772.54
243123420042	4710 104TH LN NE	JABLONSKI KEITH	1	$5,772.54	$5,772.54
243123420043	4700 104TH LN NE	HAMLIN MATTHEW	1	$5,772.54	$5,772.54
243123420044	4670 104TH LN NE	WAITE RITA	1	$5,772.54	$5,772.54
243123420045	4660 104TH LN NE	HUTTERER JOHN J & BONNIE	1	$5,772.54	$5,772.54
243123420046	4663 104TH AVE NE	SMIT CHRISTOPHER	1	$5,772.54	$5,772.54
243123420047	4673 104TH AVE NE	CARD DANIEL	1	$5,772.54	$5,772.54
243123420048	4683 104TH AVE NE	JOHNSTON CHRISTA	1	$5,772.54	$5,772.54
243123420049	4693 104TH AVE NE	SCHWENZFEIER DONALD E	1	$5,772.54	$5,772.54
243123420050	4703 104TH AVE NE	LEE SANDY	1	$5,772.54	$5,772.54
243123420051	4713 104TH AVE NE	TAUER GARY E & SANDRA J	1	$5,772.54	$5,772.54
243123420052	4723 104TH AVE NE	HER NOUZA	1	$5,772.54	$5,772.54
243123420053	4733 104TH AVE NE	VIDO EUCLIDES	1	$5,772.54	$5,772.54
243123420054	4743 104TH AVE NE	DOUGLAS SHERRI	1	$5,772.54	$5,772.54
243123420055	4753 104TH AVE NE	HPA BORROWER 2017-1 LLC	1	$5,772.54	$5,772.54
243123420056	4752 104TH AVE NE	EKLUND RUSSELL D & PHYLLIS	1	$5,772.54	$5,772.54
243123420057	4742 104TH AVE NE	TILTON GAIL JR & S A	1	$5,772.54	$5,772.54
243123420058	4722 104TH AVE NE	BRENNAN LAWRENCE	1	$5,772.54	$5,772.54

PROJECT 18-16

LEVER STREET AREA STREET RECONSTRUCTIONS PROJECT

104TH LN / 104TH AVE / 103RD LN / 101ST LN / NATIONAL ST / ROCKNEY ST / QUITO ST

CITY OF BLAINE

EXHIBIT NO. 10A - SINGLE FAMILY RESIDENTIAL PROPERTY
PROPOSED ASSESSMENT ROLL

ASSESSMENT RATE BREAKDOWN

CONSTRUCTION COSTS*		$2,444,552.00	*(CONSTRUCTION COST DOES NOT INCLUDE WATER MAIN OR SANITARY SEWER COSTS)		
ADMINISTRATIVE COSTS		$855,593.20			
TOTAL COST		$3,300,145.20			ASSESSMENT RATE PER FRONT FOOT
	RESIDENTIAL RATE	x35%	TOTAL FRONT FOOTAGE		
ASSESSABLE COST		**$1,155,050.82**	**/ 17211.9 LF**	**=**	**$67.11**

243123420059	4712 104TH AVE NE	TRUDEAU DEBORAH	1	$5,772.54	$5,772.54
243123420060	4702 104TH AVE NE	DAWSON LINDA	1	$5,772.54	$5,772.54
243123420061	4692 104TH AVE NE	SCOTT DONALD JR & KATHLEEN	1	$5,772.54	$5,772.54
243123420062	4682 104TH AVE NE	CZECH ROSEMARY	1	$5,772.54	$5,772.54
243123420063	4672 104TH AVE NE	WAGNER BETTY	1	$5,772.54	$5,772.54
243123420064	4662 104TH AVE NE	HAGE ALLEN	1	$5,772.54	$5,772.54
243123420065	10365 NATIONAL ST NE	ROTHBAUER CHARLES A & AMY JO L	1	$5,772.54	$5,772.54
243123420066	10357 NATIONAL ST NE	MISSAL BERNITA E	1	$5,772.54	$5,772.54
243123420067	10349 NATIONAL ST NE	KRUEGER RICHARD	1	$5,772.54	$5,772.54
243123420068	10341 NATIONAL ST NE	MECHELS ALAN	1	$5,772.54	$5,772.54
243123420069	4756 103RD LN NE	CENTENNIAL SCHOOL DISTRICT #12	1	$5,772.54	$5,772.54
243123420070	4746 103RD LN NE	INDEPENDENT SCHOOL DIST #12	1	$5,772.54	$5,772.54
243123420071	4740 103RD LN NE	WELLS FARGO BROKERAGE SERVICES LLC	1	$5,772.54	$5,772.54
243123420073	4732 103RD LN NE	INDEPENDENT SCHOOL DIST #12	1	$5,772.54	$5,772.54
243123420074	4724 103RD LN NE	INDEPENDENT SCHOOL DISTRICT # 12	1	$5,772.54	$5,772.54
243123420076	4716 103RD LN NE	INDEPENDENT SCHOOL DISTRICT 12	1	$5,772.54	$5,772.54
243123420083	4755 103RD LN NE	EVANS WESLEY & PATRICIA	1	$5,772.54	$5,772.54
243123420084	4747 103RD LN NE	ROSS JUDITH	1	$5,772.54	$5,772.54
243123420085	4741 103RD LN NE	GERBER ARDEN	1	$5,772.54	$5,772.54
243123420086	4733 103RD LN NE	HAWKS BRADLEY	1	$5,772.54	$5,772.54
243123420087	4725 103RD LN NE	HUMBLE SAMUEL G & LANA R	1	$5,772.54	$5,772.54
243123420088	4717 103RD LN NE	WATERBURY MARK A	1	$5,772.54	$5,772.54
243123420089	4709 103RD LN NE	JAROMBEK CHRISTOPHER	1	$5,772.54	$5,772.54
243123420090	4701 103RD LN NE	QUINER MARGARET	1	$5,772.54	$5,772.54
243123420095	10354 NATIONAL ST NE	SCHWARTZ GARY & ANNE	1	$5,772.54	$5,772.54
243123420096	10368 NATIONAL ST NE	ZIMMERMAN ERIC	1	$5,772.54	$5,772.54
243123440015	4934 101ST LN NE	COLLINS ASHLEY	1	$5,772.54	$5,772.54
243123440016	4924 101ST LN NE	MIDDLESTAEDT LAURIE	1	$5,772.54	$5,772.54
243123440020	4914 101ST LN NE	HOFFMAN MICHAEL & PATRICIA	1	$5,772.54	$5,772.54
243123440021	4904 101ST LN NE	KUEHN KRISTINE	1	$5,772.54	$5,772.54
		TOTALS:	**137**		**$790,837.98**

PROJECT 18-16

LEVER STREET AREA STREET RECONSTRUCTIONS PROJECT

104TH LN / 104TH AVE / 103RD LN / 101ST LN / NATIONAL ST / ROCKNEY ST / QUITO ST

CITY OF BLAINE

EXHIBIT NO. 10B - SINGLE FAMILY RESIDENTIAL ZONED PROPERTY - PER LINEAR FOOT
PROPOSED ASSESSMENT ROLL

ASSESSMENT RATE BREAKDOWN

CONSTRUCTION COSTS*		$2,444,552.00		*(CONSTRUCTION COST DOES NOT INCLUDE WATER MAIN OR SANITARY SEWER COSTS)		
ADMINISTRATIVE COSTS		$855,593.20				
TOTAL COST		$3,300,145.20				ASSESSMENT RATE PER FRONT FOOT
	RESIDENTIAL RATE	x35%		TOTAL FRONT FOOTAGE		
ASSESSABLE COST		**$1,155,050.82**	**/**	**17211.9 LF**	**=**	**$67.11**

RESIDENTIAL PROPERTY

ASSESSMENT RATE		ASSESSABLE FOOTAGE		AMOUNT ASSESSED
$67.11	**X**	**2423.5 LF**	**=**	**$162,641.09**

PROPERTY PIN	PROPERTY ADDRESS	PROPERTY OWNER	ASSESSABLE FOOTAGE	PROPOSED ASSESSMENT
243123420017	4629 103RD LN NE	BLAINE CITY OF	100	$6,711.00
243123420092	UNADDRESSED	BLAINE CITY OF	320	$21,495.33
243123430008	4707 NORTH RD NE	IND SCHOOL DISTRICT #12	2003	$134,434.75
		TOTALS:	**2424**	**$162,641.09**

APPENDIX D

Geotechnical Report

GEOTECHNICAL REPORT

LEVER STREET AREA RECONSTRUCTION

2019 STREET IMPROVEMENTS -AREA 4 | BLAINE MN

January 25, 2019

Prepared for:
City of Blaine
10801 Town Square Drive NE
Blaine, MN 55449

WSB PROJECT NO. 012837-000
CITY PROJECT NO. 18-16

wsb

GEOTECHNICAL REPORT

LEVER STREET AREA RECONSTRUCTION
2019 STREET IMPROVEMENTS – AREA 4
CITY PROJECT 18-16
BLAINE, MINNESOTA

FOR
CITY OF BLAINE, MINNESOTA

January 25, 2019

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.

Darin E. Hyatt, PE

Date: January 25, 2019 Lic. No. 41316

January 25, 2019

City of Blaine
10801 Town Square Drive NE
Blaine, MN 55449

Re: Geotechnical Report
2019 Street Improvements – Area 4
Lever Street Area Reconstruction
City Project: 18-16
Blaine, Minnesota
WSB Project No.: 012837-000

We have conducted a geotechnical subsurface exploration program for the above referenced project. This report contains our soil boring logs, an evaluation of the conditions encountered in the borings and our recommendations for subgrade preparation, underground utility installation, and other geotechnical related design and construction considerations.

If you have any questions concerning this report or our recommendations, or for construction material testing for this project, please call us at (952) 737-4660.

Sincerely,

Sincerely,

WSB

Trevor Meyers, PG
Geotechnical Project Geologist

Darin Hyatt, PE
Senior Geotechnical Engineer

Attachment
Geotechnical Report

MWO/tw

540 GATEWAY BLVD | BURNSVILLE, MN | 55337 | 952.737.4660 | WSBENG.COM

TABLE OF CONTENTS

1. INTRODUCTION

1.1 Project Location

The proposed roadway improvements will be located within the residential neighborhood north of County Road 10 and west of County Road 53 in Blaine, Minnesota. This installment is Project Area 4 of the City of Blaine 2019 Street Improvements and is referred to as the Lever Street Area Street Reconstruction. The project contains the following streets:

Ball Road from 104th Avenue alignment to Lever Street
Lever Street from Ball Road to North Road
103rd Lane from Lever Street to Sunset Avenue
National Street from 103rd Lane to 105th Lane
104th Avenue from National Street to Sunset Avenue
104th Lane from National Street to Rockney Street
Rockney Street from 104th Avenue to 104th Lane
101st Lane from Quito Street to Sunset Avenue
Quito Street from North Road to 101st Lane

Borings were completed through the existing pavement sections. The approximate boring locations can be found on the Soil Boring Exhibit in ***Appendix A***.

1.2 Project Description

We understand the City of Blaine 2019 Pavement Management project includes four separate project areas. This report addresses Project Area 4 – Lever Street Area Reconstruction (City Project 18-16) described in the September 12, 2018 RFP. The Lever Street Area Reconstruction includes the following:

Reconstruction of Ball Road from 104th Avenue alignment to Lever Street. This portion will generally consist of removal of existing pavement and shoulders and the reconstruction to a typical urban section road with concrete curb and gutter and storm sewer.

The reconstruction of Lever Street from Ball Road to North Road will consist of reclaiming existing pavement, additional storm sewer and stormwater treatment to improve drainage and removing/replacing concrete curb and gutter where necessary. Lever Street is a State Aid route and shall meet State Aid standards.

The remaining portions consist of the reconstruction of streets with curb and gutter and storm sewer to City specification and standard. This reconstruction includes the following roads: 103rd Lane from Lever Street to Sunset Avenue, National Street from 103rd Lane to 105th Lane, 104th Avenue from National Street to Sunset Avenue, 104th Lane from National Street to Rockney Street, Rockney Street from 104th Avenue to 104th Lane, 101st Lane from Quito Street to Sunset Avenue, and Quito Street from North Road to 101st Lane.

WSB has developed recommendations for this project in consideration of the proposed layout, loadings, and configurations as understood at this time. WSB must be made aware of the revised or additional information in order to evaluate the recommendations for continued applicability.

1.3 Purpose and Project Scope of Services

The City of Blaine authorized this work. In order to assist the design team in preparing plans and specifications, we have developed recommendations for pavement and utility subgrade preparation and pavement thicknesses. As such, we have completed a subsurface exploration program and prepared a geotechnical report for the referenced site. This stated purpose was a significant factor in determining the scope and level of service provided. Should the purpose of the report change the report immediately ceases to be valid and use of it without WSB's prior review and written authorization shall be at the user's sole risk.

Our authorized scope of work has been limited to:

1. Mobilization / Demobilization of a Truck Mounted Drill Rig.
2. Clearing underground utilities utilizing the Gopher State One Call.
3. Drilling twenty standard penetration borings to a depth of about 5 to 20 feet each.
4. Sealing the borings per Minnesota Department of Health procedures.
5. Perform soil classification and analysis.
6. Review of readily available project information and geologic data.
7. Providing this geotechnical report containing:
    a. Summary of our findings.
    b. Discussion of subsurface soil and groundwater conditions and how they may affect the proposed pavements and utilities.
    c. Estimated R-value of the soils.
    d. A discussion of soils for use as structural fill and site fill.

2. PROCEDURES

2.1 Boring Layout and Soil Sampling Procedures

WSB recommended the boring depths and selected the desired locations. Our field crew staked the boring locations using existing site features as guides. The approximate boring locations are shown on the Soil Boring Exhibit in ***Appendix A*** which is an aerial photo.

We drilled the borings on January 7 and 8, 2019, with a truck-mounted CME-55 drill rig operated by a two-person crew. The drill crew advanced the borings using continuous hollow stem augers. Drilling methods, crew chief, depths, sampling interval, casing usage, groundwater observations, test data, and other drilling information are indicated on the boring logs.

Generally, the drill crew sampled the soil in advance of the auger tip at two and one-half foot (2½') intervals of a depth to fifteen feet (15') and then at five foot (5') intervals thereafter. The soil samples were obtained using a split-barrel sampler which was driven into the ground during standard penetration tests in accordance with ASTM D 1586, Standard Method of Penetration Test and Split-Barrel Sampling of Soils.

The materials encountered were described on field logs and representative samples were containerized, and transported to our laboratory for further examination and testing.

The samples were visually examined to estimate the distribution of grain sizes, plasticity, consistency, moisture condition, color, presence of lenses and seams, and apparent geologic origin. We classified the soils according to type using the Unified Soil Classification System (USCS). A chart describing the Unified Soil Classification System is included in ***Appendix A***.

2.2 Groundwater Measurements and Borehole Abandonment

The drill crew observed the borings for free groundwater while drilling and after completion. These observations and measurements are noted on the boring logs. The crew then backfilled the borings in accordance with Minnesota Department of Health regulations.

2.3 Boring Log Procedures and Qualifications

The subsurface conditions encountered by the test borings are illustrated on the Logs of Test Borings in ***Appendix A***. Similar soils were grouped into the strata shown on the boring logs, and the appropriate estimated USCS classification symbols were also added. The depths and thickness of the subsurface strata indicated on the boring logs were estimated from the drilling results.

The transition between materials (horizontal and vertical) is approximate and is usually far more gradual than shown. Information on actual subsurface conditions exists only at the specific locations indicated and is relevant only to the time exploration was performed. Subsurface conditions and groundwater levels at other locations may differ from conditions found at the indicated locations. The nature and extent of these conditions would not become evident until exposed by construction excavation. These stratification lines were used for our analytical purposes and, due to the aforementioned limitations, should not be used as a basis of design or construction cost estimates.

3. EXPLORATION RESULTS

3.1 Site and Geology

The standard penetration test borings were generally performed on the existing roadways, however borings PB-1 and PB-2 were drilled adjacent to Ball Road NE.

The Anoka County Geologic Atlas indicated the surficial geology of the area is mostly lacustrine deposits from glacial Lake Anoka. These deposits consist primarily of very fine to medium grained sands. At depth, sediments may contain interbedded silt and silty clay layers. These sediments may also be interbedded with sand and gravel deposits from meltwater streams.

3.2 Subsurface Soil and Groundwater Conditions

The boring profile generally consisted of a pavement section and fill materials overlying naturally deposited lacustrine silty sands and sands with silt.

Pavement Section

The bituminous thickness generally ranged from about 4 to 8 inches and averaged about 5 inches. The aggregate base ranged from about 1 to 8 inches and averaged about 4 inches. An aggregate base was not discernable in Boring PB-11 below the bituminous pavement. Borings PB-1 and PB-2 consisted of surface aggregate only that were 12 and 36 inches in thickness, respectively.

Fill

PB-12 encountered fill below the pavement section and extended to 1.5 feet below ground surface. The fill consisted of sand with silt that was brown in color and moist.

Lacustrine Deposit

Below the pavement section and fill materials our borings encountered and terminated in lacustrine deposits. The lacustrine deposits consisted of silty sand and sand with silt that were fine-grained, various shades of brown and were moist before becoming wet or waterbearing.

Table 1 below presents the approximate pavement section thickness and subgrade soils that were encountered within the borings.

Table 1: Roadway Soil Boring Profiles

Boring No.	Bituminous Thickness (inches)	Aggregate Base Thickness (inches)	Subgrade Soils (Upper 4 feet)
PB-1	NE	12*	Silty Sand
PB-2	NE	36*	Silty Sand
PB-3	6	6	Silty Sand
PB-4	5	3	Silty Sand
PB-5	5	3	Silty Sand
PB-6	4	3	Silty Sand
PB-7	5	4	Silty Sand
PB-8	5	1	Silty Sand
PB-9	4	8	Silty Sand
PB-10	4	8	Silty Sand

Boring No.	Bituminous Thickness (inches)	Aggregate Base Thickness (inches)	Subgrade Soils (Upper 4 feet)
PB-11	8	ND	Silty Sand
PB-12	5	4	Fill: Sand with Silt; Silty Sand
PB-13	5	2	Silty Sand
PB-14	5	5	Silty Sand
PB-15	4	3	Silty Sand
PB-16	5	3	Silty Sand
PB-17	5	2	Silty Sand
PB-18	4	4	Silty Sand
PB-19	6	3	Sand with Silt
PB-20	5	6	Sand with Silt

NE – Not Encountered
ND – Not Discernable
*Surface Aggregate

3.3 Strength Characteristics

The penetration resistance N-values of the materials encountered were recorded during drilling and are indicated as blows per foot (BPF). Those values provide an indication of soil strength characteristics and are located on the boring log sheets. Also, visual-manual classification techniques and apparent moisture contents were also utilized to make an engineering judgment of the consistency of the materials.

Table 2 presents a summary of the penetration resistances in the soils for the standard penetration test borings completed and remarks regarding the material strengths of the soils.

Table 2: Penetration Resistances

Soil Type	Classification	Penetration Resistances	Remarks
Lacustrine	SP, SP-SM, SM	1 to 51 BPF Avg. ≈ 12 BPF	Very loose to very dense; Generally medium dense

The preceding is a generalized description of soil conditions at this site. Variations from the generalized profile exist and should be assessed from the boring logs, the normal geologic character of the deposits, and the soils uncovered during site excavation.

3.4 Groundwater Conditions

WSB took groundwater level readings in the exploratory borings, reviewed the data obtained, and discussed its interpretation of the data in the text of the report.

Groundwater was encountered in borings PB-1 and PB- 2 at a depth of 7 feet below ground surface. The other borings were only drilled to 5 foot depths and did not encounter ground water.

Note that groundwater levels may fluctuate due to seasonal variations (e.g. precipitation, snowmelt and rainfall) and/or other factors not evident at the time of measurement.

4. ENGINEERING ANALYSIS AND RECOMMENDATIONS

4.1 Discussion

Based on our borings it is our opinion that the proposed utilities and pavement can be supported on the lacustrine soils encountered in the borings.

Peat was not encountered in the borings as part of this investigation, however peat is identified in the vicinity according to the Anoka County Geologic Atlas. Peat is generally not suitable below pavement areas. The best option is complete removal of any peat deposits below the entire pavement area.

4.2 Utilities

Invert elevations are anticipated to be within 5 feet of existing grades and we anticipate the subgrade soils for the utilities will consist chiefly of silty sand and sand with silt. Underground utilities are expected to be installed by backhoes completing the excavations and placing pipe and backfills. Soil compactors should be used to compact the fill in thin even lifts to the specified densities.

4.3 Backfill and Fill Selection and Compaction

It is our opinion the onsite sand soils may be reused as backfill and fill provided they are moisture conditioned and can be compacted to their specified densities. Any wet soils excavated would need to be dried before reuse as an engineered fill. Backfills with cobbles larger than six inches (6") should not come in contact with utilities. We recommend that sandy soils be moisture conditioned to meet compaction specifications as determined from their standard Proctor tests (ASTM D-698). Sand fill should be spread in thin lifts (8-12 inches depending on compaction equipment) to allow for full depth compaction. Table 3 indicates the recommended compaction levels.

Table 3: Recommended Level of Compaction for Backfill and Fill

Area	Percent of Standard Proctor Maximum Dry Density
Pavement: Within 3 feet of grading grade* Within 3 foot perimeter of structures such as manholes	100
Pavement: Greater than 3 feet below grading grade	95
Utility Trench (unless within 3 feet of pavement grading grade)	95
Landscaping (non-structural)	90

*Grading grade is defined as the bottom of the aggregate base.

4.4 Dewatering

We do not anticipate groundwater to be present in the excavations at the assumed depths of the proposed storm sewer. If ground water is encountered during construction it is our opinion that it can be drawn down with sumps dug alongside the trench. Deeper excavations below the groundwater table, in sand soils, will likely require a sand point dewatering system.

4.5 Pavement Areas

After removal of the existing pavement section, we recommend proof roll tests on the subgrade soils to help identify areas that may require corrective action. The proof roll test should generally follow the requirements of MnDOT 2111, except a fully loaded tandem axle dump truck or a full water truck should be utilized for the proof roll. If the proof roll tests fail, excavation of the aggregate base and subgrade soils may be required. Corrective actions may include scarifying, disking, moisture control, and recompaction.

Once the site has been prepared as recommended, we anticipate the subgrade will consist of a mixture of sands, sands with silt, and silty sands. The MnDOT Flexible Pavement Design Guidance Memo from January 2017, indicates soils such as those anticipated have an estimated R-value of 20 to 70. Based on our experience, we recommend an estimated R-value of 30 be used for design of roadways at this site.

2017 MnDOT Traffic Data indicated that traffic volumes for Ball Street was approximately 8,000 for an Annual Average Daily Traffic (AADT) and Lever Street was about 1,800 for an AADT. We estimated that traffic volumes would increase at an average rate of 1%. Our design is based on a standard twenty (20) year design life of the pavement section.

Based on the estimated traffic AADT we used the State Aid 10 Ton ESAL Traffic Forecast Calculator to calculate the roadway traffic Equivalent Single Axle Loads (ESAL's) for the roadway designs. Our forecasting was based on a 10-ton road design and an urban vehicle classification on a 2-lane road.

It is our understanding that Lever Street from Ball Road to North Road will be a state aid road. Along the higher traffic volume state aid portion of the project, we calculated the 20-year flexible ESAL's will be less than 226,000. Furthermore, we calculated the 20-year flexible ESAL's for Ball Road NE from 104th Avenue alignment to Lever Street to be on the order of 852,000. For the rest of the project we have assumed the volume and distribution of vehicles using these roadways will have 20-year flexible ESAL's less than 75,000.

Based on MnDOT's FlexPave excel design utilizing granular equivalent charts, we recommend the pavement sections indicated below in Tables 4 (Lever Street), 5 (Ball Road NE), and 6 (remaining roadways).

Table 4: Lever Street from Ball Road to North Road Recommended Flexible Pavement Section

Section	Thickness (inches)	Granular Equivalent
Bituminous Course, MnDOT 2360 SPWEB240C	1 ½	3.4
Bituminous Course, MnDOT 2360 SPWEB240C	2	4.5
MnDOT Aggregate Base	6	6
TOTAL	-	13.9

Table 5: Ball Road NE from 104th Avenue Recommended Flexible Pavement Section

Section	Thickness (inches)	Granular Equivalent
Bituminous Course, MnDOT 2360 SPWEB240C	3	6.75
Bituminous Course, MnDOT 2360 SPWEB240C	3	6.75
MnDOT Aggregate Base	7	7
TOTAL	-	20.5

Table 6: Remaining Roadways Recommended Flexible Pavement Section

Section	Thickness (inches)	Granular Equivalent
Bituminous Course, MnDOT 2360 SPWEB240C	1 ½	3.4
Bituminous Course, MnDOT 2360 SPWEB240C	2	4.5
MnDOT Aggregate Base	4	4
TOTAL	-	11.9

We recommend that the bituminous pavement meet specification MnDOT 2360 SPWEB240C Bituminous Course. Aggregate base placement for pavement support should meet the gradation and quality requirements for Class 5, 5Q, or 6 per MnDOT specification 3138. All aggregate base material should be compacted to 100 percent of its standard Proctor maximum dry density.

Within several years after initial paving, some thermal shrinkage cracks will develop. We recommend routine maintenance be performed to improve pavement performance and increase pavement life. Pavement should be sealed with a liquid bitumen sealer to retard water intrusion into the base course and subgrade. Localized patch failures may also develop where trucks or buses turn on the pavement. When these occur, they should be cut out and patch repaired.

4.6 Construction Considerations

Good surface drainage should be maintained throughout the work so that the site is not vulnerable to ponding during or after a rainfall. The excavation for any soil correction to densify loose fill, or for excavation to footing depths, should not encounter groundwater intrusion. However, if water enters the excavations, it should be promptly removed prior to further construction activities. Under no circumstances should fill or concrete be placed into standing water. Trenches for underground utility lines serving the building addition are also expected to be dry.

Soil corrections at this site for foundations and pavement subgrades may not be continuous in all areas. We recommend tapering the fills back to native soils at a ten to one (10:1) slope.

It is important to review the fill limits and total depth of fill when placing structures upon compacted materials and when filling the excavation. The location of the footings must allow for at least a one to one (1:1) slope from the bottom of the footing to the outside limits of the engineered fill.

It is important to check this at the time of construction and to assure that during filling, unsuitable soils do not encroach within the one to one (1:1) slope limits and extending downward and outward from future footings.

4.7 Construction Safety

All excavations must comply with the requirements of OSHA 29 CFR, Part 1926, Subpart P “Excavations and Trenches”. This document states that excavation safety is the responsibility of the contractor. Reference to this OSHA requirement should be included in the job specifications.

The responsibility to provide safe working conditions on this site, for earthwork, building construction, or any associated operations is solely that of the contractor. This responsibility is not borne in any manner by WSB.

4.8 Cold Weather Construction

It is our understanding that construction is unlikely to occur during the winter months. However, if the construction does continue into the winter months we recommend the following guidelines.

Roadbed embankments should not be constructed during periods when the embankment material freezes while being placed and compacted, nor should any embankment material be placed on soil that is frozen to a depth greater than 4 inches. When the soils are frozen to a depth exceeding 4 inches, at a time when weather conditions are such that embankment construction could be continued without the material freezing as it is being placed and compacted, the contractor may be permitted to excavate the frozen soil and proceed with the embankment construction for so long as the weather will permit. The frozen soils should be pulverized or replaced with other suitable soils, as may be necessary to construct the embankments as specified. Only unfrozen fill should be used.

Placement of fill and/or foundation concrete must not be permitted on frozen soil, and the bearing soils under footings or under the floor slab should not be allowed to freeze after concrete is placed, because excessive post-construction settlement could occur as the frozen soils thaw.

4.9 Field Observation and Testing

The soil conditions illustrated on the Logs of Test Borings in Appendix A are indicative of the conditions only at the boring locations. For this reason, we recommend that all excavations at this site be observed by a soils engineer or technician prior to fill or backfill placement or construction of any foundation elements to determine if the soils are capable of supporting the fill backfill and/or foundation loads. These observations are necessary to judge if all unsuitable materials have been removed from within the planned construction area and an appropriate degree of lateral oversize has been provided.

WSB also recommends a representative number of field density tests be taken in all engineered fill and backfill placed to aid in judging its suitability. Fill placement and compaction should be monitored and tested to determine that the resulting fill and backfill conforms to specified density, strength or compressibility requirements. We recommend at least one compaction test for every 2,000 square feet of building area at vertical intervals not exceeding two (2) feet, and one compaction test for every 150 feet of utility trench at a vertical interval of two (2) feet. Prior to use, any proposed fill and backfill material should be submitted to the WSB laboratory for testing to verify compliance with recommendations and project specifications.

Dynamic Cone Penetrometer (DCP) tests can be completed in the aggregate base in lieu of density testing. We recommend following MnDOT Specification 2211.3.D.2.c.

WSB would be pleased to provide the necessary field observation, monitoring and testing services during construction.

4.10 Plan Review and Remarks

The observations, recommendations and conclusions described in this report are based primarily on information provided to WSB, obtained from our subsurface exploration, our experience, several necessary assumptions and the scopes of service developed for this project and are for the sole use of our client. We recommend that WSB be retained to perform a review of final design drawing and specifications to evaluate that the geotechnical engineering report has not been misinterpreted. Should there be any changes in the design or location of the structures related to this project or if there are any uncertainties in the report we should be notified. We would be pleased to review any project changes and modify the recommendations in this report (if necessary) or provide any clarification in writing.

The entire report should be kept together; for example, boring logs should not be removed and placed in the specifications separately.

The boring logs and related information included in this report are indicators of the subsurface conditions only at the specific locations indicated on the Soil Boring Exhibit and times noted on the Logs of Test Boring sheets in Appendix A. The subsurface conditions, including groundwater levels, at other locations on the site may differ significantly from conditions that existed at the time of sampling and at the boring locations.

The test borings were completed by WSB solely to obtain indications of subsurface conditions as part of a geotechnical exploration program. No services were performed to evaluate subsurface environmental conditions.

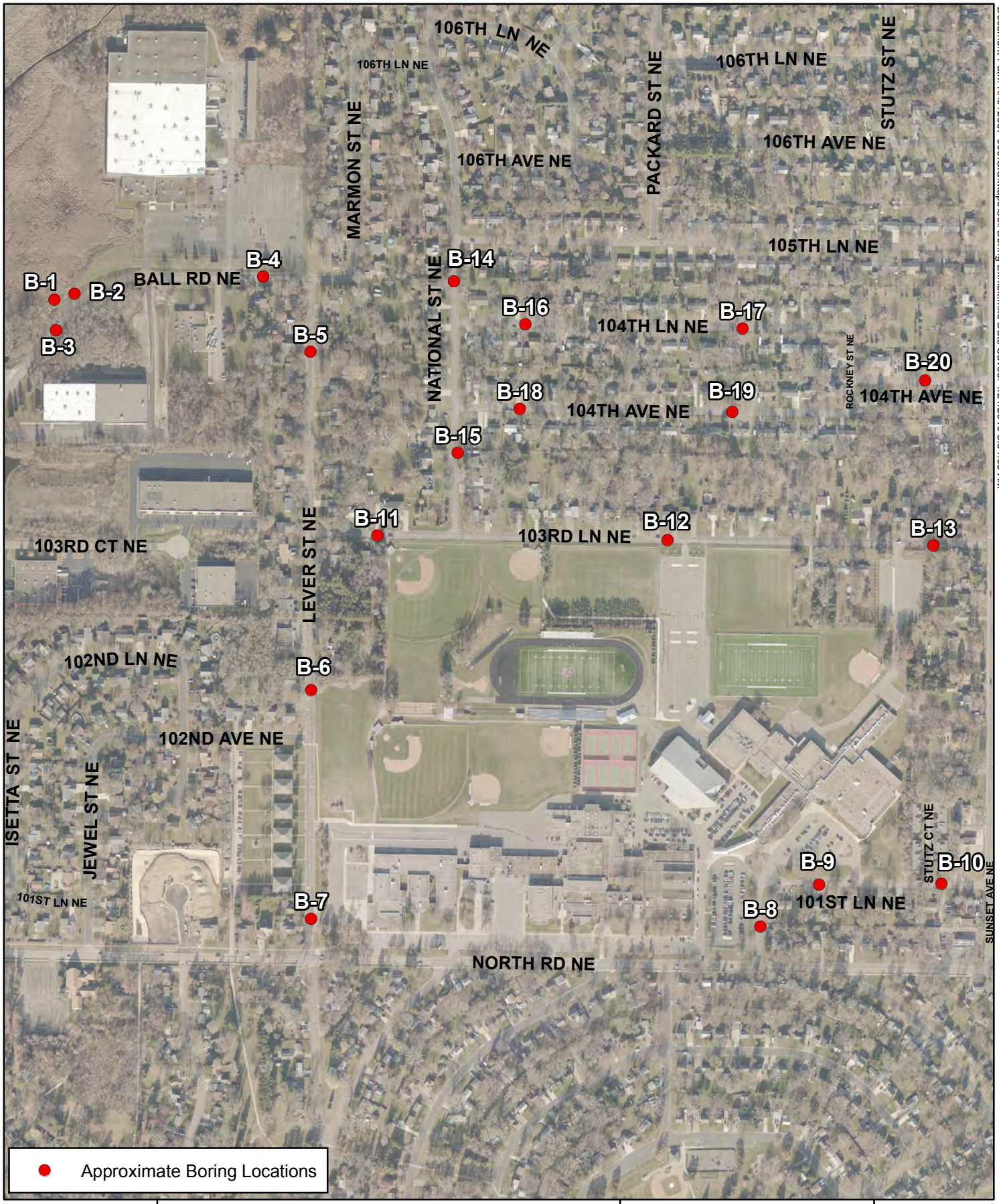
WSB has not performed any observations, investigations, studies or testing that is not specifically listed in the scope of service. WSB shall not be liable for failing to discover any condition whose discovery required the performance of services not authorized by the Agreement.

5. STANDARD OF CARE

The recommendations and opinions contained in this report are based on our professional judgment. The soil testing and geotechnical engineering services performed for this project have been performed with the level of skill and diligence ordinarily exercised by reputable members of the same profession under similar circumstances, at the same time and in the same or a similar locale. No warranty, either express or implied, is made.

APPENDIX A

Soil Boring Exhibit
Log of Test Borings
Symbols and Terminology on Test Boring Log
Notice to Report Users Boring Log Information
Unified Soil Classification Sheet (USCS)



BlaineMN.gov

Soil Boring Exhibit

Local Street Reconstruction
Blaine, MN
WSB Project #012837-000

N

0 500 Feet
1 inch = 500 feet

wsb

LOG OF TEST BORING

PROJECT NAME: Lever Street Area Reconstruction PROJECT LOCATION: Blaine, MN

CLIENT/WSB #: R-012837-000

BORING NUMBER PB-1

PAGE 1 OF 1

DEPTH (ft)	DESCRIPTION OF MATERIAL	USCS	GEOLOGIC ORIGIN	N	WL	SAMPLE No.	SAMPLE TYPE
0	SURFACE AGGREGATE, Sand with Silt and a Little Gravel, fine to medium grained, dark brown, moist		Fill				
1	SILTY SAND, fine grained, brown, moist, medium dense	SM	Lacustrine			1	HSA
3				13		2	SB
5				21		3	SB
7	SAND, fine grained, brown, waterbearing, medium dense to loose	SP			▽		
8				17		4	SB
10				6		5	SB
12	SAND, fine grained, gray, waterbearing, loose to very loose	SP					
13				7		6	SB
15				7		7	SB
20				1		8	SB
21	End of Boring 21.0 ft.						

WATER LEVEL MEASUREMENTS

START: 1/07/2019 END: 1/07/2019

DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	WATER DEPTH	WATER ELEVATION	METHOD	Crew Chief:	Logged By:
								D. Bailey	T. Meyers
1/07/2019	11:30 am	21	19.5	8	7.0		3 1/4" HSA 0' - 19.5'	Notes:	

2018 WSB GEOTECHNICAL TEMPLATE - WSB.GDT - 1/17/19 07:52 - K:\012837-000\GEOTECH-CMT\2019 STREET IMPROVEMENTS.GPJ

LOG OF TEST BORING

PROJECT NAME: Lever Street Area Reconstruction PROJECT LOCATION: Blaine, MN

CLIENT/WSB #: R-012837-000

BORING NUMBER PB-2

PAGE 1 OF 1

DEPTH (ft)	DESCRIPTION OF MATERIAL	USCS	GEOLOGIC ORIGIN	N	WL	SAMPLE No.	SAMPLE TYPE
0	SURFACE AGGREGATE, Sand with Silt and a Little Gravel, fine to medium grained, dark brown, moist		Fill			1	HSA
3	SILTY SAND, fine grained, brown, moist, medium dense	SM	Lacustrine	23		2	SB
5				18		3	SB
7					▽		
8	SAND, fine grained, brown, wet, medium dense	SP		15		4	SB
10	SAND, fine grained, gray, waterbearing, very loose to medium dense	SP		2		5	SB
13				3		6	SB
15				8		7	SB
20				12		8	SB
21	End of Boring 21.0 ft.						

WATER LEVEL MEASUREMENTS

START: 1/07/2019 END: 1/07/2019

DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	WATER DEPTH	WATER ELEVATION	METHOD	Crew Chief:	Logged By:
								D. Bailey	T. Meyers
1/07/2019	10:30 am	21	19.5	8	7.0		3 1/4" HSA 0' - 19.5'	Notes:	

2018 WSB GEOTECHNICAL TEMPLATE - WSB.GDT - 1/17/19 07:52 - K:\012837-000\GEOTECH-CMT\2019 STREET IMPROVEMENTS.GPJ

LOG OF TEST BORING

PROJECT NAME: Lever Street Area Reconstruction PROJECT LOCATION: Blaine, MN

CLIENT/WSB #: R-012837-000

BORING NUMBER PB-3

PAGE 1 OF 1

DEPTH (ft)	DESCRIPTION OF MATERIAL	USCS	GEOLOGIC ORIGIN	N	WL	SAMPLE No.	SAMPLE TYPE
	6" Asphalt Pavement over 6" Aggregate Base		Fill				
1	SILTY SAND, fine grained, brown, moist, very dense to medium dense	SM	Lacustrine			1	HSA
3				51		2	SB
4				19		3	SB
5	End of Boring 5.0 ft.						

WATER LEVEL MEASUREMENTS

START: 1/07/2019 END: 1/07/2019

DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	WATER DEPTH	WATER ELEVATION	METHOD
1/07/2019	11:40 am	5	3.5		None		3 1/4" HSA 0' - 3.5'

Crew Chief: D. Bailey

Logged By: T. Meyers

Notes:

LOG OF TEST BORING

PROJECT NAME: Lever Street Area Reconstruction PROJECT LOCATION: Blaine, MN
CLIENT/WSB #: R-012837-000

BORING NUMBER PB-4
PAGE 1 OF 1

DEPTH (ft)	DESCRIPTION OF MATERIAL	USCS	GEOLOGIC ORIGIN	N	WL	SAMPLE No.	SAMPLE TYPE
	5" Asphalt Pavement over 3" Aggregate Base		Fill				
1	SILTY SAND, fine grained, light brown, moist, medium dense to loose	SM	Lacustrine			1	HSA
3	- Percent Passing the #200 Sieve = 22 %			16		2	SB
4				9		3	SB
5	End of Boring 5.0 ft.						

WATER LEVEL MEASUREMENTS

START: 1/07/2019 END: 1/07/2019

DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	WATER DEPTH	WATER ELEVATION	METHOD
1/07/2019	12:15 pm	5	3.5		None		3 1/4" HSA 0' - 3.5'

Crew Chief: D. Bailey
Logged By: T. Meyers
Notes:

LOG OF TEST BORING

PROJECT NAME: Lever Street Area Reconstruction PROJECT LOCATION: Blaine, MN

CLIENT/WSB #: R-012837-000

BORING NUMBER PB-5

DEPTH (ft)	DESCRIPTION OF MATERIAL	USCS	GEOLOGIC ORIGIN	N	WL	SAMPLE No.	SAMPLE TYPE
	5" Asphalt Pavement over 3" Aggregate Base		Fill				
1	SILTY SAND, fine grained, light brown, moist, medium dense to loose	SM	Lacustrine			1	HSA
3				17		2	SB
4				8		3	SB
5	End of Boring 5.0 ft.						
6							
7							
8							

WATER LEVEL MEASUREMENTS

START: 1/07/2019 END: 1/07/2019

DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	WATER DEPTH	WATER ELEVATION	METHOD
1/07/2019	12:30 pm	5	3.5		None		3 1/4" HSA 0' - 3.5'

Crew Chief: D. Bailey

Logged By: T. Meyers

Notes:

LOG OF TEST BORING

PROJECT NAME: Lever Street Area Reconstruction PROJECT LOCATION: Blaine, MN

CLIENT/WSB #: R-012837-000

BORING NUMBER PB-6

DEPTH (ft)	DESCRIPTION OF MATERIAL	USCS	GEOLOGIC ORIGIN	N	WL	SAMPLE No.	SAMPLE TYPE
	4" Asphalt Pavement over 3" Aggregate Base		Fill				
1	SILTY SAND, fine grained, light brown, moist, loose	SM	Lacustrine			1	HSA
3				9		2	SB
4				5		3	SB
5	End of Boring 5.0 ft.						

WATER LEVEL MEASUREMENTS

START: 1/07/2019 END: 1/07/2019

DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	WATER DEPTH	WATER ELEVATION	METHOD
1/07/2019	1:00 pm	5	3.5		None		3 1/4" HSA 0' - 3.5'

Crew Chief: D. Bailey

Logged By: T. Meyers

Notes:

LOG OF TEST BORING

PROJECT NAME: Lever Street Area Reconstruction PROJECT LOCATION: Blaine, MN

CLIENT/WSB #: R-012837-000

BORING NUMBER PB-7

PAGE 1 OF 1

DEPTH (ft)	DESCRIPTION OF MATERIAL	USCS	GEOLOGIC ORIGIN	N	WL	SAMPLE No.	SAMPLE TYPE
	5" Asphalt Pavement over 4" Aggregate Base		Fill				
1	SILTY SAND, fine grained, light brown, moist, dense to medium dense	SM	Lacustrine			1	HSA
3				38		2	SB
4				17		3	SB
5	End of Boring 5.0 ft.						
6							
7							
8							

WATER LEVEL MEASUREMENTS

START: 1/07/2019 END: 1/07/2019

DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	WATER DEPTH	WATER ELEVATION	METHOD
1/07/2019	1:20 pm	5	3.5		None		3 1/4" HSA 0' - 3.5'

Crew Chief: D. Bailey

Logged By: T. Meyers

Notes:

LOG OF TEST BORING

PROJECT NAME: Lever Street Area Reconstruction PROJECT LOCATION: Blaine, MN

CLIENT/WSB #: R-012837-000

BORING NUMBER PB-8

PAGE 1 OF 1

DEPTH (ft)	DESCRIPTION OF MATERIAL	USCS	GEOLOGIC ORIGIN	N	WL	SAMPLE No.	SAMPLE TYPE
	5" Asphalt Pavement over 1" Aggregate Base		Fill				
1	SILTY SAND, fine grained, light brown, moist, medium dense to loose	SM	Lacustrine			1	HSA
3				12		2	SB
4				9		3	SB
5	End of Boring 5.0 ft.						

WATER LEVEL MEASUREMENTS

START: 1/08/2019 END: 1/08/2019

DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	WATER DEPTH	WATER ELEVATION	METHOD
1/08/2019	9:40 am	5	3.5		None		3 1/4" HSA 0' - 3.5'

Crew Chief: D. Bailey

Logged By: T. Meyers

Notes:

2018 WSB GEOTECHNICAL TEMPLATE - WSB.GDT - 1/17/19 07:52 - K:\012837-000\GEOTECH-CMT\2019 STREET IMPROVEMENTS.GPJ

LOG OF TEST BORING

PROJECT NAME: Lever Street Area Reconstruction PROJECT LOCATION: Blaine, MN

CLIENT/WSB #: R-012837-000

BORING NUMBER PB-9

PAGE 1 OF 1

DEPTH (ft)	DESCRIPTION OF MATERIAL	USCS	GEOLOGIC ORIGIN	N	WL	SAMPLE No.	SAMPLE TYPE
	4" Asphalt Pavement over 8" Aggregate Base		Fill				
1	SILTY SAND, fine grained, light brown, moist, loose	SM	Lacustrine			1	HSA
3				9		2	SB
4				5		3	SB
5	End of Boring 5.0 ft.						

WATER LEVEL MEASUREMENTS

START: 1/08/2019 END: 1/08/2019

DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	WATER DEPTH	WATER ELEVATION	METHOD
1/08/2019	10:30 am	5	3.5		None		3 1/4" HSA 0' - 3.5'

Crew Chief: D. Bailey

Logged By: T. Meyers

Notes:

LOG OF TEST BORING

PROJECT NAME: Lever Street Area Reconstruction PROJECT LOCATION: Blaine, MN

CLIENT/WSB #: R-012837-000

BORING NUMBER PB-10

DEPTH (ft)	DESCRIPTION OF MATERIAL	USCS	GEOLOGIC ORIGIN	N	WL	SAMPLE No.	SAMPLE TYPE
	4" Asphalt Pavement over 8" Aggregate Base		Fill				
1	SILTY SAND, fine grained, light brown, moist, medium dense to loose	SM	Lacustrine			1	HSA
3				14		2	SB
4				10		3	SB
5	End of Boring 5.0 ft.						
6							
7							
8							

WATER LEVEL MEASUREMENTS

START: 1/08/2019 END: 1/08/2019

DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	WATER DEPTH	WATER ELEVATION	METHOD
1/08/2019	10:10 am	5	3.5		None		3 1/4" HSA 0' - 3.5'

Crew Chief: D. Bailey

Logged By: T. Meyers

Notes:

LOG OF TEST BORING

PROJECT NAME: Lever Street Area Reconstruction PROJECT LOCATION: Blaine, MN

CLIENT/WSB #: R-012837-000

BORING NUMBER PB-11

PAGE 1 OF 1

DEPTH (ft)	DESCRIPTION OF MATERIAL	USCS	GEOLOGIC ORIGIN	N	WL	SAMPLE No.	SAMPLE TYPE
	8" Asphalt Pavement		Fill				
1	SILTY SAND, fine grained, light brown, moist, loose	SM	Lacustrine			1	HSA
3	- Percent Passing the #200 Sieve = 20%			6		2	SB
4				5		3	SB
5	End of Boring 5.0 ft.						

WATER LEVEL MEASUREMENTS

START: 1/07/2019 END: 1/07/2019

DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	WATER DEPTH	WATER ELEVATION	METHOD
1/07/2019	2:00 pm	5	3.5		None		3 1/4" HSA 0' - 3.5'

Crew Chief: D. Bailey

Logged By: T. Meyers

Notes:

LOG OF TEST BORING

PROJECT NAME: Lever Street Area Reconstruction PROJECT LOCATION: Blaine, MN

CLIENT/WSB #: R-012837-000

BORING NUMBER PB-12

PAGE 1 OF 1

DEPTH (ft)	DESCRIPTION OF MATERIAL	USCS	GEOLOGIC ORIGIN	N	WL	SAMPLE No.	SAMPLE TYPE
	5" Asphalt Pavement over 4" Aggregate Base		Fill				
1	FILL, Sand with Silt, fine grained, brown, moist					1	HSA
2	SILTY SAND, fine grained, light brown, moist, medium dense to loose	SM	Lacustrine				
3				11		2	SB
4				8		3	SB
5	End of Boring 5.0 ft.						
6							
7							
8							

WATER LEVEL MEASUREMENTS

START: 1/07/2019 END: 1/07/2019

DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	WATER DEPTH	WATER ELEVATION	METHOD
1/07/2019	2:20 pm	5	3.5		None		3 1/4" HSA 0' - 3.5'

Crew Chief: D. Bailey

Logged By: T. Meyers

Notes:

LOG OF TEST BORING

PROJECT NAME: Lever Street Area Reconstruction PROJECT LOCATION: Blaine, MN

CLIENT/WSB #: R-012837-000

BORING NUMBER PB-13

DEPTH (ft)	DESCRIPTION OF MATERIAL	USCS	GEOLOGIC ORIGIN	N	WL	SAMPLE No.	SAMPLE TYPE
	5" Asphalt Pavement over 2" Aggregate Base		Fill				
1	SILTY SAND, fine grained, light brown, moist, loose to very loose	SM	Lacustrine			1	HSA
3				9		2	SB
4				4		3	SB
5	End of Boring 5.0 ft.						
6							
7							
8							

WATER LEVEL MEASUREMENTS

START: 1/07/2019 END: 1/07/2019

DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	WATER DEPTH	WATER ELEVATION	METHOD
1/07/2019	2:45 pm	5	3.5		None		3 1/4" HSA 0' - 3.5'

Crew Chief: D. Bailey

Logged By: T. Meyers

Notes:

LOG OF TEST BORING

PROJECT NAME: Lever Street Area Reconstruction PROJECT LOCATION: Blaine, MN

CLIENT/WSB #: R-012837-000

BORING NUMBER PB-14

PAGE 1 OF 1

DEPTH (ft)	DESCRIPTION OF MATERIAL	USCS	GEOLOGIC ORIGIN	N	WL	SAMPLE No.	SAMPLE TYPE
	5" Asphalt Pavement over 5" Aggregate Base		Fill				
1	SILTY SAND, fine grained, light brown, moist, loose to medium dense	SM	Lacustrine			1	HSA
3				6		2	SB
4				14		3	SB
5	End of Boring 5.0 ft.						

WATER LEVEL MEASUREMENTS

START: 1/08/2019 END: 1/08/2019

DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	WATER DEPTH	WATER ELEVATION	METHOD
1/08/2019	12:15 pm	5	3.5		None		3 1/4" HSA 0' - 3.5'

Crew Chief: D. Bailey

Logged By: T. Meyers

Notes:

2018 WSB GEOTECHNICAL TEMPLATE - WSB.GDT - 1/17/19 07:52 - K:\012837-000\GEOTECH-CMT\2019 STREET IMPROVEMENTS.GPJ

LOG OF TEST BORING

PROJECT NAME: Lever Street Area Reconstruction PROJECT LOCATION: Blaine, MN

CLIENT/WSB #: R-012837-000

BORING NUMBER PB-15

PAGE 1 OF 1

DEPTH (ft)	DESCRIPTION OF MATERIAL	USCS	GEOLOGIC ORIGIN	N	WL	SAMPLE No.	SAMPLE TYPE
	4" Asphalt Pavement over 3" Aggregate Base		Fill				
1	SILTY SAND, fine grained, light brown, moist, loose	SM	Lacustrine			1	HSA
3				8		2	SB
4				5		3	SB
5	End of Boring 5.0 ft.						

WATER LEVEL MEASUREMENTS

START: 1/07/2019 END: 1/07/2019

DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	WATER DEPTH	WATER ELEVATION	METHOD
1/07/2019	3:00 pm	5	3.5		None		3 1/4" HSA 0' - 3.5'

Crew Chief: D. Bailey

Logged By: T. Meyers

Notes:

LOG OF TEST BORING

PROJECT NAME: Lever Street Area Reconstruction PROJECT LOCATION: Blaine, MN

CLIENT/WSB #: R-012837-000

BORING NUMBER PB-16

PAGE 1 OF 1

DEPTH (ft)	DESCRIPTION OF MATERIAL	USCS	GEOLOGIC ORIGIN	N	WL	SAMPLE No.	SAMPLE TYPE
	5" Asphalt Pavement over 3" Aggregate Base		Fill				
1	SILTY SAND, fine grained, brown, moist, medium dense	SM	Lacustrine			1	HSA
2							
3				16		2	SB
4	SAND WITH SILT, fine grained, light brown, moist, very loose	SP-SM	Lacustrine	3		3	SB
5	End of Boring 5.0 ft.						
6							
7							
8							

WATER LEVEL MEASUREMENTS

START: 1/08/2019 END: 1/08/2019

DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	WATER DEPTH	WATER ELEVATION	METHOD
1/08/2019	12:00 pm	5	3.5		None		3 1/4" HSA 0' - 3.5'

Crew Chief: D. Bailey

Logged By: T. Meyers

Notes:

LOG OF TEST BORING

PROJECT NAME: Lever Street Area Reconstruction PROJECT LOCATION: Blaine, MN

CLIENT/WSB #: R-012837-000

BORING NUMBER PB-17

PAGE 1 OF 1

DEPTH (ft)	DESCRIPTION OF MATERIAL	USCS	GEOLOGIC ORIGIN	N	WL	SAMPLE No.	SAMPLE TYPE
	5" Asphalt Pavement over 2" Aggregate Base		Fill				
1	SILTY SAND, fine grained, brown, moist, loose	SM	Lacustrine			1	HSA
3				9		2	SB
4	SAND WITH SILT, fine grained, gray, moist, loose	SP-SM					
5				10		3	SB
	End of Boring 5.0 ft.						

WATER LEVEL MEASUREMENTS

START: 1/08/2019 END: 1/08/2019

DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	WATER DEPTH	WATER ELEVATION	METHOD
1/08/2019	11:40 am	5	3.5		None		3 1/4" HSA 0' - 3.5'

Crew Chief: D. Bailey

Logged By: T. Meyers

Notes:

LOG OF TEST BORING

PROJECT NAME: Lever Street Area Reconstruction PROJECT LOCATION: Blaine, MN

CLIENT/WSB #: R-012837-000

BORING NUMBER PB-18

PAGE 1 OF 1

DEPTH (ft)	DESCRIPTION OF MATERIAL	USCS	GEOLOGIC ORIGIN	N	WL	SAMPLE No.	SAMPLE TYPE
	4" Asphalt Pavement over 4" Aggregate Base		Fill				
1	SILTY SAND, fine grained, light brown, moist, medium dense to loose	SM	Lacustrine			1	HSA
3				21		2	SB
4				5		3	SB
5	End of Boring 5.0 ft.						

WATER LEVEL MEASUREMENTS

START: 1/08/2019 END: 1/08/2019

DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	WATER DEPTH	WATER ELEVATION	METHOD
1/08/2019	11:25 am	5	3.5		None		3 1/4" HSA 0' - 3.5'

Crew Chief: D. Bailey

Logged By: T. Meyers

Notes:

LOG OF TEST BORING

PROJECT NAME: Lever Street Area Reconstruction PROJECT LOCATION: Blaine, MN

CLIENT/WSB #: R-012837-000

BORING NUMBER PB-19

PAGE 1 OF 1

DEPTH (ft)	DESCRIPTION OF MATERIAL	USCS	GEOLOGIC ORIGIN	N	WL	SAMPLE No.	SAMPLE TYPE
	6" Asphalt Pavement over 3" Aggregate Base		Fill				
1	SAND WITH SILT, fine grained, light brown, moist, medium dense to loose	SP-SM	Lacustrine			1	HSA
3				16		2	SB
4				6		3	SB
5	End of Boring 5.0 ft.						
6							
7							
8							

WATER LEVEL MEASUREMENTS

START: 1/08/2019 END: 1/08/2019

DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	WATER DEPTH	WATER ELEVATION	METHOD
1/08/2019	11:15 am	5	3.5		None		3 1/4" HSA 0' - 3.5'

Crew Chief: D. Bailey

Logged By: T. Meyers

Notes:

LOG OF TEST BORING

PROJECT NAME: Lever Street Area Reconstruction PROJECT LOCATION: Blaine, MN

CLIENT/WSB #: R-012837-000

BORING NUMBER PB-20

PAGE 1 OF 1

DEPTH (ft)	DESCRIPTION OF MATERIAL	USCS	GEOLOGIC ORIGIN	N	WL	SAMPLE No.	SAMPLE TYPE
	5" Asphalt Pavement over 6" Aggregate Base		Fill				
1	SAND WITH SILT, fine grained, light brown, moist, medium dense to loose	SP-SM	Lacustrine			1	HSA
3	- Percent Passing the #200 Sieve = 10 %			12		2	SB
4				6		3	SB
5	End of Boring 5.0 ft.						
6							
7							
8							

WATER LEVEL MEASUREMENTS

START: 1/08/2019 END: 1/08/2019

DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	WATER DEPTH	WATER ELEVATION	METHOD
1/08/2019	10:45 am	5	3.5		None		3 1/4" HSA 0' - 3.5'

Crew Chief: D. Bailey

Logged By: T. Meyers

Notes:

SYMBOLS AND TERMINOLOGY ON TEST BORING LOG

SYMBOLS

Drilling and Sampling

Symbol	Description
HSA	3 1/4" LD. Hollow Stem Auger
FA	Flight Auger
HA	Hand Auger
RC	Size A, B, or N rotary casing
CS	Continuous split barrel sampling
DM	Drilling Mud
JW	Jetting Water
SB	2" O.D. split barrel sampling
_L	2 1/2" or 3 1/2" OD split barrel liner sampler
_T	2" or 3" thin walled tube sample
W	Wash sample
B	Bag sample
P	Test Pit sample
_Q	BQ, NQ, or PQ wire line system
_X	AX, BX, or NX double tube barrel
N	Standard penetration test, blow per foot
CR	Core recovery, percent
WL	Water level
n/a	no measurement recorded

Laboratory Testing

Symbol	Description
MC	Moisture content, % (ASTM D2216)
DD	Dry Density, pcf
LL	Liquid Limit (ASTM D4318)
PL	Plastic Limit (ASTM D4318)
	- Inserts in last column
Qu	Unconfined compressive strength, psf (ASTM D2166)
Pq	Penetrometer Reading, tsf (ASTM D1558)
Ts	Torvane Reading, ts
G	Specific Gravity (ASTM D854)
SL	Shrinkage limits (ASTM D427)
OC	Organic Contenct (ASTM D2974)
SP	Swell Pressure, tsf (ASTM D4546)
PS	Percent swell under pressure (ASTM D4546)
FS	Free swell, % (ASTM D4546)
SS	Shrink swell, % (ASTM D4546)
pH	
SC	Sulfate content, parts/million or mg/l
CC	Chloride content, parts/million or mg/l
C	One dimensional consolidation (ASTM D2435)
Qc	Triaxial compression (ASTM D2850 and D4767)
DS	Direct Shear (ASTM D3080)
K	Coefficient of permeability, cm/sec (ASTM D2434)
P	Pinhole Test (ASTM D4647)
DH	Double hydrometer (ASTM D4221)
MA	Particle size analysis (ASTM D422)
R	Laboratory electreical resistivity, ohm-cm (ASTM G57)
VS	Field vane shear (ASTM D2573)
RQD	Rock quality designation, percent
IR	Infiltration Test (ASTM D3385)

TERMINOLOGY

Particle Sizes

Type	Size Range
Boulders	> 12"
Cobbles	3" - 12"
Coarse gravel	3/4" - 3"
Fine gravel	#4 sieve - 3/4"
Coarse sand	#4 sieve - #10 sieve
Medium sand	#10 sieve - #40 sieve
Fine sand	#40 sieve - #200 sieve
Silt	100% passing #200 sieve, and > 0.002mm
Clay	100% passing #200 sieve, and < 0.002mm

Soil Layering and Moisture

Term	Visual Observation
Lenses	Small pockets of different soils
Lamination	< 1/4" thick stratum
Layer	1/4" - 12" thick stratum
Stratified	Altering lenses of varying materials or colors
Varved	Altering laminations of clay, silt, fine sand, or colors
Dry	Powdery, no noticeable water
Moist	Damp, below saturation
Wet	MC above plastic limit
Waterbearing	Pervious soil below water table
Saturated	Cohesive soil with MC above liquit limit

Gravel Content

Coarse-Grained Soils

% Gravel	Description
2 - 15	A little gravel
16 - 30	With gravel
31 - 49	Gravelly

Fine-Grained Soils

% Gravel	Description
2 -5	Trace of gravel
5 -15	a little gravel
16 - 30	with gravel
31 - 49	Gravelly

Standard Pentration Resistance (N-value)

Cohesionless Soils

N-Value	Relative Density
0 - 4	Very loose
5 - 10	Loose
11 - 30	Medium dense
31 - 50	Dense
>50	Very dense

Cohesive Soils

N-Value	Consistency
0 - 4	Very soft
5 - 8	Soft
9 - 15	Firm
16 - 30	Hard
>30	Very hard

NOTICE TO REPORT USERS BORING LOG INFORMATION

Subsurface Profiles

The subsurface stratification lines on the graphic representation of the test borings show an approximate boundary between soil types or rock. The transition between materials is approximate and is usually far more gradual than shown. Estimating excavation depths, soil volumes, and other computations relying on the subsurface strata may not be possible to any degree of accuracy.

Water Level

WSB & Associates, Inc. took groundwater level readings in the exploratory borings, reviewed the data obtained, and discussed its interpretation of the data in the text of this report. The groundwater level may fluctuate due to seasonal variations caused by precipitation, snowmelt, rainfalls, construction or remediation activities, and/or other factors not evident at the time of measurement.

The actual determination of the subsurface water level is an interpretive process. Subsurface water level may not be accurately depicted by the levels indicated on the boring logs. Normally, a subsurface exploration obtains general information regarding subsurface features for design purposes. An accurate determination of subsurface water levels is not possible with a typical scope of work. The use of the subsurface water level information provided for estimating purposes or other site review can present a moderate to high risk of error.

The following information is obtained in the field and noted under "Water Level Measurements" at the bottom of the log.

Sample Depth:	The lowest depth of soil sampling at the time a water level measurement is taken.
Casing Depth:	The depth to the bottom of the casing or hollow stem auger at the time of water level measurement.
Cave-in Depth:	The depth at which a measuring tape stops in the bore hole.
Water Level:	The point in the bore hole at which free-standing water is encountered by a measure device from the surface.

Obstruction Depths

Obstructions and/or obstruction depths may be noted on the boring logs. Obstruction indicates the sampling equipment encountered resistance to penetration. It must be realized that continuation of drilling, the use of other drilling equipment or further exploration may provide information other than that depicted on the logs. The correlation of obstruction depths on the log with construction features such as rock excavation, foundation depths, or buried debris cannot normally be determined with any degree of accuracy. For example, penetration of weathered rock by soil sampling equipment may not correlate with removal by certain types of construction equipment. Using this information for estimating purposes often results in a high degree of misinterpretation.

Accurately identifying the obstruction or estimating depths where hard rock is present over the site requires a scope of service beyond the normal geotechnical exploration program. The risk of using the information noted on the boring logs for estimating purposes must be understood.

wsb

UNIFIED SOIL CLASSIFICATION SYSTEM

UNIFIED SOIL CLASSIFICATION AND SYMBOL CHART

COARSE-GRAINED SOILS (more than 50% of material is larger than No. 200 sieve size.)			
GRAVELS More than 50% of coarse fraction larger than No. 4 sieve size	Clean Gravels (Less than 5% fines)		
		GW	Well-graded gravels, gravel-sand mixtures, little or no fines
		GP	Poorly-graded gravels, gravel-sand mixtures, little or no fines
	Gravels with fines (More than 12% fines)		
		GM	Silty gravels, gravel-sand-silt mixtures
		GC	Clayey gravels, gravel-sand-clay mixtures
SANDS 50% or more of coarse fraction smaller than No. 4 sieve size	Clean Sands (Less than 5% fines)		
		SW	Well-graded sands, gravelly sands, little or no fines
		SP	Poorly graded sands, gravelly sands, little or no fines
	Sands with fines (More than 12% fines)		
		SM	Silty sands, sand-silt mixtures
		SC	Clayey sands, sand-clay mixtures
FINE-GRAINED SOILS (50% or more of material is smaller than No. 200 sieve size.)			
SILTS AND CLAYS Liquid limit less than 50%		ML	Inorganic silts and very fine sands, rock flour, silty of clayey fine sands or clayey silts with slight plasticity
		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 50% or greater		MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts
		CH	Inorganic clays of high plasticity, fat clays
		OH	Organic clays of medium to high plasticity, organic silts
HIGHLY ORGANIC SOILS		PT	Peat and other highly organic soils

LABORATORY CLASSIFICATION CRITERIA

GW	$C_u = \frac{D_{60}}{D_{10}}$ greater than 4; $C_c = \frac{D_{30}}{D_{10} \times D_{60}}$ between 1 and 3	
GP	Not meeting all gradation requirements for GW	
GM	Atterberg limits below "A" line or P.I. less than 4	Above "A" line with P.I. between 4 and 7 are borderline cases requiring use of dual symbols
GC	Atterberg limits above "A" line with P.I. greater than 7	
SW	$C_u = \frac{D_{60}}{D_{10}}$ greater than 4; $C_c = \frac{D_{30}}{D_{10} \times D_{60}}$ between 1 and 3	
SP	Not meeting all gradation requirements for GW	
SM	Atterberg limits below "A" line or P.I. less than 4	Limits plotting in shaded zone with P.I. between 4 and 7 are borderline cases requiring use of dual symbols.
SC	Atterberg limits above "A" line with P.I. greater than 7	

Determine percentages of sand and gravel from grain-size curve. Depending on percentage of fines (fraction smaller than No. 200 sieve size), coarse-grained soils are classified as follows:

Less than 5 percent ..... GW, GP, SW, SP
More than 12 percent ..... GM, GC, SM, SC
5 to 12 percent ..... Borderline cases requiring dual symbols

PLASTICITY CHART