BOLTON & MENK
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August 2nd, 2024

Dave Bennett, Public Works Director / City Engineer
Justin Wagner, Utilities Manager
801 Washington Street
Northfield, MN 55057

RE: NW Area Sanitary Sewer Analysis
City of Northfield, MN
Project No.: 0M2.128679

Executive Summary

Project Background

Bolton & Menk partnered with the City of Northfield to assess the impacts of future development on the existing and future sanitary sewer infrastructure in the Northwest Area. The study aimed to:

- Implement and analyze sanitary sewer flow monitoring equipment to determine the capacity of the existing trunk sewer along Lincoln Parkway.
- Estimate future wastewater contributions based on city-provided AUARs, Comprehensive Plans, and development plans.
- Confirm if the current infrastructure can meet present and future wastewater demands.
- Recommend infrastructure improvement considerations, including preliminary trunk sewer alignments, sizing, and cost estimates.

Flow Monitoring

Data was collected at 15-minute intervals over 49 days, from May 5th to June 22nd, 2024, during which 11 significant rain events were observed. This data, combined with the City's Comprehensive Sewer Plan and 10 state standards, helped assess the sewer capacity. Data from the monitoring locations shows the current infrastructure is adequately sized for the existing sewershed.

Development Service Discharge

Two proposed development sites, Cedar Meadows (60 acres) and Kraewood (12.9 acres), will discharge into the existing trunk sewer along Lincoln Parkway. Flow projections for these developments were incorporated into the analysis, indicating the existing infrastructure can support these new developments without exceeding 80% capacity.

Northwest Area Future Development

Future development scenarios were analyzed for the 1407 acres in the Northwest Area, projecting a peak flow of 6.1 million gallons per day. The analysis shows the existing infrastructure lacks the capacity to support the projected flows from this future development and a regional lift station and trunk sewer should be explored.

Northwest Area Regional Lift Station and Trunk Sewer Routing

Three options for routing and infrastructure improvements were evaluated:

- **Option 1: Lincoln Parkway** - The forcemain routes east on 320th Street, south on Eveleth Ave, and discharges into a gravity sewer near Thye Pkwy. It flows south to North Ave, follows Falk Ave, then east through Lincoln Pkwy to Dresden Ave, and crosses Highway 3 near Sheldahl Flexible Technologies. This option does not account for additional North Area residential development flows.

- **Option 2: 320th-Sheldahl** - The forcemain routes east along 320th Street, discharging into a gravity sewer between Eveleth Ave and the Progressive Railroad. It continues east on 320th Street to Dresden Ave, then south to Fremouw Ave, combining with flows from Viking Terrace, Cedar Meadows, and Kraewood. The sewer crosses Highway 3, discharging into the existing sewer downstream of Sheldahl Flexible Technologies. Existing trunk sewer capacities downstream were not investigated. This option accounts for additional residential development flows in the North Area.

- **Option 3: 320th-North** - Following the same route as Option 2, the gravity sewer diverts east near 32512 Dresden Ave through private property, continues along an unnamed gravel road, and routes beneath Highway 3, connecting to the existing trunk sewer upstream of the wastewater treatment plant. This option also accounts for additional residential development flows in the North Area.

Northfield - NW Area Trunk Sewer Routing Summary

	Linear Feet of Forcemain (LF)	Linear Feet of Gravity Trunk Sewer (LF)	Opinion of Probable Cost ($)
Option 1: Lincoln Parkway	4,350	19,150	$ 29,691,000
Option 2: 320th-Sheldahl	3,450	18,450	$ 20,980,125
Option 3: 320th-North	3,450	18,650	$ 20,401,500

Considerations

The analysis concludes the existing infrastructure can serve the wastewater flows from Cedar Meadows and Kraewood. However, future development in the Northwest Area will require infrastructure upgrades to maintain efficient gravity capacity. These upgrades should be implemented in advance of further development. Future proposals should prompt updates to the analysis to reflect anticipated service flows.

Project Background

Bolton & Menk partnered with the City of Northfield in understanding the impacts of future development on current and future sanitary sewer infrastructure in the Northwest Area. The goals of the study include the following:

- Implementation and analysis of sanitary sewer flow monitoring equipment to determine capacity of the existing Northwest Area trunk sewer.
- Estimate future wastewater contributions from the Northwest Area based on city-provided AUARs, Comprehensive Plans, and proposed development plans.
- Confirm whether the existing infrastructure can meet current and future wastewater demands.
- Recommend proposed wastewater infrastructure improvement considerations including preliminary trunk sewer alignments, infrastructure sizing, and opinion of probable costs.

Flow Monitoring

Bolton & Menk collected flow data on 15-minute intervals for 49 days to capture the flows in the sanitary sewer. The window of the study was May 5th, 2024 (12:00 am) To June 22nd, 2024 (11:59 pm). There were 11 rain events greater than 0.4" during this period, therefore our analysis accounts for potential inflow and infiltration to the system. The City's Comprehensive Sewer Plan and 10 state standards were used to assess the current and future pipe capacity of the sewer.

Data was collected at three locations shown on Figure 1 of the Appendix. Locations and pipe diameters are summarized below. Full results from the flow monitoring study are shown in Figure 2 and 3 of the Appendix. Summarized results from the flow monitoring study can be found in Table 1.

1. *Lincoln Parkway Structure between Juniper Ave W & Lathrop Dr - 15" pvc influent sewer pipe, 15" pvc effluent sewer pipe.
2. West property line of 38 Viking Drive – 15" pvc influent sewer pipe, 15" pvc effluent sewer pipe.
3. Structure along the East ditch line of Highway 3 Northbound Lane at the intersection of Fremouw Avenue & Highway 3 – 18" pvc influent sewer pipe, 18" pvc effluent sewer pipe.

*Flow Monitor at Lincoln Parkway Site experienced sediment accumulation on the submerged flow sensor, resulting in loss of velocity measurement and inability to calculate flow rate for the entirety of the study period.

Existing System Capacity with Asbuilt Slopes

The City of Northfield provided as-built records which included pipe diameters, slopes, and materials. Manning's Equation was used to calculate the full capacity of each pipe based on these properties. Observed peak flow rates from the study period were then incorporated into a capacity analysis to assess the remaining capacities in each trunk sewer segment. The results of this analysis are shown in Table 1.

Table 1. Northwest Area – Existing Trunk Sewer Capacity Analysis

Northfield - NW Area Analysis				
	Existing Capacity with Asbuilt Slopes			
	A	B	C	D
	Dry Weather Base Flow (gpm)	Metered Peak Flow (gpm)	Pipe Capacity (gpm)	Percent Full (%) **(B/C)**
Viking Terrace MH - 15" Pipe	240	568	1,297	43.8%
Highway 3 MH - 18" Pipe	586	1,204	2,108	57.1%

Data from both flow monitoring sites were reviewed and analyzed. The observed peak flow was divided by the calculated pipe capacity to determine the percentage of pipe fullness. This percentage was then compared to an 80% capacity threshold guidance. The results suggest the existing infrastructure is adequately sized to support the existing sewershed.

Development Service Discharge

The city was approached with two proposed development sites within the trunk sewershed. The first site named Cedar Meadows is a 60-acre proposed development at the intersection of North Avenue & Eveleth Avenue. The second site named Kraewood is a 12.9-Acre development along Lincoln Parkway. Both developments intend to discharge to the existing Northwest Area trunk sewer.

To determine remaining capacity within the trunk sewer, projected flows from both developments were incorporated into the analysis. Cedar Meadows' flows were projected using the Development Phasing Summary, which includes proposed unit counts and types. Kraewood development flows were projected using the approved Sewer Extension Permit Application. Projected flow calculations for both developments can be found in the Appendix. The percentage of pipe fullness is shown in Table 2.

Table 2. Northwest Area – Proposed Development Capacity Analysis

Northfield - NW Area Analysis									
	Existing Capacity with Asbuilt Slopes				Proposed Development Review				
	A	B	C	D	E	F	G	H	I
	Dry Weather Base Flow (gpm)	Metered Peak Flow (gpm)	Pipe Capacity (gpm)	Percent Full (%) **(B/C)**	Cedar Meadows Flows (gpm)	Kraewood Development Flows (gpm)	Flow Contribution with Proposed Developments (gpm) **(B+E+F)**	Pipe Capacity (gpm)	Percent Full (%) **(G/H)**
Viking Terrace MH - 15" Pipe	240	568	1,297	43.8%	150	84	802	1,297	61.9%
Highway 3 MH - 18" Pipe	586	1,204	2,108	57.1%	150	84	1,438	2,108	68.2%

The observed peak flow rates at each site during the recent flow monitoring study, plus the proposed development flows from Cedar Meadows and Kraewood were calculated. The total flow contribution, with the development flows, was divided by the as-built full pipe capacity to determine the pipe's projected fullness. This percentage was then compared to an 80% capacity threshold for potential

upsizing. The results show the pipes would be below 80% full, suggesting the existing infrastructure has capacity to support these two new developments in the sewershed.

Northwest Area Future Development

Land developers have shown interest in the Northwest Area. As discussed in the 2023 AUAR prepared by Xcel Energy, the City of Northfield has considered two scenarios for 708 acres in this region:

Scenario A consists of a mix of Technology center and industrial park land uses.

- Total: 708 acres
  - 538 acres for a Technology Center
  - 170 acres for Industrial Park use

Scenario B consists of industrial park land use only

- Total: 708 acres entirely developed into Industrial Park land use

The AUAR estimates both scenarios would generate a total of 0.24 million gallons per day (MGD) of domestic strength wastewater for the 708 acres on an average day. However, according to the City of Northfield's Unit and Area Wastewater Flows from the City of Northfield's Comprehensive Sewer Plan (2007), the Technology Center and Industrial Park are both classified under the Commercial/Industrial/Mixed Use Land Use Type and should be planned for a wastewater contribution of 2,000 gallons per acre per day. This results in a total baseflow of 1.41 MGD from this 708 acre area from both Scenario A and Scenario B land uses.

For conservative estimations, a baseflow of 1.41 MGD was used for the AUAR area.

In addition to the 708 acres designated for industrial use, 699 acres have been planned for residential use in the Northwest Area, totaling 1,407 acres of development. The residential land use units and area wastewater flows follow the guidelines set forth in the City of Northfield's Comprehensive Plan, which specify 1400 gallons per acre per day.

Table 3 shows the Unit and Area Wastewater Flows from page 44 of the City of Northfield Comprehensive Sewer Plan (Dated October 15, 2007). Table 4 provides the calculated peak flow in gallons per minute (gpm) for the Northwest Area Future Development.

Table 3. Northwest Area – Unit and Area Wastewater Flows

Unit and Area Waste Water Flows – Northfield

Land Use Type	Person/ Unit	Maximum Units/ Acre	Gal/Person/ Day	Gal/Acre/ Day
Single Family Residential (low density)	3.6	3.5	100	1260
Residential (medium density)	3.6	4.0	100	1440
Residential (high density)	3.0	6	100	1800
Multi-Family Residential (high density)	2 *	25	70	3500
Areas outside of current Land Use Map (1/3 multi-family, 2/3 single-family)	3.0	7	90	1890
Commercial/ Industrial/Mixed Use	N/A	N/A	N/A	2,000
Recreational	N/A	N/A	N/A	10
Institutional	N/A	N/A	N/A	1000

* Note: City zoning code may allow lower and higher density in some cases such as PUDs and PRDs. High density proposals should be reviewed.

Table 4. Northwest Area – Future Development Flows

Northfield - NW Area Analysis - Future Development Flows									
Area ID	Land Use	Area (ac)	Landuse (gal/acre-day)	Base Flow (gpd)	Total Base Flow (gpd)	Total Base Flow (MGD)	Peaking Factor	Peak Flow (MGD)	Peak Flow (gpm)
Northwest Area	Commercial/Industrial	708	2000	1,416,000	2,422,560	2.42	2.5	6.10	4,236
	Residential	699	1440	1,006,560					

To determine remaining capacity within the trunk sewer, peak flow from the future development in the Northwest area was incorporated into the capacity analysis. The results can be seen in Table 5.

Table 5. Northwest Area – Future Development Capacity Analysis

Northfield - NW Area Analysis													
	Existing Capacity with Asbuilt Slopes				Proposed Development Review					NW Area Projected Flows			
	A	B	C	D	E	F	G	H	I	J	K	L	M
	Dry Weather Base Flow (gpm)	Metered Peak Flow (gpm)	Pipe Capacity (gpm)	Percent Full (%) **(B/C)**	Cedar Meadows Flows (gpm)	Kraewood Development Flows (gpm)	Flow Contribution with Proposed Developments (gpm) **(B+E+F)**	Pipe Capacity (gpm)	Percent Full (%) **(G/H)**	NW Area 6.1 MGD Projected Flows (gpm)	Total Flow Contribution (gpm) **(G+J)**	Pipe Capacity (gpm)	Percent Full (%) **(K/L)**
Viking Terrace MH - 15" Pipe	240	568	1,297	43.8%	150	84	802	1,297	61.9%	4,236	5,038	1,297	388.6%
Highway 3 MH - 18" Pipe	586	1,204	2,108	57.1%	150	84	1,438	2,108	68.2%	4,236	5,674	2,108	269.1%

The total flow contributions were divided by the calculated pipe capacity to determine the percentage of pipe fullness. This percentage was then compared to an 80% capacity threshold. The results indicate the existing infrastructure lacks the capacity to support the future flows from the Northwest Area.

Northwest Area Lift station and Trunk Sewer Routing

Bolton & Menk collaborated with the city to investigate trunk sewer routing to meet the projected wastewater demands of the Northwest development area. Due to the area's existing topography and proximity to the wastewater treatment plant, a regional lift station and forcemain will need to be constructed to convey wastewater flows from this regional low point to an adequate elevation and back to gravity flow. The proposed lift station site is located on the south side of 320th Street, between Foliage Avenue and Eveleth Avenue.

Preliminary pipe networks were built in Autodesk Civil 3D to represent the plan and profile using minimum slopes from the 10 States Standards to determine pipe sizes. The routing for the three options is described below. Overview maps, opinion of probable costs, and trunk sewer sizing calculations for each option are presented in the Appendix.

Option 1: Lincoln Parkway routes the forcemain east along 320th Street and turns south along Eveleth Avenue. The forcemain discharges into a proposed gravity sewer near the existing topography high point along Eveleth Avenue, north of Thye Parkway. The Gravity sewer flows south to North Avenue, where the proposed gravity sewer follows existing trunk sewer routing through Falk Avenue. It then turns east through the Lincoln Parkway corridor to Dresden Avenue, and ultimately crossing Highway 3 near Fremouw Avenue and Sheldahl Flexible Technologies. The existing capacities within the trunk sewer downstream of the Sheldahl Flexible Technologies site were not investigated for capacity. Option 1 accounts for the additions of the proposed development flows from Cedar Meadows and Kraewood. Option 1 does not account for additional future residential development flows in the North Area.

To support the potential for 1,209 acres of residential development along the 320th corridor, Dresden Avenue was chosen as the trunk sewer alignment in Options 2 and 3. The routing for each option is described below. Table 6 provides the calculated peak flow for the Northwest Area Development and future residential development flows in the North Area.

Table 6. Northwest Area – Future Development Flows (Continued)

Northfield - NW Area Analysis - Future Development Flows									
Area ID	Land Use	Area (ac)	Landuse (gal/acre-day)	Base Flow (gpd)	Total Base Flow (gpd)	Total Base Flow (MGD)	Peaking Factor	Peak Flow (MGD)	Peak Flow (gpm)
Northwest Area	Commercial/Industrial	708	2000	1,416,000	2,422,560	2.42	2.5	6.10	4,236
	Residential	699	1440	1,006,560					
North Area	Residential	1209	1440	1,740,960	1,740,960	1.74	2.9	5.10	3,542

Option 2: 320th-Sheldahl routes the forcemain east along 320th Street before discharging into a gravity sewer on the south shoulder of 320th Street, between Eveleth Avenue and the Progressive Railroad (PGR). The gravity sewer then runs east along 320th Street to Dresden Avenue, and south along Dresden Avenue to Fremouw Avenue. Here, it combines with existing flows from Viking Terrace and proposed development flows from Cedar Meadows and Kraewood. The sewer continues east beneath Highway 3, discharging into the existing gravity sewer downstream of the Sheldahl Flexible Technologies site (805 MN-3 N, Northfield, MN). Note: The existing capacities within the trunk sewer downstream of the Sheldahl Flexible Technologies site were not investigated for capacity. Option 2 accounts for additional residential development flows due to the proposed routing of the trunk gravity sewer through the North Area.

Option 3: 320th-North follows the same routing as option 2, however, the gravity sewer diverts east near 32512 Dresden Avenue through private property and continues east along an unnamed gravel roadway before routing beneath highway 3 and connecting into the existing trunk sewer directly upstream of the wastewater treatment plant. Option 3 accounts for additional residential development flows due to the proposed routing of trunk gravity sewer through the North Area.

A summary of each option's total linear footage and opinion of probable cost can be found in Table 7.

Table 7. Northwest Area – Future Development Capacity Analysis

Northfield - NW Area Trunk Sewer Routing Summary			
	Linear Feet of Forcemain (LF)	Linear Feet of Gravity Trunk Sewer (LF)	Opinion of Probable Cost ($)
Option 1: Lincoln Parkway	4,350	19,150	$ 29,691,000
Option 2: 320th-Sheldahl	3,450	18,450	$ 20,980,125
Option 3: 320th-North	3,450	18,650	$ 20,401,500

Considerations

Based on our analysis using the city provided as-builts, 10 State Standards and the observed peak flow rates from the recent flow monitoring study, the existing infrastructure is adequately sized to convey the projected flows from both Cedar Meadows and Kraewood developments.

The projected development flows in the Northwest Area would necessitate infrastructure improvements. These improvements are designed to keep flow rates below the 80% threshold for efficient gravity capacity. If the Northwest Area development proceeds as planned, infrastructure improvements should be implemented in advance. As any new development proposals are submitted to the city, the analysis should be updated to reflect the actual anticipated service flows.

We appreciate the opportunity to analyze your sewer system capacity regarding future development. We are available to meet with you and discuss our findings and considerations in more detail as requested.

Sincerely,

Bolton & Menk, Inc.

Mark Onken, PE
Project Engineer

CC: Seth A. Peterson, PE, Bolton & Menk, Inc

Appendix

List of Figures

Figure 1 – 2024 Flow Monitoring Study – Locations

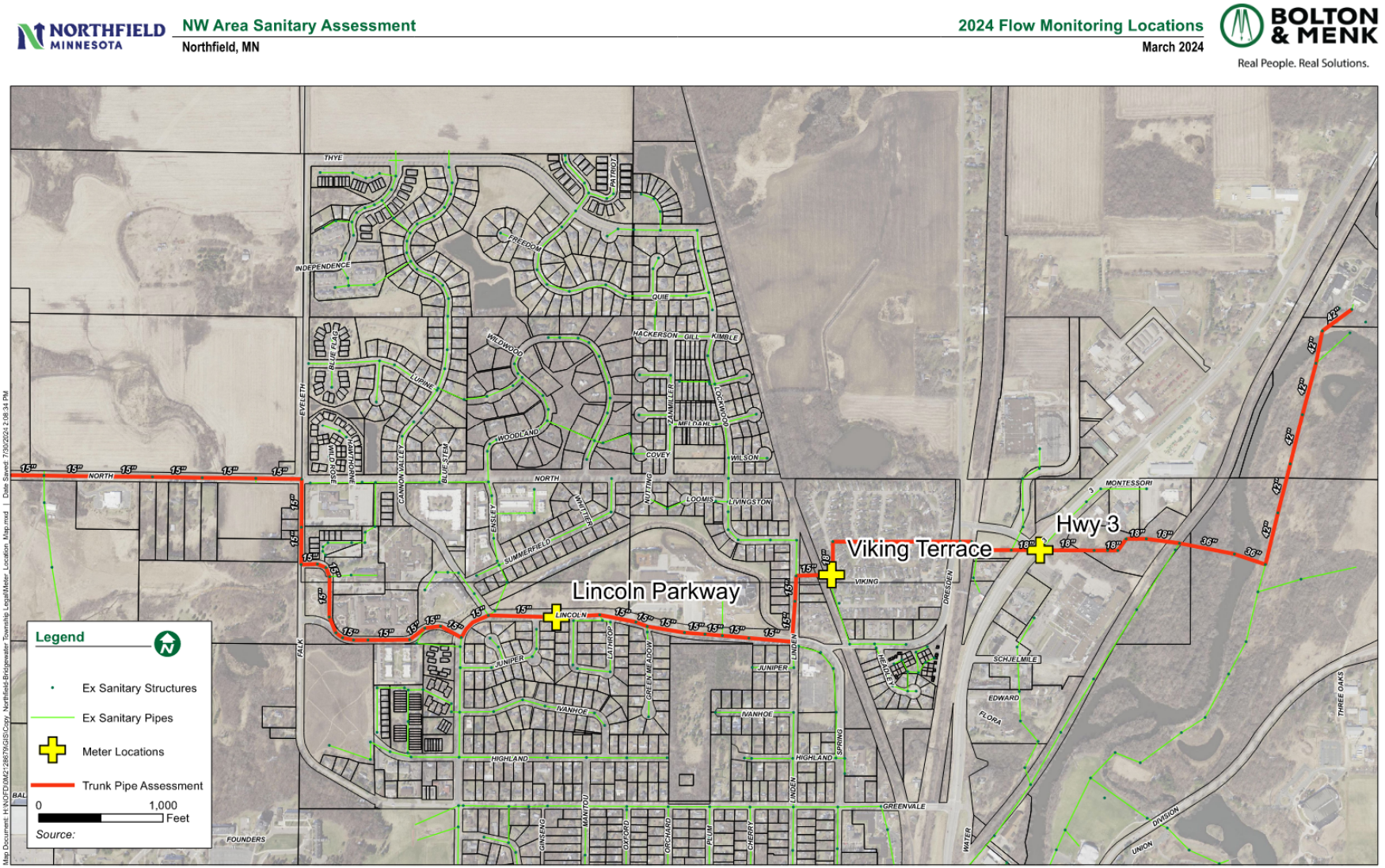

Figure 2 – 2024 Flow Monitoring Study – Viking Terrace Full Data Plot

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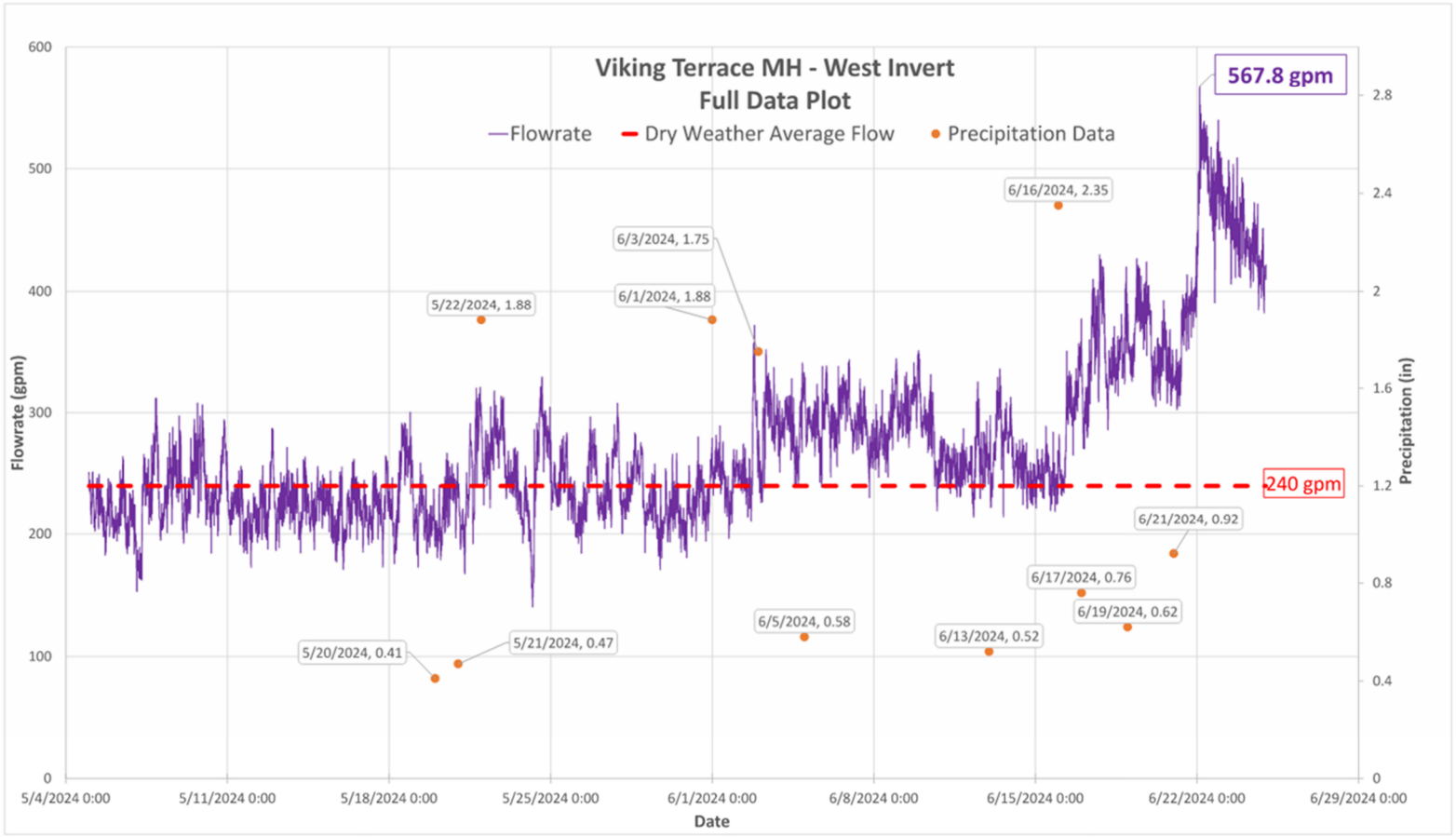

Figure 3. 2024 Flow Monitoring Study – Hwy 3 Full Data Plot

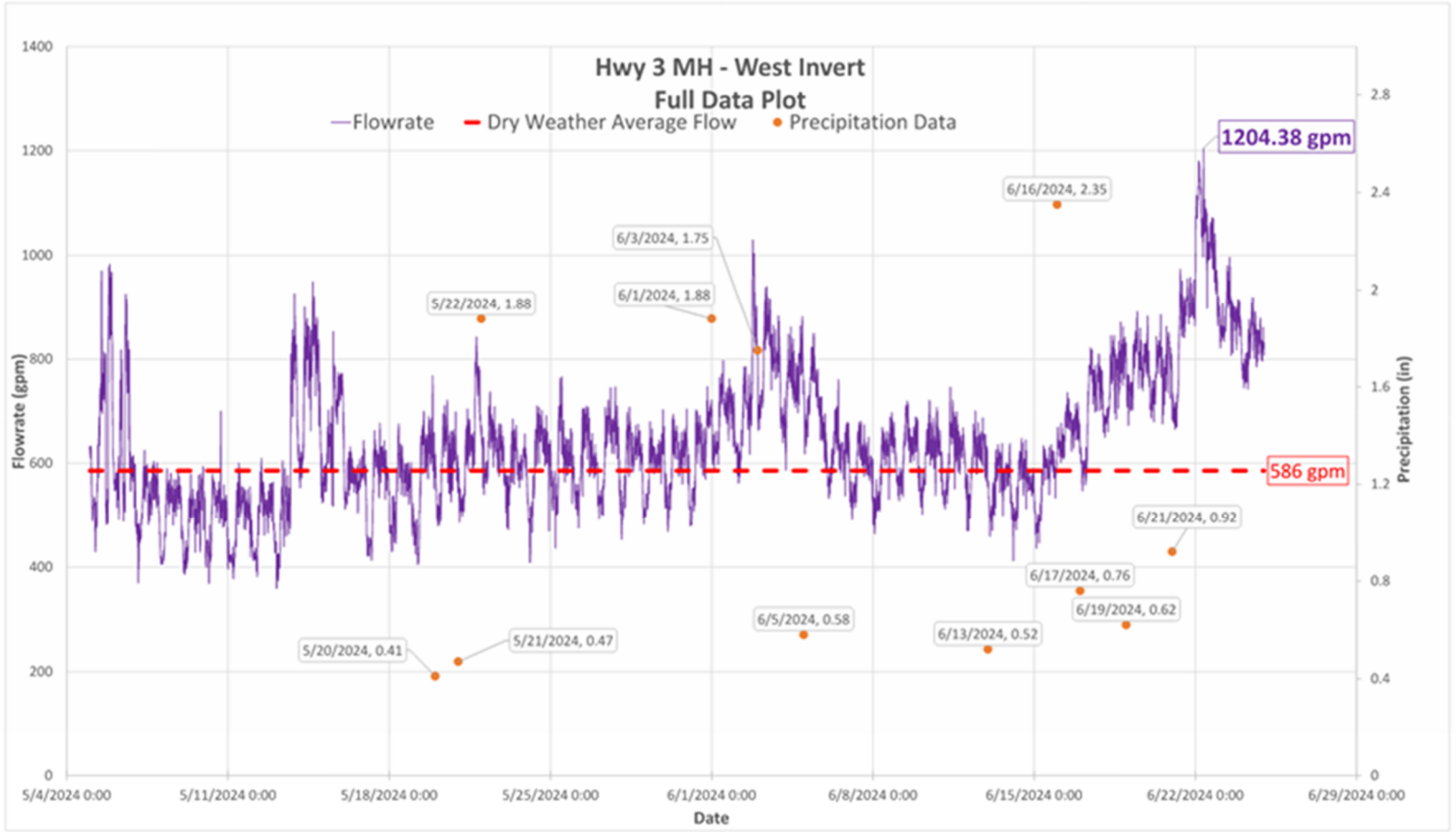

Figure 4. Cedar Meadows Flow Projection Calculation

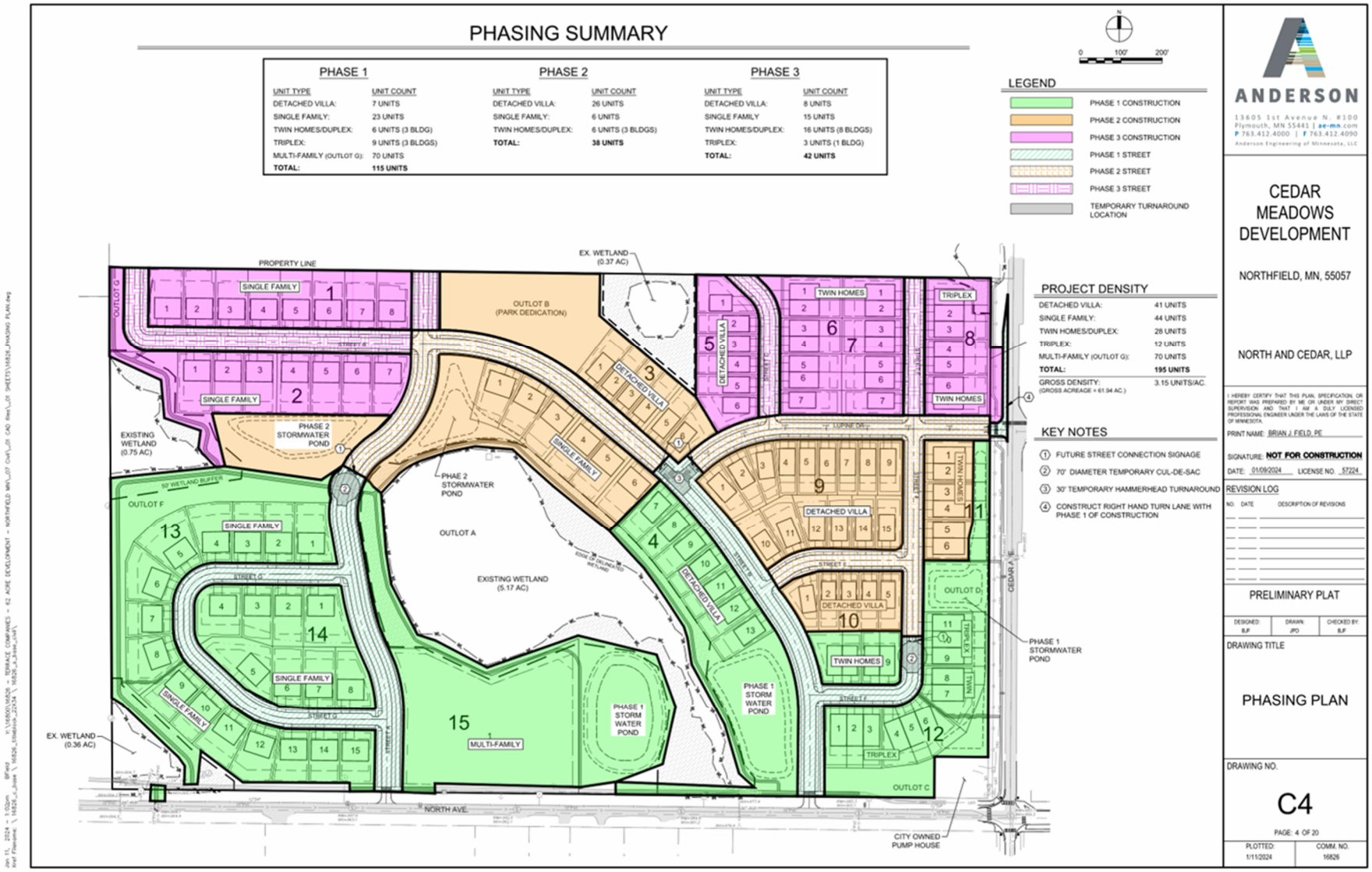

Figure 5. Cedar Meadows Flow Projection Calculation (Cont.)

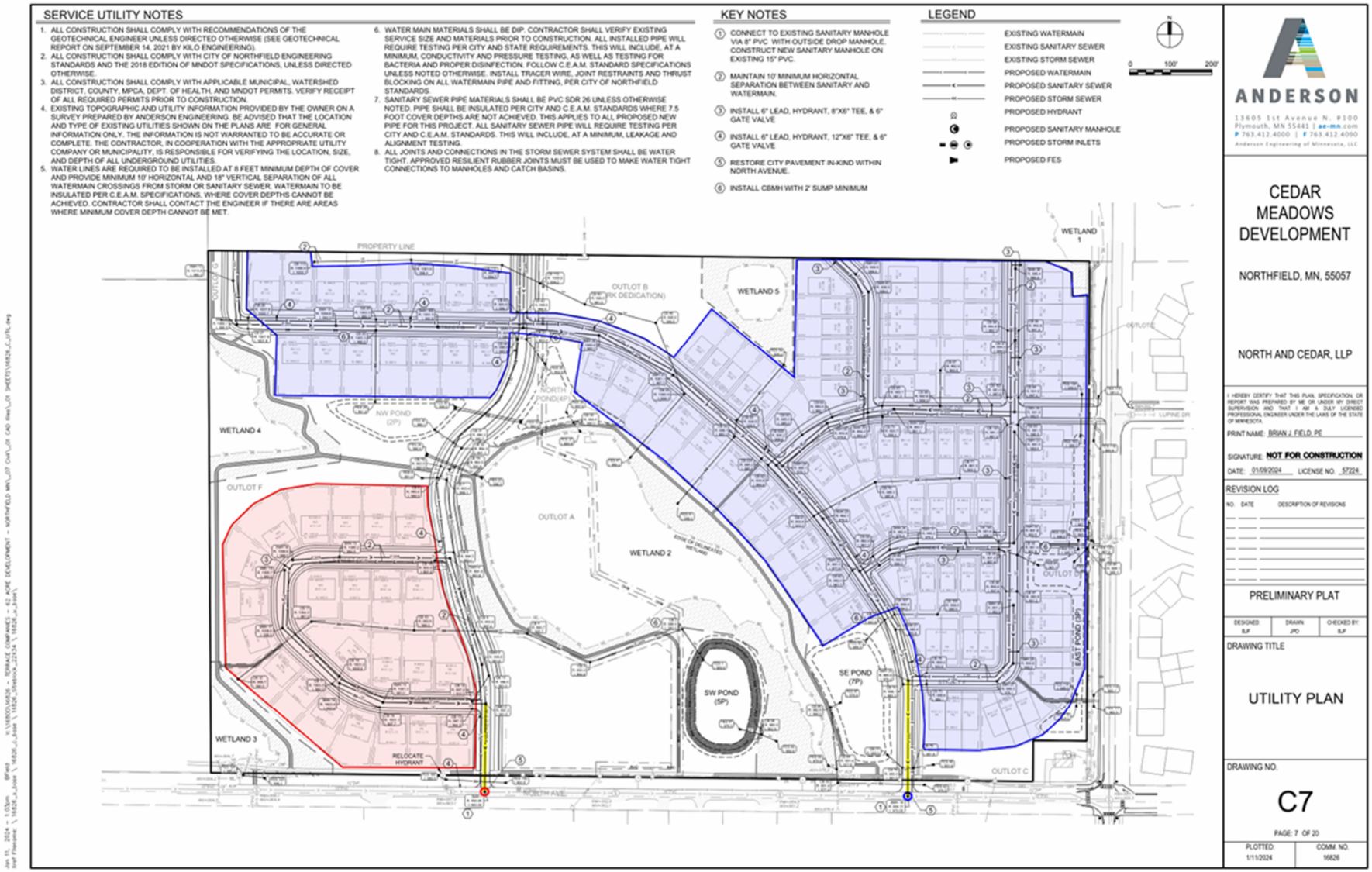

Figure 6. Cedar Meadows Flow Projection Calculation (Cont.)

Cedar Meadows - Plat Flow Projections					
City Connection Location	Area ID	Land Use	Units	Base Flow (gpd)	Total Base Flow (MGD)
SMH 1	Phase 1 - Single Family	Medium Density Residential	23	8280	0.008
	Phase 1 - Multi Family	Multi Family Residential	70	9800	0.010
SMH 19	Phase 1 Triplex	Residential High Density	9	2700	0.003
	Phase 1 - Twin Homes	Medium Denisty Residential	6	2160	0.002
	Phase 1 - Detached Villa	Medium Density Residential	7	2520	0.003
	Phase 2 - Detached Villa	Medium Density Residential	26	9360	0.009
	Phase 2 - Single Family	Medium Density Residential	6	2160	0.002
	Phase 2 - Twin Homes	Medium Density Residential	6	2160	0.002
	Phase 3 - Triplex	Residential High Density	3	900	0.001
	Phase 3 - Twin Homes	Medium Denisty Residential	16	5760	0.006
	Phase 3 - Detached Villa	Medium Density Residential	8	2880	0.003
	Phase 3 - Single Family	Medium Density Residential	15	5400	0.005

Cedar Meadows - Plat Flow Projections							
	Base Flow (MGD)	Peaking Factor	Peak Flow (MGD)	Peak Flow (gpm)	Pipe Size (in)	Full Pipe Capacity (gpm)	% Full during Peak Flows
SMH 1	0.018	4	0.07	50	8	450	11%
SMH 19	0.036	4	0.14	100	8	450	22%
Total	0.054	4	0.22	150			

	Persons/Unit	Gallons/Person	Gallons/Unit
Medium Density Residential	3.6	100	360
Residential High Density	3	100	300
Multi-Family Residential High D	2	70	140

Figure 7. Kraewood Flow Projection Calculation

Contact information

All four contacts type fields must be completed. The same individual may be used for multiple types.

1. **Project proposer name:**
   Contact name: Steven Schmidt Title: Developer/President
   Name of firm or organization: Sumac Properties Inc.
   Mailing address: 1325 Armstrong Road Suite 210
   City: Northfield State: MN Zip code: 55057
   Phone: 507-663-0482 Email: steve@schmidthomes.com
   The proposer is the entity requesting consideration for the construct of the project. The proposer is often a developer or other private entity that is not the Permittee and will not be the ultimate owner of the sewer system. The Permittee, which is usually the municipality, may also propose projects.

2. **Design engineer name for the project sewer system:**
   Contact name: Matt Pavek Title: Civil Engineer/Project Manager
   Name of firm or organization: Civil Site Group
   Mailing address: 5000 Glenwood Avenue
   City: Golden Valley State: MN Zip code: 55422
   Phone: 612-615-0060 Email: mpavek@civilsitegroup.com

3. **Permittee authorized representative (collection system) contact information:**
   Contact name: David Bennett Title: City Engineer
   Name of firm or organization: City of Northfield
   Mailing address: 801 Washington Street
   City: Northfield State: MN Zip code: 55057
   Phone: 507-645-8833 Email: david.bennett@ci.northfield.mn.us

4. **WWTP authorized representative contact information:**
   Contact name: Justin Wagner Title: Utilities Manager
   Name of firm or organization: City of Northfield
   Mailing address: 801 Washingtong Street
   City: Northfield State: MN Zip code: 55057
   Phone: 507-645-8833 Email: justin.wagner@ci.northfield.mn.us

Connections and flows components

*Complete these items with respect to how many connections are being requested for the proposed project. Project component types are defined as residential, commercial, industrial, and other. (Projects are often described in different ways, so the parameters have been selected as common quantities. **Acres** means the total area of the proposed project; **Lots** means the number of individual properties the area will be divided into, and **REU** means 'Residential Equivalent Unit', or unit equivalent to one home):*

1. **Project components**
   a. **Residential**
      Number of homes: 130
      Design flow per home: (gallons per day per home) 233 gallons per day per home
      Total residential flow from project: (gallons per day) 30,290 gallons per day
      Total residential BODs from proposed project: (pounds per day) 66.19
   b. **Commercial**
      Number of commercial components 0 Units (check only one): ☐ Acres ☐ Lots ☐ REU
      Design flow per component (gallons per day per component): _____
      Total commercial flow from project (gallons per day): _____
      Total commercial BODs from proposed project (pounds per day): _____

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Kraewood - Plat Flow Projections					
	Baseflow (gpd)	Base Flow (MGD)	Peaking Factor	Peak Flow (MGD)	Peak Flow (gpm)
Kraewood	30,290.00	0.030	4	0.12	84

Figure 8. NW Area Lift Station & Trunk Sewer Routing – Scenario A: Option 1 Overview Map

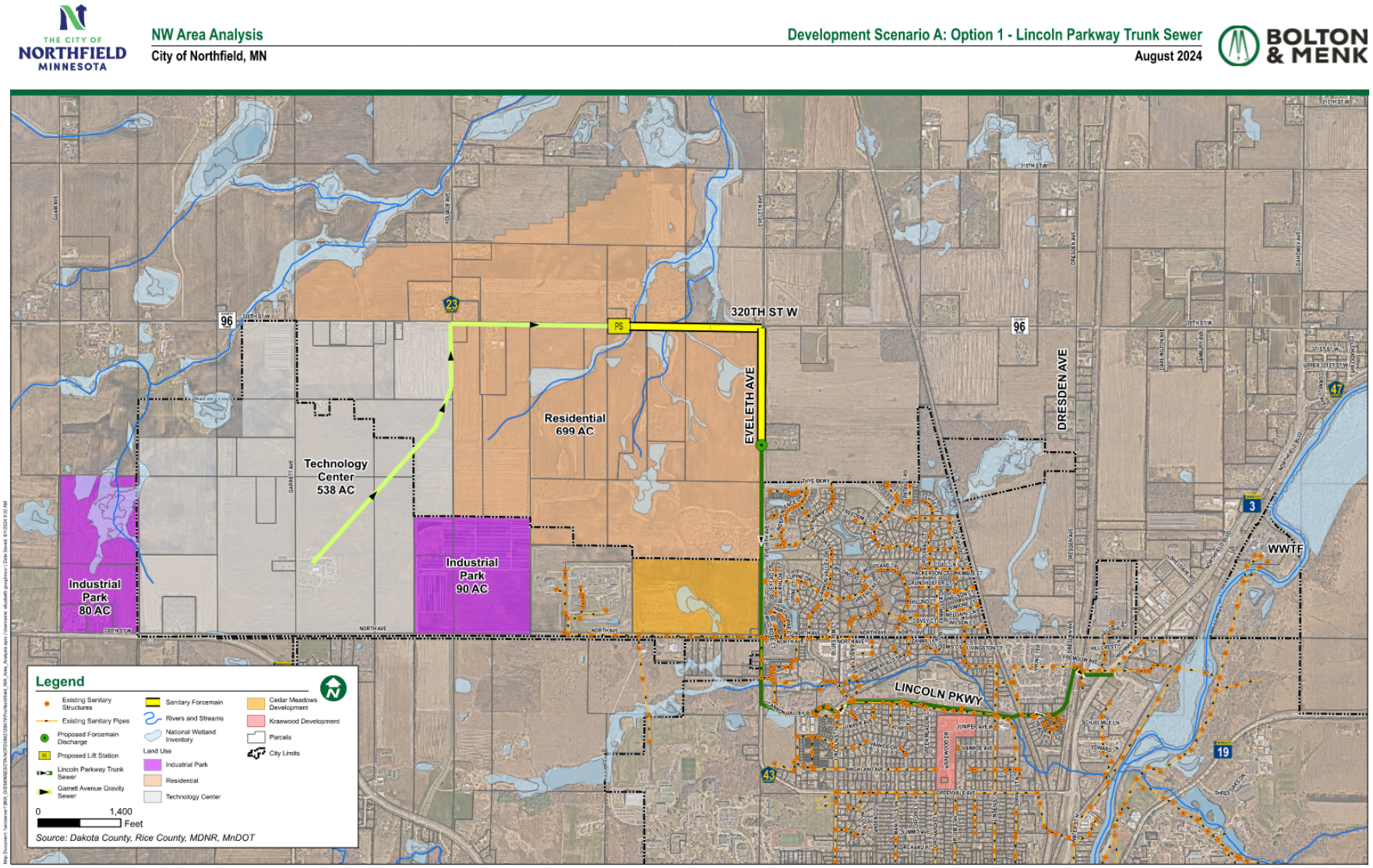

Figure 9. NW Area Lift Station & Trunk Sewer Routing – Scenario 1: Option 1 Opinion of Probable Costs

OPINION OF PROBABLE COSTS

OPTION 1: LINCOLN PARKWAY

City of Northfield

BMI PROJECT NO. 0M2.128679

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7/31/2024

Item No.	Item	Unit	Quantity	Unit Price	Total Amount
1	SANITARY GRAVITY MAIN, TRENCHED, CCFRPM, 36" (0'-15' DEEP) GARRETT AVE/320TH	LF	4250	$325.00	$1,381,250.00
2	SANITARY GRAVITY MAIN, TRENCHED, CCFRPM, 36" (15'-25' DEEP) GARRETT AVE/320TH	LF	1300	$375.00	$487,500.00
3	SANITARY GRAVITY MAIN, TRENCHED, CCFRPM, 36" (25'-35' DEEP) GARRETT AVE/320TH	LF	2200	$450.00	$990,000.00
4	6.1 MGD LIFT STATION	LS	1	$2,350,000.00	$2,350,000.00
5	SANITARY FORCE MAIN, TRENCHLESS, 18" I.D.	LF	4350	$265.00	$1,152,750.00
6	FORCEMAIN AIR RELEASE/CLEANOUT STRUCTURE AND PIT	EA	5	$35,000.00	$175,000.00
7	SANITARY GRAVITY MAIN, TRENCHED, CCFRPM, 36" (0'-15' DEEP) FM DISCHARGE TO NORTH AVE	LF	3250	$325.00	$1,056,250.00
8	SANITARY GRAVITY MAIN, TRENCHED, CCFRPM, 36" (0'-15' DEEP) NORTH AVE TO SPRING ST N.	LF	4750	$325.00	$1,543,750.00
9	SANITARY GRAVITY MAIN, TRENCHED, CCFRPM, 36" (15-25' DEEP) NORTH AVE TO SPRING ST N.	LF	1000	$375.00	$375,000.00
10	SANITARY GRAVITY MAIN, TRENCHED, CCFRPM, 42" (0'-15' DEEP) SPRING ST N. TO SHELDAHL	LF	1250	$375.00	$468,750.00
11	SANITARY GRAVITY MAIN, TRENCHED, CCFRPM, 42" (15-25' DEEP) SPRING ST N. TO SHELDAHL	LF	750	$425.00	$318,750.00
12	SANITARY GRAVITY MAIN, TRENCHED, CCFRPM, 42" (25-35' DEEP) SPRING ST N. TO SHELDAHL	LF	400	$475.00	$190,000.00
13	SANITARY MANHOLE, ALL GRAVITY	EA	62	$10,000.00	$620,000.00
14	REMOVE EX ROADWAY & EXISTING GRAVITY SEWER - NORTH AVE TO SHELDAHL	LF	7850	$500.00	$3,925,000.00
15	RECONSTRUCT ROADWAY - NORTH AVE TO SHELDAHL	LF	7850	$500.00	$3,925,000.00
16	RAILROAD/HIGHWAY CASING CROSSING	SY	3	$245,000.00	$735,000.00
17	TEMPORARY CONVEYANCE	LS	1	$100,000.00	$100,000.00
18	PERMANENT EASEMENT ACQUISITION	ACRE	1	$0.00	$0.00

TOTAL CONSTRUCTION	**$19,794,000.00**
CONTINGENCY (25%)	**$4,948,500.00**
ENGINEERING (20%)	**$4,948,500.00**
OPINION OF PROBABLE CONSTRUCTION COST:	**$29,691,000.00**

Figure 10. NW Area Lift Station & Trunk Sewer Routing – Scenario A: Option 2 Overview Map

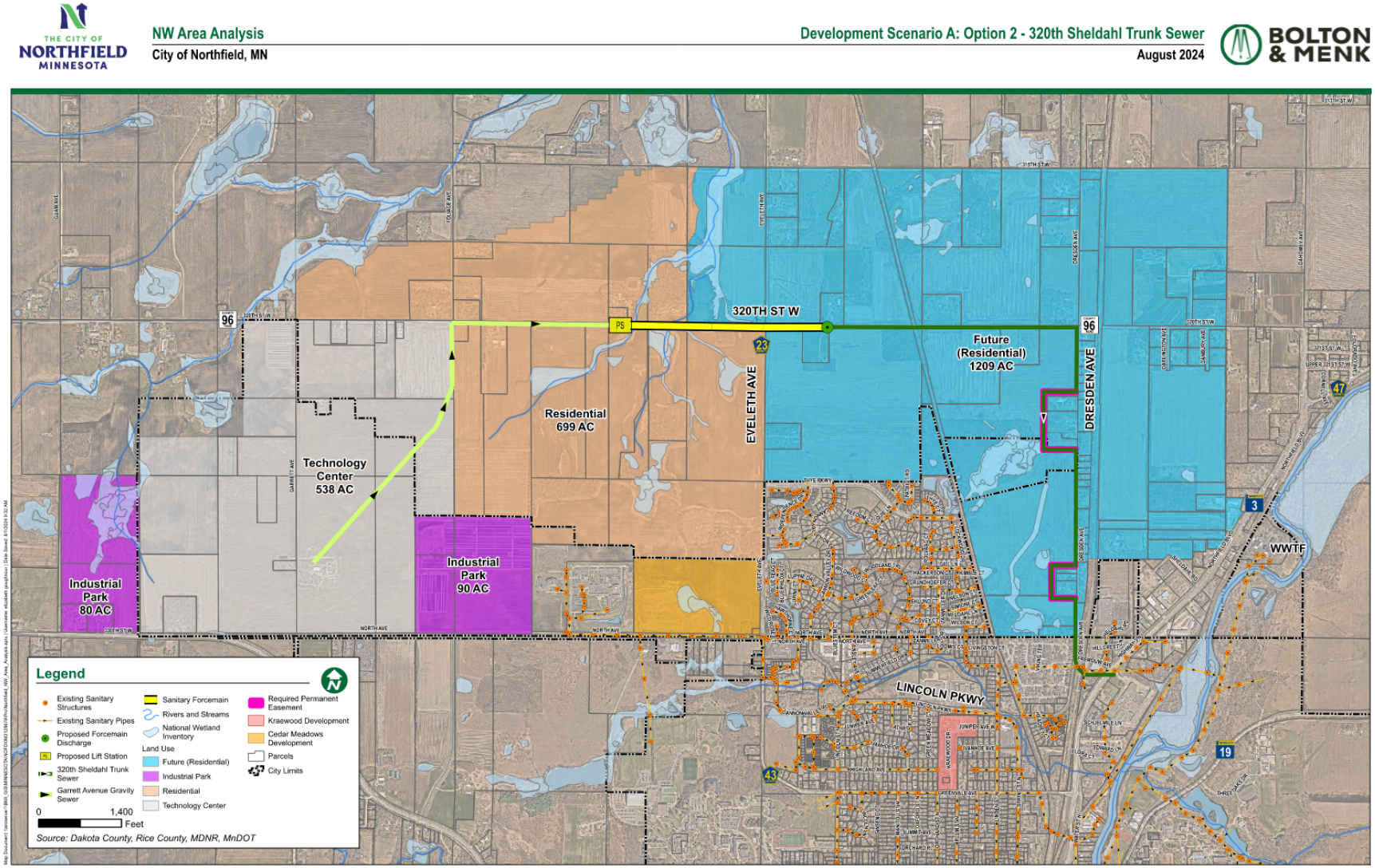

Figure 11. NW Area Lift Station & Trunk Sewer Routing – Scenario A: Option 2 Opinion of Probable Costs

OPINION OF PROBABLE COSTS

OPTION 2: 320TH SHELDAHL

City of Northfield

BMI PROJECT NO. 0M2.128679

BOLTON & MENK
Real People. Real Solutions.

7/31/2024

Item No.	Item	Unit	Quantity	Unit Price	Total Amount
1	SANITARY GRAVITY MAIN, TRENCHED, CCFRPM, 36" (0'-15' DEEP) GARRETT AVE/320TH	LF	4250	$325.00	$1,381,250.00
2	SANITARY GRAVITY MAIN, TRENCHED, CCFRPM, 36" (15'-25' DEEP) GARRETT AVE/320TH	LF	1300	$375.00	$487,500.00
3	SANITARY GRAVITY MAIN, TRENCHED, CCFRPM, 36" (25'-35' DEEP) GARRETT AVE/320TH	LF	2200	$450.00	$990,000.00
4	6.1 MGD LIFT STATION	LS	1	$2,350,000.00	$2,350,000.00
5	SANITARY FORCE MAIN, TRENCHLESS, 18" I.D.	LF	3450	$265.00	$914,250.00
6	FORCEMAIN AIR RELEASE/CLEANOUT STRUCTURE AND PIT	EA	4	$35,000.00	$140,000.00
7	SANITARY GRAVITY MAIN, TRENCHED, CCFRPM, 48" (0'-15' DEEP) FM DISCHARGE TO FREMOUW	LF	6050	$450.00	$2,722,500.00
8	SANITARY GRAVITY MAIN, TRENCHED, CCFRPM, 48" (15-25' DEEP) FM DISCHARGE TO FREMOUW	LF	2600	$600.00	$1,560,000.00
9	SANITARY GRAVITY MAIN, TRENCHED, CCFRPM, 48" (25-35' DEEP) FM DISCHARGE TO FREMOUW	LF	1300	$700.00	$910,000.00
10	SANITARY GRAVITY MAIN, TRENCHED, CCFRPM, 48" (0'-15' DEEP) FREMOUW TO SHELDAHL	LF	750	$450.00	$337,500.00
11	SANITARY MANHOLE, ALL GRAVITY	EA	60	$10,000.00	$600,000.00
12	REMOVE EX ROADWAY & EXISTING GRAVITY SEWER - FREMOUW TO SHELDAHL	LF	750	$500.00	$375,000.00
13	RECONSTRUCT ROADWAY - FREMOUW TO SHELDAHL	LF	750	$500.00	$375,000.00
14	RAILROAD/HIGHWAY CASING CROSSING	EA	3	$245,000.00	$735,000.00
15	TEMPORARY CONVEYANCE	LS	1	$50,000.00	$50,000.00
16	PERMANENT EASEMENT ACQUISITION	ACRE	2.2	$25,000.00	$55,000.00
17	TEMPORARY EASEMENT AGREEMENT	ACRE	1.5	$2,500.00	$3,750.00
				TOTAL CONSTRUCTION	**$13,986,750.00**
				CONTINGENCY (25%)	**$3,496,687.50**
				ENGINEERING (20%)	**$3,496,687.50**
				OPINION OF PROBABLE CONSTRUCTION COST:	**$20,980,125.00**

Figure 12. NW Area Lift Station & Trunk Sewer Routing – Scenario A: Option 3 Overview Map

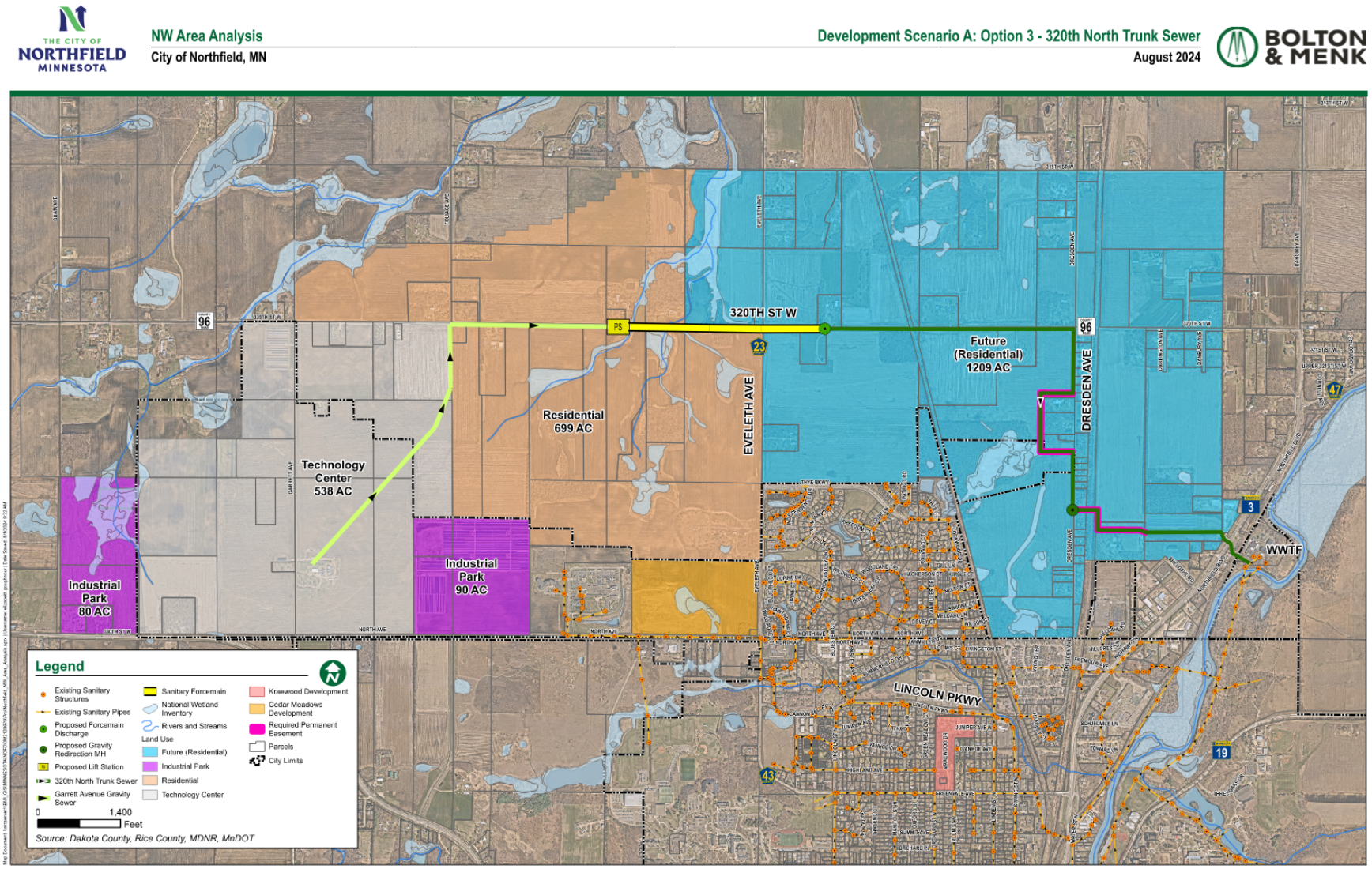

Figure 13. NW Area Lift Station & Trunk Sewer Routing – Scenario A: Option 3 Opinion of Probable Costs

OPINION OF PROBABLE COSTS

OPTION 3: 320TH NORTH

City of Northfield

BMI PROJECT NO. 0M2.128679

BOLTON & MENK
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7/31/2024

Item No.	Item	Unit	Quantity	Unit Price	Total Amount
1	SANITARY GRAVITY MAIN, TRENCHED, CCFRPM, 36" (0'-15' DEEP) GARRETT AVE/320TH	LF	4250	$325.00	$1,381,250.00
2	SANITARY GRAVITY MAIN, TRENCHED, CCFRPM, 36" (15-25' DEEP) GARRETT AVE/320TH	LF	1300	$375.00	$487,500.00
3	SANITARY GRAVITY MAIN, TRENCHED, CCFRPM, 36" (25-35' DEEP) GARRETT AVE/320TH	LF	2200	$450.00	$990,000.00
4	6.1 MGD LIFT STATION	LS	1	$2,350,000.00	$2,350,000.00
5	SANITARY FORCE MAIN, TRENCHLESS, 18" I.D.	LF	3450	$265.00	$914,250.00
6	FORCEMAIN AIR RELEASE/CLEANOUT STRUCTURE AND PIT	EA	4	$35,000.00	$140,000.00
7	SANITARY GRAVITY MAIN, TRENCHED, CCFRPM, 48" (0'-15' DEEP) FM DISCHARGE TO REDIRECTION MH	LF	5000	$450.00	$2,250,000.00
8	SANITARY GRAVITY MAIN, TRENCHED, CCFRPM, 48" (15-25' DEEP) FM DISCHARGE TO REDIRECTION MH	LF	1900	$600.00	$1,140,000.00
9	SANITARY GRAVITY MAIN, TRENCHED, CCFRPM, 48" (25-35' DEEP) FM DISCHARGE TO REDIRECTION MH	LF	300	$700.00	$210,000.00
10	SANITARY GRAVITY MAIN, TRENCHED, CCFRPM, 48" (0'-15' DEEP) REDIRECTION MH TO PLANT	LF	2000	$450.00	$900,000.00
11	SANITARY GRAVITY MAIN, TRENCHED, CCFRPM, 48" (15-25' DEEP) REDIRECTION MH TO PLANT	LF	700	$600.00	$420,000.00
12	SANITARY GRAVITY MAIN, TRENCHED, CCFRPM, 48" (25-35' DEEP) REDIRECTION MH TO PLANT	LF	1000	$700.00	$700,000.00
13	SANITARY MANHOLE, ALL GRAVITY	EA	60	$10,000.00	$600,000.00
14	RAILROAD/HIGHWAY CASING CROSSING	EA	4	$245,000.00	$980,000.00
15	TEMPORARY CONVEYANCE	LS	1	$50,000.00	$50,000.00
16	PERMANENT EASEMENT ACQUISITION	ACRE	3.3	$25,000.00	$82,500.00
17	TEMPORARY EASEMENT AGREEMENT	ACRE	2.2	$2,500.00	$5,500.00
				TOTAL CONSTRUCTION	**$13,601,000.00**
				CONTINGENCY (25%)	**$3,400,250.00**
				ENGINEERING (20%)	**$3,400,250.00**
				OPINION OF PROBABLE CONSTRUCTION COST:	**$20,401,500.00**

Figure 14. NW Area Lift Station & Trunk Sewer Routing – Scenario B: Option 1 Overview Map

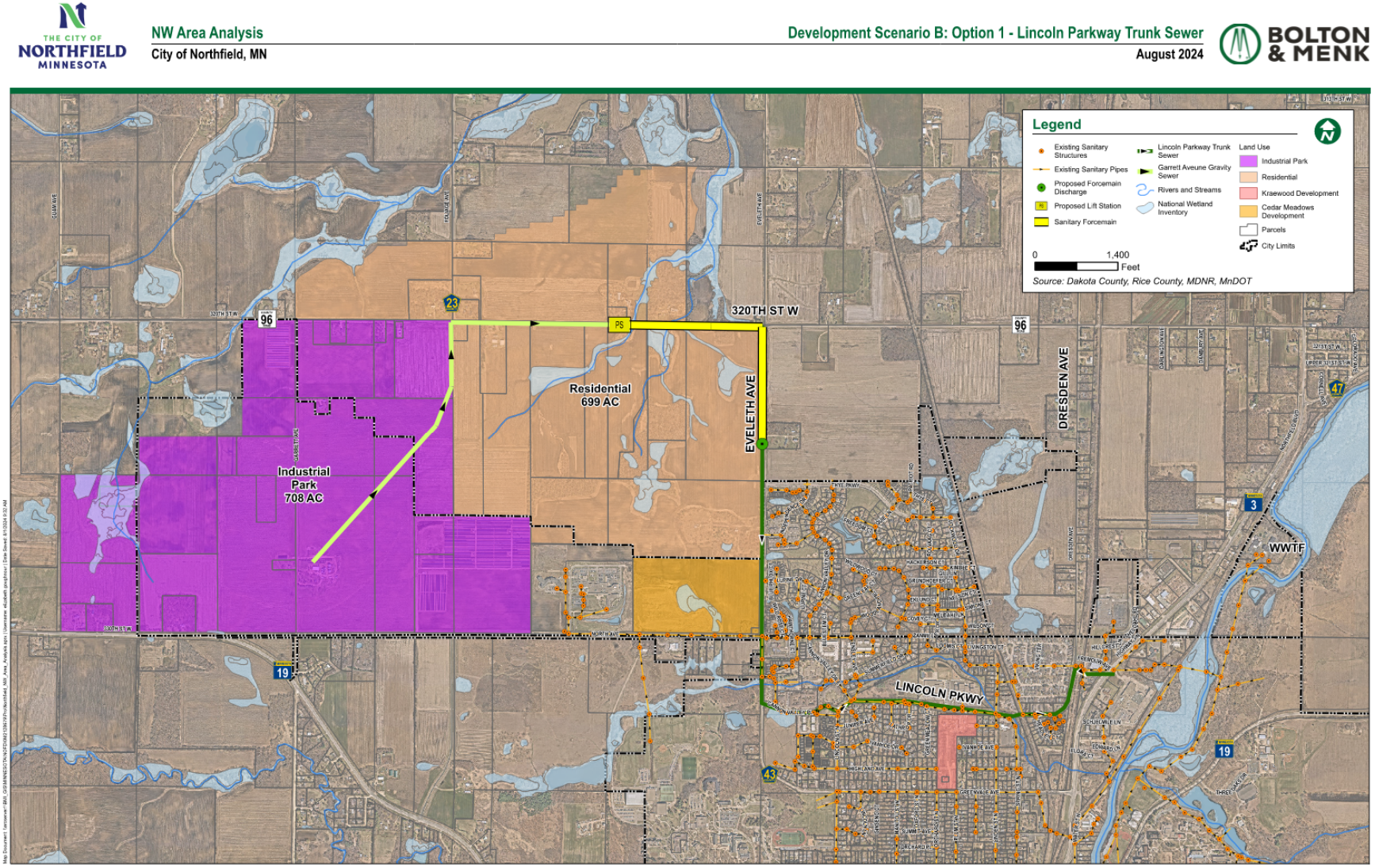

Figure 15. NW Area Lift Station & Trunk Sewer Routing – Scenario B: Option 1 Opinion of Probable Costs

OPINION OF PROBABLE COSTS

OPTION 1: LINCOLN PARKWAY

City of Northfield

BMI PROJECT NO. 0M2.128679

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7/31/2024

Item No.	Item	Unit	Quantity	Unit Price	Total Amount
1	SANITARY GRAVITY MAIN, TRENCHED, CCFRPM, 36" (0'-15' DEEP) GARRETT AVE/320TH	LF	4250	$325.00	$1,381,250.00
2	SANITARY GRAVITY MAIN, TRENCHED, CCFRPM, 36" (15'-25' DEEP) GARRETT AVE/320TH	LF	1300	$375.00	$487,500.00
3	SANITARY GRAVITY MAIN, TRENCHED, CCFRPM, 36" (25'-35' DEEP) GARRETT AVE/320TH	LF	2200	$450.00	$990,000.00
4	6.1 MGD LIFT STATION	LS	1	$2,350,000.00	$2,350,000.00
5	SANITARY FORCE MAIN, TRENCHLESS, 18" I.D.	LF	4350	$265.00	$1,152,750.00
6	FORCEMAIN AIR RELEASE/CLEANOUT STRUCTURE AND PIT	EA	5	$35,000.00	$175,000.00
7	SANITARY GRAVITY MAIN, TRENCHED, CCFRPM, 36" (0'-15' DEEP) FM DISCHARGE TO NORTH AVE	LF	3250	$325.00	$1,056,250.00
8	SANITARY GRAVITY MAIN, TRENCHED, CCFRPM, 36" (0'-15' DEEP) NORTH AVE TO SPRING ST N.	LF	4750	$325.00	$1,543,750.00
9	SANITARY GRAVITY MAIN, TRENCHED, CCFRPM, 36" (15-25' DEEP) NORTH AVE TO SPRING ST N.	LF	1000	$375.00	$375,000.00
10	SANITARY GRAVITY MAIN, TRENCHED, CCFRPM, 42" (0'-15' DEEP) SPRING ST N. TO SHELDAHL	LF	1250	$375.00	$468,750.00
11	SANITARY GRAVITY MAIN, TRENCHED, CCFRPM, 42" (15-25' DEEP) SPRING ST N. TO SHELDAHL	LF	750	$425.00	$318,750.00
12	SANITARY GRAVITY MAIN, TRENCHED, CCFRPM, 42" (25-35' DEEP) SPRING ST N. TO SHELDAHL	LF	400	$475.00	$190,000.00
13	SANITARY MANHOLE, ALL GRAVITY	EA	62	$10,000.00	$620,000.00
14	REMOVE EX ROADWAY & EXISTING GRAVITY SEWER - NORTH AVE TO SHELDAHL	LF	7850	$500.00	$3,925,000.00
15	RECONSTRUCT ROADWAY - NORTH AVE TO SHELDAHL	LF	7850	$500.00	$3,925,000.00
16	RAILROAD/HIGHWAY CASING CROSSING	SY	3	$245,000.00	$735,000.00
17	TEMPORARY CONVEYANCE	LS	1	$100,000.00	$100,000.00
18	PERMANENT EASEMENT ACQUISITION	ACRE	1	$0.00	$0.00

TOTAL CONSTRUCTION	**$19,794,000.00**
CONTINGENCY (25%)	**$4,948,500.00**
ENGINEERING (20%)	**$4,948,500.00**
OPINION OF PROBABLE CONSTRUCTION COST:	**$29,691,000.00**

Figure 16. NW Area Lift Station & Trunk Sewer Routing – Scenario B: Option 2 Overview Map

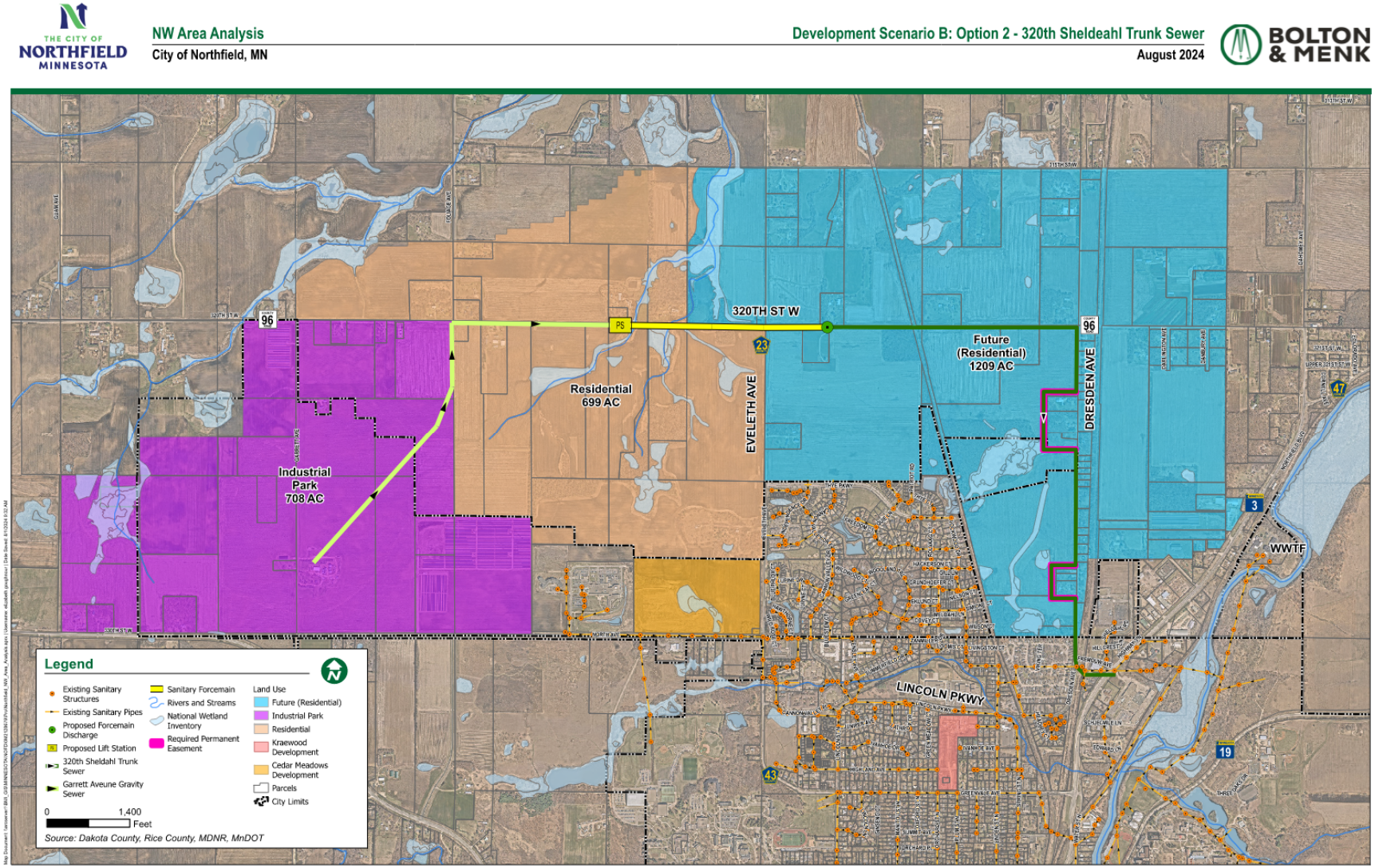

Figure 17. NW Area Lift Station & Trunk Sewer Routing – Scenario B: Option 2 Opinion of Probable Costs

OPINION OF PROBABLE COSTS

OPTION 2: 320TH SHELDAHL

City of Northfield

BMI PROJECT NO. 0M2.128679

BOLTON & MENK
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7/31/2024

Item No.	Item	Unit	Quantity	Unit Price	Total Amount
1	SANITARY GRAVITY MAIN, TRENCHED, CCFRPM, 36" (0'-15' DEEP) GARRETT AVE/320TH	LF	4250	$325.00	$1,381,250.00
2	SANITARY GRAVITY MAIN, TRENCHED, CCFRPM, 36" (15'-25' DEEP) GARRETT AVE/320TH	LF	1300	$375.00	$487,500.00
3	SANITARY GRAVITY MAIN, TRENCHED, CCFRPM, 36" (25'-35' DEEP) GARRETT AVE/320TH	LF	2200	$450.00	$990,000.00
4	6.1 MGD LIFT STATION	LS	1	$2,350,000.00	$2,350,000.00
5	SANITARY FORCE MAIN, TRENCHLESS, 18" I.D.	LF	3450	$265.00	$914,250.00
6	FORCEMAIN AIR RELEASE/CLEANOUT STRUCTURE AND PIT	EA	4	$35,000.00	$140,000.00
7	SANITARY GRAVITY MAIN, TRENCHED, CCFRPM, 48" (0'-15' DEEP) FM DISCHARGE TO FREMOUW	LF	6050	$450.00	$2,722,500.00
8	SANITARY GRAVITY MAIN, TRENCHED, CCFRPM, 48" (15-25' DEEP) FM DISCHARGE TO FREMOUW	LF	2600	$600.00	$1,560,000.00
9	SANITARY GRAVITY MAIN, TRENCHED, CCFRPM, 48" (25-35' DEEP) FM DISCHARGE TO FREMOUW	LF	1300	$700.00	$910,000.00
10	SANITARY GRAVITY MAIN, TRENCHED, CCFRPM, 48" (0'-15' DEEP) FREMOUW TO SHELDAHL	LF	750	$450.00	$337,500.00
11	SANITARY MANHOLE, ALL GRAVITY	EA	60	$10,000.00	$600,000.00
12	REMOVE EX ROADWAY & EXISTING GRAVITY SEWER - FREMOUW TO SHELDAHL	LF	750	$500.00	$375,000.00
13	RECONSTRUCT ROADWAY - FREMOUW TO SHELDAHL	LF	750	$500.00	$375,000.00
14	RAILROAD/HIGHWAY CASING CROSSING	EA	3	$245,000.00	$735,000.00
15	TEMPORARY CONVEYANCE	LS	1	$50,000.00	$50,000.00
16	PERMANENT EASEMENT ACQUISITION	ACRE	2.2	$25,000.00	$55,000.00
17	TEMPORARY EASEMENT AGREEMENT	ACRE	1.5	$2,500.00	$3,750.00
				TOTAL CONSTRUCTION	**$13,986,750.00**
				CONTINGENCY (25%)	**$3,496,687.50**
				ENGINEERING (20%)	**$3,496,687.50**
				OPINION OF PROBABLE CONSTRUCTION COST:	**$20,980,125.00**

Figure 18. NW Area Lift Station & Trunk Sewer Routing – Scenario B: Option 3 Overview Map

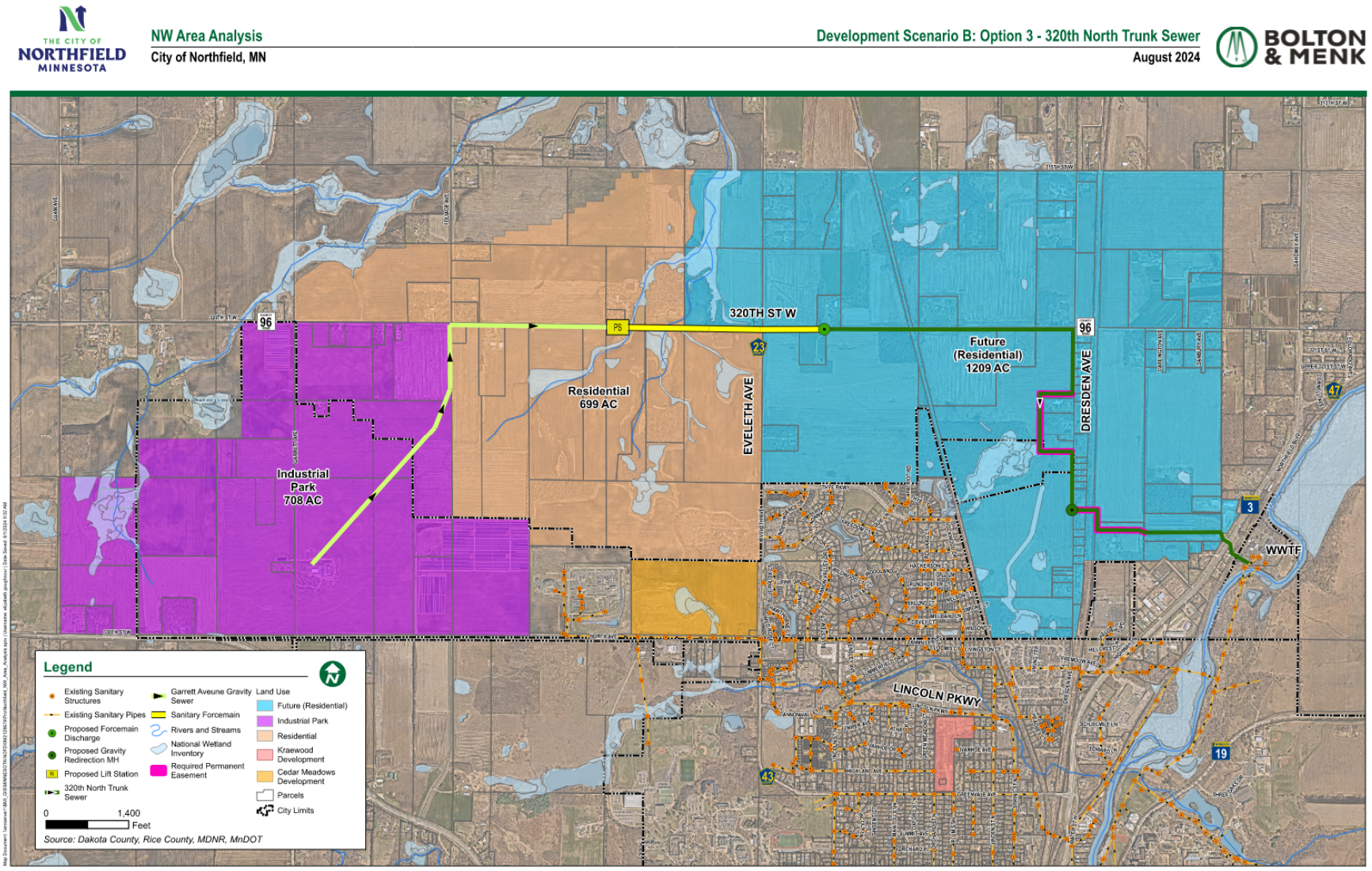

Figure 19. NW Area Lift Station & Trunk Sewer Routing – Scenario B: Option 3 Opinion of Probable Costs

OPINION OF PROBABLE COSTS

OPTION 3: 320TH NORTH

City of Northfield

BMI PROJECT NO. 0M2.128679

BOLTON & MENK
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7/31/2024

Item No.	Item	Unit	Quantity	Unit Price	Total Amount
1	SANITARY GRAVITY MAIN, TRENCHED, CCFRPM, 36" (0'-15' DEEP) GARRETT AVE/320TH	LF	4250	$325.00	$1,381,250.00
2	SANITARY GRAVITY MAIN, TRENCHED, CCFRPM, 36" (15-25' DEEP) GARRETT AVE/320TH	LF	1300	$375.00	$487,500.00
3	SANITARY GRAVITY MAIN, TRENCHED, CCFRPM, 36" (25-35' DEEP) GARRETT AVE/320TH	LF	2200	$450.00	$990,000.00
4	6.1 MGD LIFT STATION	LS	1	$2,350,000.00	$2,350,000.00
5	SANITARY FORCE MAIN, TRENCHLESS, 18" I.D.	LF	3450	$265.00	$914,250.00
6	FORCEMAIN AIR RELEASE/CLEANOUT STRUCTURE AND PIT	EA	4	$35,000.00	$140,000.00
7	SANITARY GRAVITY MAIN, TRENCHED, CCFRPM, 48" (0'-15' DEEP) FM DISCHARGE TO REDIRECTION MH	LF	5000	$450.00	$2,250,000.00
8	SANITARY GRAVITY MAIN, TRENCHED, CCFRPM, 48" (15-25' DEEP) FM DISCHARGE TO REDIRECTION MH	LF	1900	$600.00	$1,140,000.00
9	SANITARY GRAVITY MAIN, TRENCHED, CCFRPM, 48" (25-35' DEEP) FM DISCHARGE TO REDIRECTION MH	LF	300	$700.00	$210,000.00
10	SANITARY GRAVITY MAIN, TRENCHED, CCFRPM, 48" (0'-15' DEEP) REDIRECTION MH TO PLANT	LF	2000	$450.00	$900,000.00
11	SANITARY GRAVITY MAIN, TRENCHED, CCFRPM, 48" (15-25' DEEP) REDIRECTION MH TO PLANT	LF	700	$600.00	$420,000.00
12	SANITARY GRAVITY MAIN, TRENCHED, CCFRPM, 48" (25-35' DEEP) REDIRECTION MH TO PLANT	LF	1000	$700.00	$700,000.00
13	SANITARY MANHOLE, ALL GRAVITY	EA	60	$10,000.00	$600,000.00
14	RAILROAD/HIGHWAY CASING CROSSING	EA	4	$245,000.00	$980,000.00
15	TEMPORARY CONVEYANCE	LS	1	$50,000.00	$50,000.00
16	PERMANENT EASEMENT ACQUISITION	ACRE	3.3	$25,000.00	$82,500.00
17	TEMPORARY EASEMENT AGREEMENT	ACRE	2.2	$2,500.00	$5,500.00

TOTAL CONSTRUCTION	**$13,601,000.00**
CONTINGENCY (25%)	**$3,400,250.00**
ENGINEERING (20%)	**$3,400,250.00**
OPINION OF PROBABLE CONSTRUCTION COST:	**$20,401,500.00**

Figure 20. NW Area Lift Station & Trunk Sewer Routing – Pipe Sizing Calculations

Northfield - NW Area Analysis - Option 1: Lincoln Parkway								
Segment	Peak Flow (gpm)	Additional Peak Flows (gpm)	Total Peak Flow (gpm)	Pipe Size (in)	Pipe Slope (ft/ft)	Manning N Value	Full Pipe Capacity (gpm)	% Full during Peak Flows
Garrett Ave Trunk Sewer (to Liftstation)	4,236	-	4,236	36	0.00046	0.013	6,421	66%
NW Area Forcemain	4,236	-	4,236	-	-	-	-	-
Viking Terrace Metered Peak Flow with Proposed Developments	4,236	802	5,038	36	0.00046	0.013	6,421	78%
Additional Highway 3 Metered Peak Flow	5,038	636	5,674	42	0.00037	0.013	8,686	65%

Northfield - NW Area Analysis - Option 2: 320th-Sheldahl								
Segment	Peak Flow (gpm)	Additional Peak Flows (gpm)	Total Peak Flow (gpm)	Pipe Size (in)	Pipe Slope (ft/ft)	Manning N Value	Full Pipe Capacity (gpm)	% Full during Peak Flows
NW AREA (Garrett Ave Trunk)	4,236	-	4,236	36	0.00046	0.013	6,421	66%
NW Area Forcemain	4,236	-	4,236	-	-	-	-	-
North Area Gravity	4,236	3,542	7,778	48	0.00032	0.013	11,533	67%
North Area Gravity + Highway 3 Metered Peak Flows & Develoment Flows	7,778	1,438	9,216	48	0.00032	0.013	11,533	80%

Northfield - NW Area Analysis - Option 3: 320th-North								
Segment	Peak Flow (gpm)	Additional Peak Flows (gpm)	Total Peak Flow (gpm)	Pipe Size (in)	Pipe Slope (ft/ft)	Manning N Value	Full Pipe Capacity (gpm)	% Full during Peak Flows
NW AREA (Garrett Ave Trunk)	4,236	-	4,236	36	0.00046	0.013	6,421	66%
NW Area Forcemain	4,236	-	4,236	-	-	-	-	-
North Area Gravity	4,236	3,542	7,778	48	0.00032	0.013	11,533	67%