City of Northfield

Stormwater Pond Assessment

December, 2017

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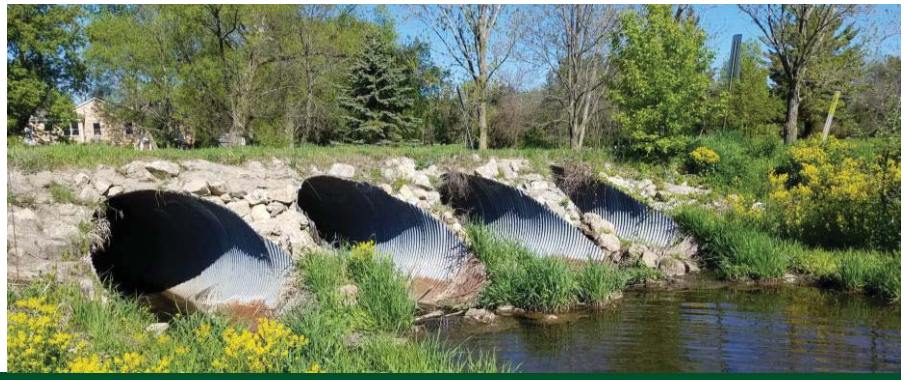


Certification

Project Summary Report

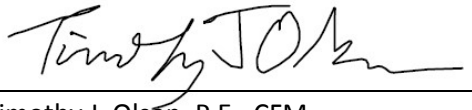
for

Stormwater Pond Assessment

City of Northfield, MN
N14113510

December 15, 2017

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.

By: 

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Date: 12- 15-2017

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Executive Summary

The City of Northfield has committed to meeting the requirements of the Minnesota Pollution Control Agency's (MPCA) Municipal Separate Storm Sewer Systems (MS4) General Permit (MNR040000). The permit describes six Minimum Control Measures (MCM) that describe regulatory, education and general inspection and maintenance requirements for the City's stormwater management system. MCM 6 for Pollution Prevention/Good Housekeeping for Municipal Operations describes requirements for pond assessment procedures and schedule for completion. Specifically, the permit reads:

"The permittee shall develop procedures and a schedule for the purpose of determining the [total suspended solids] TSS and [total phosphorous] TP treatment effectiveness of all permittee owned/operated ponds constructed and used for the collection and treatment of stormwater." (Permit No. MNR040000, page 19, 8/1/2013)

The City currently has 56 stormwater ponds that mitigate surface flooding and provide water quality treatment for total suspended solids (TSS) and total phosphorus (TP). For this project, the following information was collected for 50 ponds. The remaining ponds were assessed under a different project.

- Stormwater pond bathymetric assessment.
- Field-collected data summary.
- Pond cleaning prioritization.
- TSS and TP treatment effectiveness.
- Estimated pond cleaning costs.

Upon determining the total sediment accumulation for each pond, the basins were ranked based on their total percent full. The study identified 8 ponds that have reached or are approaching their capacities in terms of sediment accumulation. These 8 ponds were isolated for further analysis. The 8 ponds were further analyzed to understand their contributing watershed area to determine whether or not the pond meets current design standards. Also, sediment contamination levels were collected by a geotechnical engineering consultant and costs to remove the sediment and restore it to its originally intended design capacity were calculated for future capital planning efforts.

The City will initiate program cleaning of the top 8 ranked ponds through the capital improvement program. The Grant Park Pond is also slated for improvements within the anticipated 10-year timeline, bringing the total program to 9 ponds. The City will also evaluate adjacent ponds, or ponds near other capital improvement projects, and add more critical pond cleaning projects as budgets allow. The following table identifies the top 8 ponds per this assessment and their estimated total project cost for sediment removal.

UniqueID	Pond_Name	Sediment Accumulation (cu-yds)	Sediment Accumulation (tons)	Management Level	Engineer's Estimate	Total Project Estimate
PND-0077	Golf Course Pond #2	235	423	2	$89,100	$115,820
PND-0044	Parmeadow Park #3	3,447	6.204	1	$177,700	$231,040
PND-0045	Prairie Hills #1	143	257	2	$80,600	$104,820
PND-0018	Hills of Spring Creek #3	797	1,434	1	$96,700	$125,740
PND-0015	Hidden Valley Park Pond	3,754	6,757	3	$395,300	$513,860
PND-0002	Cannon Commercial	552	994	1	$103,100	$134,020
PND-0042	Parmeadow Park #1	3,340	6,011	1	$192,000	$249,600
PND-0032	Locust Upper Pond	1,490	2,682	1	$126,900	$164,980
				Total:	**$1,261,400**	**$1,639,880**

I. Project Background and Summary

The Minnesota Pollution Control Agency (MPCA) has issued the Municipal Separate Storm Sewer Systems (MS4) General Permit (MNR040000) authorizing municipalities to discharge stormwater into the local water way. Under Minimum Control Measure (MCM) 6: Pollution Prevention/Good Housekeeping for Municipal Operations, the City of Northfield was required to:

- Develop procedures for determining the Total Suspended Solids (TSS) and Total Phosphorus (TP) treatment effectiveness for its stormwater ponds.
- Develop a schedule for completing the assessment.
- Continue to inspect all structural stormwater best management practices (BMPs) per the established timeline.
- Complete all necessary maintenance requirements to maintain the operational functionality of the stormwater BMPs per the established timeline.

In December, 2016, the City released its Request for Proposals (RFP) for Stormwater Pond Assessment. The RFP laid out a detailed scope of work that included a muti-phase approach for understanding the ponds current capacities for water quality improvements and set in motion a plan for cleaning the highest priority basins. The scope included the following phases.

- Phase 1: Perform bathymetric survey and compare results to as-built surveys and grading plans. Evaluate the ponds to determine the estimate life expectancy based on historical and anticipated loadings. Provide GIS mapping of bathymetry and original construction. Provide table of sediment accumulation.
- Phase 2: Identify 10 stormwater ponds with the highest percent sediment accumulation. Sample and test the sediment in the highest priority ponds. Determine the respective disposal category. Provide project cost estimates.
- Phase 3: Determine the Total Suspended Solids (TSS) and Total Phosphorus (TP) treatment effectiveness.

In 2013/2014, the City of Northfield renewed their MS4 General Permit to discharge stormwater and has committed to meeting the requirements of the six MCMs which define regulatory mechanisms, procedural requirements, staff education and public engagement. The Stormwater Pond Assessment not only sets in motion the City's previously developed assessment procedures and schedule, it also accelerates the assessment program into the implementation and data collection phase. This proactive approach gives the City a head start into future MS4 Permitting requirements. This Summary Report will identify the following critical items.

- Stormwater pond bathymetric assessment.
- Field-collected data summary.
- Pond cleaning prioritization.
- TSS and TP treatment effectiveness.
- Estimated pond cleaning costs.

The City will develop a schedule of the next 10 years to clean the top 8 highest priority basins, including previously scheduled maintenance at Grant Park pond. After the first ten years of cleaning have been completed, The City will utilize the anticipated sediment loading projections summarized in this report to determine future pond cleaning prioritization. Also, additional ponds may need to be reanalyzed for sediment accumulation in the future to determine the anticipated costs to clean them.

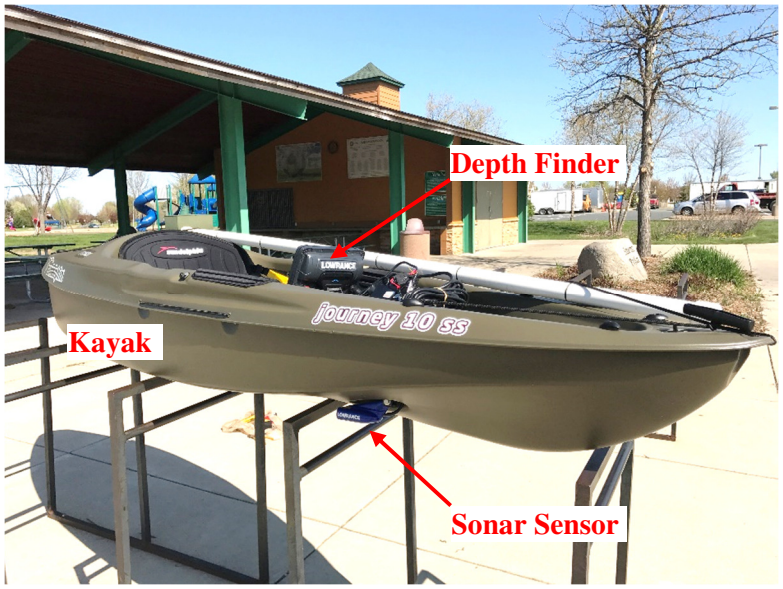

Exhibit 1: Typical kayak, depth finder and sonar sensor setup.

II. Stormwater Pond Bathymetric Assessment and Field Data Collection

Bolton & Menk has worked with BioBase (by C-MAP, Inc.) to utilize depth finder (sonar) equipment mounted to a kayak to collect pond depth information. The sonar is a "first return" measurement representing the top of the accumulated sediment, or the top of vegetation. BioBase uses software to return to the user a "bare earth" representation of the pond bottom that removes higher localized returns resulting from vegetation. In addition to the sonar, hand measurements were also collected using a survey grade rod to measure the depth to the top of sediment and the depth to the hard pond bottom as a verification and quality control mechanism. The final information is used to:

- Recreate the originally constructed dead storage contours.
- Calibrate the sonar-measured sediment depths.
- Establish the geospatial (GIS) files for the automated sediment accumulation calculations and pond cleaning prioritization.

A. Sonar Data Collection

The kayak and sonar equipment was used to record pond depths to the top of sediment by paddling around the pond to ensure that enough of the surface area was covered to establish the pond bottom elevation. Exhibit 2 below is an example of the sonar points collected.

Exhibit 2: Example of sonar data collection points (Parmeadow Pond #1).

B. Originally Constructed Dead Storage Contours

The City of Northfield maintains a database of originally design plans for nearly all of the stormwater ponds in town. The as-built and design plans are included in Appendix A. While these plans provide some indication of when the pond was constructed and the general shape and depth to which it was intended to be constructed, the actual field conditions can vary substantially from design. Therefore, the sonar data collection was utilized to re-draw the originally constructed ponds. Exhibit 3 is one example of an original design plan vs. the as-constructed contours from the sonar assessment.

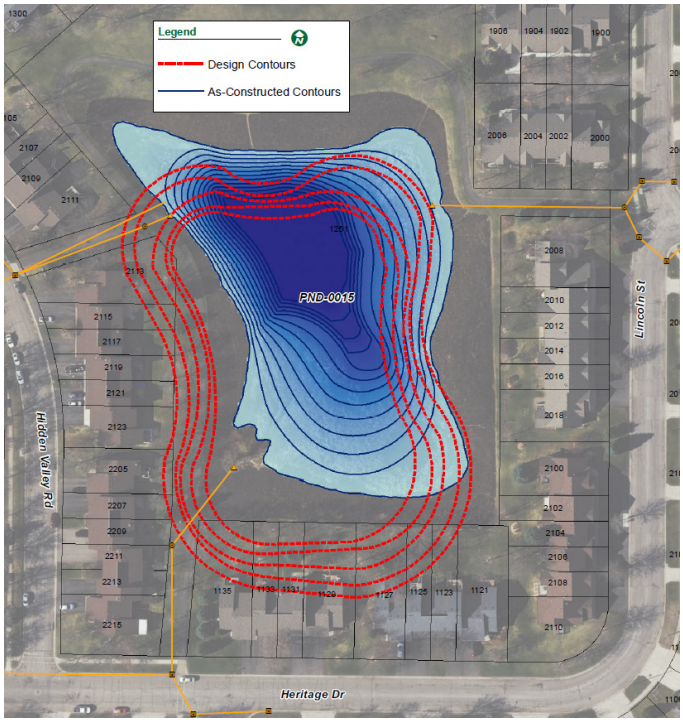

Exhibit 3: Design contours compared to as-constructed contours (Hidden Valley Park Pond).

The sonar information was utilized to establish the pond dead storage contours to the top of the accumulated sediment. Hand measurements (further described below) were used to understand the current depth of sediment to further establish the as-constructed pond bottom. The following assumptions were used to establish the as-constructed condition. Exhibit 4 shows a representative cross section and the manual manipulation required to reestablish the as-constructed dead storage condition. The following assumptions were used to recreate the dead storage contours.

- There is little to no sediment accumulation on the side slopes of the basin. The majority of the sediment accumulation occurs on the pond bottom.
- The side slopes of the pond from the normal water level (NWL) down to the top of sediment continue at the same slope to the bottom of sediment.
- The contour representing the top of sediment can be off set at the same slope as the dead storage side slopes down to the pond bottom to recreate the as-construction condition.

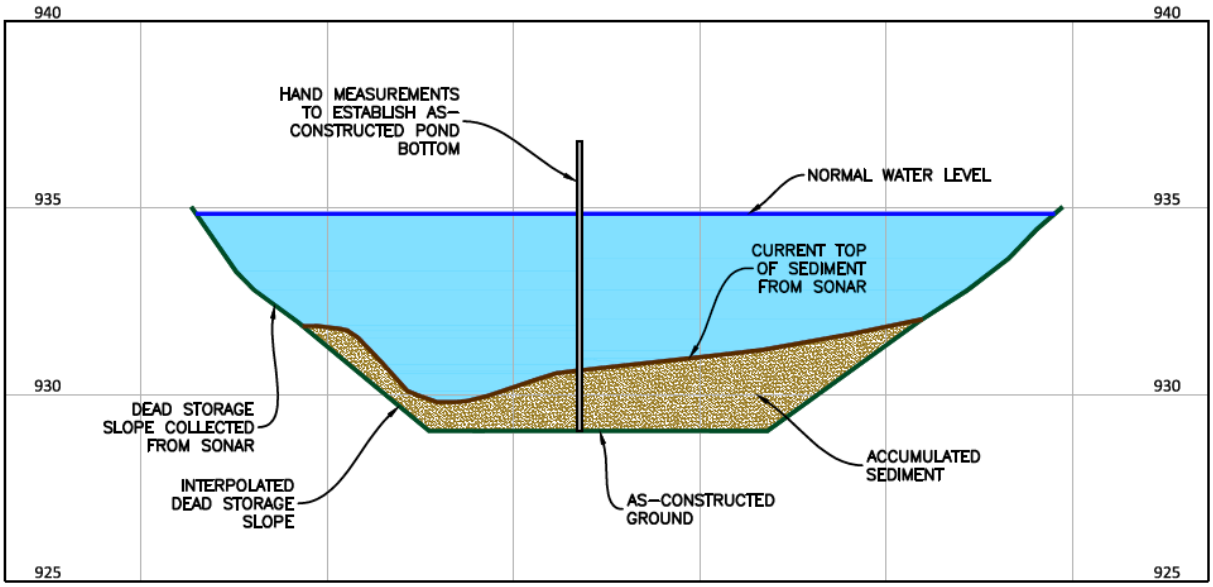

Exhibit 4: Comparison of stormwater design plan vs. as-constructed pond from sonar information.

C. Field Assessment and Photo Collection

Each pond was visually assessed for outlet conditions, evidence of erosion, accumulated sediment or deltas, excess vegetation or invasive species, and any other issues that could affect pond performance. A photo catalog was also collected and converted to GeoCP™ (Catalogued Photos). GeoCP™ is a web application designed to store photos in a convenient location, spatially reference the photos in a map, generate thumbnails for quick reference, and send to the City in a portable application. The GeoCP™ catalogue is included with this project for the City's record and use. Also, all field data collection forms and assessments are included in Appendix B for your reference.

III. Geospatial Processing and Mapping

The sonar logs are downloaded from the depth finder and uploaded to the BioBase platform for post processing. The deliverable is a series of text files that include latitude and longitude, and depth,

sediment composition and vegetation abundance, respectfully. For this project, only the depth information was processed. Using ArcMap Geographic Information System (GIS) software, the text files were converted to points files (shapefiles) for use in a series of geospatial processing tools. All pond figures are located in Appendix C. The following data layers and Pond Exhibits were automatically created using GIS programming.

- Exhibit 1: Existing Site - The existing site exhibit includes the as constructed dead storage contours and depth grid generated from the sonar data collection and hand measurement calibration effort.
- Exhibit 2: Current Pond Depth – The current pond depth exhibit shows the results from the sonar log. The sonar depth returns are converted to elevation based on a measured reference elevation or known water surface elevation. The exhibit represents the current pond depth.
- Exhibit 3: Sediment Accumulation – The sediment accumulation exhibit shows the difference between the as constructed condition and the current sediment elevations. The difference is the current accumulated sediment. These values were calibrated to the hand measurements to ensure accuracy.

IV. Sediment Accumulation and Pond Cleaning Prioritization

ArcMap GIS tools were used to automatically calculate the as-constructed dead storage volume, current pond volume and accumulated sediment volume. Pond age is then used to develop sediment accumulation metrics that include total accumulation, accumulation per year, percent full and percent accumulation per year.

The City reviewed the approach and decided that the most important parameter was accumulated sediment volume and associated percent full. Also, other adjustments to the priority list were made based on known field conditions and neighborhood response. Table 1 is a list of the top 8 ponds requiring cleaning. Appendix D includes a full table of all ponds sorted by the overall ranking.

Table 1: Summary of highest priority pond cleaning.

UniqueID	Pond Name	Year Built	Year Dredged	NWL	Sediment Accumulation (cu-yds)
PND-0077	Golf Course Pond #2	1980	0	926.11	235
PND-0044	Parmeadow Park #3	1986	1998	939.06	3,447
PND-0045	Prairie Hills #1	1996	0	974.00	143
PND-0018	Hills of Spring Creek #3	1999	0	952.50	797
PND-0015	Hidden Valley Park Pond	1983	0	954.00	3,754
PND-0002	Cannon Commercial	1999	0	913.40	552
PND-0042	Parmeadow Park #1	1986	1998	930.57	3,340
PND-0032	Locust Upper Pond	1999	0	975.00	1,490

V. Pond Treatment Capacity

As the stormwater treatment ponds fill with sediment, the ponds ability to remove total suspended solids (TSS) and total phosphorus (TP) is diminished. Many of the City's stormwater ponds were sized based on the contributing watershed area to meet a standard for pollutant removal. Generally

speaking, the Minnesota Pollution Control Agency requires that stormwater ponds be sized to remove 80% TSS and 60% TP. The following describes the MPCA's dead storage sizing requirements to meet the current water quality regulation.

MPCA Standard:

a. Dead storage volume = 1,800 cubic feet per acre of watershed area.
b. Water quality volume = 1 inch of runoff over the newly constructed impervious surface.
c. Water quality release rate = 5.66 cubic feet per second per surface area at the water quality volume.

Stormwater regulation throughout the state varies and may require utilizing other methods for water quality pond sizing based on watershed runoff volume for a specific rainfall event. As an initial check, the MPCA's method was utilized to determine the approximate dead storage volume required to meet current rules relative to the as-constructed volume. Pond outlets were not modeled to determine the current water quality release rate. At a minimum, the MPCA's method for dead storage design does not require any additional hydraulic modeling. If the City identifies ponds that have enough available space to be expanded to meet an alternative set of design, the contributing watershed should be modeled to understand the total runoff entering the basin and determine adequate dead storage and water quality release rate.

Some ponds in Northfield were constructed for water quality and/or flood control along major drainage ways. In other words, they do not fit a standard design for water quality because they were not constructed to meet a permit requirement. The pond surface area to watershed area ratio tends to be very small (less than 1%) and the basin will not function at the standard TSS and TP removal rates.

Watershed areas were developed for the highest priority ponds to compare the constructed pond volume, current pond volume with sediment accumulation and required pond volume to meet MPCA standard dead storage volume design. Table 2 provides a summary of the pond volume data and indicates whether the pond is a localized stormwater quality pond or a regional flood detention basin. Also, required pond volumes were computed if the pond were to be designed and modified to meet the MPCA Design Standard described above. Watershed exhibits for each priority pond are located in Appendix G.

The MPCA defines Pond Assessment Procedures and Schedule in MCM 6 as *"determining the TSS and TP treatment effectiveness of all permittee owned/operated ponds constructed and used for the collection and treatment of stormwater"* (Permit No: MN040000, Page 19). The pond may not have been constructed to MPCA wet sedimentation basin standards because of the year the pond was built or its location and intended use within the City. Removing the accumulated sediment will at least restore the pond to its originally intended treatment capacity. Additional retrofits to the pond to bring it to MPCA standards are not addressed in the current MS4 Permit (2013) and may not be appropriate given the intended use of the pond (i.e. for flood control as opposed to water quality).

Table 2: Summary of current and required dead storage volumes.

UniqueID	Pond_Name	Sediment Accumulation (cu-yds)	As-Constructed Volume (cu-yds)	Percent Full (%)	Direct Watershed Area (ac)	Regional Watershed Area (ac)	Pond Surface Area (ac)	Pond Surface Area to Watershed Area Ratio (%)	MPCA Required Pond Volume (cu-yds)
PND-0077	Golf Course Pond #2	235	382	61.6%	153.0	5951.2	0.25	0.0%	10,200
PND-0044	Parmeadow Park #3	3,447	5858	58.8%	4.2	1388.2	1.27	0.1%	280
PND-0045	Prairie Hills #1	143	245	58.2%	4.1	N/A	0.09	2.2%	273
PND-0018	Hills of Spring Creek #3	797	1669	47.7%	2.7	N/A	0.49	18.1%	180
PND-0015	Hidden Valley Park Pond	3,754	8095	46.4%	91.9	N/A	1.86	2.0%	6,127
PND-0002	Cannon Commercial	552	1334	41.4%	54.3	63.9	0.33	0.5%	3,620
PND-0042	Parmeadow Park #1	3,340	8952	37.3%	104.5	299.0	1.50	0.5%	6,967
PND-0032	Locust Upper Pond	1,490	4059	36.7%	25.6	N/A	0.62	2.4%	1,707

VI. Sediment Contamination Sampling and Pond Cleaning Cost Estimates

The MPCA requires testing for polycyclic aromatic hydrocarbons (PAHs), specific metals and other pollutants to determine the level of contamination. Professional Service Industries, Inc. (PSI) was hired to sample the highest priority ponds (top 8 only) to determine the level of contamination. The MPCA's document "Managing Stormwater Sediment Best Management Practices Guidance" (May, 2017) and "Managing Dredge Materials" (April, 2014) discusses sampling requirements and sediment disposal requirements based on the level of contamination. The MPCA defines the dredge material Management Levels based on Soil Reference Values (SRV) that characterize the material as hazardous waste based on concentrations of a number of metals and chemicals. The sediment sampling results are located in Appendix F. Also, the most restrictive SRV contamination level limits are displayed in Table 4. The Management Levels are defines as follows.

- **Management Level 1:** Suitable for use or reuse on residential or recreational properties. Material is at or below the concentrations limits all of the Tier 1 SRVs.
- **Management Level 2:** Suitable for use or reuse on properties with industrial use. Material is at or below the concentration limits for the Tier 2 SRVs.
- **Management Level 3:** Not suitable for use or reuse and must be landfilled. Material has significant contamination and has one or more concentrations exceeding the limits for the Level 2 SRV.

Sediment disposal costs are related to the Management Level. Other cost considerations include time of year for construction, site access, dewatering, sediment excavation methods (i.e. mechanical or hydraulic methods) and site restoration. Preliminary Engineer's Estimates were developed for each of the priority ponds. Table 3 summarizes the estimated costs to clean the priority ponds. Pond access and restoration exhibits are included in Appendix E. Itemized Preliminary Engineers Estimates with approximate quantities and estimated unit prices are also included in Appendix E. The following assumptions were included in the estimate.

- SRV Level II and SRV Level III ponds assume landfill disposal costs.
- The material removed from the pond must be as dry as possible prior to disposal. Therefore, it

is assume that 1 cubic yard of material is approximately 3,600 pounds (1.8 tons/cubic yard).

- All excavation will be mechanical methods. Estimates should be modified if the City requires an alternate method.
- Mobilization, traffic control, pond dewatering, erosion control methods and street sweeping were assumed lump sum.
- Access locations were chosen to minimize disturbance and utilize public rights of way.
- Trail/sidewalk replacement was considered in access locations that crossed existing pedestrian facilities.
- Site restoration was assumed at all access locations and should be considered approximate.

Table 3: Summary of Estimated pond sediment removal costs.

UniqueID	Pond_Name	Sediment Accumulation (cu-yds)	Sediment Accumulation (tons)	Management Level	Engineer's Estimate	Total Project Estimate
PND-0077	Golf Course Pond #2	235	423	2	$89,100	$115,820
PND-0044	Parmeadow Park #3	3,447	6.204	1	$177,700	$231,040
PND-0045	Prairie Hills #1	143	257	2	$80,600	$104,820
PND-0018	Hills of Spring Creek #3	797	1,434	1	$96,700	$125,740
PND-0015	Hidden Valley Park Pond	3,754	6,757	3	$395,300	$513,860
PND-0002	Cannon Commercial	552	994	1	$103,100	$134,020
PND-0042	Parmeadow Park #1	3,340	6,011	1	$192,000	$249,600
PND-0032	Locust Upper Pond	1,490	2,682	1	$126,900	$164,980
				Total:	**$1,261,400**	**$1,639,880**

Table 4: Dredged material SRVs. Taken from MPCA "Managing Dredged Materials" (April, 2014).

Parameter	Level 1 Soil Reference Value (SRV) (mg/kg, dry weight)	Level 2 Soil Reference Value (SRV) (mg/kg, dry weight)
In-organics-Metals		
Arsenic	9	20
Cadmium	25	200
Chromium III	44,000	100,000
Chromium VI	87	650
Copper	100	9,000
Lead	300	700
Mercury	0.5	1.5
Nickel	560	2,500
Selenium	160	1,300
Zinc	8,700	75,000
Barium	1,100	18,000
Cyanide	60	5,000
Manganese	3,600	8,100
Organics		
PCBs (Total)	1.2	8
Aldrin	1	2
Chlordane	13	74
Endrin	8	56
Dieldrin	0.8	2
Heptachlor	2	3.5
Lindane (Gamma BHC)	9	15
DDT	15	88
DDD	56	125
DDE	40	80
Toxaphene	13	28
2,3,7,8-dioxin, 2,3,7,8-furan and 15 2,3,7,8-substitued dioxin and furan congeners	0.00002	0.000035
Polycyclic Aromatic Hydrocarbons (PAHs)		
Quinoline	4	7
Naphthalene	10	28
Pyrene	890	5,800
Fluorene	850	4,120
Acenaphthene	1,200	5,260
Anthracene	7,800	45,400
Fluoranthene	1,080	6,800
Benzo (a) pyrene (BAP)/BAP equivalent	2	3
*Benzo (a) anthracene	*Dibenz (a,h) anthracene	*3-Methylcholanthrene
*Benzo (b) fluoranthene	*7H-Dibenzo (c,g) carbazole	*5-Methylchrysene
*Benzo (j) fluoranthene	*Dibenzo (a,e) pyrene	*5-Nitroacenaphthene
*Benzo (k) fluoranthene	*Dibenzo (a,h) pyrene	*1-Nitropyrene
*Benzo (a) pyrene	*Dibenzo (a,i) pyrene	*6-Nitrochrysene
*Chrysene	*Dibenzo (a,l) pyrene	*2-Nitrofluorene
*Dibenz (a,j) acridine	*1,6-Dinitropyrene	*4-Nitropyrene
*Dibenz (a,h) acridine	*1,8-Dinitropyrene	
*7,12-Dimethylbenz[a]anthracene	*Indeno (1, 2, 3-cd) pyrene	

***The results for these analytes should be added together and treated as the BAP equivalent which is compared against the soil reference value for Benzo (a) pyrene, above.**

Appendix A: Preliminary Engineer's Estimate Pond Access Exhibits

PRELIMINARY ENGINEER'S ESTIMATE

PDN-0077: GOLF COURSE POND #2

DECEMBER, 2017

No.	Item	Units	Approx. Qty	Estimated Unit Price	Estimated Total Price
	BASE BID:				
1	MOBILIZATION	LS	1	$25,000.00	$25,000.00
2	TRAFFIC CONTROL	LS	1	$1,500.00	$1,500.00
3	POND DEWATERING	LS	1	$26,500.00	$26,500.00
4	TRAIL/SIDEWALK RESTORATION	LF	0	$80.00	$0.00
5	INLET/OUTLET MAINTENANCE	LS	1	$10,000.00	$10,000.00
6	MUCK EXCAVATION (EV) - MANAGEMENT LEVEL 1	TONS	0	$16.00	$0.00
7	MUCK EXCAVATION (EV) - MANAGEMENT LEVEL 2	TONS	0	$25.00	$0.00
8	MUCK EXCAVATION (EV) - MANAGEMENT LEVEL 3	TONS	423	$40.00	$16,928.00
9	EROSION CONTROL MEASURES	LS	1	$4,000.00	$4,000.00
10	SEEDING, FERTILIZER, AND EROSION CONTROL BLANKET	SY	520	$8.00	$4,160.00
11	STREET SWEEPER WITH OPERATOR	HR	8	$130.00	$1,040.00
				TOTAL ESTIMATED CONSTRUCTION COSTS	**$89,100.00**
				PROJECT CONTINGENCY (10%)	**$8,900.00**
				PROJECT OVERHEAD (20%)	**$17,820.00**
				TOTAL ESTIMATED PROJECT COSTS	**$115,820.00**

PRELIMINARY ENGINEER'S ESTIMATE

PDN-0044: PARMEADOW PARK #3

DECEMBER, 2017

No.	Item	Units	Approx. Qty	Estimated Unit Price	Estimated Total Price
	BASE BID:				
1	MOBILIZATION	LS	1	$25,000.00	$25,000.00
2	TRAFFIC CONTROL	LS	1	$1,500.00	$1,500.00
3	POND DEWATERING	LS	1	$26,500.00	$26,500.00
4	TRAIL/SIDEWALK RESTORATION	LF	50	$80.00	$4,000.00
5	INLET/OUTLET MAINTENANCE	LS	1	$15,000.00	$15,000.00
6	MUCK EXCAVATION (EV) - MANAGEMENT LEVEL 1	TONS	6,204	$16.00	$99,270.00
7	MUCK EXCAVATION (EV) - MANAGEMENT LEVEL 2	TONS	0	$25.00	$0.00
8	MUCK EXCAVATION (EV) - MANAGEMENT LEVEL 3	TONS	0	$40.00	$0.00
9	EROSION CONTROL MEASURES	LS	1	$4,000.00	$4,000.00
10	SEEDING, FERTILIZER, AND EROSION CONTROL BLANKET	SY	170	$8.00	$1,360.00
11	STREET SWEEPER WITH OPERATOR	HR	8	$130.00	$1,040.00
			TOTAL ESTIMATED CONSTRUCTION COSTS		**$177,700.00**
				PROJECT CONTINGENCY (10%)	**$17,800.00**
				PROJECT OVERHEAD (20%)	**$35,540.00**
				TOTAL ESTIMATED PROJECT COSTS	**$231,040.00**

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PRELIMINARY ENGINEER'S ESTIMATE

PDN-0045: PRAIRIE HILLS #1

DECEMBER, 2017

No.	Item	Units	Approx. Qty	Estimated Unit Price	Estimated Total Price
	BASE BID:				
1	MOBILIZATION	LS	1	$25,000.00	$25,000.00
2	TRAFFIC CONTROL	LS	1	$1,500.00	$1,500.00
3	POND DEWATERING	LS	1	$26,500.00	$26,500.00
4	TRAIL/SIDEWALK RESTORATION	LF	0	$80.00	$0.00
5	INLET/OUTLET MAINTENANCE	LS	1	$10,000.00	$10,000.00
6	MUCK EXCAVATION (EV) - MANAGEMENT LEVEL 1	TONS	0	$16.00	$0.00
7	MUCK EXCAVATION (EV) - MANAGEMENT LEVEL 2	TONS	0	$25.00	$0.00
8	MUCK EXCAVATION (EV) - MANAGEMENT LEVEL 3	TONS	257	$40.00	$10,277.00
9	EROSION CONTROL MEASURES	LS	1	$4,000.00	$4,000.00
10	SEEDING, FERTILIZER, AND EROSION CONTROL BLANKET	SY	280	$8.00	$2,240.00
11	STREET SWEEPER WITH OPERATOR	HR	8	$130.00	$1,040.00
				TOTAL ESTIMATED CONSTRUCTION COSTS	**$80,600.00**
				PROJECT CONTINGENCY (10%)	**$8,100.00**
				PROJECT OVERHEAD (20%)	**$16,120.00**
				TOTAL ESTIMATED PROJECT COSTS	**$104,820.00**

PRELIMINARY ENGINEER'S ESTIMATE

PDN-0018: HILLS OF SPRING CREEK #3

DECEMBER, 2017

No.	Item	Units	Approx. Qty	Estimated Unit Price	Estimated Total Price
	BASE BID:				
1	MOBILIZATION	LS	1	$25,000.00	$25,000.00
2	TRAFFIC CONTROL	LS	1	$1,500.00	$1,500.00
3	POND DEWATERING	LS	1	$26,500.00	$26,500.00
4	TRAIL/SIDEWALK RESTORATION	LF	60	$80.00	$4,800.00
5	INLET/OUTLET MAINTENANCE	LS	1	$10,000.00	$10,000.00
6	MUCK EXCAVATION (EV) - MANAGEMENT LEVEL 1	TONS	1,434	$16.00	$22,948.00
7	MUCK EXCAVATION (EV) - MANAGEMENT LEVEL 2	TONS	0	$25.00	$0.00
8	MUCK EXCAVATION (EV) - MANAGEMENT LEVEL 3	TONS	0	$40.00	$0.00
9	EROSION CONTROL MEASURES	LS	1	$4,000.00	$4,000.00
10	SEEDING, FERTILIZER, AND EROSION CONTROL BLANKET	SY	110	$8.00	$880.00
11	STREET SWEEPER WITH OPERATOR	HR	8	$130.00	$1,040.00
				TOTAL ESTIMATED CONSTRUCTION COSTS	**$96,700.00**
				PROJECT CONTINGENCY (10%)	**$9,700.00**
				PROJECT OVERHEAD (20%)	**$19,340.00**
				TOTAL ESTIMATED PROJECT COSTS	**$125,740.00**

PRELIMINARY ENGINEER'S ESTIMATE

PDN-0015: HIDDEN VALLEY PARK POND

DECEMBER, 2017

No.	Item	Units	Approx. Qty	Estimated Unit Price	Estimated Total Price
	BASE BID:				
1	MOBILIZATION	LS	1	$25,000.00	$25,000.00
2	TRAFFIC CONTROL	LS	1	$1,500.00	$1,500.00
3	POND DEWATERING	LS	1	$51,500.00	$51,500.00
4	TRAIL/SIDEWALK RESTORATION	LF	180	$80.00	$14,400.00
5	INLET/OUTLET MAINTENANCE	LS	1	$20,000.00	$20,000.00
6	MUCK EXCAVATION (EV) - MANAGEMENT LEVEL 1	TONS	0	$16.00	$0.00
7	MUCK EXCAVATION (EV) - MANAGEMENT LEVEL 2	TONS	0	$25.00	$0.00
8	MUCK EXCAVATION (EV) - MANAGEMENT LEVEL 3	TONS	6,757	$40.00	$270,285.00
9	EROSION CONTROL MEASURES	LS	1	$4,000.00	$4,000.00
10	SEEDING, FERTILIZER, AND EROSION CONTROL BLANKET	SY	950	$8.00	$7,600.00
11	STREET SWEEPER WITH OPERATOR	HR	8	$130.00	$1,040.00
			TOTAL ESTIMATED CONSTRUCTION COSTS		**$395,300.00**
				PROJECT CONTINGENCY (10%)	**$39,500.00**
				PROJECT OVERHEAD (20%)	**$79,060.00**
				TOTAL ESTIMATED PROJECT COSTS	**$513,860.00**

PRELIMINARY ENGINEER'S ESTIMATE

PDN-0002: CANNON COMMERCIAL

DECEMBER, 2017

No.	Item	Units	Approx. Qty	Estimated Unit Price	Estimated Total Price
	BASE BID:				
1	MOBILIZATION	LS	1	$25,000.00	$25,000.00
2	TRAFFIC CONTROL	LS	1	$1,500.00	$1,500.00
3	POND DEWATERING	LS	1	$26,500.00	$26,500.00
4	TRAIL/SIDEWALK RESTORATION	LF	0	$80.00	$0.00
5	INLET/OUTLET MAINTENANCE	LS	1	$25,000.00	$25,000.00
6	MUCK EXCAVATION (EV) - MANAGEMENT LEVEL 1	TONS	994	$16.00	$15,910.00
7	MUCK EXCAVATION (EV) - MANAGEMENT LEVEL 2	TONS	0	$25.00	$0.00
8	MUCK EXCAVATION (EV) - MANAGEMENT LEVEL 3	TONS	0	$40.00	$0.00
9	EROSION CONTROL MEASURES	LS	1	$4,000.00	$4,000.00
10	SEEDING, FERTILIZER, AND EROSION CONTROL BLANKET	SY	520	$8.00	$4,160.00
11	STREET SWEEPER WITH OPERATOR	HR	8	$130.00	$1,040.00
				TOTAL ESTIMATED CONSTRUCTION COSTS	**$103,100.00**
				PROJECT CONTINGENCY (10%)	**$10,300.00**
				PROJECT OVERHEAD (20%)	**$20,620.00**
				TOTAL ESTIMATED PROJECT COSTS	**$134,020.00**

PRELIMINARY ENGINEER'S ESTIMATE

PDN-0042: PARMEADOW PARK #1

DECEMBER, 2017

No.	Item	Units	Approx. Qty	Estimated Unit Price	Estimated Total Price
	BASE BID:				
1	MOBILIZATION	LS	1	$25,000.00	$25,000.00
2	TRAFFIC CONTROL	LS	1	$1,500.00	$1,500.00
3	POND DEWATERING	LS	1	$26,500.00	$26,500.00
4	TRAIL/SIDEWALK RESTORATION	LF	0	$80.00	$0.00
5	INLET/OUTLET MAINTENANCE	LS	1	$35,000.00	$35,000.00
6	MUCK EXCAVATION (EV) - MANAGEMENT LEVEL 1	TONS	6,011	$16.00	$96,180.00
7	MUCK EXCAVATION (EV) - MANAGEMENT LEVEL 2	TONS	0	$25.00	$0.00
8	MUCK EXCAVATION (EV) - MANAGEMENT LEVEL 3	TONS	0	$40.00	$0.00
9	EROSION CONTROL MEASURES	LS	1	$4,000.00	$4,000.00
10	SEEDING, FERTILIZER, AND EROSION CONTROL BLANKET	SY	350	$8.00	$2,800.00
11	STREET SWEEPER WITH OPERATOR	HR	8	$130.00	$1,040.00
				TOTAL ESTIMATED CONSTRUCTION COSTS	**$192,000.00**
				PROJECT CONTINGENCY (10%)	**$19,200.00**
				PROJECT OVERHEAD (20%)	**$38,400.00**
				TOTAL ESTIMATED PROJECT COSTS	**$249,600.00**

PRELIMINARY ENGINEER'S ESTIMATE

PDN-0032: LOCUST UPPER POND

DECEMBER, 2017

No.	Item	Units	Approx. Qty	Estimated Unit Price	Estimated Total Price
	BASE BID:				
1	MOBILIZATION	LS	1	$25,000.00	$25,000.00
2	TRAFFIC CONTROL	LS	1	$1,500.00	$1,500.00
3	POND DEWATERING	LS	1	$26,500.00	$26,500.00
4	TRAIL/SIDEWALK RESTORATION	LF	0	$80.00	$0.00
5	INLET/OUTLET MAINTENANCE	LS	1	$20,000.00	$20,000.00
6	MUCK EXCAVATION (EV) - MANAGEMENT LEVEL 1	TONS	2,682	$16.00	$42,918.00
7	MUCK EXCAVATION (EV) - MANAGEMENT LEVEL 2	TONS	0	$25.00	$0.00
8	MUCK EXCAVATION (EV) - MANAGEMENT LEVEL 3	TONS	0	$40.00	$0.00
9	EROSION CONTROL MEASURES	LS	1	$4,000.00	$4,000.00
10	SEEDING, FERTILIZER, AND EROSION CONTROL BLANKET	SY	740	$8.00	$5,920.00
11	STREET SWEEPER WITH OPERATOR	HR	8	$130.00	$1,040.00
			TOTAL ESTIMATED CONSTRUCTION COSTS		**$126,900.00**
				PROJECT CONTINGENCY (10%)	**$12,700.00**
				PROJECT OVERHEAD (20%)	**$25,380.00**
				TOTAL ESTIMATED PROJECT COSTS	**$164,980.00**

City of Northfield Minnesota

Stormwater Pond Assessment

City of Northfield, Minnesota

PND-0077 Pond Excavation Exhibit

November 2017

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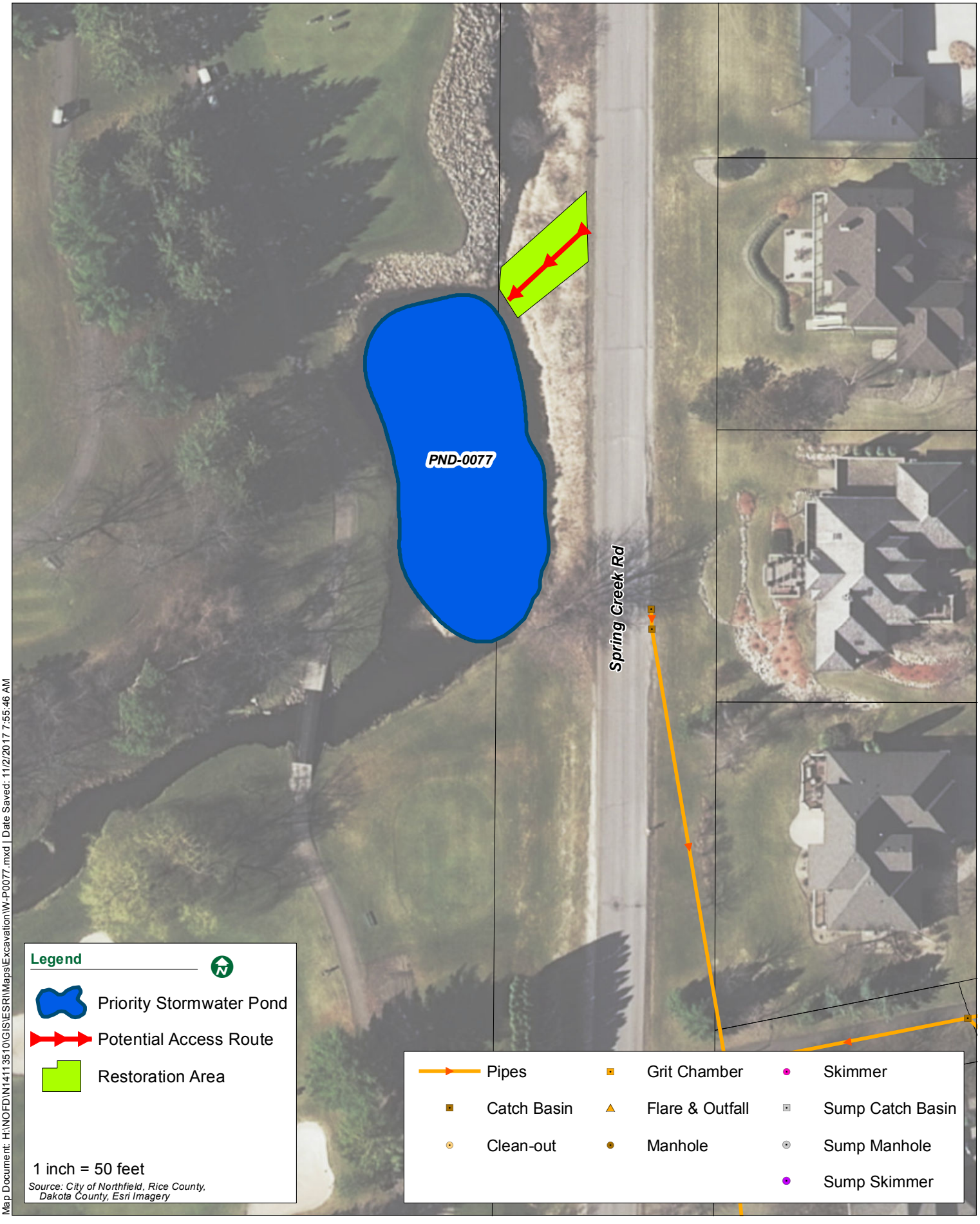

Legend

- Priority Stormwater Pond
- Potential Access Route
- Restoration Area

1 inch = 50 feet

Source: City of Northfield, Rice County, Dakota County, Esri Imagery

- Pipes
- Catch Basin
- Clean-out
- Grit Chamber
- Flare & Outfall
- Manhole
- Skimmer
- Sump Catch Basin
- Sump Manhole
- Sump Skimmer

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City of Northfield, Minnesota

Stormwater Pond Assessment

PND-0044 Pond Excavation Exhibit

November 2017

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Legend

- Priority Stormwater Pond
- Potential Access Route
- Restoration Area
- Trail Replacement

1 inch = 80 feet

Source: City of Northfield, Rice County, Dakota County, Esri Imagery

- Pipes
- Catch Basin
- Clean-out
- Grit Chamber
- Flare & Outfall
- Manhole
- Skimmer
- Sump Catch Basin
- Sump Manhole
- Sump Skimmer

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City of Northfield, Minnesota

Stormwater Pond Assessment

PND-0045 Pond Excavation Exhibit

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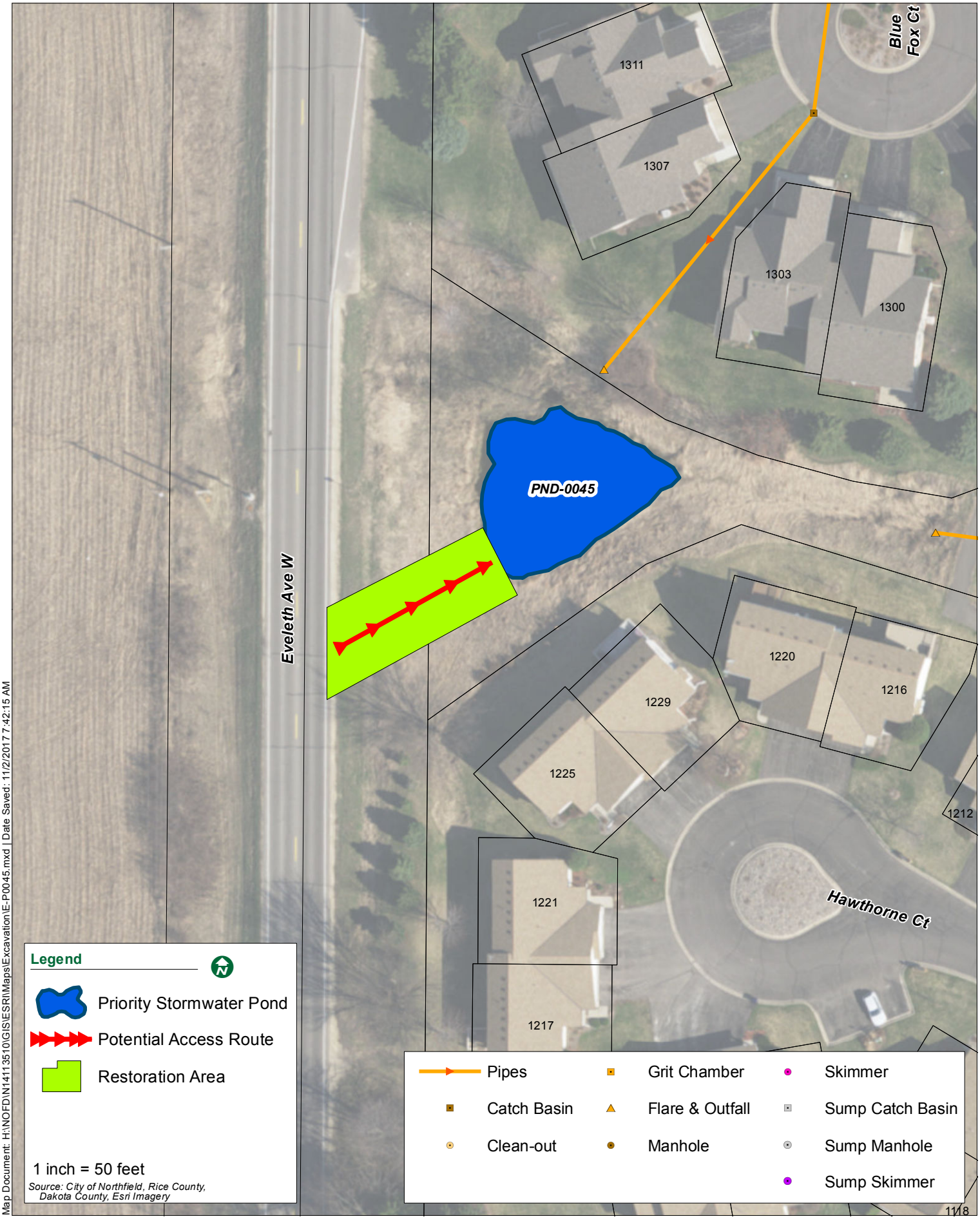

Legend

- Priority Stormwater Pond
- Potential Access Route
- Restoration Area

1 inch = 50 feet

Source: City of Northfield, Rice County, Dakota County, Esri Imagery

Pipes	Grit Chamber	Skimmer
Catch Basin	Flare & Outfall	Sump Catch Basin
Clean-out	Manhole	Sump Manhole
		Sump Skimmer

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City of Northfield, Minnesota

Stormwater Pond Assessment

PND-0018 Pond Excavation Exhibit

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Legend

- Priority Stormwater Pond
- Potential Access Route
- Restoration Area
- Trail Replacement

1 inch = 80 feet

Source: City of Northfield, Rice County, Dakota County, Esri Imagery

- Pipes
- Catch Basin
- Clean-out
- Grit Chamber
- Flare & Outfall
- Manhole
- Skimmer
- Sump Catch Basin
- Sump Manhole
- Sump Skimmer

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City of Northfield, Minnesota

Stormwater Pond Assessment

PND-0015 Pond Excavation Exhibit

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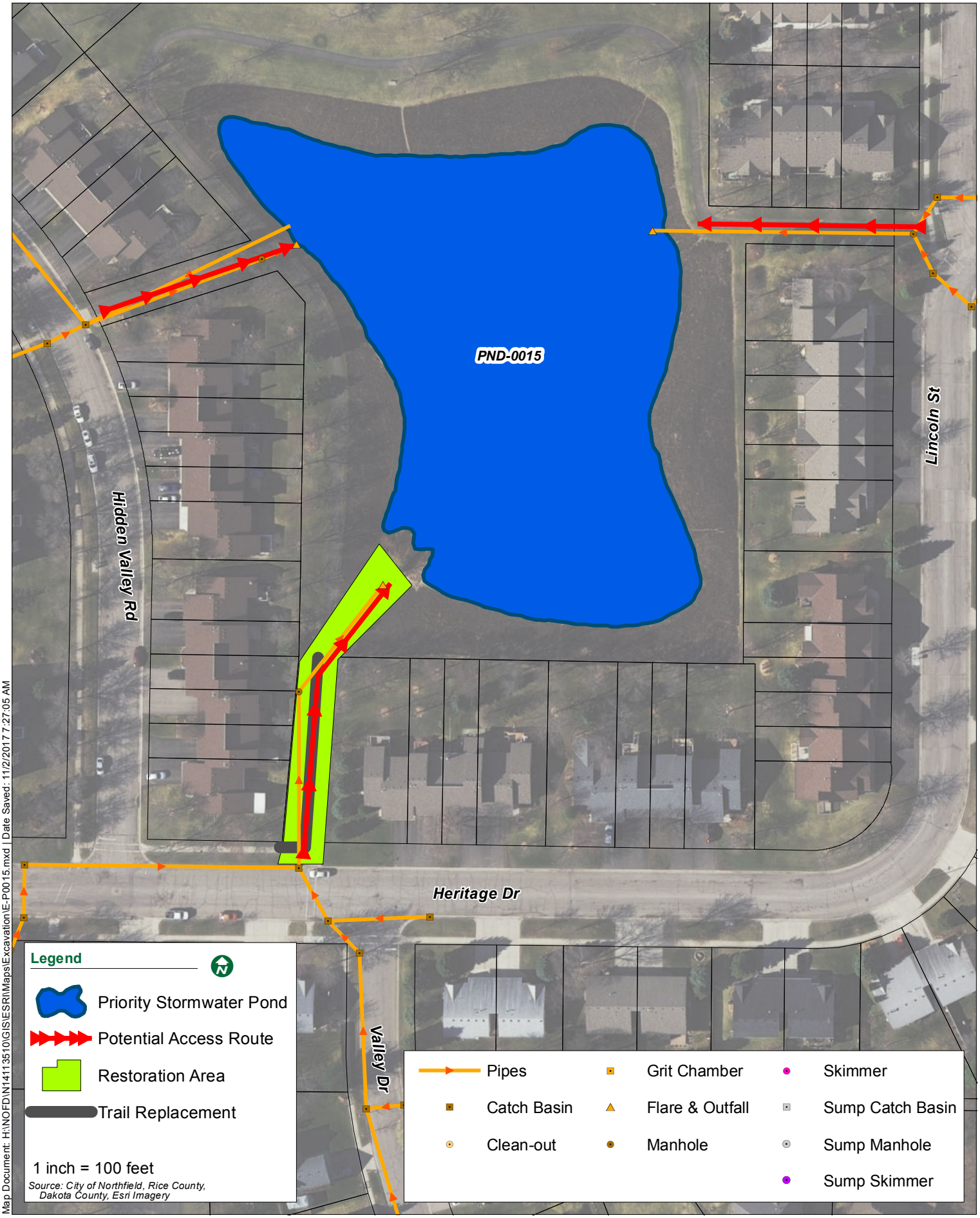

Legend

- Priority Stormwater Pond
- Potential Access Route
- Restoration Area
- Trail Replacement

1 inch = 100 feet

Source: City of Northfield, Rice County, Dakota County, Esri Imagery

- Pipes
- Catch Basin
- Clean-out
- Grit Chamber
- Flare & Outfall
- Manhole
- Skimmer
- Sump Catch Basin
- Sump Manhole
- Sump Skimmer

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City of Northfield, Minnesota

Stormwater Pond Assessment

PND-0002 Pond Excavation Exhibit

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City of Northfield, Minnesota

Stormwater Pond Assessment

PND-0042 Pond Excavation Exhibit

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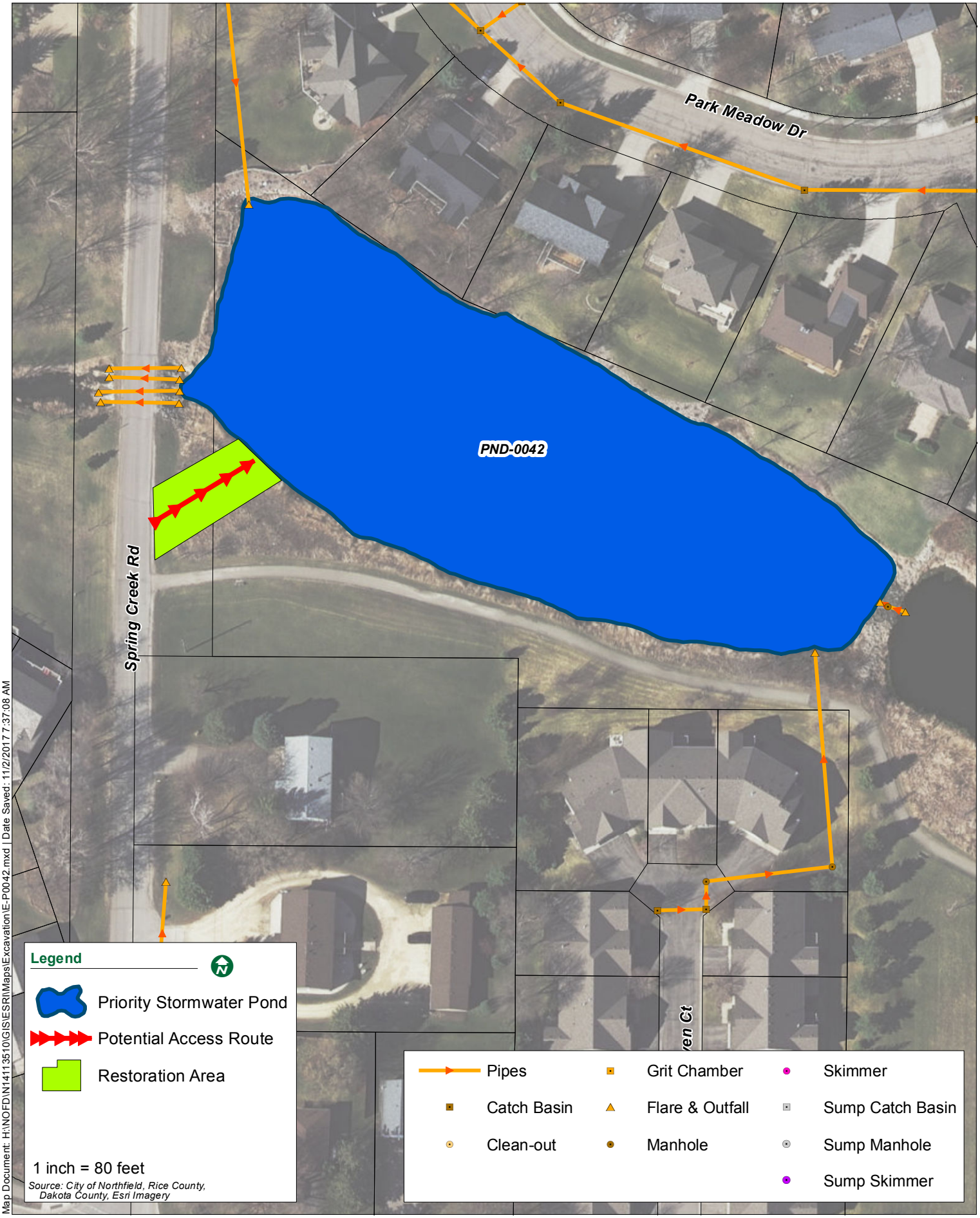

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City of Northfield, Minnesota

Stormwater Pond Assessment

PND-0032 Pond Excavation Exhibit

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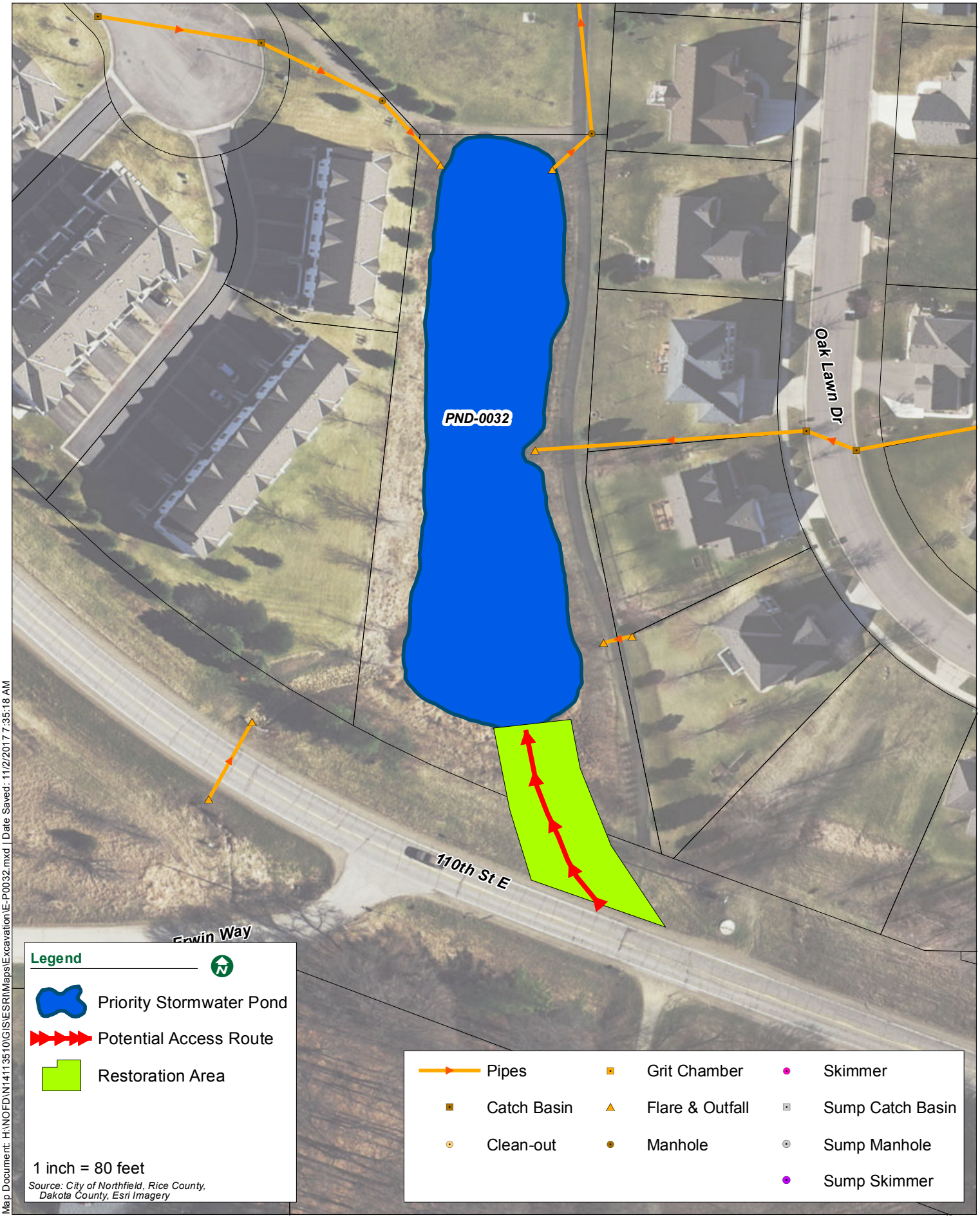

Legend

- Priority Stormwater Pond
- Potential Access Route
- Restoration Area

1 inch = 80 feet

Source: City of Northfield, Rice County, Dakota County, Esri Imagery

- Pipes
- Catch Basin
- Clean-out
- Grit Chamber
- Flare & Outfall
- Manhole
- Skimmer
- Sump Catch Basin
- Sump Manhole
- Sump Skimmer

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