Four Seasons Mall Water Quality Improvement Feasibility Report

Prepared for

City of Plymouth

July 2012

Wenck

Four Seasons Mall Water Quality Improvement Feasibility Report

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Prepared for:

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1.0 Background and Purpose

1.1 INTRODUCTION

The City of Plymouth and the Bassett Creek Watershed Management Commission (BCWMC) commissioned the development of this Feasibility Study to select an approach for water quality improvements for the North Branch subwatershed south of County Road 9 and west of Northwood Lake. The goal of the project is to evaluate a suite of Best Management Practices (BMPs) and/or capital projects to reduce total suspended solids and phosphorus loading with a target load reduction of 73 pounds of phosphorus.

Several potential options were identified including:

A. Regional water quality ponding improvements within basin NB07 including wetland mitigation
B. Water quality ponding improvements on the City of New Hope's outlot east of Highway 169
C. Alum treatment, including the possibility of an alum dosing plant, near pond NB07
D. Wetland restoration and habitat improvement under Minnesota Rule 8420.0420 Subp. 9.
E. Stream restoration from Lancaster Lane to the west
F. Flow restriction at the outlet of Pond NB07 to improve the water quality function of the pond
G. A partnership with the Four Seasons Mall Property to develop improvements that meet the BCWMC goals and development requirements of the City as well as identify additional areas that may increase pollutant reductions.

The ultimate goal of the project is to develop a project or a suite of projects to reduce 73 pounds/year or more of phosphorus loading to Northwood Lake. To that end, Wenck Associates, Inc. reviewed these projects to assess their cost and feasibility. Wenck also reviewed the entire watershed for additional opportunities that may be collectively implemented to meet the project goal of reducing watershed loading by 73 pounds/year.

1.2 PURPOSE

The purpose of this Feasibility Study is to identify the cost and feasibility of a suite of BMPs in the North Branch subwatershed in Plymouth, MN that drains to Northwood's Lake in New Hope, MN. The overall goal of the project is to reduce total phosphorus loading from the North Branch subwatershed in Plymouth by 73 pounds.

2.0 Description of the Study Area

2.1 PROJECT AREA

The project area is located in the North Branch Subwatershed south of County Road 9 and west of Highway 169 (Figure 2.1). The project area is further bordered by 36th Avenue on the south and by Lost Lake on the west including Pilgrim Lane Elementary School and Park and a City park located on 40th Avenue and Pilgrim Lane. The North Branch of Bassett Creek flows to the east of the mall and eventually discharges to the wetland located to the south of the mall. A tributary to the creek flows through the City Park before discharging to the creek before entering the wetlands to the south of the mall. The wetland then discharges east of Highway 169 and eventually to Northwood Lake.

The portion of the subwatershed north of County Road 9 was researched to provide accurate drainage to the Four Seasons Mall. However, the area north of County Road 9 was not part of this evaluation for possible stormwater improvement locations.

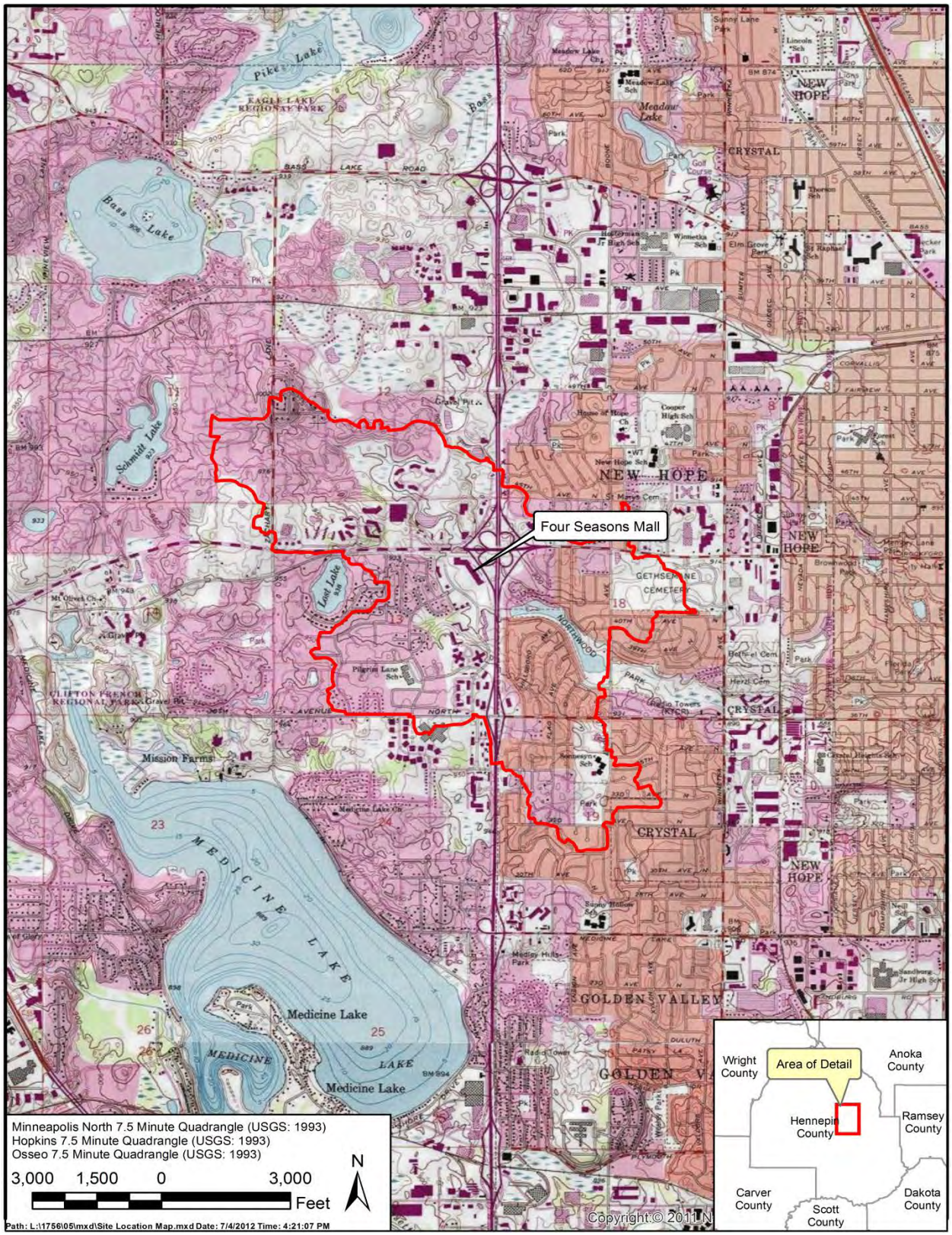


Figure 2.1. Site Location Map.

2.2 SOILS

The Hennepin County Soil Survey identified the hydric soil groups in the project area as predominantly B soils with some B/D and C soils in the southwest (Figure 2.2). Hydric soil group B is composed of soil series Angus and Lester, which are classified as well drained soils. Infiltration rates associated with soils groups B, D, and C soils According to the *Minnesota Stormwater Manual (*MPCA, 2008) are shown in Table 2.1. The proposed stormwater ponds are located in these soils.

The soils associated with the wetlands (Section 2.4) are classified as Houghton, Klossner and Glencoe and are considered poorly drained soils.

Wenck had soil borings collected at the Four Seasons Mall to determine depth to ground water and the composition of the soil and whether the existing soil would allow infiltration. The soil boring analysis was conducted by Glacial Ridge Drilling, Inc. on 06/31/2012. In summary, the soils at the Four Seasons mall are predominantly Unified Soil Classification System (ASTM D-2487-98) CL and OL soil classifications (see Table 2.1) to a depth of 8 feet. Groundwater was determined at 8 feet. See Appendix A for the field results.

Table 2.1. Hydrologic Soil Group Infiltration Rates.

Hydrologic Soil Group	Infiltration Rate (inches/hour)	Soil Textures	Corresponding Unified Soil Classification
B	0.6	Silt loam	**SM** - Silty sands, silty gravelly sands
	0.3	Loam	**MH** – Micaceous silts, diatomaceous silts, volcanic ash
C	0.2	Sandy clay loam	**ML** - Silts, very fine sands, silty or clayey fine sands
D	<0.2	Clay loam, silty clay loam, sandy clay, silty clay or clay	**GC** – Clayey gravels, clayey sandy gravels **SC** – Clayey sands, clayey gravelly sands **CL** – Low plasticity clays, sandy or silty clays **OL** – Organic silts and clays of low plasticity **CH** – Highly plastic clays and sandy clays **OH** – Organic silts and clays of high plasticity

Source: ***Minnesota Stormwater Manual,*** **MPCA (2008).**

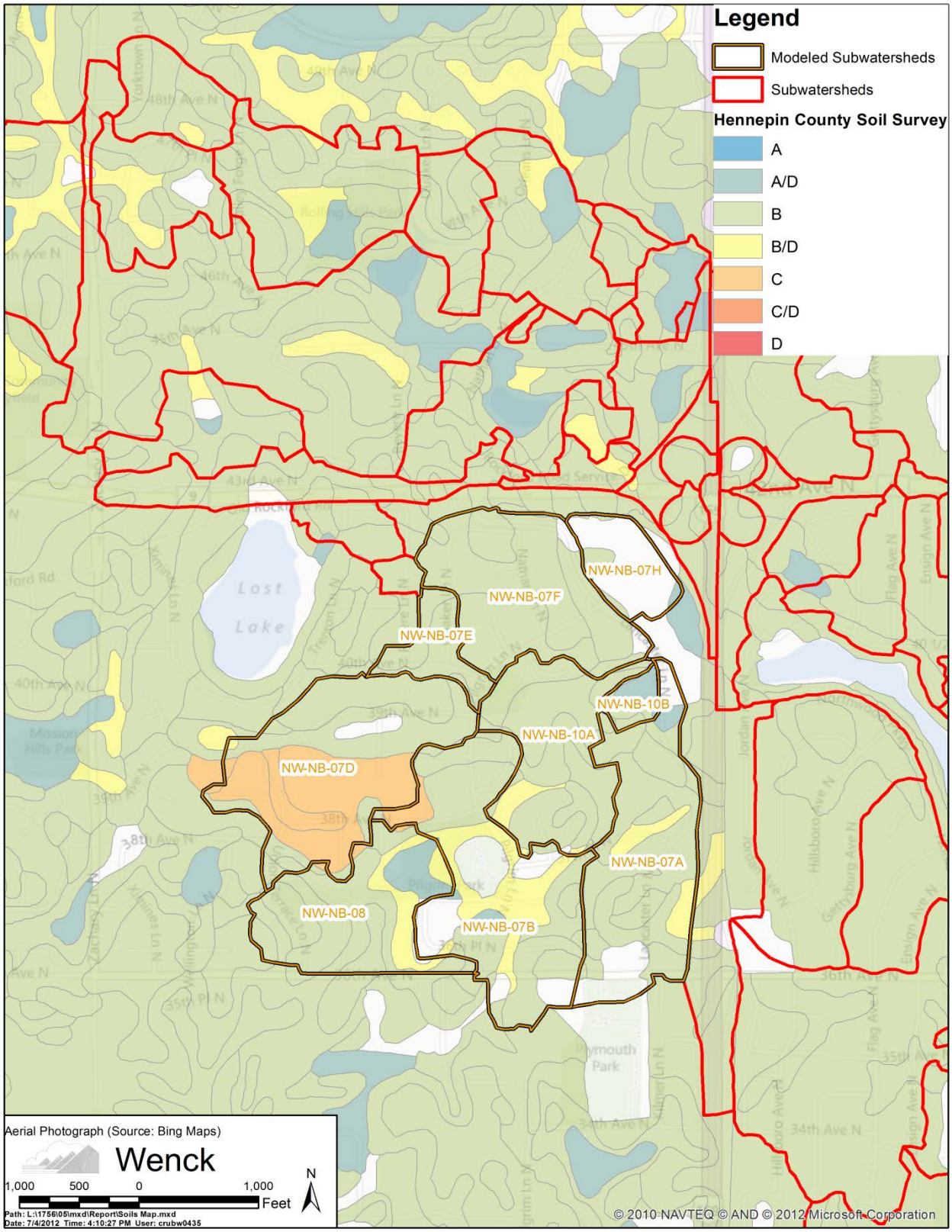


Figure 2.2. SSURGO Soils Inventory for Hennepin County in the Project Area.

2.3 LAND USE

The Metropolitan Council (METC) 2010 land use in the project area is predominantly residential with the remainder commercial, institutional, and parks and recreation (Figure 2.3). The residential land use is mostly single family homes to the west of the mall and multifamily homes to the south and southwest. The project area is bordered on the east by a major highway (Hwy 169) and a large commercial area to the north. A redevelopment study of the Four Seasons Mall area was completed in 2011 by the City of Plymouth.

2.4 WETLAND DELINEATION

A wetland delineation report completed by Arrowhead Environmental Consulting (AEC) in 2011 identified five wetland basins in the project area (Figure 2.4). Wetlands 1 and 4 were also identified on the National Wetland Inventory (NWI) map. None of the wetlands are identified on the Minnesota Department of Natural Resources (MNDR) Public Water Inventory (PWI) map.

Refer to the Wetland Delineation Report (AEC, 2011) in Appendix B for additional details regarding the wetlands in the project area.

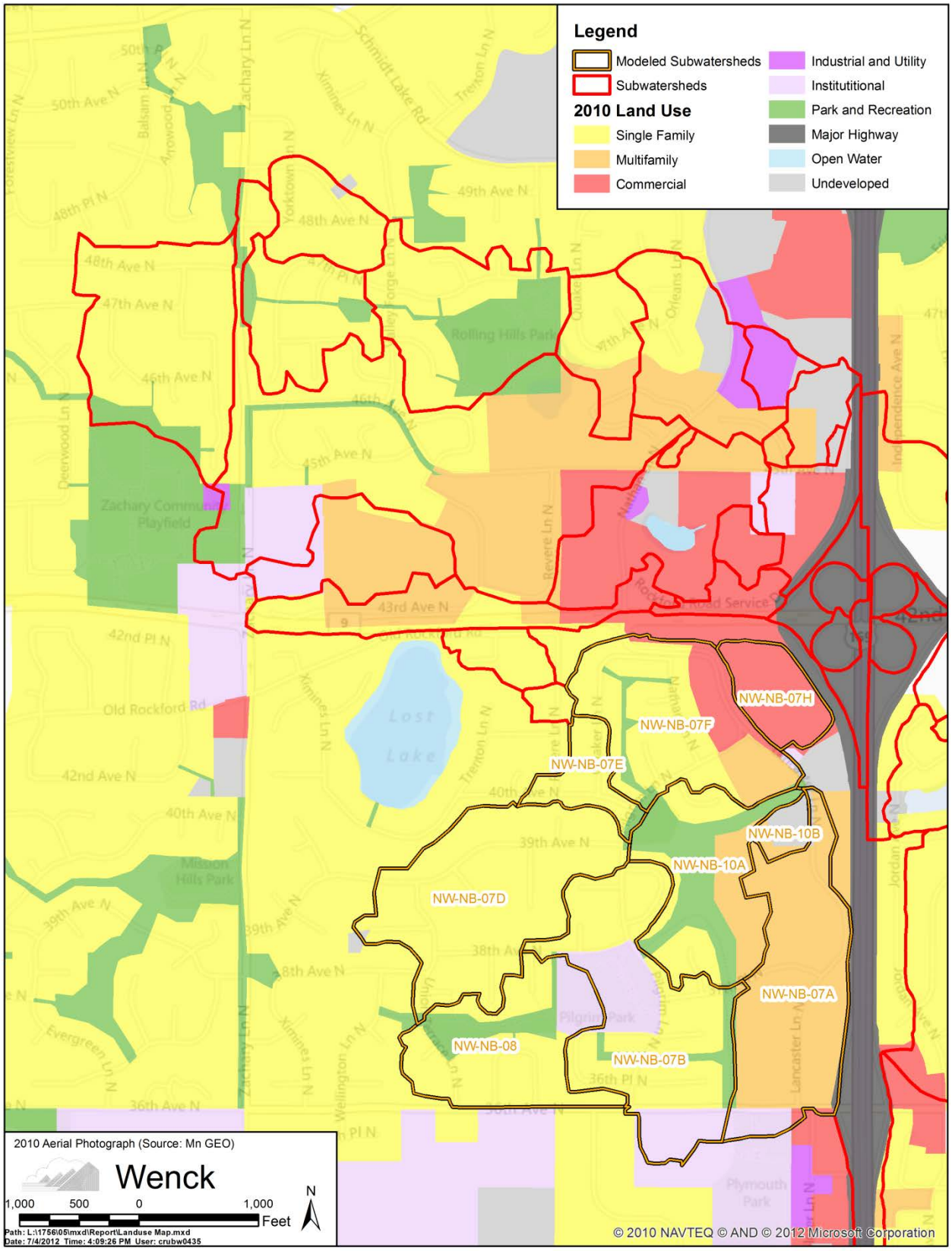


Figure 2.3. Land Use Delineation in the Project Area.

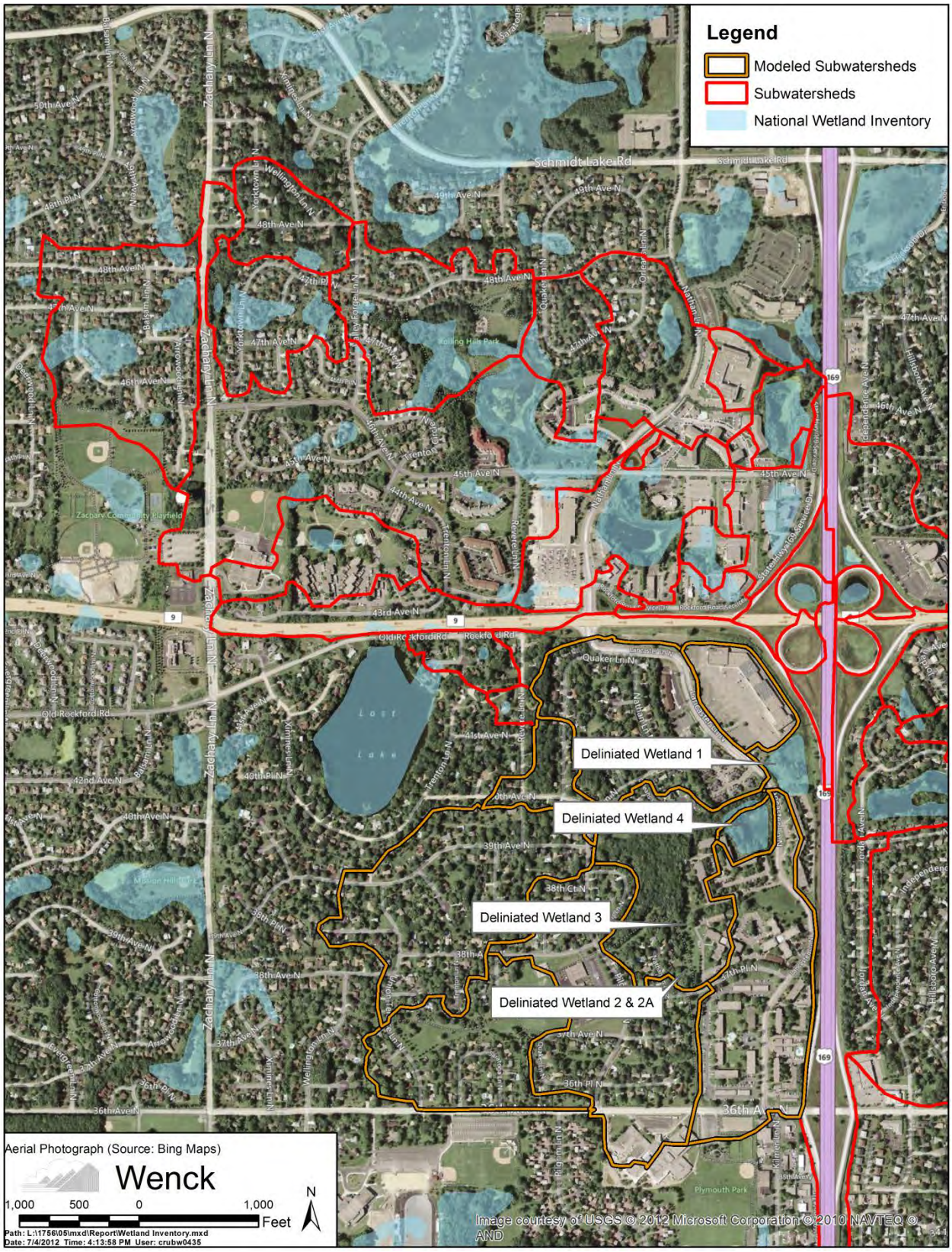


Figure 2.4. Wetland Delineation within the Project Area.

3.0 Project Identification

3.1 INITIAL PROJECT IDENTIFICATION

An initial list of projects was developed by reviewing watershed open space, land ownership, local soils, groundwater elevations, and other site specific conditions to guide the types of projects that are feasible for the area. A major constraint in the study area is space availability and land ownership. These constraints limited the areas of interest for ponding and filtration practices to open area parks located within the subwatershed, and the Four Seasons mall area itself. The initial projects identified in this first phase are shown in Figure 3.1 and briefly described as follows:

1. *Pilgrim Park Neighborhood Stormwater Pond* – Construct a stormwater pond with an iron enhanced filtration bench in the neighborhood park adjacent to Union Terrace Lane. The total treatment area for this project is 35 acres.

2. *Pilgrim Lane Elementary Stormwater Pond* – Construct a stormwater pond with an iron enhanced filtration bench in the green space available at the Pilgrim Elementary School. The total treatment area for this project is approximately 25 acres.

3. *40th Avenue Park Stormwater Pond* – Construct a stormwater pond with an iron enhanced filtration bench in the wooded area behind the park adjacent. The total treatment area for this project is 140 acres.

4. *Four Seasons Mall Stormwater Treatment Pond* – Construct a stormwater pond with an iron enhanced filtration bench in the Parking lot at the Four Seasons Mall. The total treatment area for this project is 63 acres.

5. *Channel Restoration* – Restore the seasonal stream flowing south-north from 37th Pl North and then west east towards Lancaster Lane. The total treatment area for this project is 33 acres.

6. *Alum Injection Facility at the Four Season Mall Site* – Construct an underground storage unit that will contain a large percentage of the stormwater from the southern watershed and run it through an alum injection and primary clarification process. The total treatment area for this project is 203 acres.

7. *Four Seasons Mall Wetland Conversion and Outlet Modification* – Convert delineated wetland #1 to function as a regional stormwater pond and/or modify the outlet to function under more optimal hydraulic loads. The total treatment area for this project is 286 acres.

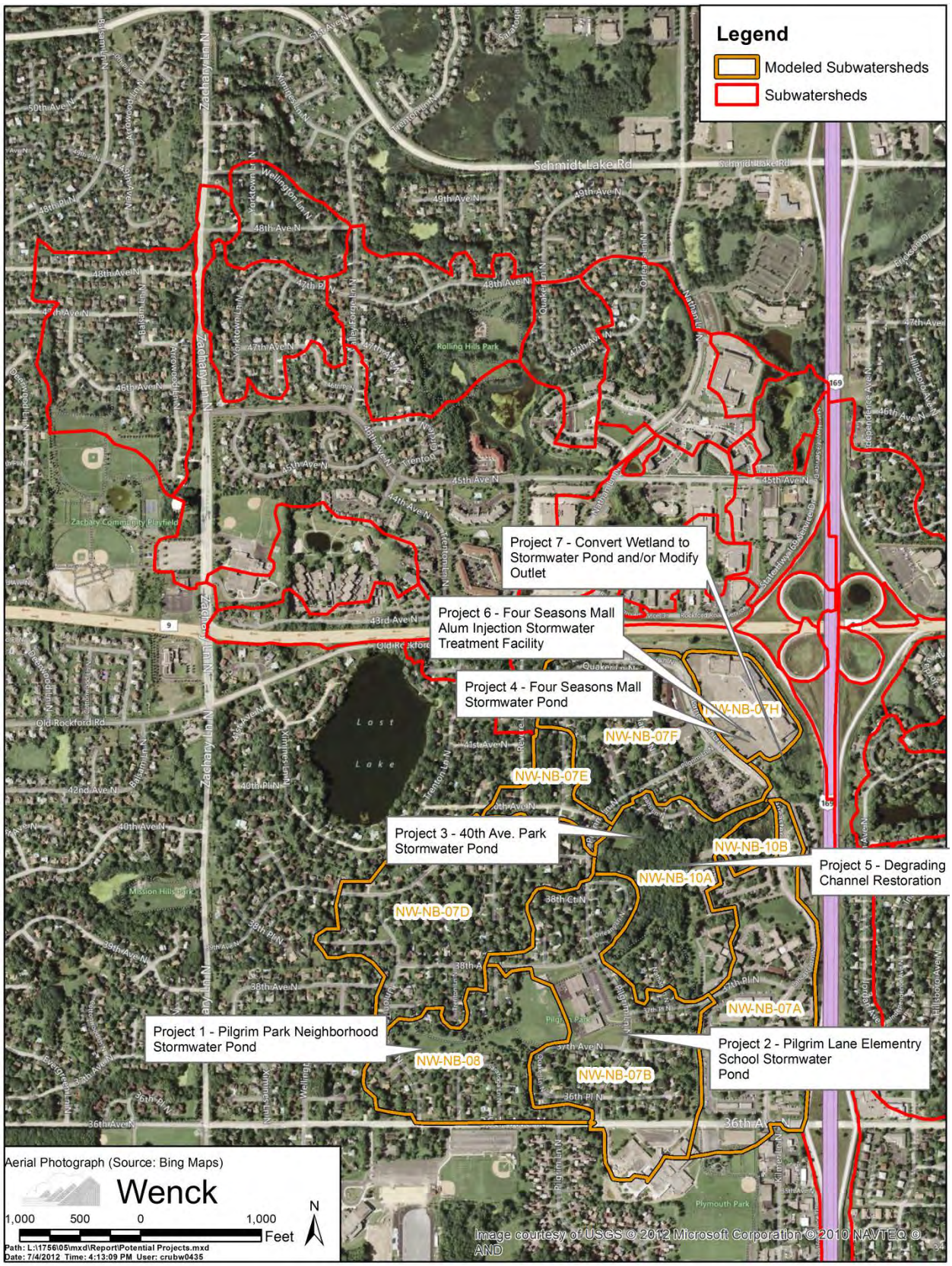


Figure 3.1. Initial Project Identification Inventory.

The next step was to perform a site investigation of all of the potential projects. A second objective during the site visit was to get a better understanding of the flow patterns between the subwatersheds in the project area. A major unknown prior to site investigations was the connectivity of subwatersheds north of Rockford Road to the Four Seasons Mall area. This step was critical to identify the volume of water moving through the Four Seasons Mall area.

The following sections describe the data that were obtained during the site surveys that were completed on 4/20/2012 and 4/24/2012.

3.1.1 Four Seasons Mall and Local Green Space Site Survey

Topographic and other site specific data was collected in areas considered for ponding/filtration projects. All four ponding/filtration project sites identified have reasonable space and existing infrastructure to implement ponding/infiltration strategies. The Pilgrim Park area, Pilgrim Elementary area, and Four Seasons Mall area have relatively flat terrain and easy access to the existing stormwater infrastructure. The open area at the 40th Avenue park location is elevated from the street limiting the ponding capability there. However the area behind the park is heavily wooded but has plenty of space for a pond to be installed that could intercept flows from 114 acres of the subwatershed. There is a channel through the wooded area that starts at a stormwater pipe outfall and winds behind the 40th Ave. Park eventually discharging to the Four Seasons Mall wetland and then to Northwoods Lake.

3.1.2 Flow Path Determination

It was important to determine the flow paths of all of the sewersheds within the subwatershed in order to accurately determine the annual and event volumes that would be experienced at each site. One major unknown at the beginning of the project was how the flows from the Northern portion of the watershed (north of Rockford Road) were related to the Four Seasons Mall Wetland area (delineated wetland No. 1). As built stormsewer information was reviewed and a survey was conducted to collect topographic and storm sewer outlet data in and around the Roadside ditch just north of Rockford Road to determine the connectivity of the Northern portion of the watershed to the southern portion (Figure 3.2). During this survey it was determined that there is a connection from north to south through a 24” RCP pipe running north-south under Rockford Road (Figure 3.3). This was an important factor when considering a regional pond conversion of the wetland at the Four Seasons Mall.

The flow directions within the subwatershed indicating how the sewersheds are interconnected based on this overview of information and site survey are shown in Figure 3.4.

Figure 3.2. Rockford Road Roadside Ditch.
Facing east from storm sewer outlet toward the connecting culvert directing flow towards the Four Seasons Mall.

Figure 3.3. 24 inch Reinforced Concrete Pipe.
Pipe leads flow from ditch to Four Seasons Mall delineated wetland area.

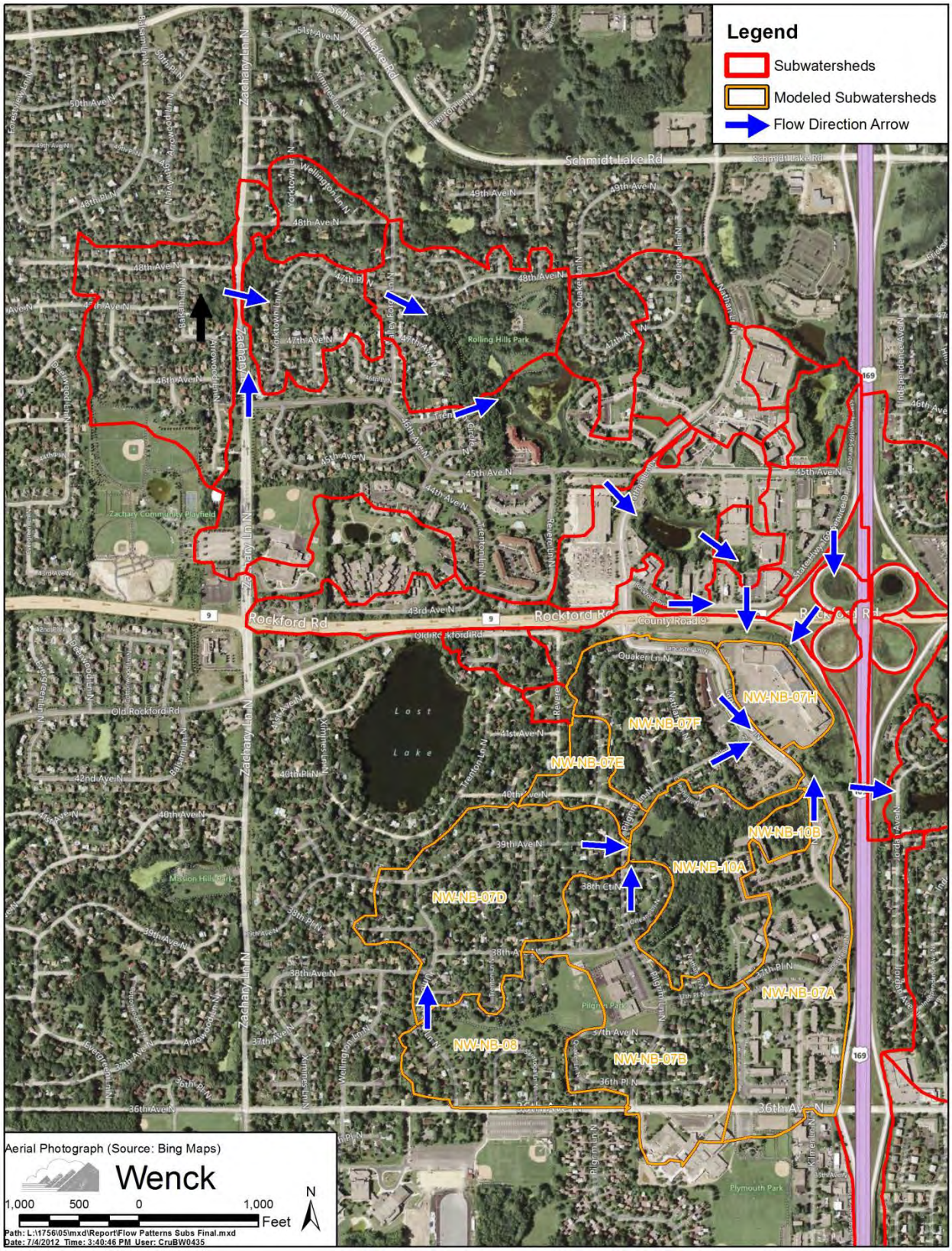


Figure 3.4. Subwatershed Flow Directions Identified.

3.1.3 Channel Degradation Investigation

A series of channels flow west to east through city owned land between Pilgrim Lane and Lancaster Lane. These channels are in woods and discharge into the Lancaster Lane wetland (delineated wetland number 4) and then into Northwood Lake and the North Branch of Bassett Creek (see Figure 3.5). The Right Reach appears to be the primary channel, and conveys runoff from the adjacent commercial and residential areas, including runoff discharged from a 12" outfall from the Nathan Lane North cul-de-sac. The wooded area is at a lower elevation than the adjacent development to the north and west, and the Center and Left Reaches flow along the toe of a slope, conveying mainly overland flow. The three channels converge in the vicinity of a 12" outfall from the Orleans Lane North cul-de-sac.

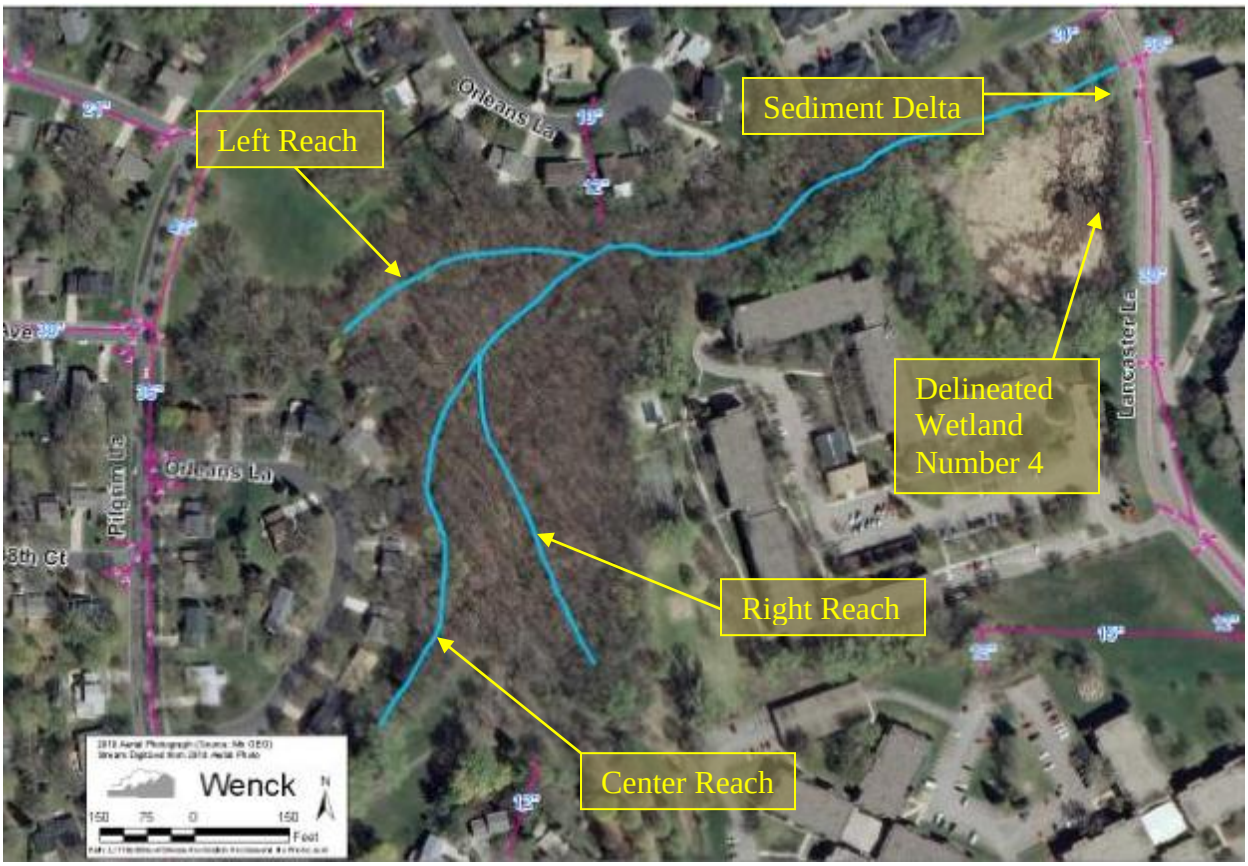


Figure 3.5. Channel Stabilization Investigation Reaches.

Wenck conducted a visual inspection of these reaches to evaluate conditions and identify the nature and extent of any channel degradation and its probable cause. All three channels are experiencing erosion and mass wasting. The Right Reach is headcutting and widening. The channel is slightly meandered, with degradation of the outer banks and bare tree roots. The other two reaches are more stable, with areas of spot erosion. The 12" outfall from the Nathan Lane North cul-de-sac is broken, and the drainage swale to the Center Reach is scoured and unstable. The channel downstream of a 24" culvert under a trail crossing on the Center reach is scoured and downcut.

A significant factor in this soil loss is likely the heavy canopy, which shades out the growth of bank-stabilizing woody and herbaceous vegetation. Flashy stormwater flows erode the unstable, exposed banks, resulting in headcutting and undercutting.

3.1.3.1 Lancaster Wetlands Sediment Analysis

There is a significant accumulation of sediment in the Lancaster wetland (delineated wetland 4 on figure 3.5) where flow from the channel slows down and spreads out into the wetland. The outlet structure is partially buried and obstructed by woody debris. There is also a sediment delta at the 30" outfall from Lancaster Lane.

Sediment samples were collected at the sediment delta to assess the level of chemical contamination and to determine if dredging restrictions apply. Sediment was collected from three boring locations on the delta, ranging in depth from the surface to 15 inches deep, and combined into a one composite sample. Wenck determined that MPCA guidelines for storm water ponds were applicable for a sediment delta formed by runoff from residential property, streets and channel erosion. MPCA guidance states that the following parameters should be analyzed in storm water ponds where maintenance dredging may take place:

- Copper
- Arsenic
- PAH's (Polycyclic Aromatic Hydrocarbons). *PAHs are a group of chemicals that are formed during the incomplete burning of coal, oil, gas, wood, garbage, or other organic substances, such as tobacco and charbroiled meat. There are more than 100 different PAHs. PAHs generally occur as complex mixtures (for example, as part of combustion products such as soot), not as single compounds.*

As indicated in Table 3.1 below, the soil samples collected from the sediment delta are below Tier 1 standards and therefore do not have disposal restrictions. The lab analysis report is in Appendix A.

Table 3.1. Sediment Sample Results

Parameter	Tier 1 Standards	Sample Results
Arsenic	9	1.5 *J*
Copper	100	9.6
PAH's	2.0	0.973

J – Estimated value, sample results between the Reporting Limit and Method Detection Limit.

3.2 PROJECTS ELIMINATED FROM CONSIDERATION

As discussed above, several projects were initially identified and explored based on City owned open space and location in the watershed. Based on discussions with the City of Plymouth, these projects were eliminated because it was determined that implementation was unlikely to occur or

potentially objectionable to the City. Following is a brief description of those projects and the reasons for their elimination.

3.2.1 Pilgrim Lane Elementary School Pond

Pilgrim Lane Elementary School (Figure 3.1) has a fair amount of open space that could be used for ponding to treat stormwater coming from the developed area to the southeast. However, the school is currently vacant and the ultimate fate and use of the school and the surrounding land is uncertain and it is unlikely that the School Board would be willing to agree to stormwater practices with such high uncertainty. Based on this understanding, the Pilgrim Park Elementary School pond was eliminated from consideration.

3.2.2 Pilgrim Park Pond

Another pond location considered in the watershed was Pilgrim Park located off of Union Terrace Lake just west of Pilgrim Park Elementary School. Based on discussions with the City of Plymouth, this green space was highly utilized by local residents and would be considered a considerable loss to the City. Based on this discussion, the Pilgrim Park Pond project was eliminated from consideration.

3.2.3 Four Seasons Mall Wetland Conversion and Outlet Modification

The wetland at the Four Seasons Mall (delineated wetland number 1) was initially determined as a potential stormwater improvement strategy for the watershed. However, due to the amount of water currently flowing to this wetland (both north and south portions of the subwatershed) mitigation costs associated with wetland conversion (approximately $1.50 to $2.00 per square foot of wetland disturbed) this project was deemed cost prohibitive.

Modification to the 66” RCP outlet to the Four Seasons Mall Wetland was eliminated due to the same factors: cost of wetland mitigation and limited effectiveness. Although the culvert is considered hydraulically overloaded, the cost benefit analysis for any modifications is not within the best interest of this project.

3.2.4 Infiltration

Infiltration practices are not a viable option for treatment within the watershed based on mediocre drainability of the soils, limited space for BMPs based on the size of the subwatersheds, and a high groundwater table in the suggested locations. The predominant HSG in the area is B soils with medium to poor drainage (Figure 2.2).

In addition to the mediocre soils, the two areas where infiltration would be considered (40^{th} Avenue and at the four Seasons Mall) have contributing areas that are too large to effectively infiltrate. Infiltration basins are typically designed to treat smaller areas where 10 acres is typically the maximum size treatable. The Minnesota Stormwater Manual suggests that an area of 50 acres is treatable with an infiltration basin. Since the contributing areas for 40^{th} avenue and at the Four Seasons Mall are 140 and 63 acres, respectively. Infiltration was eliminated as a possibility.

4.0 Hydrologic and Water Quality Modeling

Hydrologic and Water quality models were developed and used to estimate the magnitude of event storm volumes, to determine base total phosphorus loading, and to determine the effectiveness of the suggested BMPs. HydroCad™ and P8 models were developed for sewersheds NW-NB-07A, NW-NB-07B, N-NB-07D, NW-NB-07E, NW-NB-07F, NW-NB-07H, NW-NB-08, NW-NB-10A and NW-NB-10B using standard Natural Resources Conservation Services (NRCS) hydrology methods. A subset of the P8 model that was developed by Barr Engineering for this project was used to estimate annual total phosphorus loading. HydroCad was used to estimate event storm volumes for BMP sizing.

4.1 CURVE NUMBER ESTIMATION

Curve numbers were estimated within each subwatershed based on USGS NLCD 2006 Imperviousness, 2010 Metropolitan Council Land use, and the Hennepin County soils data (see sections 2.2 and 2.3 of this report for land use and soils coverage). A composite curve number was estimated for each watershed by using the weighted average (see Table 4.1). Time of concentration (Table 4.1) is estimated based on the existing land uses designations, the sewershed delineation, and stormsewer information.

Table 4.1. Watershed Data for Existing Conditions.

Subwatershed	Area (acre)	Composite Curve Number	Time of Concentration (min)
NW-NB-07A	45.5	60.7	40
NW-NB-07B	53.5	61.0	30
NW-NB-07D	52.5	67.1	26
NW-NB-07E	9.6	61.0	25
NW-NB-07F	40.5	61.0	15
NW-NB-07H	12.4	98.0	10
NW-NB-08	34.0	59.1	23
NW-NB-10A	33.0	61.0	30
NW-NB-10B	4.0	51.0	6

4.2 IMPERVIOUS FRACTION

P8 calculates runoff separately for pervious and impervious areas. Therefore, it is necessary to determine the impervious fraction of each watershed. Directly connected and indirectly connected imperviousness was derived from land use designations within the 2010 Metropolitan Council Land Use coverage database such as single-family residential, parks, and undeveloped

land. Table 4.2 shows the directly and indirectly connected impervious fractions estimated for each watershed.

Table 4.2. Impervious Fraction Estimates for Existing Conditions.

Subwatershed	Directly Connected Impervious %	Indirectly Connected Impervious %	Pervious %
NW-NB-07A	47.0%	0.0%	53.0%
NW-NB-07B	19.5%	0.0%	80.5%
NW-NB-07D	17.6%	9.3%	73.1%
NW-NB-07E	17.9%	9.8%	72.3%
NW-NB-07F	27.1%	6.6%	66.3%
NW-NB-07H*	100%	0.0%	0.0%
NW-NB-08	21.9%	7.1%	71.0%
NW-NB-10A	16.3%	3.2%	80.5%
NW-NB-10B	19.5%	0.0%	80.5%

* Four Season Mall Property

4.3 P8 WATER QUALITY COMPONENT

The sample water quality component concentrations were derived from the National Urban Runoff Program (NURP) studies performed by the United States Environmental Protection Agency (USEPA) in 1983. The default NURP 50th percentile particle file was used to estimate watershed pollutant loading.

A slight modification to the filtration efficiency for the dissolved fraction particles within the NURP 50 default file was made to reflect values found in a recent study completed in the City of Prior Lake (Erickson et.al. 2010). The conclusions from the Prior Lake study were that iron-enhanced sand filtration trenches captured approximately 85-90% of the dissolved phosphorus for rainfall events within the study period. Based on this research, a filtration efficiency of 85% was used in the P8 model for dissolved particles.

4.4 P8 WATERHSEDS AND DEVICES

All subwatersheds, except NW-NB-07H, used in the P8 model were delineated by Barr Engineering. Additional subwatersheds are shown on the figures but are not applicable to the BMP study and therefore were not modeled.

Ponds with Iron Enhanced sand filters at 40th Avenue and at the Four Seasons Mall were modeled as general devices in P8. This allowed the user to define infiltration and discharge rates for given water levels. An infiltration rate of 28 feet per day was used to size the filter benches to drain 1 foot of water in 48 hours (using a factor of safety of 3). With the area of the filter bench and the infiltration rate respective discharge rates were determined for the infiltration component of the general device. Discharge rates associated with the normal and over flow outlets were based on standard engineering hydraulic equations for weir, orifice, and conduit flow.

4.5 RAINFALL AND TEMPERATURE

Rainfall frequencies and depths used in the HydroCad modeling are provided in Table 4.3. Rainfall depths were obtained from the *Hydrology Guide for Minnesota* (USDA 1966). 10-year 24-hour rainfall is estimated to be 4.1 inches using the *Hydrology Guide for Minnesota, USDA 1966.*

Table 4.3. Precipitation Depth by Event Frequency.

Frequency	Precipitation Depth (inches)
2-year (50% annual chance)	2.7
10-year (10%)	4.1
100-year (1%)	5.9

Rainfall and temperature data used in the P8 model were obtained for the period of January 1, 1999 to December 31, 2011 from the Minneapolis/St. Paul International Airport observation location. The resolution of the data obtained from this site is accumulated daily precipitation (inches) and average daily maximum and minimum temperature (degrees Fahrenheit). The temperature data requirements for P8 are satisfied with daily resolution; however, P8 requires that the precipitation to have hourly resolution. Hourly data was estimated for the daily precipitation obtained from the airport site by using a SCS 24-hour type 2 distribution as described in Mays, 2005.

5.0 Concept Design and Engineering Cost Estimates

5.1 SCENARIO DEVELOPMENT

Once the initial project screening was completed, the final list of projects to evaluate was broken into two scenarios. These projects were selected based on input from the City of Plymouth and the City of New Hope and were considered the most feasible projects in the watershed for reaching the goal of 73 ponds removal of phosphorus. The projects were also presented to regulators for an initial review.

The first scenario includes more passive stormwater treatment including ponds with iron enhanced sand filter outlets and stream stabilization. The second scenario includes active treatment of stormwater using aluminum sulfate (alum) injection and a clarifier connected to the sanitary sewer. Following is a detailed description of each component of the two scenarios along with preliminary design and engineering cost estimates.

5.2 WATERSHED PONDING AND STREAM RESTORATION (SCENARIO 1)

Scenario 1 includes two ponds located at strategic points in the watershed. These ponds were selected based on location in the watershed and land ownership. Both ponds incorporate iron enhanced filter benches in order to capture more of the dissolved fraction of total phosphorus. A typical cross section depicting the general layout of a pond with an iron enhanced filter bench is shown in Figure 5.1.

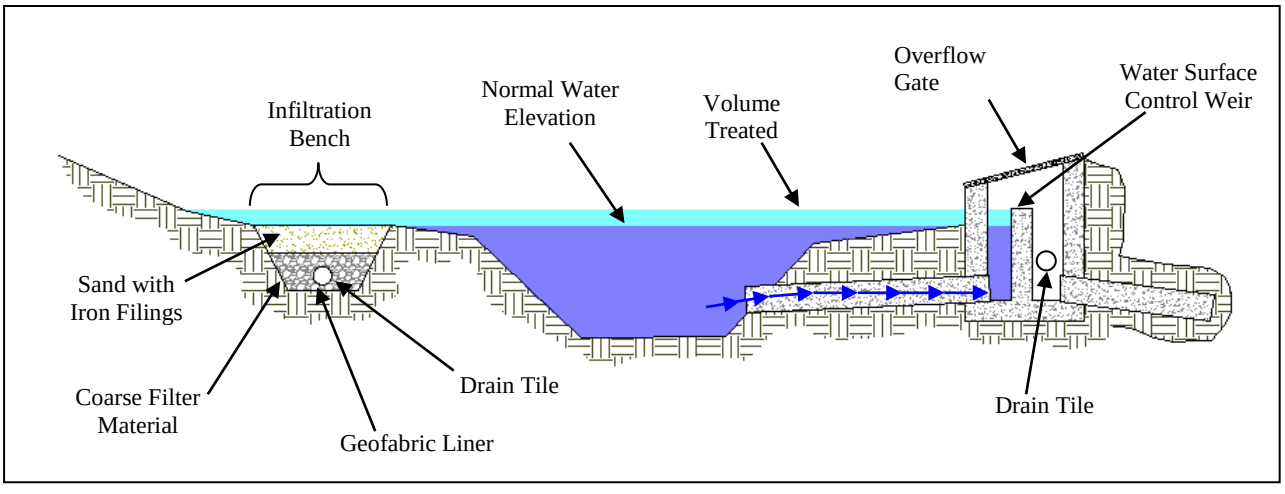


Figure 5.1. Schematic of a Stormwater Pond with an Iron Enhanced Filter Bench.

A second component of Scenario 1 is stream restoration and stabilization of the channel east of Pilgrim Lane. Channel stabilization activities include but are not limited to installing brush bundles, boulder toe protection, riprap plunge pool and riffle structures, cross vanes, tree removal and seeding.

5.2.1 40th Ave. Pond with Iron Enhanced Sand Filtration

This project consists of replacing the existing pipe leading into the channel running behind the park with a 42 inch reinforced concrete pipe (RCP) to intercept runoff from storm sewersheds NW-NB-07B (53.5 acres), NW-NB-07D (52.5 acres), and NW-NB-08 (34.0 acres; Figure 5.2). The runoff from the pipe will enter into the existing channel and then into a newly constructed pond fitted with a 10 foot wide iron enhanced sand filter bench at elevation 920. The outlet of the pond will be controlled by a weir at elevation 921 embedded into a 108 inch diameter overflow structure with a crest elevation of 922.5 foot. A 48 inch RCP will serve as the mechanism for the normal water level to be controlled by the weir. Additionally a 48 inch RCP will discharge from the overflow structure back in to the existing stream. The stream immediately downstream of the pond will be protected by a riprap lined plunge pool. Figure 5.3 shows the work plan/conceptual design of the 40th avenue pond project.

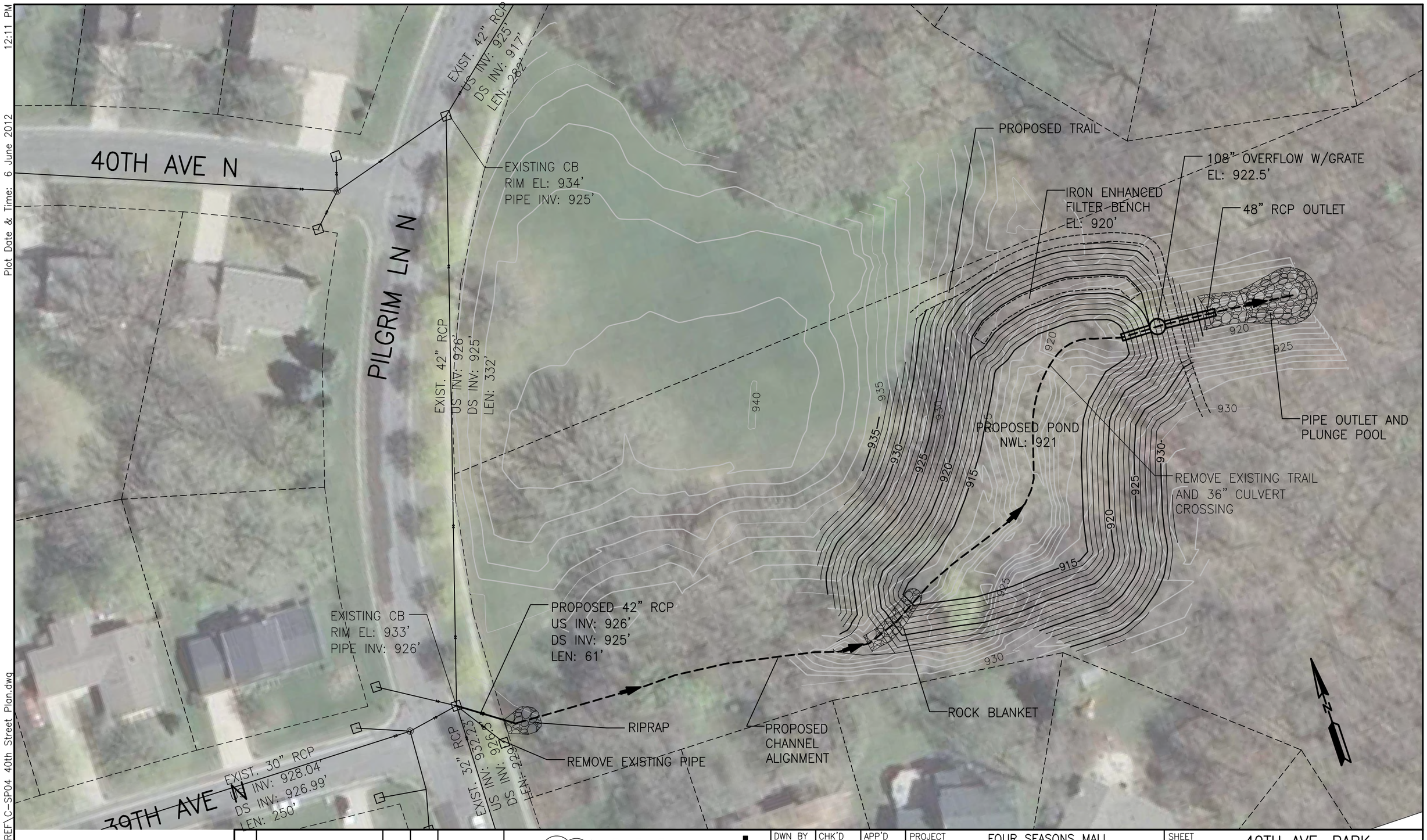
The estimated cut volume for this design is 8,109 cubic yards of material of which 200 cubic yards could be reused as fill to construct the berm at the outlet assuming that the soils are conducive to this type of fill. This area is very dense with tree cover, so tree removal is a large component of the constructing this pond. Once construction activities are completed the perimeter of the affected area will be seeded and mulched and trees will be planted to assist in the aesthetics of the park. Additionally a new foot trail will be constructed around the pond to enable residents to access the city trail along the main creek system.

5.2.2 Four Seasons Mall Pond with Iron Enhanced Sand Filtration

This project consists of installing a catch basin, flow splitter in line with the existing stormwater at the intersection of Pilgrim Lane and Lancaster Lane. The splitter will direct flows coming from the north along Lancaster Lane (47.1 acres of residential area from NW-NB-07E and NW-NB-07F into a proposed pond located on the Four Seasons Mall Property. The existing parking lot drainage system is assumed to flow from the northwest side of the parking area towards the wetland (delineated wetland number 1, see Figure 2.4). As part of this project it is assumed that all of the impervious area from the Four Seasons Mall Property will be directed to the pond. The effective drainage area of 63 acres is shown in Figure 5.2.

An iron enhanced filter bench will be integrated with the pond outlet system at elevation 889 feet. The normal water level in the pond will be controlled by a concrete weir installed in a 108 inch overflow structure. The weir elevation is proposed to be at elevation 890 feet. The overflow crest is proposed to be set at 891 feet. The total cut volume for this design is 4,194 cubic yards. Figure 5.4 shows the work plan/conceptual design for this project.

Figure 5.2. Effective Areas for Scenario 1 BMPs.



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DWN BY	CHK'D	APP'D
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DWG DATE 6/4/2012

SCALE 1"=50'

PROJECT FOUR SEASONS MALL STORMWATER IMPROVEMENTS

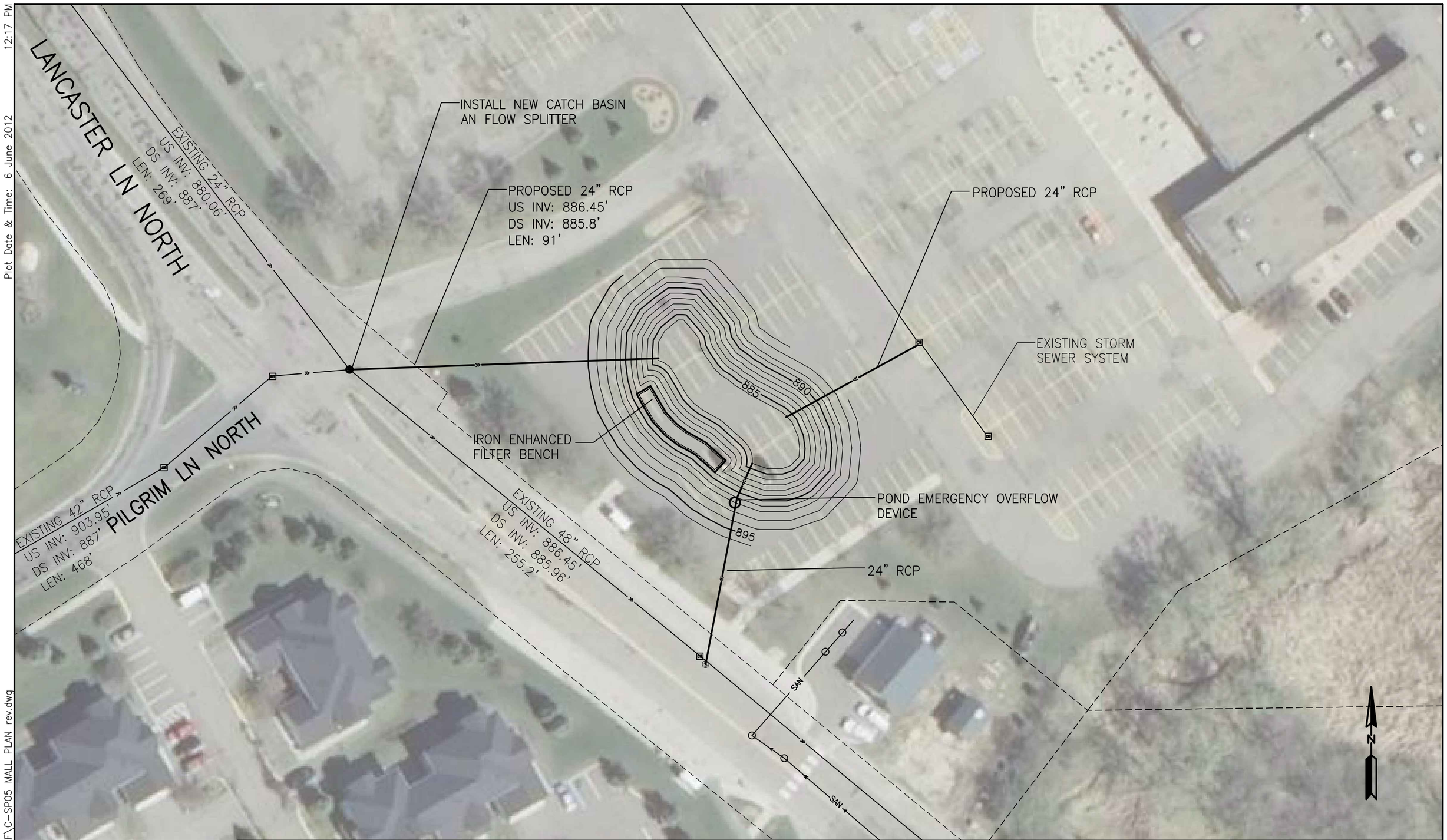
CLIENT CITY OF PLYMOUTH, MN

SHEET TITLE 40TH AVE. PARK CONCEPT PLAN

PROJECT NO. 1756-05

SHEET NO. FIGURE 5.3

REV NO.



REV	REVISION DESCRIPTION	DWN	APP	REV DATE

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DWN BY	CHK'D	APP'D
BWC		

DWG DATE 4/23/2012

SCALE 1"=50'

PROJECT FOUR SEASONS MALL STORMWATER IMPROVEMENTS

CLIENT CITY OF PLYMOUTH, MN

SHEET TITLE FOUR SEASONS MALL POND CONCEPT PLAN

PROJECT NO.	SHEET NO.	REV NO.
1756-05	FIGURE 5.4	

5.2.3 Stream Channel Restoration and Stabilization

Stabilization of streambanks reduces the transport of sediment-attached phosphorus from these channels to Northwood Lake. In addition, there are numerous locations along the Center Channel where residents are dumping leaves and grass clippings on the streambanks. These property owners should be educated about the impacts of those actions and encouraged to discontinue those practices.

One of the primary causes of channel degradation is the heavy tree canopy that shades the banks and prevents the growth of stabilizing long-rooted herbaceous and woody vegetation. Trees in the channel corridors should be thinned to open the canopy, and a 30 foot wide buffer established on each side of the channel.

There are approximately 2,375 linear feet of channel that would benefit from some type of improvement (Figure 5.5). Just less than 1,000 feet of channel are in relatively good condition and would benefit from simple tree and brush thinning, minor regrading, and planting a 30 foot wide buffer with mulched seed and native woody vegetation. An additional 500 feet of bank could be seeded and protected until vegetation establishment with an erosion control blanket on the slopes and mulch and woody vegetation in the buffer. About 325 linear feet has experienced some erosion and mass wasting which may continue if not stabilized. A treatment of tree thinning, brush bundles stacked on the streambanks, and native vegetation in a 30 foot buffer would be sufficient to stabilize the banks and filter overland runoff. Finally, about 570 linear feet appears to be actively eroding, and a boulder toe should be considered to provide stability, along with a native buffer. This includes areas downstream of culverts and outfalls as well as the streambank downstream of the proposed 47th Avenue Pond outlet.

Some segments of these channels are sloped at 0.05 or greater, and are headcutting. Each of the channels would benefit from installation of rock vane grade controls, at least one for every 2-3 feet of elevation change. Where there are steeper slopes and more headcutting, grade controls at every one foot elevation change should be considered.

Some of the recommended work is suitable for city forces (tree thinning and brush removal) or completion by Tree Trust or Minnesota Conservation Corps crews. Many of these crew leaders have experience felling trees and using the removed limbs and branches to form and install brush bundles. The Minnesota Conservation Corps has received funding in the last few years from the Minnesota Clean Water, Land and Legacy Amendment, and awards grants to public partners in the form of crew days. A cost-effective way of accomplishing the stream
Restoration work would be to complete work such as grading, boulder toes and grade control structures by public contract, and the less equipment-intense work by Tree Trust or MCC crews guided by knowledgeable engineers and crew leaders.

Figure 5.5. Conceptual Work Plan for the Stream Restoration Project.

5.2.4 Removal Efficiency and Estimated Cost

The estimated cost and total phosphorus removal efficiency associated with the projects described in this section are shown in Table 5.1. The phosphorus removal efficiency shown in Table 5.1 is based on P8 modeling results (pond performance) and field evaluations and literature values (stream restoration). The ponds efficiency is based on 12year average P8 results for years 2000-2011. Figures 5.6 and 5.7 illustrate the annual variability in the phosphorus load and BMP efficiency predicted in the P8 model for 40th avenue and Four Seasons Mall sites. Low phosphorus load values and efficiency values correspond to years with low precipitation.

Table 5.1. Project Estimated Cost and Phosphorus Removal Efficiency.

Project	Treatment Area (acres)	Average Annual Load (lbs-TP/year)	Average Removal Efficiency	Total 30 year Life Cycle Cost
40th Street Pond*	140	75	79%	$421,104
Four Seasons Mall Pond*	57	52	41%	$326,997
Stream Restoration**	15	25	100%***	$320,566
Total	212	152	69%	$1,068,667

*Estimated as the TP removal for an eleven year average in the P8 model using the general device described in Section 4.4
**Estimated based on field estimates on the total weight of annual soil loss per year and a conversion factor of 200mg TP/kg soil
*** The 100% efficiency associated with the stream restoration project assumes that the banks are stabilized and no further degradation is occurring.

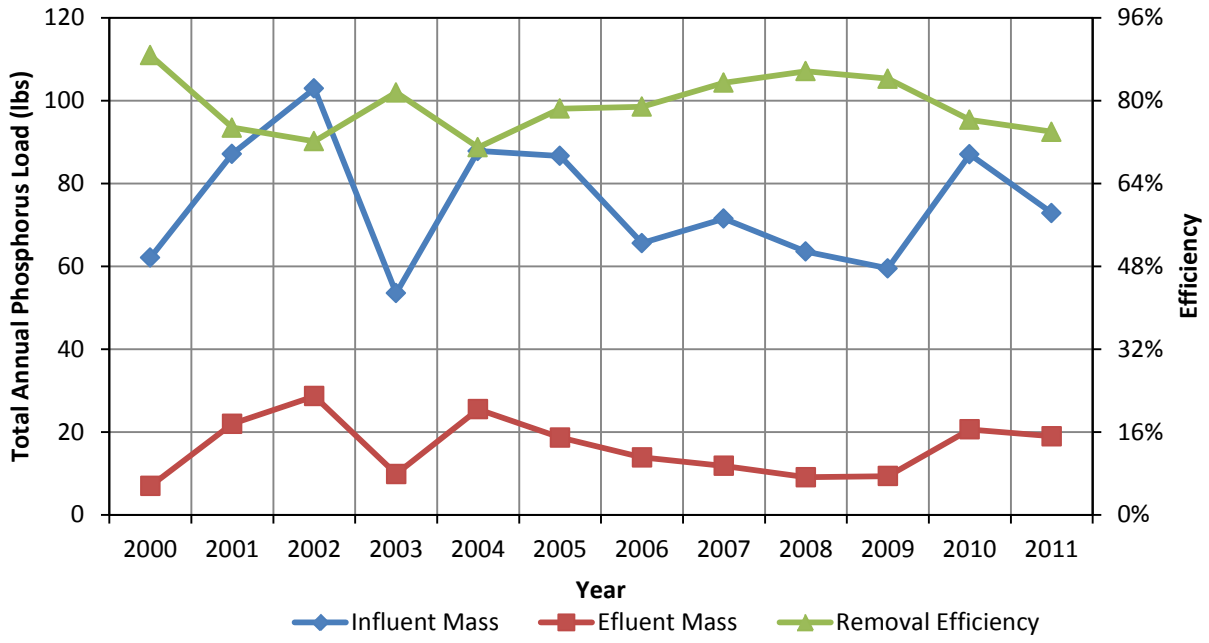


Figure 5.6. P8 Outputs for Modeled Years 2000 through 2011 - 40th Street Pond.

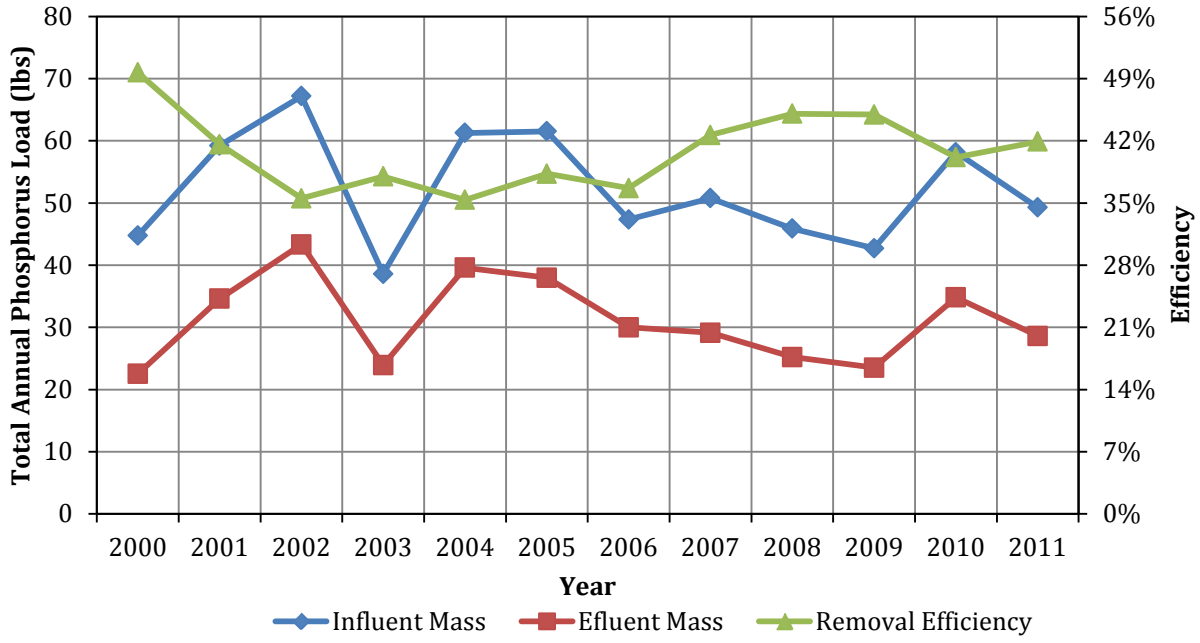


Figure 5.7. P8 Outputs for Modeled Years 2000 through 2011 - Four Seasons Mall Pond.

To determine the annual load produced by stream degradation, two assumptions were made. First, it is assumed that there is 200 mg total phosphorus per kg soil (Cross and Schlesinger, 1995). Second, the bank material consists of sandy loam soil with a density of 100 lbs per cubic foot (NRCS 2003). The average bank height and recession rates were determined during the stream assessment on 4/24/12 (described in Section 3.1.3). The Recession rate assigned to each reach was based on criteria described in Table 5.2. The general calculation for annual phosphorus load due to the restoration is described by Equation 1. Parameters used to determine TP load with Equation 1 are listed in Table 5.3.

$$\left[\begin{array}{c}\text{Annual}\\ \text{TP Load}\\ \left(\frac{\text{lbs}}{\text{year}}\right)\end{array}\right] = \left[\begin{array}{c}\text{Length of}\\ \text{the reach}\\ \text{(ft)}\end{array}\right] \times \left[\begin{array}{c}2\\ \text{For two sides}\\ \text{of the channel}\end{array}\right] \times \left[\begin{array}{c}\text{Lateral}\\ \text{Recession}\\ \text{Rate}\\ \left(\frac{\text{ft}}{\text{yr}}\right)\end{array}\right] \times \left[\begin{array}{c}\text{Average}\\ \text{Bank}\\ \text{Height}\\ \text{(ft)}\end{array}\right] \times \left[\begin{array}{c}\text{Convert}\\ \text{to lbs}\\ 100\\ \left(\frac{\text{lbs}}{\text{Cu. ft.}}\right)\end{array}\right]$$

$$\times \left[\begin{array}{c}\text{Convert}\\ \text{to kg}\\ \text{(1kg/2.2lbs)}\end{array}\right] \times \left[\begin{array}{c}\text{Convert}\\ \text{to TP}\\ \text{200 mg TP}\\ \text{per}\\ \text{kg Soil}\end{array}\right] \times \left[\begin{array}{c}\text{Convert}\\ \text{back to lbs}\\ 2.2 \times 10^{-6}\\ \text{(lbs/mg)}\end{array}\right] \qquad \text{Equation 1}$$

A more detailed breakdown of the individual project costs are shown in Appendix C, Tables C1 to C3. Thirty-year life cycle costs are estimated based on an annual inflation rate of 2.3% and an annual discount rate of 3.5%. Assumed life cycle costs for each project are shown in Appendix C, Table C5.

Table 5.2. Lateral Recession Rates for Stream Bank Erosion.

Lateral Recession Rate (ft/yr)	Category	Description
0.01-0.05	Slight	Some bare bank but active erosion not readily apparent. Some rills but no vegetative overhang. No exposed tree roots.
0.06-0.2	Moderate	Bank is predominantly bare with some rills and vegetative overhang. Some exposed tree roots but no slumps or slips.
0.3-0.5	Severe	Bank is bare with rills and severe vegetative overhang. Many exposed tree roots and some fallen trees and slumps or slips. Some changes in cultural features such as fence corners missing and realignment of roads or trails. Channel cross section becomes U-shaped as opposed to V-shaped.
0.5+	Very Severe	Bank is bare with gullies and severe vegetative overhang. Many fallen trees, drains and culverts eroding out and changes in cultural features as above. Massive slips or washouts common. Channel cross section is U-shaped and stream course may be meandering.

*(Source Wisconsin Field Office Technical Guide (FOTG), NRCS http://efotg.sc.egov.usda.gov/treemenuFS.aspx).

Table 5.3. Annual Stream Degradation Soil Loss and Phosphorus Load.

Parameter	Center Reach 0+00 - 9+50	Center Reach 9+50 – 17+50	Right Reach	Left Reach	Total
Total Length (ft)	1,900	1,600	1,400	900	5,800
Bank Height (ft)	0.5	2.0	3.0	0.5	-
Recession Rate (ft/yr)	0.05	0.10	0.25	0.05	-
Soil Density (lbs/ft^3)	100	100	100	100	-
Annual Soil Loss (lb/yr)	4,750	32,000	105,500	2,250	144,500
Annual Phosphorus Load (lbs/yr)	0.95	6.39	20.96	0.45	28.75**

*Reach locations shown on Figure 3.5
**To be conservative use 25 lb TP per year removed

5.3 STORMWATER COLLECTION AND ALUM INJECTION (SCENARIO 2)

Scenario 2 includes collection of stormwater into an underground storage vault at the Four Seasons Mall site and then active treatment using alum. Stormwater from the 1 inch runoff event will be collected into underground storage chambers and then pumped to a clarifier. A one inch runoff event corresponds to 90% of the storms that occur in the metro area. Stormwater will be injected with alum prior to entering the clarifier. Alum floc will be settled to the bottom of the clarifier which is connected to the sanitary sewer. The treatment of stormwater with alum can achieve up to an 80% removal of total phosphorus and has the added advantage of removing dissolved phosphorus. Stormwater ponds typically only address particulate phosphorus, however the addition of iron enhance sand filtration at the pond outlet adds dissolved phosphorus removal.

Alum injection facilities require a considerable amount of annual maintenance including annual chemical and electrical costs, metering adjustments, and pump maintenance.

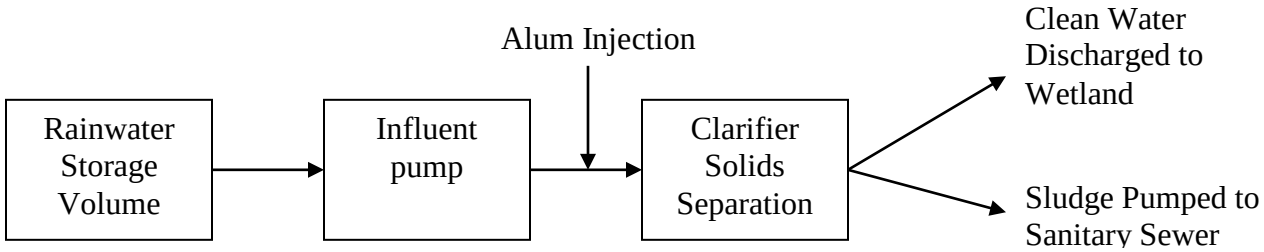
Figure 5.8 shows the effective treatment area for this scenario. Figure 5.9 shows the work plan/conceptual design for this scenario.

5.3.1 Underground Stormwater Storage

Because stormwater is episodic in nature, it must be stored prior to treatment with alum. The 1 inch runoff volume from sewersheds NW-NB-07A, NW-NB-07B, NW-NB-07D through F, NW-NB-08, NW-NB-10A and NW-NB-10B, and all of the impervious area at the Four Seasons Mall site (NW-NB-07H) is estimated to be 0.84 acre-ft. This can be stored using five 96 inch corrugated metal pipe culverts as storage units. The work involved with these units requires removal of pavement, sidewalk and curb both in the parking lot and in the street. Another component of the work involved with this scenario would be the installation of a new catch basin that will be retrofit with a SAFL Baffle and used as pretreatment for large solids into the storage vaults.

5.3.2 Chemical Treatment System

In general the chemical treatment train for the alum injection stormwater treatment system is described by the process flow diagram shown below.



Water will be pumped from the stormwater storage chambers to the clarifier through an influent pump station. The influent lift station consists of a precast concrete, 8-foot-diameter, 15-foot-deep structure, located near the stormwater storage system. The pump requirements include two pumps, operated in Lead/Lag (2 cfs or 900 gpm) and operated by level float switches. The forcemain to the clarifier would be 10 inch PVC pipe.

Before reaching the Clarifier Alum will be injected to the influent. The injections system includes a storage tank and a feed pump that has a start/stop mechanism based on run status of the influent lift station pumps. The estimated alum dosing rate is 10 ppm (but this needs to be verified by jar testing at project startup). The monthly chemical usage is to be determined with initial tests but is assumed to cost around $5,000 per year including delivery to the site. The storage tank size necessary for the site is a 300 gal (this can be modified as needed based on jar testing results).

The solids from the clarifier are handled in a dry pit, precast concrete structure. Flocculated material effluent is pumped from the system to the MCES sanitary sewer located south and west on Lancaster Road.

5.3.3 Removal Efficiency and Estimated Cost

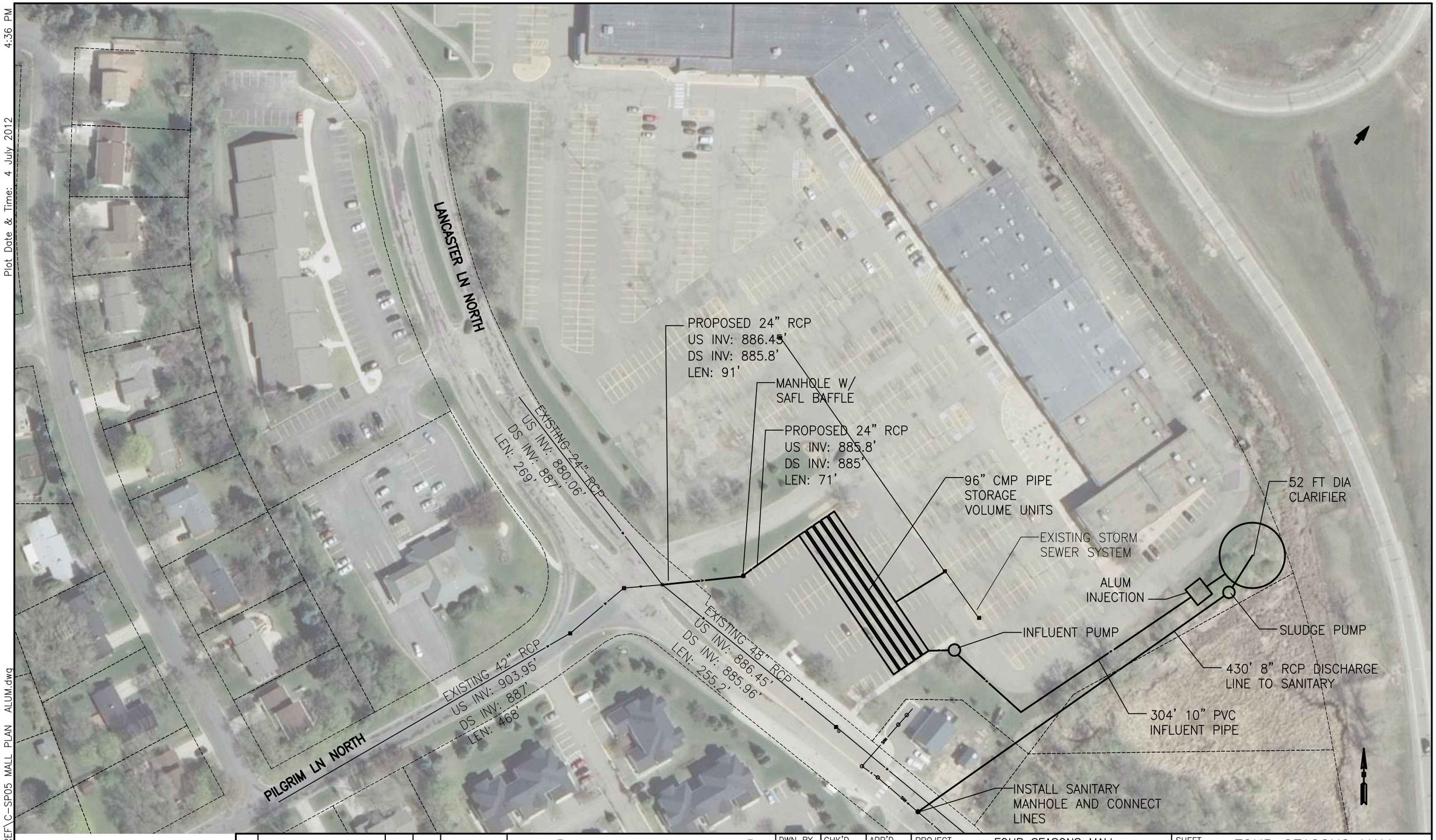
The estimated cost and total phosphorus removal efficiency associated with the projects described in this section are provided shown in Table 5.4. A more detailed breakdown of the individual project costs are shown in Appendix C, Tables C1 to C3. Thirty-year life cycle costs are shown in Table 5.4. These are estimated based on an annual inflation rate of 2.3% and an annual discount rate of 3.5%. Assumed life cycle costs for each project are shown in Appendix C, Table C5.

Table 5.4. Thirty-Year Life Cycle Costs.

Project	Treatment Area (acres)	Annual Load (lbs-TP/year)	Removal Efficiency	Total 30 year Life Cycle Cost
Alum Injection System	203	127	70%*	$1,853,345
Total	203	127	70%	$1,853,345

*Removal efficiency is less than stated 80% for Alum treatment since we are only targeting the 1 inch volume storm events assuming that 90% of the annual storm events are less than 1 inches.

Figure 5.8. Effective Areas for Scenario 2 BMPs.



Plot Date & Time: 4 July 2012 4:36 PM

M:\1756\05\REF\C-SP05 MALL PLAN ALUM.dwg

REV	REVISION DESCRIPTION	DWN	APP	REV DATE

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DWN BY	CHK'D	APP'D
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DWG DATE 4/23/2012

SCALE 1"=100'

PROJECT FOUR SEASONS MALL STORMWATER IMPROVEMENTS

CLIENT CITY OF PLYMOUTH, MN

SHEET TITLE FOUR SEASONS MALL ALUM INJECTION

PROJECT NO.	SHEET NO.	REV NO.
1756-05	FIGURE 5.9	

6.0 Regulatory Requirements

6.1 WATERSHED PONDING AND STREAM RESTORATION (SCENARIO 1)

Scenario 1 represents more passive treatment in the watershed and includes two ponds located at strategic points in the watershed. These ponds were selected based on location in the watershed and land ownership. A second component of this scenario is stream restoration and stabilization of the channel east of Pilgrim Lane.

The proposed project is located in the Bassett Creek Watershed Management Organization (BCWMO). The BCWMO requires all construction projects that with greater than 10,000 square feet or more than 200 cubic yards of cut or fill to apply for a permit.

6.2 STORMWATER COLLECTION AND ALUM INJECTION (SCENARIO 2)

Scenario 2 includes collection stormwater into underground storage at the Four Seasons Mall site and then active treatment using alum. Stormwater from the 1 inch runoff event will be collected into underground storage chamber and then pumped to a clarifier. Stormwater will be injected with alum prior to entering the clarifier. Alum floc will be settled to the bottom of the clarifier which is connected to the sanitary sewer.

The proposed project is located in the Bassett Creek Watershed Management Organization (BCWMO). The BCWMO requires all construction projects that with greater than 10,000 square feet or more than 200 cubic yards of cut or fill to apply for a permit.

The proposed project includes discharge to the sanitary sewer system. A Sanitary Sewer Extension Permit is required by the Minnesota Pollution Control Agency (MPCA) to connect to the sanitary sewer. Before the MPCA approves of the sewer connection, the permit must first be approved by the Metropolitan Council Environmental Services (MCES).

Since the Alum Injection is considered a stormwater BMP, the requirements are set forth in the MS4 and a National Pollution Discharge Elimination System/Surface Water Discharger (NPDES/SDS) permit would not be required. If the City of Plymouth does not wish to incorporate the Alum Injection BMP into the MS4, an individual NPDES/SDS permit is required.

7.0 Conclusion

Seven projects were initially chosen as potential candidates for reaching a goal of 73 lb/year removal of phosphorus from the North Branch subwatershed in Plymouth, MN. This list was refined into two scenarios through field investigations and coordination between the City of Plymouth and the agencies. The scenarios presented in this Feasibility study are watershed ponding and stream restoration (scenario 1) and stormwater collection and alum injection (scenario 2).

Both scenarios are effective at reaching the 73 lb/year removal goal. Scenario 1 removes a total of 105 lbs of phosphorus per year and has a total present day value construction cost estimate of $939,831. The 30-year lifecycle cost for scenario 1 is $1,068,667. Scenario 2 removes a total of 89 pounds of phosphorus per year and has a present day value cost estimate of $1,205,826. The 30-year lifecycle cost of scenario 2 is estimated to be $1,853,345. Lifecycle costs are based on a 2.3% inflation rate and a 3.5% discount rate. The costs are associated with things like general maintenance to outlet structures, replacement of equipment, site inspections, and other general operations and maintenance. Table 7.1 summarizes the performance and cost information for both scenarios. Table C5 in Appendix C itemizes the various lifecycle costs and their frequency of occurrence over the 30 year span for each project.

Table 7.1. Scenario Removal and Cost Summary .

Scenario	Total TP Removed (lbs/year)	Present Value Construction Cost Estimate	30-year lifecycle cost estimate
1 - Watershed ponding and stream restoration	105	$939,831	$1,068,667
2 - Stormwater collection and alum injection	89	$1,205,826	$1,853,345

8.0 References

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Appendix A
Four Seasons Mall Soil Boring Analysis

GLACIAL RIDGE DRILLING, INC. **Penetration Test Boring Field Data**

Project No. GR12-01 Location Plymouth mtl' 4 Seasons mall Boring No. ST-1

Client Wench Boring Location 58'South and 46' West of SE mall corner

Surface Elevation: Rig 12T Crew DR DN Completed by: Dan

Depth	BPF	Sample	ASTM	ADJ	Grain Size	Inclusions	Color	Moist	Recovery
1	4 6	1	CL		FM		Dk	Dry	10"
2	5		CL		FM		Dk Brn	Dry	
3	2 2	2	CL		FM		Dk Brn	M	10"
4	4								
5	2 6	3	SC	Sm	FM		Blk	M	12"
6	7		CL		FM		Blk Brn		
7									
8	2 1	4	CL		FM		Gy	MW	6"
9	2								
10	1 2	5	OL				Dk Brn	M	14"
1	4		CL			Tr Gr		M	
2									
3	2 3	6	CL	ML			Gy	MW	14"
4	4								
15	2 3	7	OL				Blk	M	13"
6	3								
7									
8									
9									
0									
1									
2									
3									
4									
5									
6									
7									
8									
9									
0									

Drill Data	Date	Time	W.L. Checks	Date	Time	Depth/Auger	W.L. Notes
Start	6-28-12		While Drilling	6-28-12			8' wet
Finish			After Last sample				Dry
Back Fill			Auger pulled				
			Recheck				

Remarks

Boring Depth 15

Topsoil depth

BRAUN INTERTEC

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11001 Hampshire Avenue S.
Minneapolis, MN 55438

Phone: 952.995.2000
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Web: braunintertec.com

Mr. Jeff Madejczyk
Wenck Associates, Inc.
1800 Pioneer Creek Center P.O. Box 428
Maple Plain, MN 55359

July 09, 2012

Report #: 1203606

RE: 1756-05 City of Plymouth

Dear Jeff Madejczyk:

Braun Intertec Corporation received samples for the project identified above on June 21, 2012. Analytical results are summarized in the following report.

All routine quality assurance procedures were followed, unless otherwise noted.

Analytical results are reported on an "as received" basis unless otherwise noted. Where possible, the samples will be retained by the laboratory for 14 days following issuance of the initial final report. The samples will be disposed of or returned at that time. Arrangements can be made for extended storage by contacting me at this time.

We appreciate your decision to use Braun Intertec Corporation for this project. We are committed to being your vendor of choice to meet your analytical chemistry needs.

If you have any questions please contact me at the above phone number.

Sincerely,

Steven J. Albrecht
Project Manager

BRAUN INTERTEC

11001 Hampshire Ave. S.
Minneapolis, MN 55438
952.995.2000 Phone
952.995.2020 Fax

Wenck Associates, Inc.	Client Ref: 1756-05 City of Plymouth	Report #: 1203606
1800 Pioneer Creek Center P.O. Box 428	Client Contact: Mr. Jeff Madejczyk	Project Mgr: Steven J. Albrecht
Maple Plain, MN 55359	PO Number:	Account ID: W02540

Qualifiers and Abbreviations

vn	The surrogate recovery is below the laboratory generated control limits.
vi	The method reporting limit (MRL) is elevated because a dilution was required due to the presence of a sample matrix interference with the internal standard.
sd	See case narrative section for further information.
J	Detected but below the Method Reporting Limit; therefore, result is an estimated concentration (CLP J-Flag).
go	The laboratory control sample recovery is outside of laboratory control limits.
A2	Dibenzo(a,h)pyrene recovery for the second source sample is 61.7%. Method requirements are 70% to 130%. There may be a bias in the reported results.
A1	1,8-Dinitropyrene recovery for the continuing calibration sample is 126%. Method requirements are 80% to 120%. There may be a high bias in the reported results.
COC	Chain of Custody
dry	Sample results reported on a dry weight basis
MDL	Method Detection Limit
MRL	Method Reporting Limit
NA	Not Applicable
ND	Analyte NOT DETECTED above the MDL value
NR	Not Reported
%Rec	Percent Recovery
RPD	Relative Percent Difference
VOC	Volatile Organic Compound

BRAUN INTERTEC

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Wenck Associates, Inc.	Client Ref: 1756-05 City of Plymouth	Report #: 1203606
1800 Pioneer Creek Center P.O. Box 428	Client Contact: Mr. Jeff Madejczyk	Project Mgr: Steven J. Albrecht
Maple Plain, MN 55359	PO Number:	Account ID: W02540

Sample Summary

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
062112	1203606-01	Soil	06/21/12 11:00	06/21/12 12:10

BRAUN INTERTEC

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952.995.2020 Fax

Wenck Associates, Inc.	Client Ref: 1756-05 City of Plymouth	Report #: 1203606
1800 Pioneer Creek Center P.O. Box 428	Client Contact: Mr. Jeff Madejczyk	Project Mgr: Steven J. Albrecht
Maple Plain, MN 55359	PO Number:	Account ID: W02540

Conditions Upon Receipt

Cooler: Cooler 1

Temperature:	8.3 °C	**COC Included:**	Yes	**Custody Seals Used:**	No
Temperature Blank:	Yes	**COC Complete:**	Yes	**Custody Seals Intact:**	NA
Received on Ice:	Yes	**COC & Labels Agree:**	Yes	**Hand Delivered by Client:**	Yes
Preservation Confirmed:	No	**Sufficient Sample Provided:**	Yes	**Headspace Present (VOC):**	No

BRAUN INTERTEC

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Minneapolis, MN 55438
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Wenck Associates, Inc.	Client Ref: 1756-05 City of Plymouth	Report #: 1203606
1800 Pioneer Creek Center P.O. Box 428	Client Contact: Mr. Jeff Madejczyk	Project Mgr: Steven J. Albrecht
Maple Plain, MN 55359	PO Number:	Account ID: W02540

062112

1203606-01 (Soil)

6/21/12 11:00

Classical Chemistry Parameters

Analyte	Result	MRL	MDL	Units	Dilution	Batch	Prepared	Analyzed	Analyst	Method	Notes
% Solids	**93**	0.050	0.010	% Wt	1	B2F0562	6/22/12	6/22/12	MJW	EPA 3545A 11.4	

Metals

Analyte	Result	MRL	MDL	Units	Dilution	Batch	Prepared	Analyzed	Analyst	Method	Notes
Arsenic	1.5 J	1.9	0.15	mg/kg dry	1	B2F0556	6/22/12	6/26/12	DRM	EPA 6010C	
Copper	**9.6**	0.93	0.011	mg/kg dry	1	B2F0556	6/22/12	6/26/12	DRM	EPA 6010C	

Polyaromatic Hydrocarbons by Selected Ion Monitoring

Sample Note(s): sd, vi

Analyte	Result	MRL	MDL	Units	Dilution	Batch	Prepared	Analyzed	Analyst	Method	Notes
1,6-Dinitropyrene	ND	5400	26	ug/kg dry	10	B2G0011	7/2/12	7/6/12	SGM	EPA 8270D SIM	go
1,8-Dinitropyrene	ND	5400	12	ug/kg dry	10	B2G0011	7/2/12	7/6/12	SGM	EPA 8270D SIM	A1
1-Methylnaphthalene	ND	54	29	ug/kg dry	10	B2G0011	7/2/12	7/6/12	SGM	EPA 8270D SIM	
1-Nitropyrene	ND	110	21	ug/kg dry	10	B2G0011	7/2/12	7/6/12	SGM	EPA 8270D SIM	
2-Chloronaphthalene	ND	21	17	ug/kg dry	10	B2G0011	7/2/12	7/6/12	SGM	EPA 8270D SIM	
2-Methylnaphthalene	ND	21	15	ug/kg dry	10	B2G0011	7/2/12	7/6/12	SGM	EPA 8270D SIM	
2-Nitrofluorene	ND	110	17	ug/kg dry	10	B2G0011	7/2/12	7/6/12	SGM	EPA 8270D SIM	
3-Methylcholanthrene	ND	54	4.3	ug/kg dry	10	B2G0011	7/2/12	7/6/12	SGM	EPA 8270D SIM	
4-Nitropyrene	ND	110	9.0	ug/kg dry	10	B2G0011	7/2/12	7/6/12	SGM	EPA 8270D SIM	
5-Methylchrysene	ND	21	1.4	ug/kg dry	10	B2G0011	7/2/12	7/6/12	SGM	EPA 8270D SIM	
5-Nitroacenaphthene	ND	110	20	ug/kg dry	10	B2G0011	7/2/12	7/6/12	SGM	EPA 8270D SIM	
6-Nitrochrysene	ND	110	26	ug/kg dry	10	B2G0011	7/2/12	7/6/12	SGM	EPA 8270D SIM	
7,12-Dimethylbenz(a)anthracene	ND	21	3.5	ug/kg dry	10	B2G0011	7/2/12	7/6/12	SGM	EPA 8270D SIM	
7H-Dibenzo(c,g)carbazole	ND	54	4.3	ug/kg dry	10	B2G0011	7/2/12	7/6/12	SGM	EPA 8270D SIM	
Acenaphthene	7.6 J	21	6.3	ug/kg dry	10	B2G0011	7/2/12	7/6/12	SGM	EPA 8270D SIM	
Acenaphthylene	ND	21	16	ug/kg dry	10	B2G0011	7/2/12	7/6/12	SGM	EPA 8270D SIM	
Anthracene	**22**	21	6.6	ug/kg dry	10	B2G0011	7/2/12	7/6/12	SGM	EPA 8270D SIM	

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Wenck Associates, Inc.	Client Ref: 1756-05 City of Plymouth	Report #: 1203606
1800 Pioneer Creek Center P.O. Box 428	Client Contact: Mr. Jeff Madejczyk	Project Mgr: Steven J. Albrecht
Maple Plain, MN 55359	PO Number:	Account ID: W02540

062112

1203606-01 (Soil)

6/21/12 11:00

Polyaromatic Hydrocarbons by Selected Ion Monitoring

Sample Note(s): sd, vi

Analyte	Result	MRL	MDL	Units	Dilution	Batch	Prepared	Analyzed	Analyst	Method	Notes
Benz(a)anthracene	**96**	21	1.9	ug/kg dry	10	B2G0011	7/2/12	7/6/12	SGM	EPA 8270D SIM	
Benzo(a)pyrene	**150**	54	2.1	ug/kg dry	10	B2G0011	7/2/12	7/6/12	SGM	EPA 8270D SIM	
Benzo(b)fluoranthene	**150**	54	2.0	ug/kg dry	10	B2G0011	7/2/12	7/6/12	SGM	EPA 8270D SIM	
Benzo(e)pyrene	**210**	21	2.1	ug/kg dry	10	B2G0011	7/2/12	7/6/12	SGM	EPA 8270D SIM	go
Benzo(g,h,i)perylene	**130**	21	2.5	ug/kg dry	10	B2G0011	7/2/12	7/6/12	SGM	EPA 8270D SIM	
Benzo(j)fluoranthene	**66**	54	1.4	ug/kg dry	10	B2G0011	7/2/12	7/6/12	SGM	EPA 8270D SIM	
Benzo(k)fluoranthene	**66**	54	1.0	ug/kg dry	10	B2G0011	7/2/12	7/6/12	SGM	EPA 8270D SIM	
Carbazole	ND	110	3.5	ug/kg dry	10	B2G0011	7/2/12	7/6/12	SGM	EPA 8270D SIM	
Chrysene	**180**	21	3.1	ug/kg dry	10	B2G0011	7/2/12	7/6/12	SGM	EPA 8270D SIM	
Dibenz(a,h)acridine	ND	54	11	ug/kg dry	10	B2G0011	7/2/12	7/6/12	SGM	EPA 8270D SIM	
Dibenz(a,h)anthracene	ND	21	3.5	ug/kg dry	10	B2G0011	7/2/12	7/6/12	SGM	EPA 8270D SIM	
Dibenz(a,j)acridine	ND	54	3.3	ug/kg dry	10	B2G0011	7/2/12	7/6/12	SGM	EPA 8270D SIM	
Dibenzo(a,e)pyrene	10 J	54	2.6	ug/kg dry	10	B2G0011	7/2/12	7/6/12	SGM	EPA 8270D SIM	
Dibenzo(a,h)pyrene	ND	110	2.3	ug/kg dry	10	B2G0011	7/2/12	7/6/12	SGM	EPA 8270D SIM	A2
Dibenzo(a,i)pyrene	ND	110	3.3	ug/kg dry	10	B2G0011	7/2/12	7/6/12	SGM	EPA 8270D SIM	
Dibenzo(a,l)pyrene	ND	54	1.6	ug/kg dry	10	B2G0011	7/2/12	7/6/12	SGM	EPA 8270D SIM	
Dibenzofuran	ND	21	7.7	ug/kg dry	10	B2G0011	7/2/12	7/6/12	SGM	EPA 8270D SIM	
Fluoranthene	**250**	21	7.8	ug/kg dry	10	B2G0011	7/2/12	7/6/12	SGM	EPA 8270D SIM	
Fluorene	11 J	21	7.0	ug/kg dry	10	B2G0011	7/2/12	7/6/12	SGM	EPA 8270D SIM	
Indeno(1,2,3-cd)pyrene	**83**	21	2.0	ug/kg dry	10	B2G0011	7/2/12	7/6/12	SGM	EPA 8270D SIM	
Naphthalene	ND	54	11	ug/kg dry	10	B2G0011	7/2/12	7/6/12	SGM	EPA 8270D SIM	
Perylene	**60**	21	2.5	ug/kg dry	10	B2G0011	7/2/12	7/6/12	SGM	EPA 8270D SIM	go
Phenanthrene	**100**	21	5.1	ug/kg dry	10	B2G0011	7/2/12	7/6/12	SGM	EPA 8270D SIM	
Pyrene	**260**	21	7.5	ug/kg dry	10	B2G0011	7/2/12	7/6/12	SGM	EPA 8270D SIM	

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1800 Pioneer Creek Center P.O. Box 428	Client Contact: Mr. Jeff Madejczyk	Project Mgr: Steven J. Albrecht
Maple Plain, MN 55359	PO Number:	Account ID: W02540

062112

1203606-01 (Soil)

6/21/12 11:00

Polyaromatic Hydrocarbons by Selected Ion Monitoring

Sample Note(s): sd, vi

Analyte	Result	MRL	MDL	Units	Dilution	Batch	Prepared	Analyzed	Analyst	Method	Notes
Quinoline	ND	54	3.6	ug/kg dry	10	B2G0011	7/2/12	7/6/12	SGM	EPA 8270D SIM	
Surrogate: 2-Fluorobiphenyl	*77.4 %*	*Limits: 30-120%*				*B2G0011*	*7/2/12*	*7/6/12*	*SGM*	*EPA 8270D SIM*	
Surrogate: Nitrobenzene-d5	*68.8 %*	*Limits: 30-120%*				*B2G0011*	*7/2/12*	*7/6/12*	*SGM*	*EPA 8270D SIM*	
Surrogate: Terphenyl-d14	*88.7 %*	*Limits: 30-120%*				*B2G0011*	*7/2/12*	*7/6/12*	*SGM*	*EPA 8270D SIM*	

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Classical Chemistry Parameters - Quality Control

Batch B2F0562 - % Solids

Method Blank (B2F0562-BLK1) Prepared & Analyzed: 06/22/12

Analyte	Result		MRL	MDL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
% Solids	0.0259	J	0.050	0.010	% Wt	NA	NA	NA	NA	NA	NA	

Duplicate (B2F0562-DUP1) **Source: 1203512-01** Prepared & Analyzed: 06/22/12

Analyte	Result	MRL	MDL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
% Solids	96.8	0.050	0.010	% Wt	NA	96.8	NA	NA	0.0469	20	

Standard Reference Material (B2F0562-SRM1) Prepared & Analyzed: 06/22/12

Analyte	Result	MRL	MDL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
% Solids	91.6			% Wt	91.9	NA	99.6	90-110	NA	NA	

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Maple Plain, MN 55359	PO Number:	Account ID: W02540

Metals - Quality Control

Batch B2F0556 - EPA 3050B

Method Blank (B2F0556-BLK1) Prepared: 06/22/12 Analyzed: 06/25/12

Analyte	Result	MRL	MDL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Arsenic	ND	2.0	0.16	mg/kg	NA	NA	NA	NA	NA	NA	
Copper	0.0350 J	1.0	0.012	mg/kg	NA	NA	NA	NA	NA	NA	

Laboratory Control Sample (B2F0556-BS1) Prepared: 06/22/12 Analyzed: 06/25/12

Analyte	Result	MRL	MDL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Arsenic	299	2.0	0.16	mg/kg	300	NA	99.7	80-120	NA	NA	
Copper	299	1.0	0.012	mg/kg	300	NA	99.7	80-120	NA	NA	

Laboratory Control Sample Duplicate (B2F0556-BSD1) Prepared: 06/22/12 Analyzed: 06/25/12

Analyte	Result	MRL	MDL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Arsenic	300	2.0	0.16	mg/kg	300	NA	100	80-120	0.503	20	
Copper	300	1.0	0.012	mg/kg	300	NA	100	80-120	0.317	20	

Matrix Spike (B2F0556-MS1) **Source: 1203633-01RE1** Prepared: 06/22/12 Analyzed: 06/25/12

Analyte	Result	MRL	MDL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Arsenic	257	9.3	0.72	mg/kg	279	2.70	91.3	75-125	NA	NA	
Copper	285	4.6	0.056	mg/kg	279	27.9	92.3	75-125	NA	NA	

Matrix Spike Duplicate (B2F0556-MSD1) **Source: 1203633-01RE1** Prepared: 06/22/12 Analyzed: 06/25/12

Analyte	Result	MRL	MDL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Arsenic	281	10	0.78	mg/kg	299	2.70	93.0	75-125	8.97	20	
Copper	309	5.0	0.060	mg/kg	299	27.9	94.0	75-125	8.15	20	

Standard Reference Material (B2F0556-SRM1) Prepared: 06/22/12 Analyzed: 06/25/12

Analyte	Result	MRL	MDL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Arsenic	120	4.3	0.34	mg/kg	133	NA	90.2	57.1-110	NA	NA	
Copper	120	2.2	0.026	mg/kg	132	NA	91.0	66.2-111	NA	NA	

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Maple Plain, MN 55359	PO Number:	Account ID: W02540

Polyaromatic Hydrocarbons by Selected Ion Monitoring - Quality Control

Batch B2G0011 - EPA 3546

Method Blank (B2G0011-BLK1) Prepared: 07/02/12 Analyzed: 07/05/12

Analyte	Result	MRL	MDL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
1,6-Dinitropyrene	ND	500	2.4	ug/kg	NA	NA	NA	NA	NA	NA	
1,8-Dinitropyrene	ND	500	1.1	ug/kg	NA	NA	NA	NA	NA	NA	
1-Methylnaphthalene	ND	5.0	2.7	ug/kg	NA	NA	NA	NA	NA	NA	
1-Nitropyrene	ND	10	1.9	ug/kg	NA	NA	NA	NA	NA	NA	
2-Chloronaphthalene	ND	2.0	1.5	ug/kg	NA	NA	NA	NA	NA	NA	
2-Methylnaphthalene	ND	2.0	1.4	ug/kg	NA	NA	NA	NA	NA	NA	
2-Nitrofluorene	ND	10	1.5	ug/kg	NA	NA	NA	NA	NA	NA	
3-Methylcholanthrene	ND	5.0	0.40	ug/kg	NA	NA	NA	NA	NA	NA	
4-Nitropyrene	ND	10	0.84	ug/kg	NA	NA	NA	NA	NA	NA	
5-Methylchrysene	ND	2.0	0.13	ug/kg	NA	NA	NA	NA	NA	NA	
5-Nitroacenaphthene	ND	10	1.8	ug/kg	NA	NA	NA	NA	NA	NA	
6-Nitrochrysene	ND	10	2.4	ug/kg	NA	NA	NA	NA	NA	NA	
7,12-Dimethylbenz(a)anthracene	ND	2.0	0.32	ug/kg	NA	NA	NA	NA	NA	NA	
7H-Dibenzo(c,g)carbazole	ND	5.0	0.40	ug/kg	NA	NA	NA	NA	NA	NA	
Acenaphthene	ND	2.0	0.59	ug/kg	NA	NA	NA	NA	NA	NA	
Acenaphthylene	ND	2.0	1.5	ug/kg	NA	NA	NA	NA	NA	NA	
Anthracene	ND	2.0	0.62	ug/kg	NA	NA	NA	NA	NA	NA	
Benz(a)anthracene	ND	2.0	0.18	ug/kg	NA	NA	NA	NA	NA	NA	
Benzo(a)pyrene	ND	5.0	0.20	ug/kg	NA	NA	NA	NA	NA	NA	
Benzo(b)fluoranthene	ND	5.0	0.19	ug/kg	NA	NA	NA	NA	NA	NA	
Benzo(e)pyrene	ND	2.0	0.20	ug/kg	NA	NA	NA	NA	NA	NA	
Benzo(g,h,i)perylene	ND	2.0	0.23	ug/kg	NA	NA	NA	NA	NA	NA	
Benzo(j)fluoranthene	ND	5.0	0.13	ug/kg	NA	NA	NA	NA	NA	NA	
Benzo(k)fluoranthene	ND	5.0	0.098	ug/kg	NA	NA	NA	NA	NA	NA	
Carbazole	ND	10	0.33	ug/kg	NA	NA	NA	NA	NA	NA	
Chrysene	ND	2.0	0.29	ug/kg	NA	NA	NA	NA	NA	NA	
Dibenz(a,h)acridine	ND	5.0	1.0	ug/kg	NA	NA	NA	NA	NA	NA	
Dibenz(a,h)anthracene	ND	2.0	0.32	ug/kg	NA	NA	NA	NA	NA	NA	
Dibenz(a,j)acridine	ND	5.0	0.30	ug/kg	NA	NA	NA	NA	NA	NA	
Dibenzo(a,e)pyrene	ND	5.0	0.24	ug/kg	NA	NA	NA	NA	NA	NA	
Dibenzo(a,h)pyrene	ND	10	0.21	ug/kg	NA	NA	NA	NA	NA	NA	
Dibenzo(a,i)pyrene	ND	10	0.31	ug/kg	NA	NA	NA	NA	NA	NA	
Dibenzo(a,l)pyrene	ND	5.0	0.15	ug/kg	NA	NA	NA	NA	NA	NA	
Dibenzofuran	ND	2.0	0.72	ug/kg	NA	NA	NA	NA	NA	NA	
Fluoranthene	ND	2.0	0.72	ug/kg	NA	NA	NA	NA	NA	NA	
Fluorene	ND	2.0	0.66	ug/kg	NA	NA	NA	NA	NA	NA	
Indeno(1,2,3-cd)pyrene	ND	2.0	0.19	ug/kg	NA	NA	NA	NA	NA	NA	
Naphthalene	ND	5.0	1.0	ug/kg	NA	NA	NA	NA	NA	NA	
Perylene	ND	2.0	0.23	ug/kg	NA	NA	NA	NA	NA	NA	
Phenanthrene	ND	2.0	0.48	ug/kg	NA	NA	NA	NA	NA	NA	
Pyrene	ND	2.0	0.70	ug/kg	NA	NA	NA	NA	NA	NA	
Quinoline	ND	5.0	0.33	ug/kg	NA	NA	NA	NA	NA	NA	
Surrogate: 2-Fluorobiphenyl	*31.0*			ug/kg	*62.4*	*NA*	*49.7*	*30-120*			
Surrogate: Nitrobenzene-d5	*18.5*			ug/kg	*62.4*	*NA*	*29.7*	*30-120*			*vn*
Surrogate: Terphenyl-d14	*55.7*			ug/kg	*62.4*	*NA*	*89.2*	*30-120*			

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Maple Plain, MN 55359	PO Number:	Account ID: W02540

Polyaromatic Hydrocarbons by Selected Ion Monitoring - Quality Control

Batch B2G0011 - EPA 3546

Laboratory Control Sample (B2G0011-BS1) Prepared: 07/02/12 Analyzed: 07/05/12

Analyte	Result	MRL	MDL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
1,6-Dinitropyrene	ND	500	2.4	ug/kg	498	NA	NA	50-120	NA	NA	
1,8-Dinitropyrene	399 J	500	1.1	ug/kg	498	NA	80.2	50-120	NA	NA	
1-Methylnaphthalene	58.1	5.0	2.7	ug/kg	49.8	NA	117	50-120	NA	NA	
1-Nitropyrene	39.4	10	1.9	ug/kg	49.8	NA	79.2	50-120	NA	NA	
2-Chloronaphthalene	30.0	2.0	1.5	ug/kg	49.8	NA	60.3	50-120	NA	NA	
2-Methylnaphthalene	29.3	2.0	1.4	ug/kg	49.8	NA	58.9	50-120	NA	NA	
2-Nitrofluorene	45.8	10	1.5	ug/kg	49.8	NA	92.1	50-120	NA	NA	
3-Methylcholanthrene	40.3	5.0	0.40	ug/kg	49.8	NA	80.9	50-120	NA	NA	
4-Nitropyrene	42.8	10	0.84	ug/kg	49.8	NA	86.1	50-120	NA	NA	
5-Methylchrysene	43.4	2.0	0.13	ug/kg	49.8	NA	87.3	50-120	NA	NA	
5-Nitroacenaphthene	50.8	10	1.8	ug/kg	49.8	NA	102	50-120	NA	NA	
6-Nitrochrysene	51.1	10	2.4	ug/kg	49.8	NA	103	50-120	NA	NA	
7,12-Dimethylbenz(a)anthracene	46.7	2.0	0.32	ug/kg	49.8	NA	93.8	50-120	NA	NA	
7H-Dibenzo(c,g)carbazole	43.6	5.0	0.40	ug/kg	49.8	NA	87.7	50-120	NA	NA	
Acenaphthene	36.8	2.0	0.59	ug/kg	49.8	NA	73.9	50-120	NA	NA	
Acenaphthylene	35.7	2.0	1.5	ug/kg	49.8	NA	71.8	50-120	NA	NA	
Anthracene	41.3	2.0	0.62	ug/kg	49.8	NA	82.9	50-120	NA	NA	
Benz(a)anthracene	50.6	2.0	0.18	ug/kg	49.8	NA	102	50-120	NA	NA	
Benzo(a)pyrene	47.8	5.0	0.20	ug/kg	49.8	NA	96.1	50-120	NA	NA	
Benzo(b)fluoranthene	50.7	5.0	0.19	ug/kg	49.8	NA	102	50-120	NA	NA	
Benzo(e)pyrene	133	2.0	0.20	ug/kg	99.5	NA	133	50-120	NA	NA	
Benzo(g,h,i)perylene	52.2	2.0	0.23	ug/kg	49.8	NA	105	50-120	NA	NA	
Benzo(j)fluoranthene	41.6	5.0	0.13	ug/kg	49.8	NA	83.7	50-120	NA	NA	
Benzo(k)fluoranthene	50.5	5.0	0.098	ug/kg	49.8	NA	101	50-120	NA	NA	
Carbazole	49.3	10	0.33	ug/kg	49.8	NA	99.0	50-120	NA	NA	
Chrysene	50.6	2.0	0.29	ug/kg	49.8	NA	102	50-120	NA	NA	
Dibenz(a,h)acridine	42.7	5.0	1.0	ug/kg	49.8	NA	85.8	50-120	NA	NA	
Dibenz(a,h)anthracene	51.5	2.0	0.32	ug/kg	49.8	NA	104	50-120	NA	NA	
Dibenz(a,j)acridine	42.7	5.0	0.30	ug/kg	49.8	NA	85.8	50-120	NA	NA	
Dibenzo(a,e)pyrene	42.5	5.0	0.24	ug/kg	49.8	NA	85.4	50-120	NA	NA	
Dibenzo(a,h)pyrene	28.2	10	0.21	ug/kg	49.8	NA	56.6	40-120	NA	NA	
Dibenzo(a,i)pyrene	37.0	10	0.31	ug/kg	49.8	NA	74.4	50-120	NA	NA	
Dibenzo(a,l)pyrene	38.6	5.0	0.15	ug/kg	49.8	NA	77.5	50-120	NA	NA	
Dibenzofuran	32.5	2.0	0.72	ug/kg	49.8	NA	65.3	50-120	NA	NA	
Fluoranthene	48.5	2.0	0.72	ug/kg	49.8	NA	97.6	50-120	NA	NA	
Fluorene	40.3	2.0	0.66	ug/kg	49.8	NA	81.0	50-120	NA	NA	
Indeno(1,2,3-cd)pyrene	51.3	2.0	0.19	ug/kg	49.8	NA	103	50-120	NA	NA	
Naphthalene	31.4	5.0	1.0	ug/kg	49.8	NA	63.1	50-120	NA	NA	
Perylene	88.7	2.0	0.23	ug/kg	49.8	NA	178	50-120	NA	NA	
Phenanthrene	45.1	2.0	0.48	ug/kg	49.8	NA	90.6	50-120	NA	NA	
Pyrene	48.1	2.0	0.70	ug/kg	49.8	NA	96.6	50-120	NA	NA	
Quinoline	34.5	5.0	0.33	ug/kg	49.8	NA	69.4	50-120	NA	NA	
Surrogate: 2-Fluorobiphenyl	*32.0*			ug/kg	*62.2*	*NA*	*51.5*	*30-120*			
Surrogate: Nitrobenzene-d5	*22.1*			ug/kg	*62.2*	*NA*	*35.6*	*30-120*			
Surrogate: Terphenyl-d14	*55.0*			ug/kg	*62.2*	*NA*	*88.4*	*30-120*			

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11001 Hampshire Ave. S.
Minneapolis, MN 55438
952.995.2000 Phone
952.995.2020 Fax

Wenck Associates, Inc.	Client Ref: 1756-05 City of Plymouth	Report #: 1203606
1800 Pioneer Creek Center P.O. Box 428	Client Contact: Mr. Jeff Madejczyk	Project Mgr: Steven J. Albrecht
Maple Plain, MN 55359	PO Number:	Account ID: W02540

Polyaromatic Hydrocarbons by Selected Ion Monitoring - Quality Control

Batch B2G0011 - EPA 3546

Laboratory Control Sample Duplicate (B2G0011-BSD1) Prepared: 07/02/12 Analyzed: 07/06/12

Analyte	Result	MRL	MDL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
1,6-Dinitropyrene	ND	500	2.4	ug/kg	498	NA	NA	50-120	NA	20	
1,8-Dinitropyrene	451 J	500	1.1	ug/kg	498	NA	90.7	50-120	12.2	20	
1-Methylnaphthalene	54.1	5.0	2.7	ug/kg	49.8	NA	109	50-120	7.07	20	
1-Nitropyrene	41.0	10	1.9	ug/kg	49.8	NA	82.4	50-120	4.04	20	
2-Chloronaphthalene	28.5	2.0	1.5	ug/kg	49.8	NA	57.3	50-120	5.23	20	
2-Methylnaphthalene	27.3	2.0	1.4	ug/kg	49.8	NA	54.9	50-120	6.94	20	
2-Nitrofluorene	47.3	10	1.5	ug/kg	49.8	NA	95.1	50-120	3.21	20	
3-Methylcholanthrene	41.5	5.0	0.40	ug/kg	49.8	NA	83.5	50-120	3.08	20	
4-Nitropyrene	44.0	10	0.84	ug/kg	49.8	NA	88.5	50-120	2.78	20	
5-Methylchrysene	45.4	2.0	0.13	ug/kg	49.8	NA	91.2	50-120	4.34	20	
5-Nitroacenaphthene	51.5	10	1.8	ug/kg	49.8	NA	104	50-120	1.34	20	
6-Nitrochrysene	45.0	10	2.4	ug/kg	49.8	NA	90.5	50-120	12.7	20	
7,12-Dimethylbenz(a)anthracene	48.2	2.0	0.32	ug/kg	49.8	NA	96.9	50-120	3.25	20	
7H-Dibenzo(c,g)carbazole	44.6	5.0	0.40	ug/kg	49.8	NA	89.7	50-120	2.25	20	
Acenaphthene	36.1	2.0	0.59	ug/kg	49.8	NA	72.7	50-120	1.76	20	
Acenaphthylene	35.4	2.0	1.5	ug/kg	49.8	NA	71.1	50-120	0.966	20	
Anthracene	42.0	2.0	0.62	ug/kg	49.8	NA	84.4	50-120	1.78	20	
Benz(a)anthracene	52.8	2.0	0.18	ug/kg	49.8	NA	106	50-120	4.20	20	
Benzo(a)pyrene	50.9	5.0	0.20	ug/kg	49.8	NA	102	50-120	6.16	20	
Benzo(b)fluoranthene	53.0	5.0	0.19	ug/kg	49.8	NA	107	50-120	4.52	20	
Benzo(e)pyrene	139	2.0	0.20	ug/kg	99.5	NA	140	50-120	4.86	20	
Benzo(g,h,i)perylene	53.3	2.0	0.23	ug/kg	49.8	NA	107	50-120	2.10	20	
Benzo(j)fluoranthene	44.2	5.0	0.13	ug/kg	49.8	NA	88.9	50-120	6.03	20	
Benzo(k)fluoranthene	53.1	5.0	0.098	ug/kg	49.8	NA	107	50-120	4.99	20	
Carbazole	51.2	10	0.33	ug/kg	49.8	NA	103	50-120	3.91	20	
Chrysene	52.6	2.0	0.29	ug/kg	49.8	NA	106	50-120	3.75	20	
Dibenz(a,h)acridine	44.4	5.0	1.0	ug/kg	49.8	NA	89.2	50-120	3.88	20	
Dibenz(a,h)anthracene	53.1	2.0	0.32	ug/kg	49.8	NA	107	50-120	2.89	20	
Dibenz(a,j)acridine	43.9	5.0	0.30	ug/kg	49.8	NA	88.3	50-120	2.87	20	
Dibenzo(a,e)pyrene	42.9	5.0	0.24	ug/kg	49.8	NA	86.3	50-120	1.04	20	
Dibenzo(a,h)pyrene	30.5	10	0.21	ug/kg	49.8	NA	61.3	40-120	7.93	20	
Dibenzo(a,i)pyrene	38.0	10	0.31	ug/kg	49.8	NA	76.4	50-120	2.54	20	
Dibenzo(a,l)pyrene	39.5	5.0	0.15	ug/kg	49.8	NA	79.4	50-120	2.39	20	
Dibenzofuran	33.1	2.0	0.72	ug/kg	49.8	NA	66.5	50-120	1.84	20	
Fluoranthene	49.7	2.0	0.72	ug/kg	49.8	NA	99.8	50-120	2.30	20	
Fluorene	41.1	2.0	0.66	ug/kg	49.8	NA	82.6	50-120	1.86	20	
Indeno(1,2,3-cd)pyrene	53.0	2.0	0.19	ug/kg	49.8	NA	107	50-120	3.15	20	
Naphthalene	28.1	5.0	1.0	ug/kg	49.8	NA	56.5	50-120	11.0	20	
Perylene	90.9	2.0	0.23	ug/kg	49.8	NA	183	50-120	2.52	20	
Phenanthrene	47.4	2.0	0.48	ug/kg	49.8	NA	95.3	50-120	4.97	20	
Pyrene	49.9	2.0	0.70	ug/kg	49.8	NA	100	50-120	3.67	20	
Quinoline	32.8	5.0	0.33	ug/kg	49.8	NA	66.0	50-120	5.07	20	
Surrogate: 2-Fluorobiphenyl	*35.1*			ug/kg	*62.2*	*NA*	*56.5*	*30-120*			
Surrogate: Nitrobenzene-d5	*26.5*			ug/kg	*62.2*	*NA*	*42.6*	*30-120*			
Surrogate: Terphenyl-d14	*56.3*			ug/kg	*62.2*	*NA*	*90.6*	*30-120*			

BRAUN INTERTEC

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Wenck Associates, Inc.	Client Ref: 1756-05 City of Plymouth	Report #: 1203606
1800 Pioneer Creek Center P.O. Box 428	Client Contact: Mr. Jeff Madejczyk	Project Mgr: Steven J. Albrecht
Maple Plain, MN 55359	PO Number:	Account ID: W02540

For Braun Intertec Use Only
Laboratory Work Order No.
120 3606

BRAUN INTERTEC
Braun Intertec Corporation
11001 Hampshire Ave. S
Minneapolis, MN 55438

REQUEST FOR LABORATORY ANALYTICAL SERVICES

Bottle orders and sampling inquires:
labservices@braunintertec.com
Phone: 952-995-2600 Fax: 952-995-2601

IMPORTANT
Date Results Requested: _____
Time _____
Rush Charges Authorized? ____ Yes ____ No
Rush / Quote # _____

Page 1 of 1

008716

REPORT RESULTS TO
Contact Name: Jeff Madejczyk | Project ID/Name: 1756-05 / City of Plymouth | P.O. #/Project #
Company: Wenck
Mailing Address: 1800 Pioneer Creek Center
City, State, Zip: Maple Plain, MN
Telephone #: 763-479-4263 | Fax #: 763-479-4242
E-mail: jmadejczyk@wenck.com

SEND INVOICE TO
Contact Name: Melissa | Company: Wenck
Address
City, State, Zip
Telephone # | Fax #

Special Instructions and/or Specific Regulatory Requirements:
(method, limit of detection, petrofund, reporting units)

ANALYSIS REQUESTED
(Enter an 'X' in the box below to indicate request)

Site Location (State): MN

LAB ID#	CLIENT SAMPLE IDENTIFICATION (IDs must be unique)	DATE SAMPLED	TIME SAMPLED	MATRIX/ MEDIA	VOLUME/AREA (specify units)	Number of Containers	Metals Field Filtered Y/N	Copper	Arsenic	PAH	FOR LAB USE ONLY
	062112-1	6-21-12	11:00			1	N	X	X	X	
	062112-2	6-21-12	11:00			1	N				
	062112-3	6-21-12	11:00			1	N				
	062112-4	6-21-12	14:00			1	N				

CHAIN OF CUSTODY
Collected by: (Print) Carl Enzenauer | Collector's Signature: Carl Enzenauer
Relinquished by: | Date/Time 6-21-12 | Received by: | Date/Time
Relinquished by: | Date/Time | Received Contents Not Verified: | Date/Time 6/21/12 17:10
Custody Seal Intact ☐ Yes ☐ No ☐ N/A ☒ Hand Delivered by Client | Received Contents Verified: | Date/Time
On Ice ☒ Yes ☐ No | Comments:
Temp Blank ☒ Yes ☐ No
Temp: 8.3 °C

Form # CS02.03 F:\Groups\QA-QC\Forms\clientservices\COC-CS02 Effective Date: 10/10/07

Appendix B
Wetland Delineation Report

Four Seasons Mall – Plymouth, MN

Wetland Delineation Report For:

Derek Asche
Water Resources Manager
City of Plymouth
3400 Plymouth Boulevard
Plymouth, MN 55447

arrowhead environmental consulting

Wetland Consulting Services
Performed by:
Ben Carlson, WDC (#1125)

AEC Project # 2011-019

June 9, 2011

Arrowhead Environmental Consulting
2909 Meadow Lane
Mound, MN 55364

TABLE OF CONTENTS

Project Overview

On May 16 and 19, 2011 Arrowhead Environmental Consulting (AEC) performed a wetland delineation for the Four Seasons Mall project located in Plymouth, MN.

- Five wetland basins were delineated within the project boundary; Wetland 1 is a Fresh (Wet) Meadow/Shallow Marsh (Type 2/3) wetland within the northeastern portion of the project, Wetlands 2 and 2A are Seasonally Flooded Basins (Type 1) in the very southern portion of the project, Wetland 3 is a Fresh (Wet) Meadow (Type 2) in the south-central portion of the project, and Wetland 4 is a Shallow Marsh (Type 3) in the east-central portion of the project.

- The SE portion of Wetland 1 is indicated on the NWI map as a PEMCd wetland. Wetlands 2 and 2A are not indicated on the NWI map, Wetland 3 is not indicated on the NWI map, Wetland 4 is indicated on the NWI map as a PEMC/PEMF wetland.

- None of the delineated wetlands are indicated on the Minnesota Department of Natural Resources Public Water Inventory Map (PWI).

- Wetland 1 is mapped in the Angus, Hamel, Houghton, and Lester soil series. Wetlands 2 and 2A are mapped in the Glencoe soil series, Wetland 3 is mapped in the Glencoe soil series, and Wetland 4 is mapped in the Hamel and Klossner soil series.

- Wetland 1 is dominated by reed canary grass, cattail and sedge species, with scattered willows; Wetlands 2 and 2A are dominated by Kentucky bluegrass, fowl bluegrass, giant manna grass, and standing water; Wetland 3 is dominated by hummock sedge, reed canary grass, giant goldenrod, and Canada thistle; Wetland 4 is dominated by reed canary grass, sedge species, and cattail.

- The wetland boundaries were generally placed along the vegetative transition from hydrophytic to non-hydrophytic vegetation (which correlated to a rise in topography), the shift from hydric to non-hydric soils, and the presence or lack of hydrology indicators.

Introduction

The Four Seasons Mall delineation is located SW of the intersection of Highway 169 and Rockford road (along Lancaster Lane). The legal description of the project location is: A part of the E ½ of Section 13, T118N, R22W, Hennepin County, Plymouth, Minnesota. The project is a total of 48 acres (are of investigation).

Methods

AEC utilized the *1987 US Army Corps of Engineers Wetlands Delineation Manual* and *Midwest Regional Supplement* to perform the wetland delineation. A United States Geological Survey (USGS) Map (Osseo Quad) (Figure 1), the Minnesota Department of Natural Resources (MN DNR) Public Water Inventory (PWI) Map (Figure 2), the Hennepin County Soil Survey Map (Figure 3), and the National Wetland Inventory (NWI) Map (Figure 4) were reviewed prior to the site visit and used in the delineation process. The delineated wetland boundaries (GPS located) are indicated on Figure 5 and are overlaid on a 2010 aerial image. AEC used the routine delineation method.

Wetland classification followed methods described by the USACOE - St. Paul District: Eggers and Reed "Wetland Plants and Plant Communities of MN and WI". The Circular 39 and Cowardin et al. classifications are given as well. The indicator status of plants was determined using the National List of Plant Species That Occur in Wetlands – Region 3 (Sabine 1999). In accordance with the Midwest Regional Supplement, the + and – have been removed from the vegetation indicator status.

Pink pinflags were used to delineate the wetlands and were numbered sequentially; flagging was hung from adjacent vegetation to aid in location of the pinflags. Sample points were taken to document the vegetation, soils, and hydrology indicators within representative upland and wetland locations.

Results

Office Results

The SE portion of Wetland 1 is indicated on the NWI map as a PEMCd wetland. Wetlands 2 and 2A are not indicated on the NWI map. Wetland 3 is not indicated on the NWI map. Wetland 4 is indicated on the NWI map as a PEMC/PEMF wetland. Wetland 1 is mapped in the Angus, Hamel, Houghton, and Lester soil series. Wetlands 2 and 2A are mapped in the Glencoe soil series. Wetland 3 is mapped in the Glencoe soil series, and Wetland 4 is mapped in the Hamel and Klossner soil series. The Glencoe, Klossner, Hamel and Houghton soil series are classified as hydric soils (SCS Hydric Soils of the United States). None of the delineated wetlands are indicated on the Minnesota Department of Natural Resources Public Water Inventory Map (PWI).

Field Results

Wetland 1

AEC classified Wetland 1 as a Fresh (Wet) Meadow/Shallow Marsh (Type 2/3, PEME/PEMF) wetland. Wetland 1 is dominated by reed canary grass (*Phalaris*

arundinacea), narrow leaved cattail (*Typha angustifolia*), sedge (*Carex*) species, with scattered willow species (sandbar and crack willow, *Salix exigua* and *Salix fragilis* respectively). The adjacent upland area is dominated by smooth brome (*Bromus inermis*), Kentucky bluegrass (*Poa pratensis*), and dandelion (*Taraxacum officinale*).

The western and northern portion of Wetland 1 is a shallow drainage swale (generally 30-40' in width) that flows to the SE and discharges into the shallow marsh portion of Wetland 1. The boundary for Wetland 1 varied significantly with portions exhibiting a broad transition while other areas exhibited rather steep slopes, the wetland edge was place approximately 12-18" above the current water line which generally correlated to a shift in the vegetation (from hydrophytic to non-hydrophytic). The wetland soil borings met the A2 (Histic Epipedon) and F3 (Depleted Matrix) hydric soil indicators and water was generally observed within 6" of the soil surface (with saturation to the surface). The upland soil borings did not meet any hydric soil indicators with no saturation observed (the upland sample points appeared to be fill material for the adjacent road embankments).

Wetlands 2/2A

AEC classified Wetlands 2 and 2A as a Seasonally Flooded Basins (Type 1, PEMA) wetlands. Wetlands 2 and 2A are divided by a bike trail but are connected by a culvert. Wetlands 2/2A are dominated by mostly open water with Kentucky bluegrass, fowl bluegrass (*Poa palustris*), and giant manna grass (*Glyceria grandis*). The adjacent upland area is dominated by Kentucky blue grass, dandelion, and white clover (*Trifolium repens*).

Wetlands 2/2A are small depressional basins that are likely inundated during spring time snow melt and after significant precipitation events. The boundary for Wetlands 2/2A exhibited moderate slopes, the wetland edge was placed approximately 6" above the current water line. The wetland soil borings met the F3 (Depleted Matrix) hydric soil indicator and standing water was observed. The upland soil borings did not meet a hydric soil indicator; water was observed at 12" below the soil surface.

Wetland 3

AEC classified Wetland 3 as a Fresh (Wet) Meadow (Type 2, PEMB) wetland. Wetland 3 is dominated by sedge species (Hummock sedge, *Carex stricta*), reed canary grass, giant goldenrod (*Solidago gigantea*), and Canada thistle (*Cirsium arvense*). The adjacent upland area is dominated by Kentucky blue grass, dandelion, and Canada thistle.

The boundary for Wetland 3 exhibited moderate slopes; the wetland edge was placed along the transition from hydrophytic vegetation to non-hydrophytic vegetation and where the soil was no longer saturated to the surface. The wetland soil boring met the A12 (thick dark surface) hydric soil indicator and water was observed at 8" below the soil surface (with saturation to the surface). The upland soil boring did not meet a hydric soil indicator and saturation was observed at 8" below the soil surface.

Wetland 4
AEC classified Wetland 4 as a Shallow Marsh (Type 3, PEMC/PEMF) wetland. Wetland 4 is dominated by sedge species, reed canary grass, and cattail. The adjacent upland area is dominated by common buckthorn (*Rhamnus cathartica*) and basswood (*Tilia americana*).

The boundary for Wetland 4 exhibited rather steep slopes; the wetland edge was placed along an abrupt rise in elevation that correlated to a shift in the vegetation. The wetland soil boring met the A2 (Histic Epipedon) hydric soil indicator and water was observed at 1" below the soil surface (with saturation to the surface). The upland soil boring did not meet a hydric soil indicator and no saturation was observed.

Throughout the forested area down-slope from Wetland 3 (and west of Wetland 4) AEC noted a number of highly eroded drainage channels (see Photo Log). These drainage channels convey water to Wetland 4 during spring time snow melt and after significant precipitation events. The forested area adjacent to the drainage ditches is dominated by basswood, common buckthorn, and green ash (*Fraxinus pennsylvanica*). A soil boring within the ditch indicated non-hydric soils as is typical in this setting. Flowing water was observed at the time of sampling however, flowage is likely temporary. These drainage ditch areas do not meet jurisdictional wetland criteria.

Discussion

Five wetland basins and were delineated within the project bounds. Areas delineated as wetland met the three criteria required for a wetland delineation: dominance of hydrophytic vegetation, presence of hydric soil, and (at a minimum) one primary hydrology indicator or two secondary hydrology indicators under normal conditions.

In order to be official the wetland delineation must be reviewed and approved by the Local Government Unit (LGU) and potentially other agencies (Local, State, Federal). Any work within or adjacent to a wetland will require Wetland Conservation Act (WCA) permits (and potentially other permits). Please consult with AEC if you plan on filling, draining, excavating wetlands within your project location.

If you have any questions regarding this report or any questions about our services please feel free to contact Ben Carlson at any time (612-237-5996).

Thank you,

Ben Carlson

Ben Carlson, WDC
Ecologist/Owner
Arrowhead Environmental Consulting

Data Sources:
USGS Quadrangle Map – Osseo 7.5-Minute Quadrangle, Minnesota, U.S.A.

Minnesota Department of Natural Resources Protected Waters Inventory Map, Hennepin County 1983 (Revised 1996 data from the Mn DNR Data Deli, online).

Soil Survey of Hennepin County. U.S.D.A. Data obtained from the NRCS/SSURGO website.

United States Fish and Wildlife Service National Wetland Inventory Map – Hopkins Quadrangle. 1991. (Taken from May 1980 aerial photographs).

Aerial Photos were obtained the Land Management Information Center website (2010).

Literature Referenced/Technical Documents:
Environmental Laboratory. 1987. *1987 U.S. Army Corps of Engineers Wetlands Delineation Manual*. Technical Report Y-87-1, US Army Engineer Waterways Experiment Station, Vicksburg, Mississippi.

U.S. Army Engineer Research and Development Center. 2007. *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Midwest Region*. US Army Engineer Waterways Experiment Station, Vicksburg, Mississippi.

Eggers, Steve D. and Donald M. Reed. 1997. *Wetland Plants and Plant Communities of Minnesota and Wisconsin*. US Army Corps of Engineers, St. Paul District. 263pp, unclassified.

Shaw, S.P., and C.G. Fredine. 1956. *Wetlands of the United States*. U.S. Fish and Wildlife Service, Circular 39. 67pp.

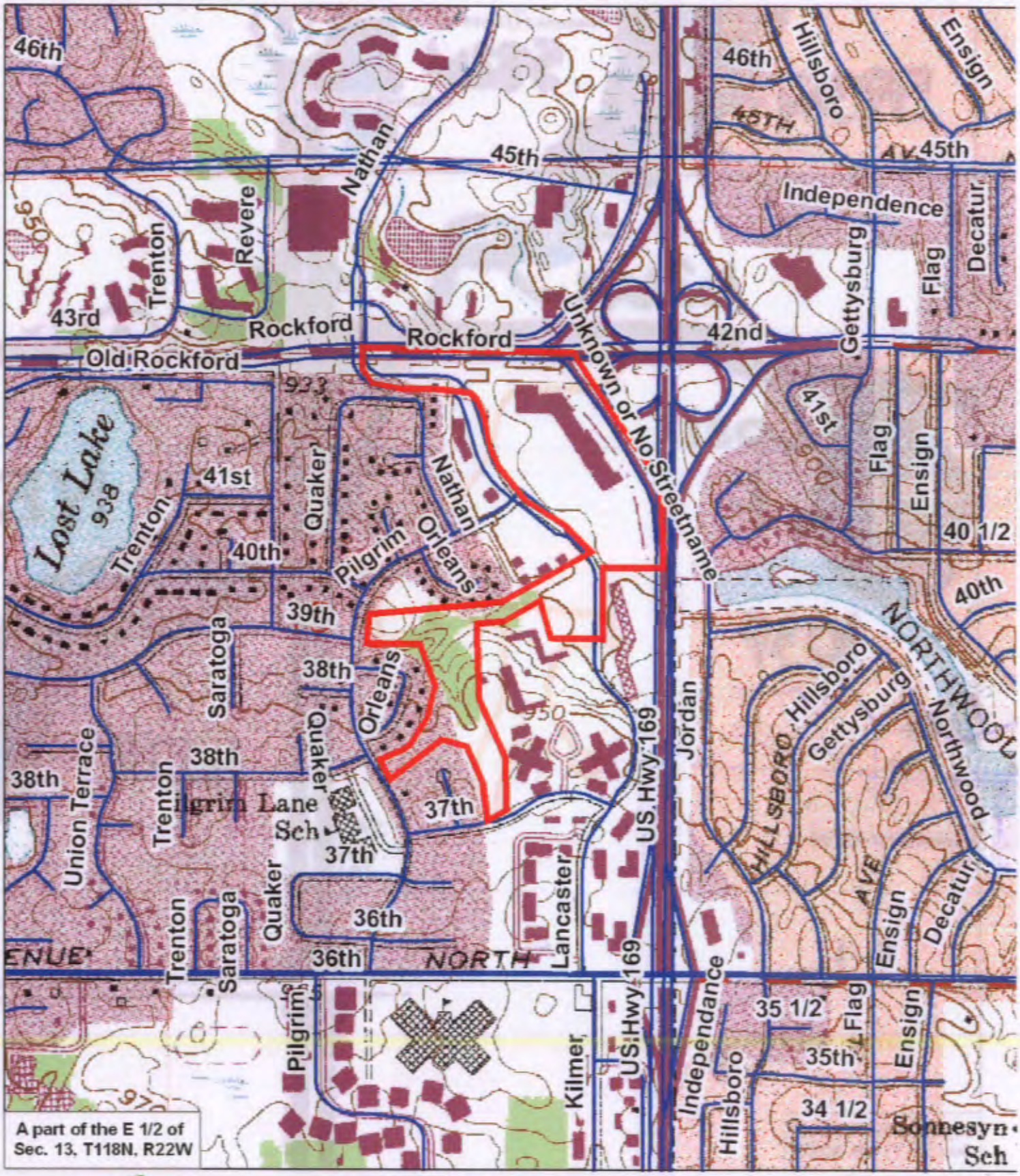
Cowardin, L.M., V. Carter, F.C. Golet, and R.T. LaRoe. 1979. *Classification of Wetlands and Deepwater Habitats of the United States*. U.S. Fish and Wildlife Service, FWS/OBS-79/31. 103pp.

Sabine, B. J. 1999. *National List of Plant Species that Occur in Wetlands: Region 3 – North Central (Indiana, Illinois, Iowa, Michigan, Minnesota, Missouri, Wisconsin)*. Resource Management Group, Inc. 77pp.

USDA Soil Conservation Service, Washington, D.C., Misc. 2006. *Field indicators of Hydric Soils in the United States*. A guide for Identifying and Delineating Hydric Soils, Version 6.0

National Technical Committee for Hydric Soils. 1991. *Hydric Soils of the United States*. USDA Soil Conservation Service, Washington, D.C., Misc. Publication Number 1491. 1991.

Figures



Map of Project Location

Overlaid on USGS Topo Map

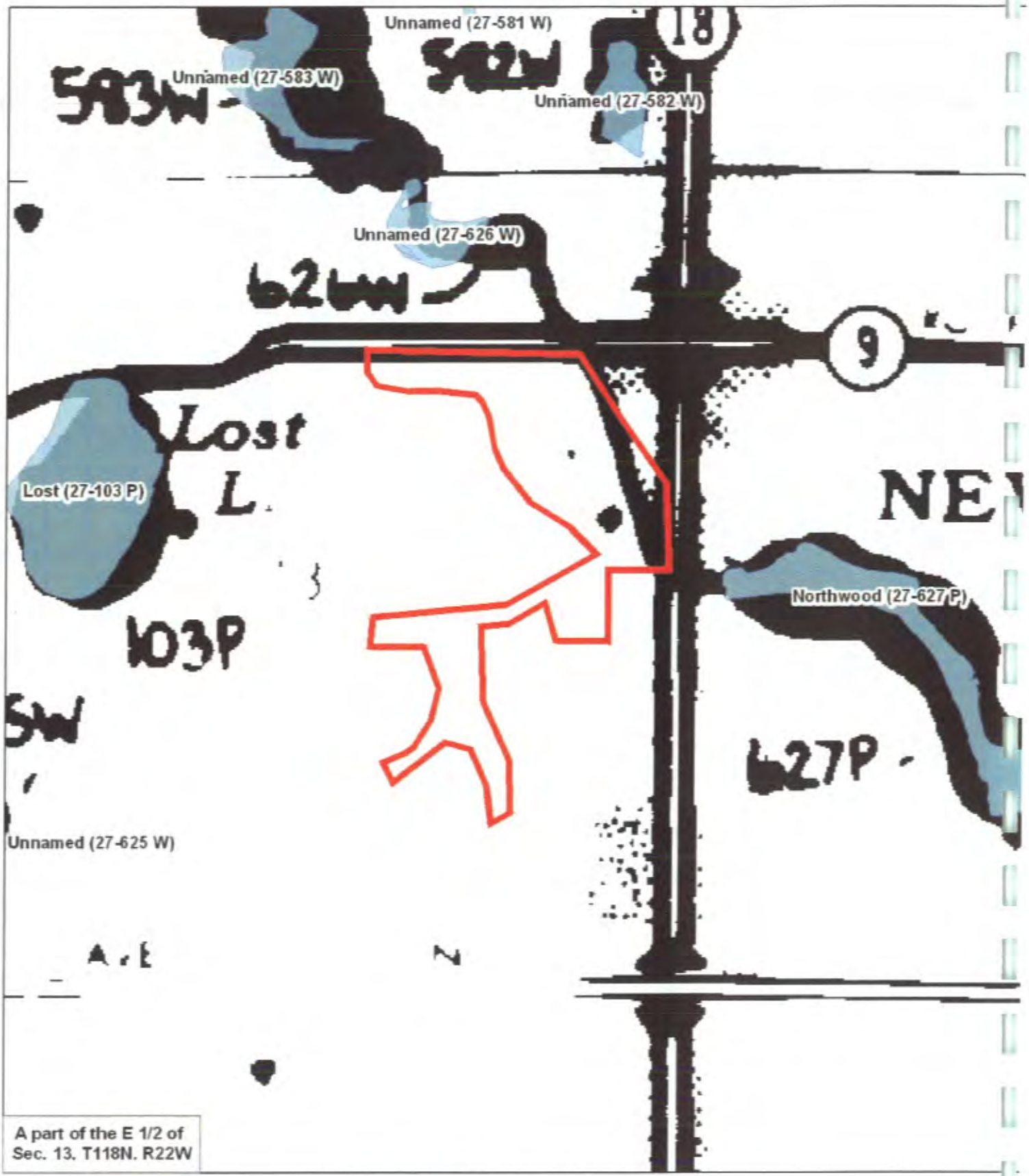
Approximate Parcel Boundary

0 625 1,250 2,500 Feet

arrowhead environmental consulting

Figure 1

Four Seasons
Hwy 169 & Rockford
Plymouth, MN



arrowhead environmental consulting

Map of Project Location

Overlaid on MN DNR PWI Map

Approximate Parcel Boundary

0 625 1,250 2,500 Feet

Figure 1

Four Seasons
Hwy 169 & Rockford
Plymouth, M

Hennepin County Soil Survey

Overlaid on 2010 Aerial Image

Approximate Parcel Boundary | Non-Hydric | Hydric

0 250 500 1,000 Feet

arrowhead environmental consulting

Figure 3

Four Seasons
Hwy 169 & Rockford
Plymouth, MN

National Wetland Inventory Map

Overlaid on 2010 Aerial Image

Approximate Parcel Boundary

0 250 500 1,000 Feet

arrowhead environmental consulting

Figure 4

Four Seasons
Hwy 169 & Rockford
Plymouth, M

Wetland Delineation Map

Overlaid on 2010 Aerial Image

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Approximate Parcel Boundary | GPS Boundary | Sample Point

0 250 500 1,000 Feet

Figure 5

Four Seasons
Hwy 169 & Rockford
Plymouth, MN

Supporting Data

WETLAND DETERMINATION DATA FORM - Midwest Region

Project/Site: Four Seasons Mall | City/County: Plymouth/Hennepin | Sampling Date: 5/16/2011
Applicant/Owner: City of Plymouth | State: MN | Sampling Point: 1-1 Wet
Investigator(s): BPC (WDC #1125) | Section, Township, Range: Sec. 13, T118N, R22W
Landform (hillslope, terrace, etc.): Basin | Local relief (concave, convex, none): Concave
Slope (%): 2 | Lat: | Long: | Datum:
Soil Map Unit Name: Urban Land | NWI Classification: None
Are climatic/hydrologic conditions of the site typical for this time of the year? Y (If no, explain in remarks)
Are vegetation ____, soil ____, or hydrology ____ significantly disturbed? Are "normal circumstances"
Are vegetation ____, soil ____, or hydrology ____ naturally problematic? present? Yes

SUMMARY OF FINDINGS

(If needed, explain any answers in remarks.)

Hydrophytic vegetation present?	Y	
Hydric soil present?	Y	**Is the sampled area within a wetlan** Y
Wetland hydrology present?	Y	If yes, optional wetland site ID:

Remarks: (Explain alternative procedures here or in a separate report.)

VEGETATION -- Use scientific names of plants.

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species	Indicator Staus
1			
2			
3			
4			
5			
	0	= Total Cover	

Sapling/Shrub stratum (Plot size: 15')			
1			
2			
3			
4			
5			
	0	= Total Cover	

Herb stratum (Plot size: 5')			
1 *Phalaris arundinacea*	50	Y	FACW
2 *Typha angustifolia*	20	Y	OBL
3 *Carex stricta*	30	Y	OBL
4			
5			
6			
7			
8			
9			
10			
	100	= Total Cover	

Woody vine stratum (Plot size: 15')			
1			
2			
	0	= Total Cover	

Dominance Test Worksheet

Number of Dominant Species that are OBL, FACW, or FAC: 3 (A)
Total Number of Dominant Species Across all Strata: 3 (B)
Percent of Dominant Species that are OBL, FACW, or FAC: 100.00% (A/B)

Prevalence Index Worksheet

Total % Cover of:

OBL species	50	x 1 =	50
FACW species	50	x 2 =	100
FAC species	0	x 3 =	0
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column totals	100 (A)		150 (B)

Prevalence Index = B/A = 1.50

Hydrophytic Vegetation Indicators:

- ___ Rapid test for hydrophytic vegetation
- X Dominance test is >50%
- X Prevalence index is ≤3.0*
- ___ Morphogical adaptations* (provide supporting data in Remarks or on a separate sheet)
- ___ Problematic hydrophytic vegetation* (explain)

*Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic vegetation present? Y

Remarks: (Include photo numbers here or on a separate sheet)

SOIL

Sampling Point: 1-1 Wet

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type*	Loc**	Texture	Remarks
0-6	10YR 4/2	100					Clay loam	
6-16	10GY 6/1	95	7.5YR 4/6	5	C	M	Clay loam	

*Type: C = Concentration, D = Depletion, RM = Reduced Matrix, MS = Masked Sand Grains. **Location: PL = Pore Lining, M = Matrix

Hydric Soil Indicators:

- ___ Histisol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- X Loamy Gleyed Matrix (F2)
- X Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils:

- ___ Coast Prairie Redox (A16) (**LRR K, L, R**)
- ___ Dark Surface (S7) (**LRR K, L**)
- ___ 5 cm Mucky Peat or Peat (S3) (**LRR K, L, R**)
- ___ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (explain in remarks)

*Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric soil present? Y

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- X High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- X Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Gauge or Well Data (D9)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (D9)
- ___ Stunted or Stressed Plants (D1)
- X Geomorphic Position (D2)
- X FAC-Neutral Test (D5)

Field Observations:

Surface water present?	Yes ___	No X	Depth (inches):	___	
Water table present?	Yes X	No ___	Depth (inches)	6	
Saturation present? (includes capillary fringe)	Yes X	No ___	Depth (inches)	0	

Wetland hydrology present? Y

Describe recorded data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM - Midwest Region

Project/Site: Four Seasons Mall | City/County: Plymouth/Hennepin | Sampling Date: 5/16/2011
Applicant/Owner: City of Plymouth | State: MN | Sampling Point: 1-1 Up
Investigator(s): BPC (WDC #1125) | Section, Township, Range: Sec. 13, T118N, R22W
Landform (hillslope, terrace, etc.): Slope | Local relief (concave, convex, none): Concave
Slope (%): 5 | Lat: | Long: | Datum:
Soil Map Unit Name: Urban Land | NWI Classification: None
Are climatic/hydrologic conditions of the site typical for this time of the year? Y (If no, explain in remarks)
Are vegetation ____, soil ____, or hydrology ____ significantly disturbed? Are "normal circumstances" present? Yes
Are vegetation ____, soil ____, or hydrology ____ naturally problematic? (If needed, explain any answers in remarks.)

SUMMARY OF FINDINGS

Hydrophytic vegetation present?	N	Is the sampled area within a wetland? N
Hydric soil present?	N	If yes, optional wetland site ID:
Wetland hydrology present?	N	

Remarks: (Explain alternative procedures here or in a separate report.)

VEGETATION -- Use scientific names of plants.

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species	Indicator Status
1			
2			
3			
4			
5			
	0	= Total Cover	

Sapling/Shrub stratum (Plot size: 15')			
1			
2			
3			
4			
5			
	0	= Total Cover	

Herb stratum (Plot size: 5')			
1 *Bromus inermis*	90	Y	UPL
2 *Poa pratensis*	10	N	FAC
3			
4			
5			
6			
7			
8			
9			
10			
	100	= Total Cover	

Woody vine stratum (Plot size: 15')			
1			
2			
	0	= Total Cover	

Dominance Test Worksheet
Number of Dominant Species that are OBL, FACW, or FAC: 0 (A)
Total Number of Dominant Species Across all Strata: 1 (B)
Percent of Dominant Species that are OBL, FACW, or FAC: 0.00% (A/B)

Prevalence Index Worksheet
Total % Cover of:

OBL species	0	x 1 =	0
FACW species	0	x 2 =	0
FAC species	10	x 3 =	30
FACU species	0	x 4 =	0
UPL species	90	x 5 =	450
Column totals	100 (A)		480 (B)

Prevalence Index = B/A = 4.80

Hydrophytic Vegetation Indicators:
___ Rapid test for hydrophytic vegetation
___ Dominance test is >50%
___ Prevalence index is ≤3.0*
___ Morphogical adaptations* (provide supporting data in Remarks or on a separate sheet)
___ Problematic hydrophytic vegetation* (explain)

*Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic vegetation present? N

Remarks: (Include photo numbers here or on a separate sheet)

SOIL

Sampling Point: 1-1 Up

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (Inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type*	Loc**	Texture	Remarks
0-8	10YR 3/2	100					Clay loam	
8-18	10YR 4/4	100					Clay loam	

*Type: C = Concentration, D = Depletion, RM = Reduced Matrix, MS = Masked Sand Grains. **Location: PL = Pore Lining, M = Matrix

Hydric Soil Indicators:

- ___ Histisol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils:

- ___ Coast Prairie Redox (A16) (**LRR K, L, R**)
- ___ Dark Surface (S7) (**LRR K, L**)
- ___ 5 cm Mucky Peat or Peat (S3) (**LRR K, L, R**)
- ___ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (explain in remarks)

*Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric soil present? N

Remarks:

Fill material for road embankment

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Gauge or Well Data (D9)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface water present?	Yes	___	No	X	Depth (inches): ___
Water table present?	Yes	___	No	X	Depth (inches): ___
Saturation present? (includes capillary fringe)	Yes	___	No	X	Depth (inches): ___

Wetland hydrology present? N

Describe recorded data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM - Midwest Region

Project/Site: Four Seasons Mall | City/County: Plymouth/Hennepin | Sampling Date: 5/16/2011
Applicant/Owner: City of Plymouth | State: MN | Sampling Point: 1-2 Wet
Investigator(s): BPC (WDC #1125) | Section, Township, Range: Sec. 13, T118N, R22W
Landform (hillslope, terrace, etc.): Basin | Local relief (concave, convex, none): Concave
Slope (%): 1 | Lat: | Long: | Datum:
Soil Map Unit Name: Houghton | NWI Classification: PEMCd
Are climatic/hydrologic conditions of the site typical for this time of the year? Y (If no, explain in remarks)
Are vegetation ____, soil ____, or hydrology ____ significantly disturbed? Are "normal circumstances"
Are vegetation ____, soil ____, or hydrology ____ naturally problematic? present? Yes

SUMMARY OF FINDINGS

(If needed, explain any answers in remarks.)

Hydrophytic vegetation present?	Y	Is the sampled area within a wetland?	Y
Hydric soil present?	Y	If yes, optional wetland site ID:	
Wetland hydrology present?	Y		

Remarks: (Explain alternative procedures here or in a separate report.)

VEGETATION -- Use scientific names of plants.

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species	Indicator Staus
1 *Fraxinus pennsylvanica*	20	Y	FACW
2 *Salix nigra*	20	Y	OBL
3			
4			
5			
	40	= Total Cover	
Sapling/Shrub stratum (Plot size: 15')			
1			
2			
3			
4			
5			
	0	= Total Cover	
Herb stratum (Plot size: 5')			
1 *Carex lacustris*	60	Y	OBL
2 *Typha angustifolia*	20	Y	OBL
3			
4			
5			
6			
7			
8			
9			
10			
	80	= Total Cover	
Woody vine stratum (Plot size: 15')			
1			
2			
	0	= Total Cover	

Dominance Test Worksheet

Number of Dominant Species that are OBL, FACW, or FAC: 4 (A)
Total Number of Dominant Species Across all Strata: 4 (B)
Percent of Dominant Species that are OBL, FACW, or FAC: 100.00% (A/B)

Prevalence Index Worksheet

Total % Cover of:

OBL species	100	x 1 =	100
FACW species	20	x 2 =	40
FAC species	0	x 3 =	0
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column totals	120 (A)		140 (B)

Prevalence Index = B/A = 1.17

Hydrophytic Vegetation Indicators:

- ___ Rapid test for hydrophytic vegetation
- X Dominance test is >50%
- X Prevalence index is ≤3.0*
- ___ Morphogical adaptations* (provide supporting data in Remarks or on a separate sheet)
- ___ Problematic hydrophytic vegetation* (explain)

*Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic

Hydrophytic vegetation present? Y

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: 1-2 Wet

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (Inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type*	Loc**	Texture	Remarks
0-8	N 2.5/0	100					Sapric (Oa)	

*Type: C = Concentration, D = Depletion, RM = Reduced Matrix, MS = Masked Sand Grains. **Location: PL = Pore Lining, M = Matrix

Hydric Soil Indicators:

- ___ Histisol (A1)
- X Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils:

- ___ Coast Prairie Redox (A16) (**LRR K, L, R**)
- ___ Dark Surface (S7) (**LRR K, L**)
- ___ 5 cm Mucky Peat or Peat (S3) (**LRR K, L, R**)
- ___ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (explain in remarks)

*Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric soil present? Y

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- X Surface Water (A1)
- X High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- X Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Gauge or Well Data (D9)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- X Geomorphic Position (D2)
- X FAC-Neutral Test (D5)

Field Observations:

Surface water present?	Yes	X	No	___	Depth (inches):	1
Water table present?	Yes	X	No	___	Depth (inches):	0
Saturation present? (includes capillary fringe)	Yes	X	No	___	Depth (inches):	0

Wetland hydrology present? Y

Describe recorded data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM - Midwest Region

Project/Site: Four Seasons Mall | City/County: Plymouth/Hennepin | Sampling Date: 5/16/2011
Applicant/Owner: City of Plymouth | State: MN | Sampling Point: 1-2 Up
Investigator(s): BPC (WDC #1125) | Section, Township, Range: Sec. 13, T118N, R22W
Landform (hillslope, terrace, etc.): Slope | Local relief (concave, convex, none): Concave
Slope (%): 5 | Lat: | Long: | Datum:
Soil Map Unit Name: Urban Land | NWI Classification: None
Are climatic/hydrologic conditions of the site typical for this time of the year? Y (If no, explain in remarks)
Are vegetation ____, soil ____, or hydrology ____ significantly disturbed? Are "normal circumstances" present? Yes
Are vegetation ____, soil ____, or hydrology ____ naturally problematic? (If needed, explain any answers in remarks.)

SUMMARY OF FINDINGS

Hydrophytic vegetation present?	Y
Hydric soil present?	N
Wetland hydrology present?	N

Is the sampled area within a wetland? N
If yes, optional wetland site ID:

Remarks: (Explain alternative procedures here or in a separate report.)

VEGETATION -- Use scientific names of plants.

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species	Indicator Staus
1 *Fraxinus pennsylvanica*	40	Y	FACW
2 *Salix nigra*	30	Y	OBL
3			
4			
5			
	70	= Total Cover	
Sapling/Shrub stratum (Plot size: 15')			
1 *Rhamnus frangula*	5	Y	FAC
2			
3			
4			
5			
	5	= Total Cover	
Herb stratum (Plot size: 5')			
1 *Geranium maculatum*	20	Y	FACU
2 *Taraxacum officinale*	5	N	FACU
3 *Poa pratensis*	10	Y	FAC
4			
5			
6			
7			
8			
9			
10			
	35	= Total Cover	
Woody vine stratum (Plot size: 15')			
1			
2			
	0	= Total Cover	

Dominance Test Worksheet

Number of Dominant Species that are OBL, FACW, or FAC: 4 (A)
Total Number of Dominant Species Across all Strata: 5 (B)
Percent of Dominant Species that are OBL, FACW, or FAC: 80.00% (A/B)

Prevalence Index Worksheet

Total % Cover of:

OBL species	30	x 1 =	30
FACW species	40	x 2 =	80
FAC species	15	x 3 =	45
FACU species	25	x 4 =	100
UPL species	0	x 5 =	0
Column totals	110 (A)		255 (B)

Prevalence Index = B/A = 2.32

Hydrophytic Vegetation Indicators:

- ___ Rapid test for hydrophytic vegetation
- X Dominance test is >50%
- X Prevalence index is ≤3.0*
- ___ Morphogical adaptations* (provide supporting data in Remarks or on a separate sheet)
- ___ Problematic hydrophytic vegetation* (explain)

*Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic vegetation present? Y

Remarks: (Include photo numbers here or on a separate sheet)

Canopy from Fraxinus and Salix in vegetation plot

SOIL

Sampling Point: 1-2 Up

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (Inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type*	Loc**	Texture	Remarks
0-18	10YR 3/2	100					Loam	
18-22	10YR 4/4	100					Clay loam	

*Type: C = Concentration, D = Depletion, RM = Reduced Matrix, MS = Masked Sand Grains. **Location: PL = Pore Lining, M = Matrix.

Hydric Soil Indicators:

- ___ Histisol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils:

- ___ Coast Prairie Redox (A16) (**LRR K, L, R**)
- ___ Dark Surface (S7) (**LRR K, L**)
- ___ 5 cm Mucky Peat or Peat (S3) (**LRR K, L, R**)
- ___ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (explain in remarks)

*Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric soil present? N

Remarks:

Fill material for road embankment

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Gauge or Well Data (D9)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface water present?	Yes	___	No	X	Depth (inches): ___
Water table present?	Yes	___	No	X	Depth (inches): ___
Saturation present? (includes capillary fringe)	Yes	___	No	X	Depth (inches): ___

Wetland hydrology present? N

Describe recorded data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM - Midwest Region

Project/Site: Four Seasons Mall | City/County: Plymouth/Hennepin | Sampling Date: 5/16/2011
Applicant/Owner: City of Plymouth | State: MN | Sampling Point: 1-3 Wet
Investigator(s): BPC (WDC #1125) | Section, Township, Range: Sec. 13, T118N, R22W
Landform (hillslope, terrace, etc.): Basin | Local relief (concave, convex, none): Concave
Slope (%): 2 | Lat: | Long: | Datum:
Soil Map Unit Name: Houghton | NWI Classification: None
Are climatic/hydrologic conditions of the site typical for this time of the year? Y (If no, explain in remarks)
Are vegetation ____, soil ____, or hydrology ____ significantly disturbed? Are "normal circumstances" present? Yes
Are vegetation ____, soil ____, or hydrology ____ naturally problematic? (If needed, explain any answers in remarks.)

SUMMARY OF FINDINGS

Hydrophytic vegetation present? Y
Hydric soil present? Y
Wetland hydrology present? Y
Is the sampled area within a wetlan Y
If yes, optional wetland site ID:

Remarks: (Explain alternative procedures here or in a separate report.)

VEGETATION -- Use scientific names of plants.

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species	Indicator Staus
1			
2			
3			
4			
5			
	0	= Total Cover	

Sapling/Shrub stratum (Plot size: 15')			
1			
2			
3			
4			
5			
	0	= Total Cover	

Herb stratum (Plot size: 5')			
1 *Phalaris arundinacea*	80	Y	FACW
2 *Solidago gigantea*	20	Y	FACW
3			
4			
5			
6			
7			
8			
9			
10			
	100	= Total Cover	

Woody vine stratum (Plot size: 15')			
1			
2			
	0	= Total Cover	

Dominance Test Worksheet

Number of Dominant Species that are OBL, FACW, or FAC: 2 (A)
Total Number of Dominant Species Across all Strata: 2 (B)
Percent of Dominant Species that are OBL, FACW, or FAC: 100.00% (A/B)

Prevalence Index Worksheet

Total % Cover of:

OBL species	0	x 1 =	0	
FACW species	100	x 2 =	200	
FAC species	0	x 3 =	0	
FACU species	0	x 4 =	0	
UPL species	0	x 5 =	0	
Column totals	100	(A)	200	(B)

Prevalence Index = B/A = 2.00

Hydrophytic Vegetation Indicators:

- ___ Rapid test for hydrophytic vegetation
- X Dominance test is >50%
- X Prevalence index is ≤3.0*
- ___ Morphogical adaptations* (provide supporting data in Remarks or on a separate sheet)
- ___ Problematic hydrophytic vegetation* (explain)

*Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic

Hydrophytic vegetation present? Y

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: 1-3 Wet

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (Inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type*	Loc**	Texture	Remarks
0-7	10YR 3/2	98	10YR 4/4	2	C	M	Clay loam	
7-18	10YR 4/2	95	10YR 6/4	5	C	M	Sandy Clay loam	

*Type: C = Concentration, D = Depletion, RM = Reduced Matrix, MS = Masked Sand Grains. **Location: PL = Pore Lining, M = Matrix.

Hydric Soil Indicators:

- ___ Histisol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- X Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils:

- ___ Coast Prairie Redox (A16) (**LRR K, L, R**)
- ___ Dark Surface (S7) (**LRR K, L**)
- ___ 5 cm Mucky Peat or Peat (S3) (**LRR K, L, R**)
- ___ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (explain in remarks)

*Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric soil present? Y

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- X High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- X Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Gauge or Well Data (D9)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- X Geomorphic Position (D2)
- X FAC-Neutral Test (D5)

Field Observations:

Surface water present?	Yes	___	No	X	Depth (inches): ___
Water table present?	Yes	X	No	___	Depth (inches): 12
Saturation present? (includes capillary fringe)	Yes	X	No	___	Depth (inches): 0

Wetland hydrology present? Y

Describe recorded data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM - Midwest Region

Project/Site: Four Seasons Mall | City/County: Plymouth/Hennepin | Sampling Date: 5/16/2011
Applicant/Owner: City of Plymouth | State: MN | Sampling Point: 1-3 Up
Investigator(s): BPC (WDC #1125) | Section, Township, Range: Sec. 13, T118N, R22W
Landform (hillslope, terrace, etc.): Slope | Local relief (concave, convex, none): Concave
Slope (%): 5 | Lat: | Long: | Datum:
Soil Map Unit Name: Lester | NWI Classification: None
Are climatic/hydrologic conditions of the site typical for this time of the year? Y (If no, explain in remarks)
Are vegetation ____, soil ____, or hydrology ____ significantly disturbed? Are "normal circumstances" present? Yes
Are vegetation ____, soil ____, or hydrology ____ naturally problematic? (If needed, explain any answers in remarks.)

SUMMARY OF FINDINGS

Hydrophytic vegetation present? N
Hydric soil present? N
Wetland hydrology present? N
Is the sampled area within a wetland? N
If yes, optional wetland site ID:

Remarks: (Explain alternative procedures here or in a separate report.)

VEGETATION -- Use scientific names of plants.

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species	Indicator Status
1			
2			
3			
4			
5			
	0	= Total Cover	

Sapling/Shrub stratum (Plot size: 15')			
1			
2			
3			
4			
5			
	0	= Total Cover	

Herb stratum (Plot size: 5')			
1 *Bromus inermis*	85	Y	UPL
2 *Solidago canadensis*	15	N	FACU
3			
4			
5			
6			
7			
8			
9			
10			
	100	= Total Cover	

Woody vine stratum (Plot size: 15')			
1			
2			
	0	= Total Cover	

Dominance Test Worksheet

Number of Dominant Species that are OBL, FACW, or FAC: 0 (A)
Total Number of Dominant Species Across all Strata: 1 (B)
Percent of Dominant Species that are OBL, FACW, or FAC: 0.00% (A/B)

Prevalence Index Worksheet

Total % Cover of:

OBL species	0	x 1 =	0
FACW species	0	x 2 =	0
FAC species	0	x 3 =	0
FACU species	15	x 4 =	60
UPL species	85	x 5 =	425
Column totals	100 (A)		485 (B)

Prevalence Index = B/A = 4.85

Hydrophytic Vegetation Indicators:

___ Rapid test for hydrophytic vegetation
___ Dominance test is >50%
___ Prevalence index is ≤3.0*
___ Morphogical adaptations* (provide supporting data in Remarks or on a separate sheet)
___ Problematic hydrophytic vegetation* (explain)

*Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic vegetation present? N

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: 1-3 Up

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (Inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type*	Loc**	Texture	Remarks
0-10	10YR 3/2	100					Sandy Clay loam	
10-15	10YR 4/3	98	10YR 5/4	2	C	M	Sandy Clay loam	Gravels
15-18	10YR 5/3	100					Clay	

*Type: C = Concentration, D = Depletion, RM = Reduced Matrix, MS = Masked Sand Grains. **Location: PL = Pore Lining, M = Matrix

Hydric Soil Indicators:

- ___ Histisol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils:

- ___ Coast Prairie Redox (A16) (**LRR K, L, R**)
- ___ Dark Surface (S7) (**LRR K, L**)
- ___ 5 cm Mucky Peat or Peat (S3) (**LRR K, L, R**)
- ___ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (explain in remarks)

*Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric soil present? N

Remarks:

Fill material for road embankment

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Gauge or Well Data (D9)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface water present?	Yes	___	No	X	Depth (inches): ___
Water table present?	Yes	___	No	X	Depth (inches): ___
Saturation present? (includes capillary fringe)	Yes	___	No	X	Depth (inches): ___

Wetland hydrology present? N

Describe recorded data (stream gauge, monitoring well, aerial photos, previous inspections) if available:

Remarks:

WETLAND DETERMINATION DATA FORM - Midwest Region

Project/Site: Four Seasons Mall | City/County: Plymouth/Hennepin | Sampling Date: 5/16/2011
Applicant/Owner: City of Plymouth | State: MN | Sampling Point: 2-1 Wet
Investigator(s): BPC (WDC #1125) | Section, Township, Range: Sec. 13, T118N, R22W
Landform (hillslope, terrace, etc.): Basin | Local relief (concave, convex, none): Concave
Slope (%): 1 | Lat: | Long: | Datum:
Soil Map Unit Name: Glencoe | NWI Classification: None
Are climatic/hydrologic conditions of the site typical for this time of the year? Y (If no, explain in remarks)
Are vegetation ____, soil ____, or hydrology ____ significantly disturbed? Are "normal circumstances" present? Yes
Are vegetation ____, soil ____, or hydrology ____ naturally problematic? (If needed, explain any answers in remarks.)

SUMMARY OF FINDINGS

Hydrophytic vegetation present?	Y	**Is the sampled area within a wetlan** Y
Hydric soil present?	Y	If yes, optional wetland site ID:
Wetland hydrology present?	Y	

Remarks: (Explain alternative procedures here or in a separate report.)

VEGETATION -- Use scientific names of plants.

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species	Indicator Staus
1			
2			
3			
4			
5			
	0	= Total Cover	

Sapling/Shrub stratum (Plot size: 15')			
1			
2			
3			
4			
5			
	0	= Total Cover	

Herb stratum (Plot size: 5')			
1 *Poa pratensis*	10	Y	FAC
2 *Glyceria grandis*	5	Y	OBL
3			
4			
5			
6			
7			
8			
9			
10			
	15	= Total Cover	

Woody vine stratum (Plot size: 15')			
1			
2			
	0	= Total Cover	

Dominance Test Worksheet
Number of Dominant Species that are OBL, FACW, or FAC: 2 (A)
Total Number of Dominant Species Across all Strata: 2 (B)
Percent of Dominant Species that are OBL, FACW, or FAC: 100.00% (A/B)

Prevalence Index Worksheet
Total % Cover of:

OBL species	5	x 1 =	5	
FACW species	0	x 2 =	0	
FAC species	10	x 3 =	30	
FACU species	0	x 4 =	0	
UPL species	0	x 5 =	0	
Column totals	15	(A)	35	(B)

Prevalence Index = B/A = 2.33

Hydrophytic Vegetation Indicators:
- ___ Rapid test for hydrophytic vegetation
- X Dominance test is >50%
- X Prevalence index is ≤3.0*
- ___ Morphogical adaptations* (provide supporting data in Remarks or on a separate sheet)
- ___ Problematic hydrophytic vegetation* (explain)

*Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic vegetation present? Y

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: 2-1 Wet

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (Inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type*	Loc**	Texture	Remarks
0-12	10YR 5/2	95	10YR 3/4	5	C	M	Loam	

*Type: C = Concentration, D = Depletion, RM = Reduced Matrix, MS = Masked Sand Grains. **Location: PL = Pore Lining, M = Matrix

Hydric Soil Indicators:

- ___ Histisol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- X Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils:

- ___ Coast Prairie Redox (A16) (**LRR K, L, R**)
- ___ Dark Surface (S7) (**LRR K, L**)
- ___ 5 cm Mucky Peat or Peat (S3) (**LRR K, L, R**)
- ___ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (explain in remarks)

*Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric soil present? Y

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- X Surface Water (A1)
- X High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- X Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Gauge or Well Data (D9)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- X Geomorphic Position (D2)
- X FAC-Neutral Test (D5)

Field Observations:

Surface water present?	Yes	X	No	___	Depth (inches):	2
Water table present?	Yes	X	No	___	Depth (inches):	0
Saturation present? (includes capillary fringe)	Yes	X	No	___	Depth (inches):	0

Wetland hydrology present? Y

Describe recorded data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM - Midwest Region

Project/Site: Four Seasons Mall | City/County: Plymouth/Hennepin | Sampling Date: 5/16/2011
Applicant/Owner: City of Plymouth | State: MN | Sampling Point: 2-1 Up
Investigator(s): BPC (WDC #1125) | Section, Township, Range: Sec. 13, T118N, R22W
Landform (hillslope, terrace, etc.): Slope | Local relief (concave, convex, none): Concave
Slope (%): 1 | Lat: | Long: | Datum:
Soil Map Unit Name: Glencoe | NWI Classification: None
Are climatic/hydrologic conditions of the site typical for this time of the year? Y (If no, explain in remarks)
Are vegetation ____, soil ____, or hydrology ____ significantly disturbed? Are "normal circumstances" present? Yes
Are vegetation ____, soil ____, or hydrology ____ naturally problematic? (If needed, explain any answers in remarks.)

SUMMARY OF FINDINGS

Hydrophytic vegetation present? N	Is the sampled area within a wetland? N
Hydric soil present? N	If yes, optional wetland site ID:
Wetland hydrology present? N	

Remarks: (Explain alternative procedures here or in a separate report.)

VEGETATION -- Use scientific names of plants.

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species	Indicator Status
1			
2			
3			
4			
5			
	0 = Total Cover		
Sapling/Shrub stratum (Plot size: 15')			
1			
2			
3			
4			
5			
	0 = Total Cover		
Herb stratum (Plot size: 5')			
1 *Trifolium arvense*	25	Y	UPL
2 *Taraxacum officinale*	25	Y	FACU
3 *Poa pratensis*	50	Y	FAC
4			
5			
6			
7			
8			
9			
10			
	100 = Total Cover		
Woody vine stratum (Plot size: 15')			
1			
2			
	0 = Total Cover		

Dominance Test Worksheet

Number of Dominant Species that are OBL, FACW, or FAC: 1 (A)
Total Number of Dominant Species Across all Strata: 3 (B)
Percent of Dominant Species that are OBL, FACW, or FAC: 33.33% (A/B)

Prevalence Index Worksheet

Total % Cover of:

OBL species	0	x 1 =	0
FACW species	0	x 2 =	0
FAC species	50	x 3 =	150
FACU species	25	x 4 =	100
UPL species	25	x 5 =	125
Column totals	100 (A)		375 (B)

Prevalence Index = B/A = 3.75

Hydrophytic Vegetation Indicators:

- ___ Rapid test for hydrophytic vegetation
- ___ Dominance test is >50%
- ___ Prevalence index is ≤3.0*
- ___ Morphogical adaptations* (provide supporting data in Remarks or on a separate sheet)
- ___ Problematic hydrophytic vegetation* (explain)

*Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic vegetation present? N

Remarks: (Include photo numbers here or on a separate sheet)

SOIL

Sampling Point: 2-1 Up

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (Inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type*	Loc**	Texture	Remarks
0-4	10YR 3/2	100					Sandy Loam	
4-16	10YR 4/4	100					Loamy Sand	

*Type: C = Concentration, D = Depletion, RM = Reduced Matrix, MS = Masked Sand Grains. **Location: PL = Pore Lining, M = Matrix

Hydric Soil Indicators:

- ___ Histisol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils:

- ___ Coast Prairie Redox (A16) (**LRR K, L, R**)
- ___ Dark Surface (S7) (**LRR K, L**)
- ___ 5 cm Mucky Peat or Peat (S3) (**LRR K, L, R**)
- ___ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (explain in remarks)

*Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric soil present? N

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- X High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Gauge or Well Data (D9)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface water present?	Yes ___	No X	Depth (inches):	___	
Water table present?	Yes X	No ___	Depth (inches):	10	
Saturation present? (includes capillary fringe)	Yes X	No ___	Depth (inches):	0	

Wetland hydrology present? Y

Describe recorded data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Temporary saturation due to elevated precipitation

WETLAND DETERMINATION DATA FORM - Midwest Region

Project/Site: Four Seasons Mall | City/County: Plymouth/Hennepin | Sampling Date: 5/16/2011
Applicant/Owner: City of Plymouth | State: MN | Sampling Point: 2A-1 Wet
Investigator(s): BPC (WDC #1125) | Section, Township, Range: Sec. 13, T118N, R22W
Landform (hillslope, terrace, etc.): Basin | Local relief (concave, convex, none): Concave
Slope (%): 1 | Lat: | Long: | Datum:
Soil Map Unit Name: Glencoe | NWI Classification: None
Are climatic/hydrologic conditions of the site typical for this time of the year? Y (If no, explain in remarks)
Are vegetation ____, soil ____, or hydrology ____ significantly disturbed? Are "normal circumstances" present? Yes
Are vegetation ____, soil ____, or hydrology ____ naturally problematic? (If needed, explain any answers in remarks.)

SUMMARY OF FINDINGS

Hydrophytic vegetation present?	Y	Is the sampled area within a wetland? Y
Hydric soil present?	Y	If yes, optional wetland site ID:
Wetland hydrology present?	Y	

Remarks: (Explain alternative procedures here or in a separate report.)

VEGETATION -- Use scientific names of plants.

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species	Indicator Status
1 *Fraxinus pennsylvanica*	30	Y	FACW
2			
3			
4			
5			
	30 = Total Cover		
Sapling/Shrub stratum (Plot size: 15')			
1			
2			
3			
4			
5			
	0 = Total Cover		
Herb stratum (Plot size: 5')			
1 *Poa palustris*	40	Y	FACW
2			
3			
4			
5			
6			
7			
8			
9			
10			
	40 = Total Cover		
Woody vine stratum (Plot size: 15')			
1			
2			
	0 = Total Cover		

Dominance Test Worksheet

Number of Dominant Species that are OBL, FACW, or FAC: 2 (A)
Total Number of Dominant Species Across all Strata: 2 (B)
Percent of Dominant Species that are OBL, FACW, or FAC: 100.00% (A/B)

Prevalence Index Worksheet

Total % Cover of:

OBL species	0	x 1 =	0
FACW species	70	x 2 =	140
FAC species	0	x 3 =	0
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column totals	70 (A)		140 (B)

Prevalence Index = B/A = 2.00

Hydrophytic Vegetation Indicators:

- ___ Rapid test for hydrophytic vegetation
- X Dominance test is >50%
- X Prevalence index is ≤3.0*
- ___ Morphogical adaptations* (provide supporting data in Remarks or on a separate sheet)
- ___ Problematic hydrophytic vegetation* (explain)

*Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic

Hydrophytic vegetation present? Y

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: 2A-1 Wel

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type*	Loc**	Texture	Remarks
0-12	10YR 5/2	95	10YR 3/4	5	C	M	Loam	

*Type: C = Concentration, D = Depletion, RM = Reduced Matrix, MS = Masked Sand Grains. **Location: PL = Pore Lining, M = Matrix.

Hydric Soil Indicators:

- ___ Histisol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- X Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils:

- ___ Coast Prairie Redox (A16) (**LRR K, L, R**)
- ___ Dark Surface (S7) (**LRR K, L**)
- ___ 5 cm Mucky Peat or Peat (S3) (**LRR K, L, R**)
- ___ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (explain in remarks)

*Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric soil present? Y

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- X Surface Water (A1)
- X High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- X Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Gauge or Well Data (D9)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- X Geomorphic Position (D2)
- X FAC-Neutral Test (D5)

Field Observations:

Surface water present?	Yes	X	No	___	Depth (inches):	1
Water table present?	Yes	X	No	___	Depth (inches):	0
Saturation present? (includes capillary fringe)	Yes	X	No	___	Depth (inches):	0

Wetland hydrology present? Y

Describe recorded data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM - Midwest Region

Project/Site: Four Seasons Mall | City/County: Plymouth/Hennepin | Sampling Date: 5/16/2011
Applicant/Owner: City of Plymouth | State: MN | Sampling Point: 2A-1 Up
Investigator(s): BPC (WDC #1125) | Section, Township, Range: Sec. 13, T118N, R22W
Landform (hillslope, terrace, etc.): Slope | Local relief (concave, convex, none): Concave
Slope (%): 1 | Lat: | Long: | Datum:
Soil Map Unit Name: Glencoe | NWI Classification: None
Are climatic/hydrologic conditions of the site typical for this time of the year? Y (If no, explain in remarks)
Are vegetation ____, soil ____, or hydrology ____ significantly disturbed? Are "normal circumstances"
Are vegetation ____, soil ____, or hydrology ____ naturally problematic? present? Yes

SUMMARY OF FINDINGS

(If needed, explain any answers in remarks.)

Hydrophytic vegetation present? N
Hydric soil present? Y
Wetland hydrology present? Y

Is the sampled area within a wetlan N
If yes, optional wetland site ID:

Remarks: (Explain alternative procedures here or in a separate report.)

VEGETATION -- Use scientific names of plants.

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species	Indicator Status
1 *Tilia americana*	30	Y	FACU
2			
3			
4			
5			
	30	= Total Cover	

Sapling/Shrub stratum (Plot size: 15')			
1			
2			
3			
4			
5			
	0	= Total Cover	

Herb stratum (Plot size: 5')			
1 *Poa pratensis*	100	Y	FAC
2			
3			
4			
5			
6			
7			
8			
9			
10			
	100	= Total Cover	

Woody vine stratum (Plot size: 15')			
1			
2			
	0	= Total Cover	

Dominance Test Worksheet

Number of Dominant Species that are OBL, FACW, or FAC: 1 (A)
Total Number of Dominant Species Across all Strata: 2 (B)
Percent of Dominant Species that are OBL, FACW, or FAC: 50.00% (A/B)

Prevalence Index Worksheet

Total % Cover of:

OBL species	0	x 1 =	0
FACW species	0	x 2 =	0
FAC species	100	x 3 =	300
FACU species	30	x 4 =	120
UPL species	0	x 5 =	0
Column totals	130 (A)		420 (B)

Prevalence Index = B/A = 3.23

Hydrophytic Vegetation Indicators:

___ Rapid test for hydrophytic vegetation
___ Dominance test is >50%
___ Prevalence index is ≤3.0*
___ Morphogical adaptations* (provide supporting data in Remarks or on a separate sheet)
___ Problematic hydrophytic vegetation* (explain)

*Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic vegetation present? N

Remarks: (Include photo numbers here or on a separate sheet)

SOIL

Sampling Point: 2A-1 Up

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (Inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type*	Loc**	Texture	Remarks
0-8	10YR 3/2	100					Loam	
8-14	10YR 5/2	95	10YR 3/4	5	C	M	Loam	

*Type: C = Concentration, D = Depletion, RM = Reduced Matrix, MS = Masked Sand Grains. **Location: PL = Pore Lining, M = Matrix

Hydric Soil Indicators:

- ___ Histisol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- X Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils:

- ___ Coast Prairie Redox (A16) (**LRR K, L, R**)
- ___ Dark Surface (S7) (**LRR K, L**)
- ___ 5 cm Mucky Peat or Peat (S3) (**LRR K, L, R**)
- ___ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (explain in remarks)

*Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric soil present? Y

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- X High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Gauge or Well Data (D9)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface water present?	Yes	___	No	X	Depth (inches): ___
Water table present?	Yes	X	No	___	Depth (inches): 12
Saturation present? (includes capillary fringe)	Yes	X	No	___	Depth (inches): 0

Wetland hydrology present? Y

Describe recorded data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Temporary saturation due to elevated precipitation

WETLAND DETERMINATION DATA FORM - Midwest Region

Project/Site: Four Seasons Mall | City/County: Plymouth/Hennepin | Sampling Date: 5/16/2011
Applicant/Owner: City of Plymouth | State: MN | Sampling Point: 3-1 Wet
Investigator(s): BPC (WDC #1125) | Section, Township, Range: Sec. 13, T118N, R22W
Landform (hillslope, terrace, etc.): Basin | Local relief (concave, convex, none): Concave
Slope (%): 1 | Lat: | Long: | Datum:
Soil Map Unit Name: Glencoe | NWI Classification: None
Are climatic/hydrologic conditions of the site typical for this time of the year? Y (If no, explain in remarks)
Are vegetation ____, soil ____, or hydrology ____ significantly disturbed? Are "normal circumstances"
Are vegetation ____, soil ____, or hydrology ____ naturally problematic? present? Yes

SUMMARY OF FINDINGS

(If needed, explain any answers in remarks.)

Hydrophytic vegetation present?	Y	**Is the sampled area within a wetlan**	Y
Hydric soil present?	Y	If yes, optional wetland site ID:	
Wetland hydrology present?	Y		

Remarks: (Explain alternative procedures here or in a separate report.)

VEGETATION -- Use scientific names of plants.

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species	Indicator Staus
1			
2			
3			
4			
5			
	0	= Total Cover	
Sapling/Shrub stratum (Plot size: 15')			
1			
2			
3			
4			
5			
	0	= Total Cover	
Herb stratum (Plot size: 5')			
1 *Phalaris arundinacea*	30	Y	FACW
2 *Carex stricta*	40	Y	OBL
3 *Solidago gigantea*	20	Y	FACW
4 *Cirsium arvense*	10	N	FACU
5			
6			
7			
8			
9			
10			
	100	= Total Cover	
Woody vine stratum (Plot size: 15')			
1			
2			
	0	= Total Cover	

Dominance Test Worksheet

Number of Dominant Species that are OBL, FACW, or FAC: 3 (A)
Total Number of Dominant Species Across all Strata: 3 (B)
Percent of Dominant Species that are OBL, FACW, or FAC: 100.00% (A/B)

Prevalence Index Worksheet

Total % Cover of:

OBL species	40	x 1 =	40
FACW species	50	x 2 =	100
FAC species	0	x 3 =	0
FACU species	10	x 4 =	40
UPL species	0	x 5 =	0
Column totals	100 (A)		180 (B)

Prevalence Index = B/A = 1.80

Hydrophytic Vegetation Indicators:

- ___ Rapid test for hydrophytic vegetation
- X Dominance test is >50%
- X Prevalence index is ≤3.0*
- ___ Morphogical adaptations* (provide supporting data in Remarks or on a separate sheet)
- ___ Problematic hydrophytic vegetation* (explain)

*Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic

Hydrophytic vegetation present? Y

Remarks: (Include photo numbers here or on a separate sheet)

SOIL

Sampling Point: 3-1 Wet

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (Inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type*	Loc**	Texture	Remarks
0-20	10YR 2/1	100					Loam	
20-26	10YR 5/2	95	10YR 3/4	5	C	M	Clay loam	

*Type: C = Concentration, D = Depletion, RM = Reduced Matrix, MS = Masked Sand Grains **Location: PL = Pore Lining, M = Matrix

Hydric Soil Indicators:

- ___ Histisol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10)
- ___ Depleted Below Dark Surface (A11)
- X Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils:

- ___ Coast Prairie Redox (A16) (**LRR K, L, R**)
- ___ Dark Surface (S7) (**LRR K, L**)
- ___ 5 cm Mucky Peat or Peat (S3) (**LRR K, L, R**)
- ___ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (explain in remarks)

*Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric soil present? Y

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- X High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Gauge or Well Data (D9)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- X Geomorphic Position (D2)
- X FAC-Neutral Test (D5)

Field Observations:

Surface water present?	Yes	___	No	X	Depth (inches):	___
Water table present?	Yes	X	No	___	Depth (inches):	8
Saturation present? (includes capillary fringe)	Yes	X	No	___	Depth (inches):	0

Wetland hydrology present? Y

Describe recorded data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM - Midwest Region

Project/Site: Four Seasons Mall | City/County: Plymouth/Hennepin | Sampling Date: 5/16/2011
Applicant/Owner: City of Plymouth | State: MN | Sampling Point: 3-1 Up
Investigator(s): BPC (WDC #1125) | Section, Township, Range: Sec. 13, T118N, R22W
Landform (hillslope, terrace, etc.): Slope | Local relief (concave, convex, none): Concave
Slope (%): 1 | Lat: | Long: | Datum:
Soil Map Unit Name: Angus | NWI Classification: None
Are climatic/hydrologic conditions of the site typical for this time of the year? Y (If no, explain in remarks)
Are vegetation ____, soil ____, or hydrology ____ significantly disturbed? Are "normal circumstances" present? Yes
Are vegetation ____, soil ____, or hydrology ____ naturally problematic? (If needed, explain any answers in remarks.)

SUMMARY OF FINDINGS

Hydrophytic vegetation present? N
Hydric soil present? N
Wetland hydrology present? Y
Is the sampled area within a wetlan N
If yes, optional wetland site ID:

Remarks: (Explain alternative procedures here or in a separate report.)

VEGETATION -- Use scientific names of plants.

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species	Indicator Staus
1			
2			
3			
4			
5			
	0 = Total Cover		

Sapling/Shrub stratum (Plot size: 15')			
1			
2			
3			
4			
5			
	0 = Total Cover		

Herb stratum (Plot size: 5')			
1 *Cirsium arvense*	20	Y	FACU
2 *Taraxacum officinale*	10	N	FACU
3 *Poa pratensis*	70	Y	FAC
4			
5			
6			
7			
8			
9			
10			
	100 = Total Cover		

Woody vine stratum (Plot size: 15')			
1			
2			
	0 = Total Cover		

Dominance Test Worksheet

Number of Dominant Species that are OBL, FACW, or FAC: 1 (A)
Total Number of Dominant Species Across all Strata: 2 (B)
Percent of Dominant Species that are OBL, FACW, or FAC: 50.00% (A/B)

Prevalence Index Worksheet

Total % Cover of:

OBL species	0	x 1 =	0
FACW species	0	x 2 =	0
FAC species	70	x 3 =	210
FACU species	30	x 4 =	120
UPL species	0	x 5 =	0
Column totals	100 (A)		330 (B)

Prevalence Index = B/A = 3.30

Hydrophytic Vegetation Indicators:

___ Rapid test for hydrophytic vegetation
___ Dominance test is >50%
___ Prevalence index is ≤3.0*
___ Morphogical adaptations* (provide supporting data in Remarks or on a separate sheet)
___ Problematic hydrophytic vegetation* (explain)

*Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic vegetation present? N

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: 3-1 Up

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (Inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type*	Loc**	Texture	Remarks
0-20	10YR 2/1	100					Loam	
20-28	10YR 3/2	100					Clay Loam	

*Type: C = Concentration, D = Depletion, RM = Reduced Matrix, MS = Masked Sand Grains **Location: PL = Pore Lining, M = Matrix

Hydric Soil Indicators:

- ___ Histisol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils:

- ___ Coast Prairie Redox (A16) (**LRR K, L, R**)
- ___ Dark Surface (S7) (**LRR K, L**)
- ___ 5 cm Mucky Peat or Peat (S3) (**LRR K, L, R**)
- ___ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (explain in remarks)

*Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric soil present? N

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Gauge or Well Data (D9)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface water present?	Yes	___	No	X	Depth (inches): ___
Water table present?	Yes	X	No	___	Depth (inches): 15
Saturation present? (includes capillary fringe)	Yes	X	No	___	Depth (inches): 8

Wetland hydrology present? Y

Describe recorded data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Temporary saturation due to elevated precipitation

WETLAND DETERMINATION DATA FORM - Midwest Region

Project/Site: Four Seasons Mall | City/County: Plymouth/Hennepin | Sampling Date: 5/19/2011
Applicant/Owner: City of Plymouth | State: MN | Sampling Point: 4-1 Wet
Investigator(s): BPC (WDC #1125) | Section, Township, Range: Sec. 13, T118N, R22W
Landform (hillslope, terrace, etc.): Basin | Local relief (concave, convex, none): Concave
Slope (%): 1 | Lat: | Long: | Datum:
Soil Map Unit Name: Klossner | NWI Classification: PEMC
Are climatic/hydrologic conditions of the site typical for this time of the year? Y (If no, explain in remarks.)
Are vegetation ____, soil ____, or hydrology ____ significantly disturbed? Are "normal circumstances" present? Yes
Are vegetation ____, soil ____, or hydrology ____ naturally problematic? (If needed, explain any answers in remarks.)

SUMMARY OF FINDINGS

Hydrophytic vegetation present? Y
Hydric soil present? Y
Wetland hydrology present? Y
Is the sampled area within a wetland? Y
If yes, optional wetland site ID:

Remarks: (Explain alternative procedures here or in a separate report.)

VEGETATION -- Use scientific names of plants.

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species	Indicator Staus
1 *Fraxinus pennsylvanica*	30	Y	FACW
2			
3			
4			
5			
	30 = Total Cover		
Sapling/Shrub stratum (Plot size: 15')			
1			
2			
3			
4			
5			
	0 = Total Cover		
Herb stratum (Plot size: 5')			
1 *Phalaris arundinacea*	10	Y	FACW
2 *Typha angustifolia*	30	Y	OBL
3 *Carex hystericina*	10	Y	OBL
4			
5			
6			
7			
8			
9			
10			
	50 = Total Cover		
Woody vine stratum (Plot size: 15')			
1			
2			
	0 = Total Cover		

Dominance Test Worksheet
Number of Dominant Species that are OBL, FACW, or FAC: 4 (A)
Total Number of Dominant Species Across all Strata: 4 (B)
Percent of Dominant Species that are OBL, FACW, or FAC: 100.00% (A/B)

Prevalence Index Worksheet
Total % Cover of:

OBL species	40	x 1 =	40
FACW species	40	x 2 =	80
FAC species	0	x 3 =	0
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column totals	80 (A)		120 (B)

Prevalence Index = B/A = 1.50

Hydrophytic Vegetation Indicators:
___ Rapid test for hydrophytic vegetation
X Dominance test is >50%
X Prevalence index is ≤3.0*
___ Morphogical adaptations* (provide supporting data in Remarks or on a separate sheet)
___ Problematic hydrophytic vegetation* (explain)

*Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic vegetation present? Y

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: 4-1 Wet

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type*	Loc**	Texture	Remarks
0-8	N 2.5/0	100					Sapric (Oa)	

*Type: C = Concentration, D = Depletion, RM = Reduced Matrix, MS = Masked Sand Grains. **Location: PL = Pore Lining, M = Matrix

Hydric Soil Indicators:

- ___ Histisol (A1)
- X Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils:

- ___ Coast Prairie Redox (A16) (**LRR K, L, R**)
- ___ Dark Surface (S7) (**LRR K, L**)
- ___ 5 cm Mucky Peat or Peat (S3) (**LRR K, L, R**)
- ___ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (explain in remarks)

*Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric soil present? Y

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- X Surface Water (A1)
- X High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Gauge or Well Data (D9)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- X Geomorphic Position (D2)
- X FAC-Neutral Test (D5)

Field Observations:

Surface water present?	Yes	X	No	___	Depth (inches):	1
Water table present?	Yes	X	No	___	Depth (inches):	0
Saturation present? (includes capillary fringe)	Yes	X	No	___	Depth (inches)	0

Wetland hydrology present? Y

Describe recorded data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM - Midwest Region

Project/Site: Four Seasons Mall | City/County: Plymouth/Hennepin | Sampling Date: 5/19/2011
Applicant/Owner: City of Plymouth | State: MN | Sampling Point: 4-1 Up
Investigator(s): BPC (WDC #1125) | Section, Township, Range: Sec. 13, T118N, R22W
Landform (hillslope, terrace, etc.): Terrace | Local relief (concave, convex, none): Convex
Slope (%): 3 | Lat: | Long: | Datum:
Soil Map Unit Name: Lester | NWI Classification: None
Are climatic/hydrologic conditions of the site typical for this time of the year? Y (If no, explain in remarks)
Are vegetation ____, soil ____, or hydrology ____ significantly disturbed? Are "normal circumstances" present? Yes
Are vegetation ____, soil ____, or hydrology ____ naturally problematic? (If needed, explain any answers in remarks.)

SUMMARY OF FINDINGS

Hydrophytic vegetation present? N
Hydric soil present? N
Wetland hydrology present? N
Is the sampled area within a wetlan N
If yes, optional wetland site ID:

Remarks: (Explain alternative procedures here or in a separate report.)

VEGETATION -- Use scientific names of plants.

	Absolute % Cover	Dominant Species	Indicator Staus
Tree Stratum (Plot size: 30')			
1 *Fraxinus pennsylvanica*	20	Y	FACW
2 *Tilia americana*	20	Y	FACU
3			
4			
5			
	40	= Total Cover	
Sapling/Shrub stratum (Plot size: 15')			
1 *Rhamnus cathartica*	20	Y	FAC
2			
3			
4			
5			
	20	= Total Cover	
Herb stratum (Plot size: 5')			
1 *Cirsium vulgare*	5	Y	FACU
2 *Taraxacum officinale*	5	Y	FACU
3 *Cirsium arvense*	5	Y	FACU
4 *Rhamnus cathartica*	20	Y	FAC
5 *Phalaris arundinacea*	10	Y	FACW
6			
7			
8			
9			
10			
	45	= Total Cover	
Woody vine stratum (Plot size: 15')			
1			
2			
	0	= Total Cover	

Dominance Test Worksheet

Number of Dominant Species that are OBL, FACW, or FAC: 4 (A)
Total Number of Dominant Species Across all Strata: 8 (B)
Percent of Dominant Species that are OBL, FACW, or FAC: 50.00% (A/B)

Prevalence Index Worksheet

Total % Cover of:

OBL species	0	x 1 =	0
FACW species	30	x 2 =	60
FAC species	40	x 3 =	120
FACU species	35	x 4 =	140
UPL species	0	x 5 =	0
Column totals	105 (A)		320 (B)

Prevalence Index = B/A = 3.05

Hydrophytic Vegetation Indicators:

___ Rapid test for hydrophytic vegetation
___ Dominance test is >50%
___ Prevalence index is ≤3.0*
___ Morphogical adaptations* (provide supporting data in Remarks or on a separate sheet)
___ Problematic hydrophytic vegetation* (explain)

*Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic

Hydrophytic vegetation present? N

Remarks: (Include photo numbers here or on a separate sheet)

SOIL

Sampling Point: 4-1 Up

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (Inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type*	Loc**	Texture	Remarks
0-20	10YR 3/1	100					Loam	
20-28	10YR 2/1	100					Clay Loam	

*Type: C = Concentration, D = Depletion, RM = Reduced Matrix, MS = Masked Sand Grains **Location: PL = Pore Lining, M = Matrix

Hydric Soil Indicators:

- ___ Histisol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils:

- ___ Coast Prairie Redox (A16) (**LRR K, L, R**)
- ___ Dark Surface (S7) (**LRR K, L**)
- ___ 5 cm Mucky Peat or Peat (S3) (**LRR K, L, R**)
- ___ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (explain in remarks)

*Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric soil present? N

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Gauge or Well Data (D9)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface water present? Yes ___ No X Depth (inches): ___

Water table present? Yes ___ No X Depth (inches): ___

Saturation present? (includes capillary fringe) Yes ___ No X Depth (inches): ___

Wetland hydrology present? N

Describe recorded data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM - Midwest Region

Project/Site: Four Seasons Mall | City/County: Plymouth/Hennepin | Sampling Date: 5/19/2011
Applicant/Owner: City of Plymouth | State: MN | Sampling Point: SP-A
Investigator(s): BPC (WDC #1125) | Section, Township, Range: Sec. 13, T118N, R22W
Landform (hillslope, terrace, etc.): Ditch | Local relief (concave, convex, none): Concave
Slope (%): 2 | Lat: | Long: | Datum:
Soil Map Unit Name: Lester | NWI Classification: None
Are climatic/hydrologic conditions of the site typical for this time of the year? Y (If no, explain in remarks)
Are vegetation ____, soil ____, or hydrology ____ significantly disturbed? Are "normal circumstances" present? Yes
Are vegetation ____, soil ____, or hydrology ____ naturally problematic? (If needed, explain any answers in remarks.)

SUMMARY OF FINDINGS

Hydrophytic vegetation present? Y	Is the sampled area within a wetland? N
Hydric soil present? N	If yes, optional wetland site ID:
Wetland hydrology present? Y	

Remarks: (Explain alternative procedures here or in a separate report.)

VEGETATION -- Use scientific names of plants.

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species	Indicator Status
1 *Fraxinus pennsylvanica*	40	Y	FACW
2 *Tilia americana*	30	Y	FACU
3			
4			
5			
	70	= Total Cover	

Sapling/Shrub stratum (Plot size: 15')			
1 *Rhamnus cathartica*	40	Y	FAC
2			
3			
4			
5			
	40	= Total Cover	

Herb stratum (Plot size: 5')			
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
	0	= Total Cover	

Woody vine stratum (Plot size: 15')			
1			
2			
	0	= Total Cover	

Dominance Test Worksheet

Number of Dominant Species that are OBL, FACW, or FAC: 2 (A)
Total Number of Dominant Species Across all Strata: 3 (B)
Percent of Dominant Species that are OBL, FACW, or FAC: 66.67% (A/B)

Prevalence Index Worksheet

Total % Cover of:

OBL species	0	x 1 =	0
FACW species	40	x 2 =	80
FAC species	40	x 3 =	120
FACU species	30	x 4 =	120
UPL species	0	x 5 =	0
Column totals	110 (A)		320 (B)

Prevalence Index = B/A = 2.91

Hydrophytic Vegetation Indicators:

- ___ Rapid test for hydrophytic vegetation
- X Dominance test is >50%
- X Prevalence index is ≤3.0*
- ___ Morphogical adaptations* (provide supporting data in Remarks or on a separate sheet)
- ___ Problematic hydrophytic vegetation* (explain)

*Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic vegetation present? Y

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: SP-A

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (Inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type*	Loc**	Texture	Remarks
0-30	10YR 4/3	50					Coarse Sand	Mixed soils
0-30	10YR 5/3	50					Coarse Sand	

*Type: C = Concentration, D = Depletion, RM = Reduced Matrix, MS = Masked Sand Grains. **Location: PL = Pore Lining, M = Matrix

Hydric Soil Indicators:

- ___ Histisol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils:

- ___ Coast Prairie Redox (A16) (**LRR K, L, R**)
- ___ Dark Surface (S7) (**LRR K, L**)
- ___ 5 cm Mucky Peat or Peat (S3) (**LRR K, L, R**)
- ___ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (explain in remarks)

*Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric soil present? N

Remarks:

Mixed fluvial soils

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- X Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Gauge or Well Data (D9)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface water present?	Yes	X	No	___	Depth (inches):	2
Water table present?	Yes	X	No	___	Depth (inches):	0
Saturation present? (includes capillary fringe)	Yes	X	No	___	Depth (inches):	0

Wetland hydrology present? Y

Describe recorded data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Eroded drainage ditch temporarily flooded

Soil Texture and Feature Guide

TEXTURES

LS *Loamy Sand*

SL *Sandy Loam*

Loam *Loam*

SiL *Silt Loam*

SCL *Sandy Clay Loam*

CL *Clay Loam*

SiCL *Silty Clay Loam*

SC *Sandy Clay*

Clay *Clay*

SiC *Silty Clay*

An "F" modifier in front of any sandy soil texture abbreviation ("S") represents "Fine" ie. FSL or FLS.

FEATURES

F	*few*	**VF**	*very fine*	**F**	*faint*
C	*common*	**F**	*fine*	**D**	*distinct*
M	*many*	**M**	*medium*	**P**	*prominent*
		C	*coarse*		
		VC	*very coarse*		

IOSM *Iron Oxide Soft Masses*

ORC *Oxidized Root Channels*

DPL *Depletions*

Photo 1: View of Wetland 1 edge at transect 1-1 location facing west.

Photo 2: View of Wetland 1 facing northwest from transect 1-1 location.

Photo 3: View of Wetland 1 facing east from the northwestern edge.

Photo 4: View of Wetland 1 edge at transect 1-2 location facing south.

Photo 5: View of Wetland 1 edge at transect 1-3 location facing west.

Photo 6: View of Wetland 2 facing northeast.

Photo 7: View of Wetland 2A facing southwest.

Photo 8: View of Wetland 3 edge at transect location facing east.

Photo 9: View of Wetland 4 edge at transect location facing south.

Photo 10: View of SP-A (drainage channel) facing west.

Appendix C
Cost Estimates

Table C1: Estimated Present Value Fees for the 40th Ave. Pond Project

Item	Unit	Quantity	Unit Cost	Total Cost
Mobilization	LS	1	$10,500.00	$10,500.00
Clearing and Grubbing	Acre	2.0	$5,000.00	$10,000.00
Erosion Control	LS	1	$15,000.00	$15,000.00
Common Excavation On site (assumes reuse of onsite matl.)	CY	200	$6.00	$1,200.00
Common Excavation Off site	CY	7,909	$20.00	$158,180.00
Class II Riprap	CY	200	$125.00	$25,000.00
48" RCP	LF	40	$120.00	$4,800.00
42" RCP	LF	40	$120.00	$4,800.00
84" DIA Outlet Control Structure	EA	1	$7,500.00	$7,500.00
48" RCP FES w/TG	EA	1	$2,000	$2,000.00
42" RCP FES w/TG	EA	1	$2,000	$2,000.00
Connection to Storm Sewer MH	EA	1	$800.00	$800.00
Removal of old Pipe	LF	40	$5.00	$200.00
Geotextile Fabric	SY	1,400.0	$3.00	$4,200.00
Clean Sand	CY	60.0	$35.00	$2,100.00
Coarse filter material	CY	40	$45.00	$1,800.00
Iron Fillings	T	1.5	$800.00	$1,200.00
Drain tile	LF	150.0	$8.00	$1,200.00
Remove Sidewalk	SF	150.0	$2.00	$300.00
Replace Sidewalk	SF	150.0	$7.00	$1,050.00
Upland perimeter seeding and mulching	Acre	1.0	$2,000.00	$2,000.00
Trees	EA	5.0	$500.00	$2,500.00
Traffic Control	LS	1.0	$1,500.00	$1,500.00
Aggregate Base Class V	TON	30.0	$20.00	$600.00
Salvage existing Topsoil	LS	1.0	$2,500.00	$2,500.00
Site Cleanup	LS	1.0	$2,500.00	$2,500.00
Construction Cost Estimate				$265,430.00
Contingency (20 %Construction Cost)				$53,086.00
Total Construction Cost				$318,516.00
Construction Management Services (5%)				$15,925.80
Design Fee (15 %)				$47,777.40
Preliminary Cost Estimate				**$382,219.20**

Table C2: Estimated Present Value Fees for the Four Seasons Mall Pond Project

Item	Unit	Quantity	Unit Cost	Total Cost
Mobilization	LS	1	$10,000.00	$10,000.00
Excavation	CY	4,194	$15.00	$62,910.00
24" RCP	LF	100.0	$120.00	$12,000.00
24" RCP	LF	200.0	$120.00	$24,000.00
24" RCP	LF	122.0	$120.00	$14,640.00
Class II Riprap	CY	13	$90.00	$1,170.00
Pond Outlet Structure	EA	1	$1,800.00	$1,800.00
Manhole/Flow Splitter Installation	LS	1	$15,000.00	$15,000.00
Connect Existing SS Lines to MH	EA	3	$800.00	$2,400.00
Connect New SS Lines to MHs	EA	3	$800.00	$2,400.00
Pavement Removal	SY	3,572.0	$3.00	$10,716.00
Pavement Replacement	SY	500.0	$25.00	$12,500.00
Sidewalk Removal	SF	300.0	$2.00	$600.00
Sidewalk Replacement	SF	300.0	$7.00	$2,100.00
Curb Removal	LF	60.0	$5.00	$300.00
Curb Replacement	LF	60.0	$20.00	$1,200.00
Traffic Control	LS	1.0	$2,000.00	$2,000.00
Traffic Detour	LS	1.0	$3,500.00	$3,500.00
Geotextile Fabric	SY	64.0	$3.00	$192.00
Clean Sand	CY	20.0	$35.00	$700.00
Iron Fillings	TON	1.5	$800.00	$1,200.00
Coarse filter material	CY	10	$45.00	$450.00
Drain tile	LF	100.0	$8.00	$800.00
Erosion Control	LS	1	$15,000.00	$15,000.00
Site Cleanup	LS	1.0	$2,500.00	$2,500.00
Construction Cost Estimate				$200,078.00
Contingency (20 %Construction Cost)				$40,015.60
Total Construction Cost				$240,093.60
Construction Management Services (5%)				$12,004.68
Design Fee (15 %)				$36,014.04
Preliminary Cost Estimate				**$288,112.32**

Table C3: Present Value Fees for the Center Channel Portion of the Channel Restoration Project Cost Estimate

Item	Unit	Quantity	Unit Cost	Total Cost
Mobilization/Demobilization, ESC, misc. removals	EA	1	$10,000.00	$10,000.00
Clear and grub brush & small trees	LF	3,700	$5.00	$18,500.00
Tree removal >20"	EA	90.0	$200.00	$18,000.00
Reslope and minor grading	LF	3,700.0	$2.00	$7,400.00
Brush bundles (100 LF)	LF	200.0	$17.00	$3,400.00
Seed & ECB (500 LF)	SY	1,110	$5.00	$5,550.00
Native seed and mulch	Acre	3	$4,000.00	$10,000.00
Toe protection (370 LF)	TON	186	$100.00	$18,630.00
Cross vane 10' (10)	CY	49	$300.00	$14,700.00
12" FES	EA	1	$1,000.00	$1,000.00
Plunge pool 12" riprap	CY	8.0	$100.00	$800.00
Plunge pool 12" geotextile	SY	6.0	$2.50	$15.00
24" FES	EA	1.0	$1,200.00	$1,200.00
Plunge pool 24" riprap	CY	12.0	$100.00	$1,200.00
Plunge pool 24" geotextile	SY	7.0	$2.50	$17.50
Shrubs	EA	150.0	$35.00	$5,250.00
Construction Cost Estimate				$115,662.50
Contingency (20 %Construction Cost)				$23,132.50
Total Construction Cost				$138,795.00
Construction Management Services (5%)				$6,939.75
Design Fee (15 %)				$20,819.25
Total Cost Estimate				**$166,554.00**

Table C3 (Continued): Right Channel Portion of the Channel Restoration Project
Present Value Cost Estimate

Item	Unit	Quantity	Unit Cost	Total Cost
Mobilization/Demobilization, ESC	EA	1	$10,000.00	$10,000.00
Clear and grub brush & small trees	LF	1,050	$5.00	$5,250.00
Tree removal >20"	EA	30.0	$200.00	$6,000.00
Reslope and minor grading	LF	1,050.0	$5.00	$5,250.00
Brush bundles (225 LF)	LF	450.0	$17.00	$7,650.00
Native seed and mulch	Acre	1	$4,000.00	$2,400.00
Toe protection (200 LF)	TON	138	$100.00	$13,800.00
Cross vane 10' (12)	CY	59	$300.00	$17,640.00
Shrubs	EA	100	$35.00	$3,500.00
Construction Cost Estimate				$71,490.00
Contingency (20 %Construction Cost)				$14,298.00
Total Construction Cost				$85,788.00
Construction Management Services (5%)				$4,289.40
Design Fee (15 %)				$12,868.20
Engineer's Cost Estimate				**$102,945.60**

Table C4: Present Value Estimated Fees for the Alum Injection System

Item	Unit	Quantity	Unit Cost	Total Cost
Mobilization	LS	1	$12,000	$12,000
Pond Excavation	CY	9,852.0	$15	$147,780
Clarifier Excavation and Backfill	CY	1,000	$15	$15,000
Controlled Fill	CY	6,169	$5	$30,845
Pavement Removal	SY	2,958	$3	$8,874
Erosion Control	LS	1	$15,000	$15,000
Install New Manhole	LS	1	$2,600	$2,600
SAFL Baffle	EA	1	$3,500	$3,500
24" RCP	LF	124	$120	$14,880
Connection to Storm Sewer MH	EA	1	$800	$800
Connection to Sanitary Sewer	EA	2	$1,000	$2,000
Install Sanitary Manhole	EA	1	$3,000	$3,000
CMP Storage Units	LF	950	$150	$142,500
Removal of Pavement	SY	250	$3	$750
New Pavement	SY	250	$25	$6,250
Remove Sidewalk	SF	150	$2	$300
Replace Sidewalk	SF	150	$7	$1,050
Remove Curb	LF	30	$5	$150
Replace Curb	LF	30	$20	$600
Clarifier Concrete	CY	213	$600	$128,000
Clarifier Internals	FT-DIA	52	$2,000	$105,000
4" PVC Sludge Pipe	LF	460	$40	$18,000
10" PVC Influent Pipe	LF	410	$65	$27,000
14" PVC Effluent Pipe	LF	25	$75	$2,000
Influent Pump	EA	2	$20,000	$40,000
Influent Lift Station	LS	1	$10,000	$10,000
Sludge Pump	LS	2	$5,000	$10,000
Sludge Pump Structure	LS	1	$30,000	$30,000
Alum Treatment Building	SF	120	$75	$9,000
Chemical Feed System	LS	1	$10,000	$10,000
Electric and Controls	LS	1	$30,000	$30,000
Traffic Control	LS	1	$2,000	$2,000

Table C4 (continued): Present Value Estimated Fees for the Alum Injection System

Item	Unit	Quantity	Unit Cost	Total Cost
Traffic Detour	LS	1	$3,500	$3,500
Site Restoration	LS	1	$5,000	$5,000
Construction Cost Estimate				$837,379.00
Contingency (20 %Construction Cost)				$167,475.80
Total Construction Cost				$1,004,854.80
Construction Management Services (5%)				$50,242.74
Design Fee (15 %)				$150,728.22
Preliminary Cost Estimate				**$1,205,825.76**

Table C5: Items Considered for 30 Year Life Cycle Costs

Project	Item/action	Frequency	Associated Present Value Cost
40th Ave. Pond	General O&M/Site Visits	Annually	$500
	Repair/retrofit Outlet Structure	Once every 10 years	$6,000
	Remove Sediment from Pond	Once every 30 years	$17,000
Four Seasons Mall Pond	General O&M/Site Visits	Annually	$500
	Repair/retrofit Outlet Structure	Once every 10 years	$6,000
	Remove Sediment from Pond	Once every 30 years	$17,000
Channel Restoration	General O&M/Site Visits	Annually	$900
	Repair/retrofit Outlet Structure	Once every 10 years	$6,000
	Maintain fallen debris and obstructions	Once every 30 years	$20,000
Alum System	Apply Chemicals	Annually	$5,000
	General Clarifier Maintenance	Annually	$25,000
	Electricity for Pumps	Annually	$2,000
	Strength Charge for Discharge to Sanitary	Annually	$10,000
	Replace Influent and Sludge Pumps	Once every 10 years	$40,000
	Replace Clarifier Internals	Once every 20 years	$105,000
	Replace Chemical Feed System	Once every 20 years	$10,000
	Repairs to Storage Structure and SAFL Baffle	Once every 10 years	$10,000
	Remove Sediment from Storage Area	Once every 30 years	$17,000

Appendix D
Soil Chemical Analyses

BRAUN INTERTEC

Braun Intertec Corporation
11001 Hampshire Avenue S.
Minneapolis, MN 55438

Phone: 952.995.2000
Fax: 952.995.2020
Web: braunintertec.com

Mr. Jeff Madejczyk
Wenck Associates, Inc.
1800 Pioneer Creek Center P.O. Box 428
Maple Plain, MN 55359

July 05, 2012

Report #: 1203606

RE: 1756-05 City of Plymouth

Dear Jeff Madejczyk:

Braun Intertec Corporation received samples for the project identified above on June 21, 2012. Analytical results are summarized in the following report.

All routine quality assurance procedures were followed, unless otherwise noted.

Analytical results are reported on an "as received" basis unless otherwise noted. Where possible, the samples will be retained by the laboratory for 14 days following issuance of the initial final report. The samples will be disposed of or returned at that time. Arrangements can be made for extended storage by contacting me at this time.

We appreciate your decision to use Braun Intertec Corporation for this project. We are committed to being your vendor of choice to meet your analytical chemistry needs.

If you have any questions please contact me at the above phone number.

Sincerely,

DRAFT REPORT
Project Manager

BRAUN INTERTEC

11001 Hampshire Ave. S.
Minneapolis, MN 55438
952.995.2000 Phone
952.995.2020 Fax

Wenck Associates, Inc.	Client Ref: 1756-05 City of Plymouth	Report #: 1203606
1800 Pioneer Creek Center P.O. Box 428	Client Contact: Mr. Jeff Madejczyk	Project Mgr: DRAFT REPORT
Maple Plain, MN 55359	PO Number:	Account ID: W02540

Qualifiers and Abbreviations

J	Detected but below the Method Reporting Limit; therefore, result is an estimated concentration (CLP J-Flag).
COC	Chain of Custody
dry	Sample results reported on a dry weight basis
MDL	Method Detection Limit
MRL	Method Reporting Limit
NA	Not Applicable
ND	Analyte NOT DETECTED above the MDL value
NR	Not Reported
%Rec	Percent Recovery
RPD	Relative Percent Difference
VOC	Volatile Organic Compound

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1800 Pioneer Creek Center P.O. Box 428	Client Contact: Mr. Jeff Madejczyk	Project Mgr: DRAFT REPORT
Maple Plain, MN 55359	PO Number:	Account ID: W02540

Sample Summary

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
DRAFT: 062112	1203606-01	Soil	06/21/12 11:00	06/21/12 12:10

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1800 Pioneer Creek Center P.O. Box 428	Client Contact: Mr. Jeff Madejczyk	Project Mgr: DRAFT REPORT
Maple Plain, MN 55359	PO Number:	Account ID: W02540

Conditions Upon Receipt

Cooler: Cooler 1

Temperature:	8.3 °C	**COC Included:**	Yes	**Custody Seals Used:**	No
Temperature Blank:	Yes	**COC Complete:**	Yes	**Custody Seals Intact:**	NA
Received on Ice:	Yes	**COC & Labels Agree:**	Yes	**Hand Delivered by Client:**	Yes
Preservation Confirmed:	No	**Sufficient Sample Provided:**	Yes	**Headspace Present (VOC):**	No

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1800 Pioneer Creek Center P.O. Box 428	Client Contact: Mr. Jeff Madejczyk	Project Mgr: DRAFT REPORT
Maple Plain, MN 55359	PO Number:	Account ID: W02540

Analyte	Result	MRL	MDL	Units	Batch	Prepared	Analyzed/Analyst	Method	Notes
1203606-01 DRAFT: 062112									
Arsenic	1.5 J	1.9	0.15	mg/kg dry	B2F0556	6/22/12	6/26/12 DRM	EPA 6010C	
Copper	**9.6**	0.93	0.011	mg/kg dry	B2F0556	6/22/12	6/26/12 DRM	EPA 6010C	
% Solids	**93**	0.050	0.010	% Wt	B2F0562	6/22/12	6/22/12 MJW	EPA 3545A 11.4	

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1800 Pioneer Creek Center P.O. Box 428	Client Contact: Mr. Jeff Madejczyk	Project Mgr: DRAFT REPORT
Maple Plain, MN 55359	PO Number:	Account ID: W02540

DRAFT: Classical Chemistry Parameters - Quality Control

Batch B2F0562 - % Solids

Method Blank (B2F0562-BLK1) Prepared & Analyzed: 06/22/12

Analyte	Result	MRL	MDL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
% Solids	0.0259 J	0.050	0.010	% Wt	NA	NA	NA	NA	NA	NA	

Duplicate (B2F0562-DUP1) **Source: 1203512-01** Prepared & Analyzed: 06/22/12

Analyte	Result	MRL	MDL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
% Solids	96.8	0.050	0.010	% Wt	NA	96.8	NA	NA	0.0469	20	

Standard Reference Material (B2F0562-SRM1) Prepared & Analyzed: 06/22/12

Analyte	Result	MRL	MDL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
% Solids	91.6			% Wt	91.9	NA	99.6	90-110	NA	NA	

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1800 Pioneer Creek Center P.O. Box 428	Client Contact: Mr. Jeff Madejczyk	Project Mgr: DRAFT REPORT
Maple Plain, MN 55359	PO Number:	Account ID: W02540

DRAFT: Metals - Quality Control

Batch B2F0556 - EPA 3050B

Method Blank (B2F0556-BLK1) Prepared: 06/22/12 Analyzed: 06/25/12

Analyte	Result	MRL	MDL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Arsenic	ND	2.0	0.16	mg/kg	NA	NA	NA	NA	NA	NA	
Copper	0.0350 J	1.0	0.012	mg/kg	NA	NA	NA	NA	NA	NA	

Laboratory Control Sample (B2F0556-BS1) Prepared: 06/22/12 Analyzed: 06/25/12

Analyte	Result	MRL	MDL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Arsenic	299	2.0	0.16	mg/kg	300	NA	99.7	80-120	NA	NA	
Copper	299	1.0	0.012	mg/kg	300	NA	99.7	80-120	NA	NA	

Laboratory Control Sample Duplicate (B2F0556-BSD1) Prepared: 06/22/12 Analyzed: 06/25/12

Analyte	Result	MRL	MDL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Arsenic	300	2.0	0.16	mg/kg	300	NA	100	80-120	0.503	20	
Copper	300	1.0	0.012	mg/kg	300	NA	100	80-120	0.317	20	

Matrix Spike (B2F0556-MS1) **Source: 1203633-01RE1** Prepared: 06/22/12 Analyzed: 06/25/12

Analyte	Result	MRL	MDL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Arsenic	257	9.3	0.72	mg/kg	279	2.70	91.3	75-125	NA	NA	
Copper	285	4.6	0.056	mg/kg	279	27.9	92.3	75-125	NA	NA	

Matrix Spike Duplicate (B2F0556-MSD1) **Source: 1203633-01RE1** Prepared: 06/22/12 Analyzed: 06/25/12

Analyte	Result	MRL	MDL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Arsenic	281	10	0.78	mg/kg	299	2.70	93.0	75-125	8.97	20	
Copper	309	5.0	0.060	mg/kg	299	27.9	94.0	75-125	8.15	20	

Standard Reference Material (B2F0556-SRM1) Prepared: 06/22/12 Analyzed: 06/25/12

Analyte	Result	MRL	MDL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Arsenic	120	4.3	0.34	mg/kg	133	NA	90.2	57.1-110	NA	NA	
Copper	120	2.2	0.026	mg/kg	132	NA	91.0	66.2-111	NA	NA	

BRAUN INTERTEC

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Wenck Associates, Inc.	Client Ref: 1756-05 City of Plymouth	Report #: 1203606
1800 Pioneer Creek Center P.O. Box 428	Client Contact: Mr. Jeff Madejczyk	Project Mgr: DRAFT REPORT
Maple Plain, MN 55359	PO Number:	Account ID: W02540

For Braun Intertec Use Only
Laboratory Work Order No.
120 3606

BRAUN INTERTEC
Braun Intertec Corporation
11001 Hampshire Ave. S
Minneapolis, MN 55438

REQUEST FOR LABORATORY ANALYTICAL SERVICES

Bottle orders and sampling inquires:
labservices@braunintertec.com
Phone: 952-995-2600 Fax: 952-995-2601

IMPORTANT
Date Results Requested: _____
Time _____
Rush Charges Authorized? ____ Yes ____ No
Rush / Quote # _____

Page 1 of 1

008716

REPORT RESULTS TO
Contact Name Jeff Madejczyk | Project ID/Name 1756-05 / City of Plymouth | P.O. #/Project #
Company Wenck
Mailing Address 1800 Pioneer Creek Center
City, State, Zip Maple Plain, MN
Telephone # 763-479-4263 | Fax # 763-479-4242
E-mail jmadejczyk@wenck.com

SEND INVOICE TO
Contact Name Melissa | Company Wenck
Address
City, State, Zip
Telephone # | Fax #

Special Instructions and/or Specific Regulatory Requirements:
(method, limit of detection, petrofund, reporting units)

ANALYSIS REQUESTED
(Enter an 'X' in the box below to indicate request)

LAB ID#	CLIENT SAMPLE IDENTIFICATION (IDs must be unique)	DATE SAMPLED	TIME SAMPLED	MATRIX/ MEDIA	VOLUME/AREA (specify units)	Number of Containers	Metals Field Filtered Y/N	Site Location (State) MN	Copper	Arsenic	PAH	FOR LAB USE ONLY
	062112-1	6-21-12	11:00			1	N		X	X	X	
	062112-2	6-21-12	11:00			1	N					
	062112-3	6-21-12	11:00			1	N					
	062112-4	6-21-12	14:00			1	N					

CHAIN OF CUSTODY
Collected by: (Print) Carl Enzenauer | Collector's Signature: Carl Enzenauer
Relinquished by: | Date/Time 6-21-12 | Received by: | Date/Time
Relinquished by: | Date/Time | Received Contents Not Verified: | Date/Time 6/21/12 17:10
Custody Seal Intact ☐ Yes ☐ No ☐ N/A ☒ Hand Delivered by Client | Received Contents Verified: | Date/Time
On Ice ☒ Yes ☐ No | Comments:
Temp Blank ☒ Yes ☐ No
Temp: 8.3 °C

Form # CS02.03 F:\Groups\QA-QC\Forms\clientservices\COC-CS02 Effective Date: 10/10/07