

Chapter 2.0 Physical Environment and Land Use

City of St. Louis Park Surface Water Management Plan

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Chapter 2.0 Physical Environment and Land Use

This chapter of the SWMP provides a technical description of the City of St. Louis Park and its water resources. General concepts and data related to climate and precipitation, topography, soils, geology, and land use are discussed. In addition, the following water resources data are discussed: surface water resources, stormwater systems, wildlife habitat, pollutant sources, water quality and quantity and groundwater resources

Having a complete understanding of the physical environment helps identify management issues, resolve problems, and provides the basis for the city's goals, policies, and implementation strategies.

2.1 Climate and Precipitation

Because of its location near the center of the North American continent, St. Louis Park (and Minnesota at large) has a continental climate, meaning that it experiences a wide variation in climate conditions (e.g., droughts, floods, heat, and cold).

The mean annual temperature for St. Louis Park is 46.8°F, as measured at the Minneapolis-St. Paul (MSP) airport (1987–2017). Mean monthly temperatures vary from 16.3°F in January to 74.1°F in July (1987–2017). Extreme temperatures on record include a high of 105°F on July 31, 1988, and a low of -32°F on February 2, 1996. For the period of 1987–2017, the average date for the latest occurrence of freezing temperatures is April 25, whereas the average date for the first autumn frost is October 12. The average frost-free period (growing season) is 170 days.

Table 2-1 summarizes precipitation data measured at the MSP airport. Average total annual precipitation (1987–2017) is 32.0 inches and has ranged from a low of 19.9 inches in 1988 to a high of 40.3 inches in 2016. The mean monthly precipitation (1987–2017) varies from 0.83 inches in February to 4.69 inches in July. From May to September, the growing season months, the average rainfall (1987–2017) is 20.15 inches, or about 63 percent of the average annual precipitation. Average annual evapotranspiration is 34.6 inches (1987–2017). Table 2-1 and Figure 2-2 show the average monthly precipitation measured at the MSP airport. Figure 2-1 shows the average monthly maximum and minimum temperatures measured at the MSP airport.

Table 2-1: Precipitation Summary—Minneapolis-St. Paul Airport

Month	Total Precipitation (Inches)				Snow (Inches)	
	Mean	Max. Year	Min. Year	One-day Max	Mean	Max Year
Jan.	0.84	2.39 1996	0.12 1990	0.90 1/17/1990	10.2	33.3 1999
Feb.	0.83	2.11 2012	0.03 1987	0.85 2/20/2011	8.6	19.7 2004
Mar.	1.77	3.88 1990	0.41 1994	1.52 3/27/1998	8.8	22.7 1989

Month	Total Precipitation (Inches)				Snow (Inches)	
	Mean	Max. Year	Min. Year	One-day Max	Mean	Max Year
Apr.	2.86	6.99 2001	0.15 1987	2.59 4/6/2006	3.1	20.2 2002
May	3.57	9.17 2012	0.15 1987	2.58 5/24/2012	0.0	0.5 2013
Jun.	4.65	11.02 2014	0.13 1988	4.13 6/19/2014	0.0	N/A
Jul.	4.69	13.98 1987	1.07 1988	9.15 7/23/1987	0.0	N/A
Aug.	4.17	10.11 2016	0.35 2003	3.19 8/19/1997	0.0	N/A
Sep.	3.07	8.43 1991	0.95 2011	2.59 9/15/1992	0.0	N/A
Oct.	2.5	5.95 2009	0.55 1999	4.61 10/4/2005	0.9	8.2 1991
Nov.	1.77	5.45 1996	0.08 2002	1.85 11/1/1991	7.3	46.9 1991
Dec.	1.24	3.28 2010	0.28 1997	1.16 12/11/2010	11.5	33.6 2011
Annual	31.98	41.65 2016	19.93 1988	9.15 7/23/1987	49.0	86.6 2010–11
May–Sep.	20.15	28.02 2002	10.09 1996	9.15 7/23/1987	0.0	N/A

Source: Minnesota DNR Climate Data, https://www.dnr.state.mn.us/climate/historical/acis_stn_meta.html

Figure 2-1: Average Monthly High and Low Temperatures at Minneapolis-St. Paul International Airport (1987–2017)

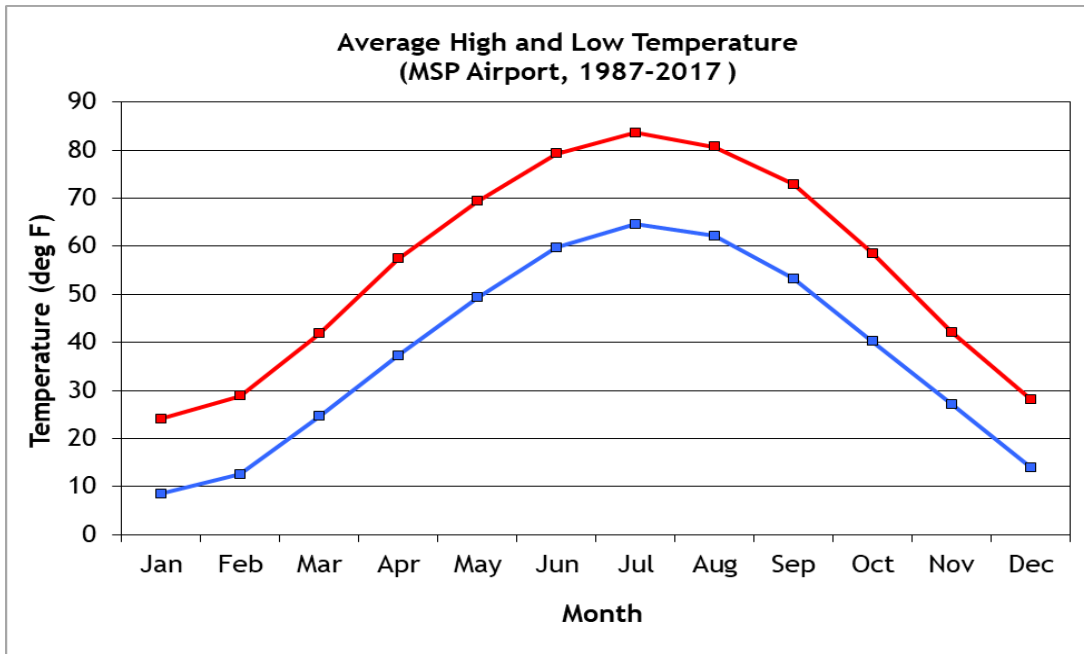
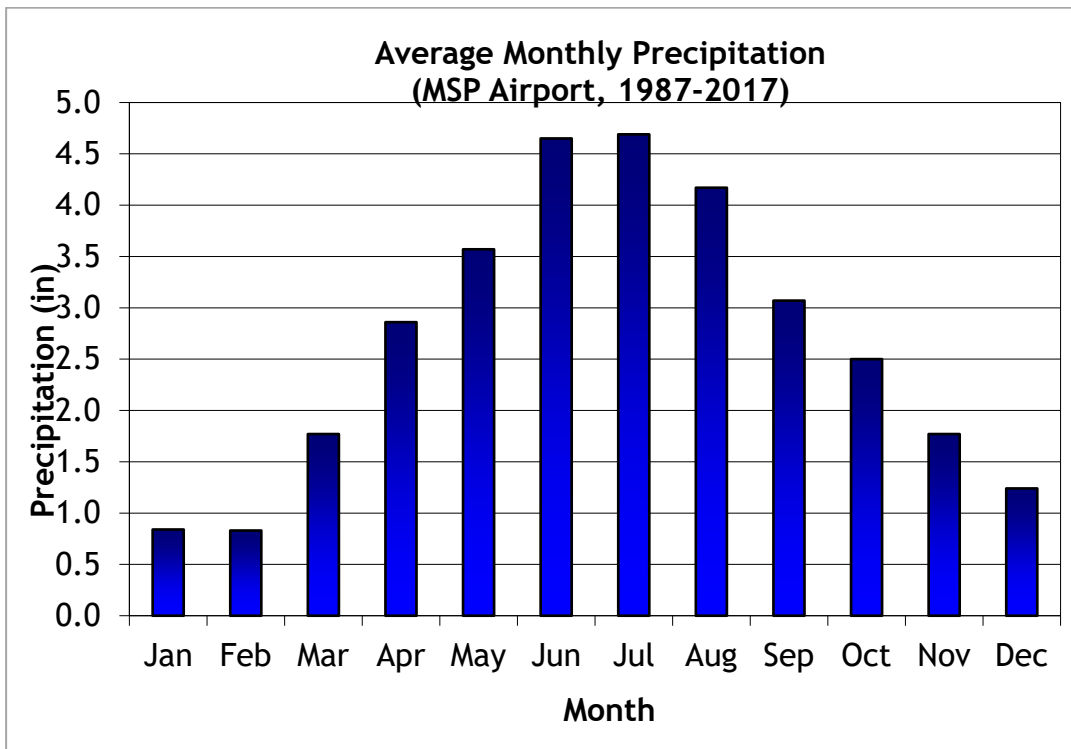


Figure 2-2: Average Monthly Precipitation for Minneapolis-St. Paul International Airport (1987–2017)



Average annual snowfall (1987–2017) is 49.0 inches at the MSP airport. Extreme snowfall records range from 86.6 inches during the 2010–2011 season to 17.4 inches at MSP during the 1986–1987 season.

The amount, rate, and type of precipitation are important in determining flood levels and stormwater runoff rates, all of which impact water resources. In urbanized watersheds, shorter-duration events tend to play larger roles in predicting high water levels in basins. Shorter-duration events are generally used by hydrologists to study local issues (e.g., sizing catch basins, storm sewer pipes.). Longer-duration events are generally used by hydrologists to study regional issues such as predicting high water levels for regional basins and basins that have no outlets (i.e., landlocked basins) or those that have small outlets relative to their watershed size.

Extremes of precipitation and snowmelt are important for design of flood control systems. The National Weather Service has data on extreme precipitation events that can be used to aid in the design of flood control systems. Extremes of snowmelt and rainstorms that occur with snowmelt in early spring most often affect major rivers, the design of large stormwater storage areas, and landlocked basins. Extremes of precipitation most often affect the design of conveyance facilities.

In contrast with stormwater drainage facilities, stormwater quality treatment systems are designed based on the smaller, more frequent storms. These more frequent storms account for most of the annual pollutant loadings from urban watersheds. Analysis of National Weather Service rainfall data (1987–2017) from the MSP station found that almost 95 percent of storms produced one inch or less of rainfall.

Technical Paper 40 (TP-40), which was developed by the National Oceanic and Atmospheric Administration (NOAA) and initially published in 1961, was the key document used by hydrologists and designers of hydraulic structures (e.g., storm sewer infrastructure, detention ponds, etc.). TP-40 was developed using less recorded precipitation data, with a smaller time range and fewer precipitation stations. A recent increase in large storm events had scientists questioning if the document was underprojecting rainfall depths, so an updated document was developed. NOAA Atlas 14 Volume 8 (commonly known as Atlas 14) was developed by the Hydrometeorological Design Studies Center within the Office of Hydrologic Development of the NOAA's National Weather Service (Perica et al. 2013). Atlas 14 used denser precipitation data networks than the previous document had as well as a greater period of record, new statistical approaches, and new spatial interpolation and mapping techniques to develop new precipitation frequency estimates. Atlas 14 is now the primary source of precipitation information in the Midwest. See Table 2-2 for the Atlas 14 rainfall depths used in St. Louis Park.

Table 2-2: Atlas 14 Rainfall Depths for City of St. Louis Park, MN

Storm Event	Depth, inches
50% annual probability (2-year) 24-hour	2.9
10% annual probability (10-year) 24-hour	4.3
1% annual probability (100-year) 24-hour	7.4

Climate information can be obtained from a number of sources, including the following sites:

- For climate information about the Twin Cities metropolitan area:
https://www.dnr.state.mn.us/climate/twin_cities/index.html
- For a wide range of Minnesota climate information: <http://climateapps.dnr.state.mn.us>
- For additional Minnesota climate information:
<https://www.dnr.state.mn.us/climate/index.html>

2.2 Topography

The area of St. Louis Park that is north of Minnetonka Boulevard is characterized by rolling uplands with intermittent ponds and wetlands. Areas in the southern portion of the city have nearly level and gently rolling topography. Some relatively large, flat areas are present along Minnehaha Creek. Figure 2-3 shows the areas of the city with slopes greater than 12 percent.

The elevations generally vary from 880 to 990 feet throughout the city. The highest point in the city is located at the Westwood Hills Nature Center, whereas the lowest area is located at the Bass Lake basin. The City of St. Louis Park has two-foot contour data coverage for the entire city. The contours were created based on LiDAR data of Twin Cities Metropolitan area, which was collected in 2011.

2.3 Soils

Soils information for the City of St. Louis Park is available in the Hennepin County Soil Survey (USDA-NRCS, 2004), which includes information concerning the classification of soils within St. Louis Park.

The infiltration capacities of soils affect the amount of direct runoff resulting from rainfall. The higher the infiltration rate for a given area of soil, the lower the potential for runoff from the land. Conversely, soils with low infiltration rates produce high runoff volumes and high peak discharge rates. Hydrologic grouping symbols A through D established by the Soil Conservation Service (now called the Natural Resources Conservation Service or NRCS) represent soils with high to low infiltration rates, respectively. The combination of these hydrologic groupings and land use are used to estimate the amount of runoff that will occur over a given area for a

particular rainfall amount. As land is developed for urban use, much of the soil is covered with impervious surfaces, and soils in the remaining areas are significantly disturbed and altered. Development often results in the consolidation of the soil and tends to reduce the infiltration capacities of otherwise permeable soils, resulting in significantly greater amounts of runoff.

Figure 2-4 shows the soils in St. Louis Park by hydrologic soil group. However, because of significant urban development, much of the city is categorized as having “undefined/urban soil.” The map intends to provide general guidance about the infiltration capacities of the soils throughout St. Louis Park. Soils and their respective infiltration capacity should be confirmed on a site-by-site and project-by-project basis.

2.4 Geology

St. Louis Park is in the east central portion of Hennepin County. The general geology of Hennepin County, including St. Louis Park, has been studied, and the results are outlined in the *Geologic Atlas of Hennepin County, Minnesota* (Minnesota Geological Survey [MGS] Atlas C-4, 1992).

St. Louis Park is located in the Twin Cities structural basin. The bedrock beneath the city consists of Paleozoic sedimentary rocks that dip gently to the southeast. The uppermost bedrock unit for most of the city is Platteville Limestone and St. Peter Sandstone for the rest of the city. There are also a few buried valleys where the Prairie du Chien group comprises the top layer. The Plattville Formation is dominantly limestone and dolostone. The Glenwood Formation is dominantly shale. Together, they are as much as 34 feet thick, but generally the thickness is less than that because the upper part of the Platteville Formation is usually eroded at the uppermost bedrock unit. The St. Peter Sandstone is generally 145 to 155 feet thick in the Twin Cities where it is overlain by the Glenwood and Platteville Formations. The Prairie du Chien group is generally between 125 to 140 feet thick in the middle of the Twin Cities basin, where it is covered by St. Peter Sandstone. An MGS map entitled “Bedrock Geology of the Twin Cities Ten-County Metropolitan Area, Minnesota” further describes these bedrock layers.

The bedrock elevations in the area can vary, depending on the type, from 750 to 800 feet. The surficial geology of the city is comprised of a sand, loamy sand, and gravel outwash, which ranges in depth from 50 to 200 feet.

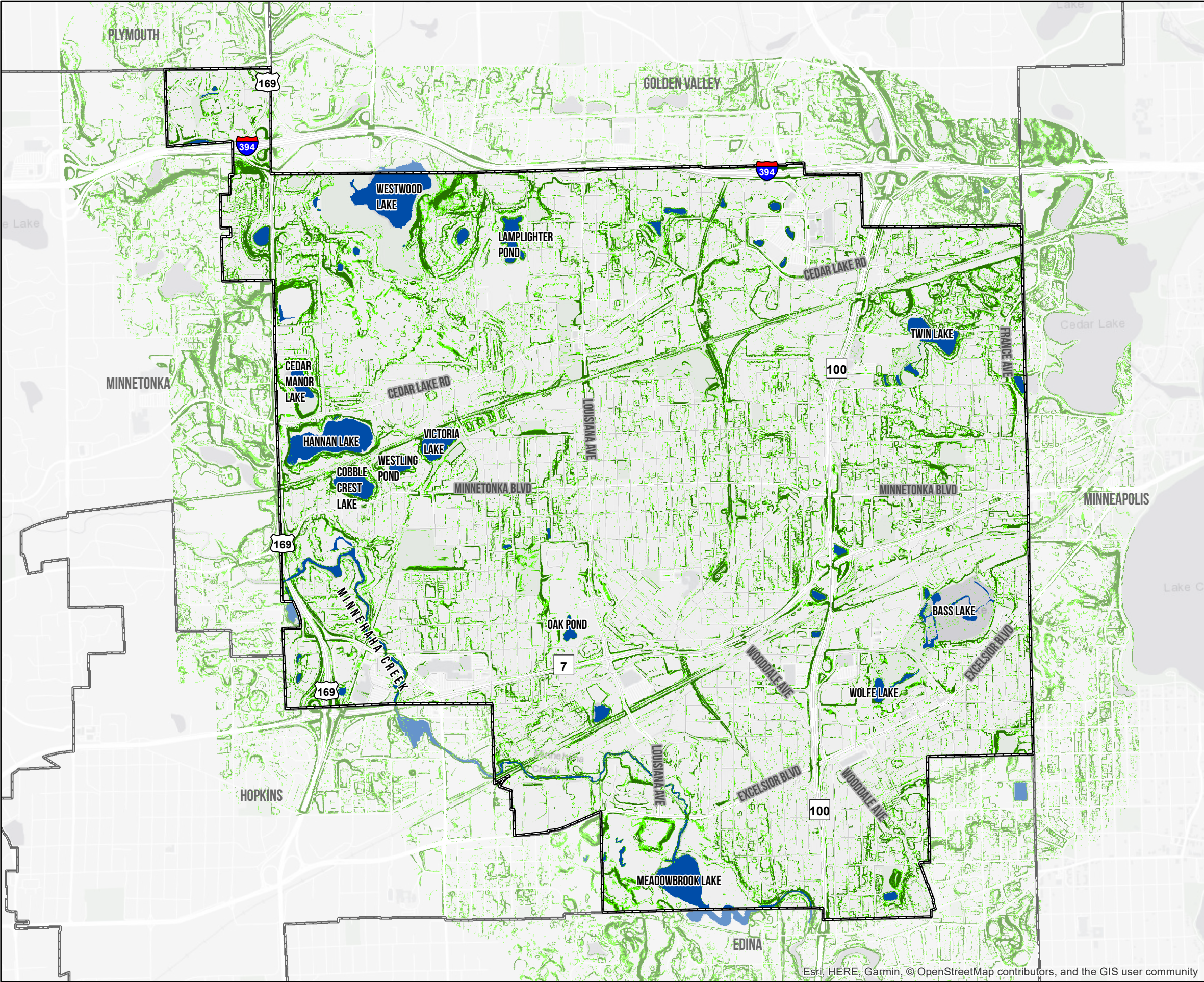
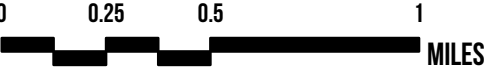




FIGURE 2-3: SLOPES GREATER THAN TWELVE PERCENT

LEGEND

-  City Boundary
-  Slope Less than 12%
-  Slope Between 12% and 18%
-  Slope Greater than 18%
-  Lakes





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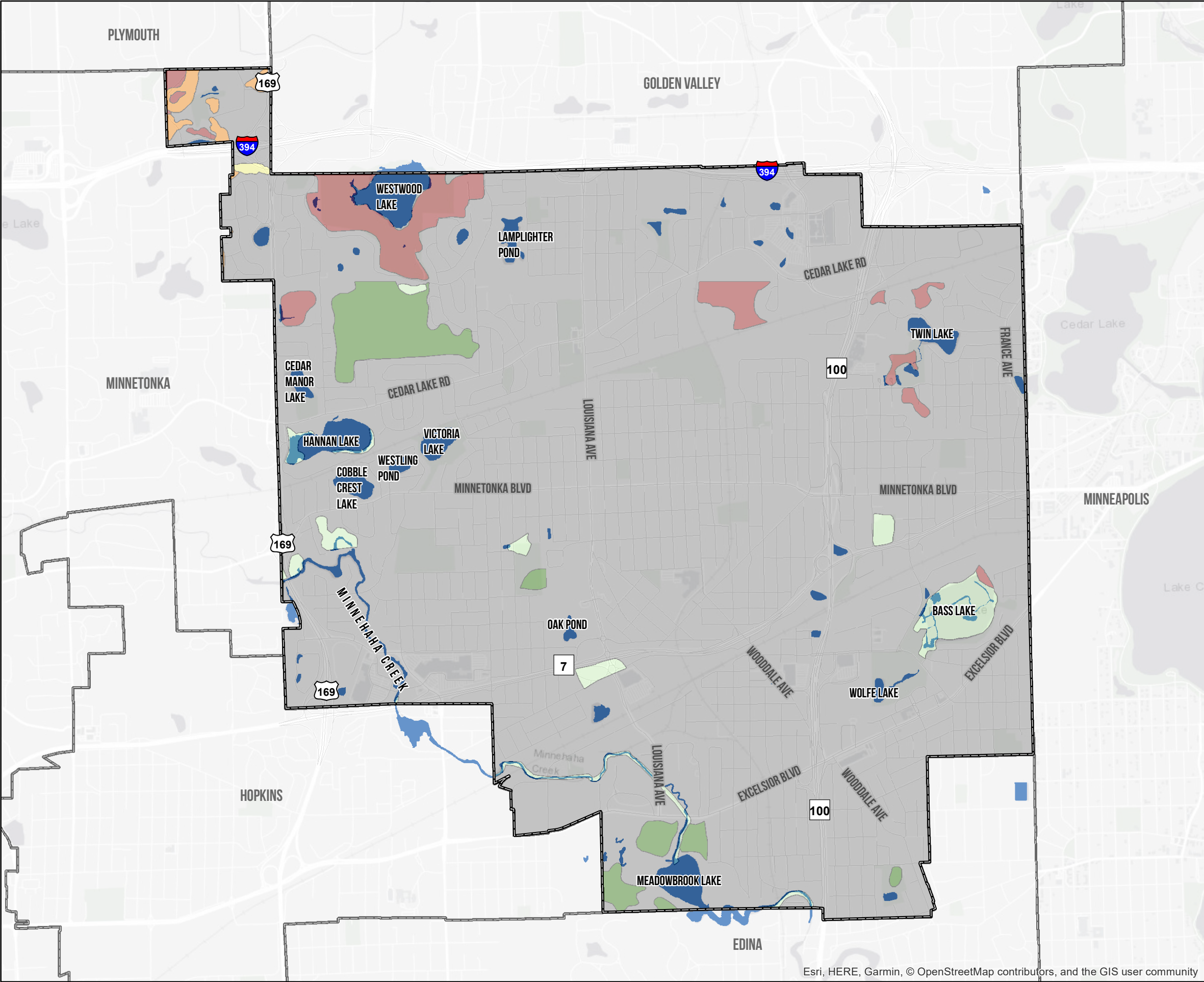
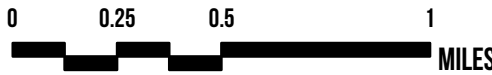


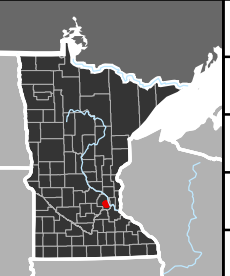


FIGURE 2-4: HYDROLOGIC SOIL GROUPS

LEGEND

- A - High Infiltration Rate
- A/D - High Infiltration Rate (if drainage system in place)
- B - Moderate Infiltration Rate
- C - Slow Infiltration Rate
- C/D - Slow/Very Slow Infiltration Rate
- Undefined/Urban Soils
- City Boundary
- Lakes





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2.5 Groundwater

This section summarizes the finding of the city's 2015 Part-1 Wellhead Protection Plan Update.

The growing population in the Twin Cities metropolitan area has put increased pressure on groundwater supplies. Increased impervious surfaces also reduce the amount of groundwater recharge. The City of St. Louis Park obtains its entire water supply from nine primary groundwater wells and one emergency backup well. The wells draw water from the Prairie du Chien, Mount Simon, and Jordan aquifer formations. Municipal Wells 4, 8, and 10 are multiaquifer wells, open to both the Prairie du Chien and Jordan aquifers. Wells 14, 15, and 16 are completed in the Jordan sandstone, and Wells 11, 12, and 13 are open to the Mount Simon aquifer. Well 6, the emergency well, is open to both the Prairie du Chien and Jordan aquifers. The city has no immediate plans to replace or add municipal wells or utilize any other sources of water supply because existing groundwater wells appear to adequately meet the city's current and projected water demands.

The MDH is responsible for the protection of groundwater supplies and aims to prevent contaminants from entering the recharge zones of public water supply wells. This can result in the restriction of certain stormwater best management practices (BMPs) for areas with high potential vulnerability to protect groundwater supplies.

The MDH Source Water Protection Vulnerability rating for St. Louis Park's municipal wells determine that Wells 8, 11, 12, and 13 are not vulnerable to contaminants from land and water use. Wells 4, 6, 10, 14, 15, and 16 were found to be vulnerable because the well water either had a detection of tritium, or a nearby well within the same aquifer had a detection of tritium. The overall quality of groundwater in St. Louis Park is good. No contaminants were detected at levels that violated federal drinking water standards. Some contaminants were detected in trace amounts, but these were below legal limits.

Figure 2-5 shows groundwater sensitivity areas within St. Louis Park. More information about the wellhead protection area delineation and the well and drinking water supply management area (DWSMA) vulnerability assessments can be found in the City of St. Louis Park Part I Wellhead Protection Plan Update (Source Water Solutions, LLC, February 2015) and in **Appendix C**.

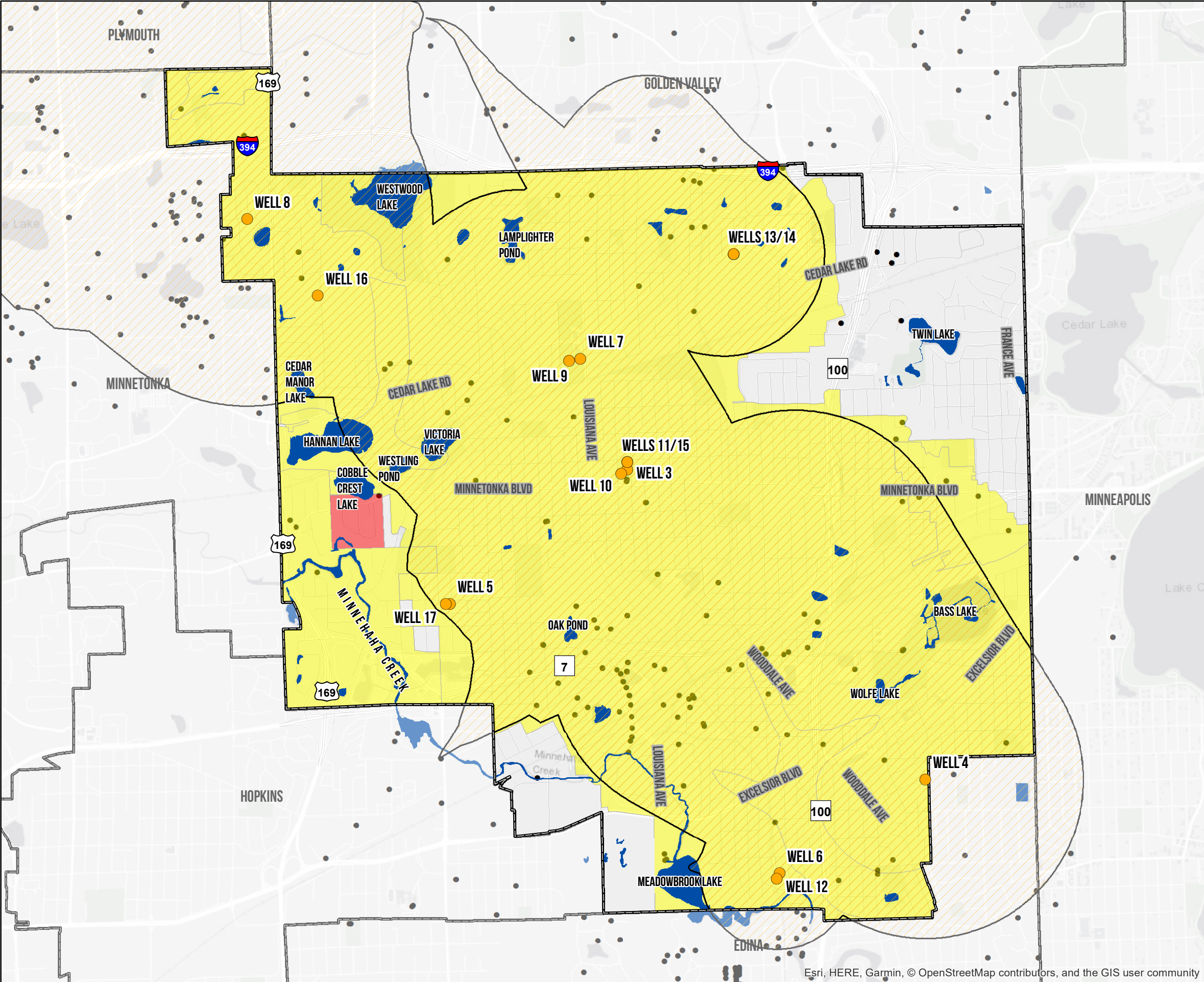


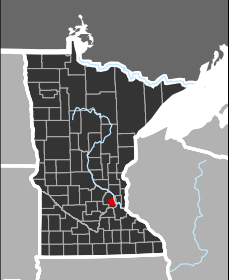


FIGURE 2-5: GROUNDWATER SENSITIVITY TO POLLUTION

LEGEND

- Municipal Wells
- Private Wells
- DWSMA Vulnerability
 - High
 - Moderate
 - Low
- City Boundary
- Lakes





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2.6 Surface Water System

St. Louis Park's surface water system consists of a combination of natural lakes, ponds, wetlands, and a creek, along with stormwater infrastructure, open channels, and constructed ponds.

2.6.1 Public Waters

The MnDNR designates certain water resources as public waters to indicate those lakes, wetlands, and watercourses over which the MnDNR has regulatory authority. By statute, the definition of public waters includes “public waters” and “public wetlands.” Public wetlands include all type-3, -4, and -5 wetlands (as defined by the U.S. Fish and Wildlife Service) that are 2.5 acres or more in size in incorporated areas.

The MnDNR uses county-scale maps to show the general location of public waters and wetlands under its regulatory authority. These maps are commonly known as public waters inventory (PWI) maps. The regulatory boundaries of these waters and wetlands are called ordinary high-water level (OHWL). PWI maps are available on a county-by-county basis. Additionally, county-by-county lists of these waters are available in tabular form.

The PWI maps and lists are available on the MnDNR Public Waters Inventory webpage: www.dnr.state.mn.us/waters/watermgmt_section/pwi/maps.html.

Public waters are identified with a number and the letter P. Public wetlands are identified with a number and the letter W. Table 2-3 summarizes the MnDNR public waters in St. Louis Park along with the associated OHWL, in cases where they are known. Figure 2-6 shows the location of PWI waterbodies and watercourses within the City of St. Louis Park.

Table 2-3: MnDNR Public Waters in St. Louis Park

Waterbody Name	MnDNR Public Waters Number	OHWL (feet) ¹
<i>Public Waters</i>		
Westwood	27071100	887.8
Unnamed (Kilmer)	27072700	NA
Hannan	27005200	NA
Unnamed (Cobblecrest)	27005300	NA
Victoria	27005100	NA
Lamplighter Park	27071000	NA
Unnamed (Oak Pond)	27066000	NA
Twin	27065600	871.3
Unnamed (Quentin Pond)	27065700	871.3
Bass	27001500	NA

¹ National Geodetic Vertical Datum or NGVD, 1929

Waterbody Name	MnDNR Public Waters Number	OHWL (feet) ¹
Wolfe Park	27066400	872.9
Meadowbrook	27005400	NA
<i>Public Wetlands</i>		
Unnamed (Shelard Pond)	27073000	NA
Unnamed (Crestview Wetland)	27071200	NA
Unnamed (Cedar Manor)	27071300	899.1
Unnamed (Westling Pong)	27071400	NA
Unnamed (Minnehaha Creek Wetland)	27071500	NA
Unnamed (Cedar Lake Road Wetland)	270108700	NA
Unnamed (Cedar Lake Road Wetland)	27065800	NA
Unnamed (Triangle Wetland)	27065900	NA
Unnamed (South Oak)	27066100	NA
Unnamed (Methodist Wetland)	27066200	NA
Unnamed (Excelsior Wetland)	27066300	NA
<i>Public Watercourses</i>		
Minnehaha Creek	27003600	NA

Source: DNR Lake Finder Website

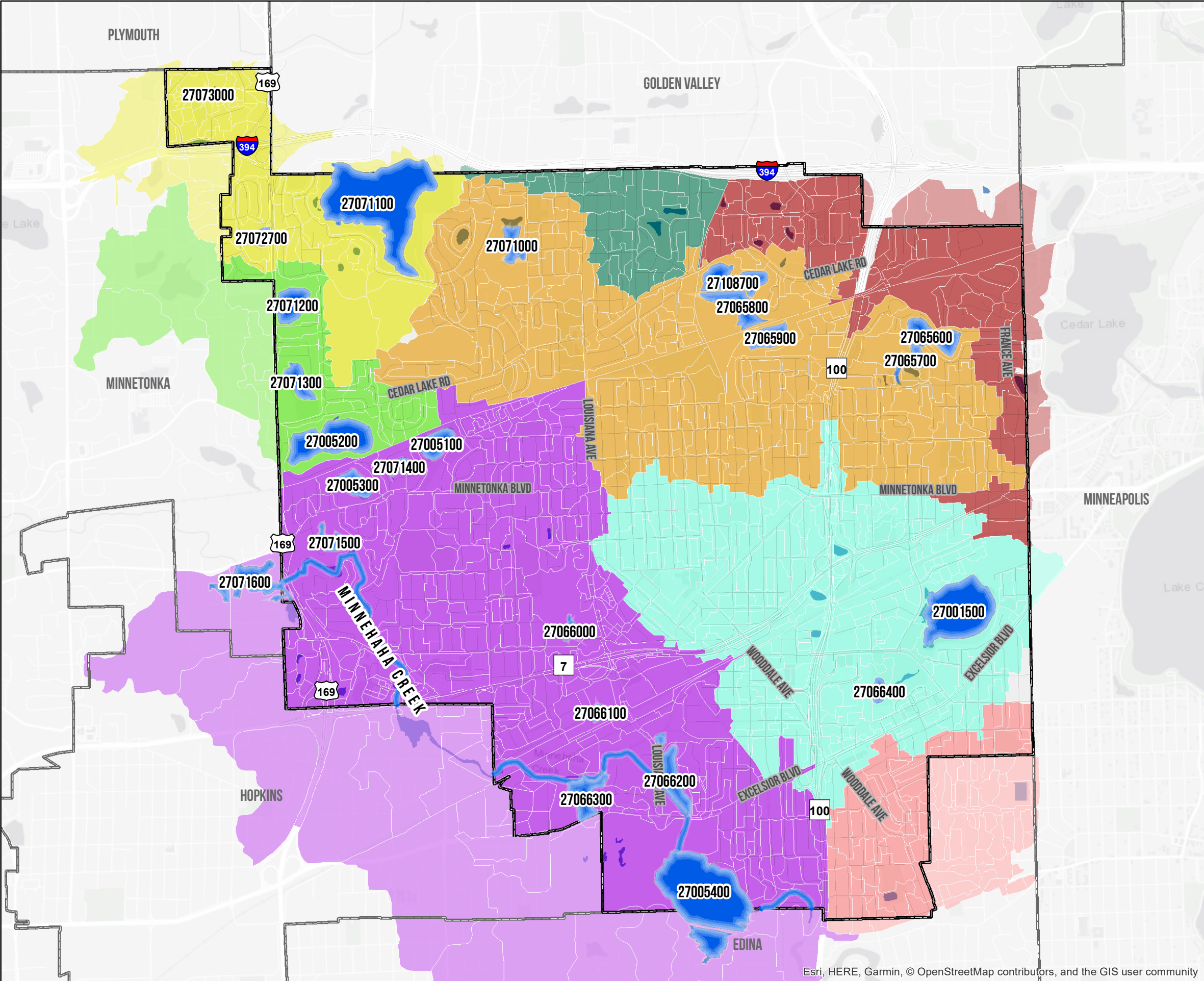
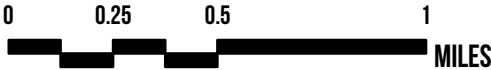




FIGURE 2-6: PUBLIC WATERS INVENTORY (PWD)

LEGEND

- Minnesota Public Waters
- 01-Westwood Lake District (740 acres)
- 02-Golden Valley District (219 acres)
- 03-Hannan Lake District (605 acres)
- 04-Minnehaha Creek District (3,783 acres)
- 05-Twin Lake District (1,636 acres)
- 06-Minneapolis District (649 acres)
- 07-Bass Lake District (1,362 acres)
- 08-Edina District (497 acres)
- City Boundary





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2.6.2 Public Ditches

Judicial ditches and county ditches are public drainage systems established under Chapter 103E of Minnesota Statutes and are under the jurisdiction of the county or a WMO. Judicial ditches and county ditches within St. Louis Park include county ditches 14, 17, and 29, which are located in the MCWD, and judicial ditch 6, which is located in the BCWMC watershed. The authority for the ditches within the MCWD was transferred from Hennepin County to the MCWD, which is now responsible for the maintenance of these ditches, while ditches within the BCWMC remain under the authority of Hennepin County.

County Ditch #14: This ditch was established prior to 1908 and originally connected a wetland northwest of Bass Lake to Bass Lake. It then traveled out of Bass Lake to the east and flowed to the southwest corner of Bde Maka Ska. The portion of the ditch that exists within St. Louis Park has been converted into a storm sewer.

County Ditch #17: This ditch was established in 1908 and was intended to drain a large wetland complex in St. Louis Park, Minneapolis, and Edina. The alignment extends from what is now the intersection of Morningside and Browndale to the outlet of Bde Maka Ska around 37th Street. It has been entirely converted into a storm sewer that does not follow the exact path of the ditch but receives drainage from the same area.

County Ditch #29: This ditch begins around Minnetonka Boulevard and Highway 100 and runs east to its end near the railroad tracks. The ditch has been completely converted into a storm sewer that generally follows the alignment of the former ditch.

Judicial Ditch #6: This ditch began in the City of St. Louis Park and drained areas on the east side of Westwood Lake and the area between Lamplighter Pond and the railroad. This system drained to the north into Golden Valley and Bassett Creek. This ditch has been completely converted into a storm sewer that no longer follows the alignment of the original ditch system. Much of this system now drains to the south and eventually discharges to Minnehaha Creek.

Figure 2-7 shows the location of public (judicial and county) ditches within the City of St. Louis Park.

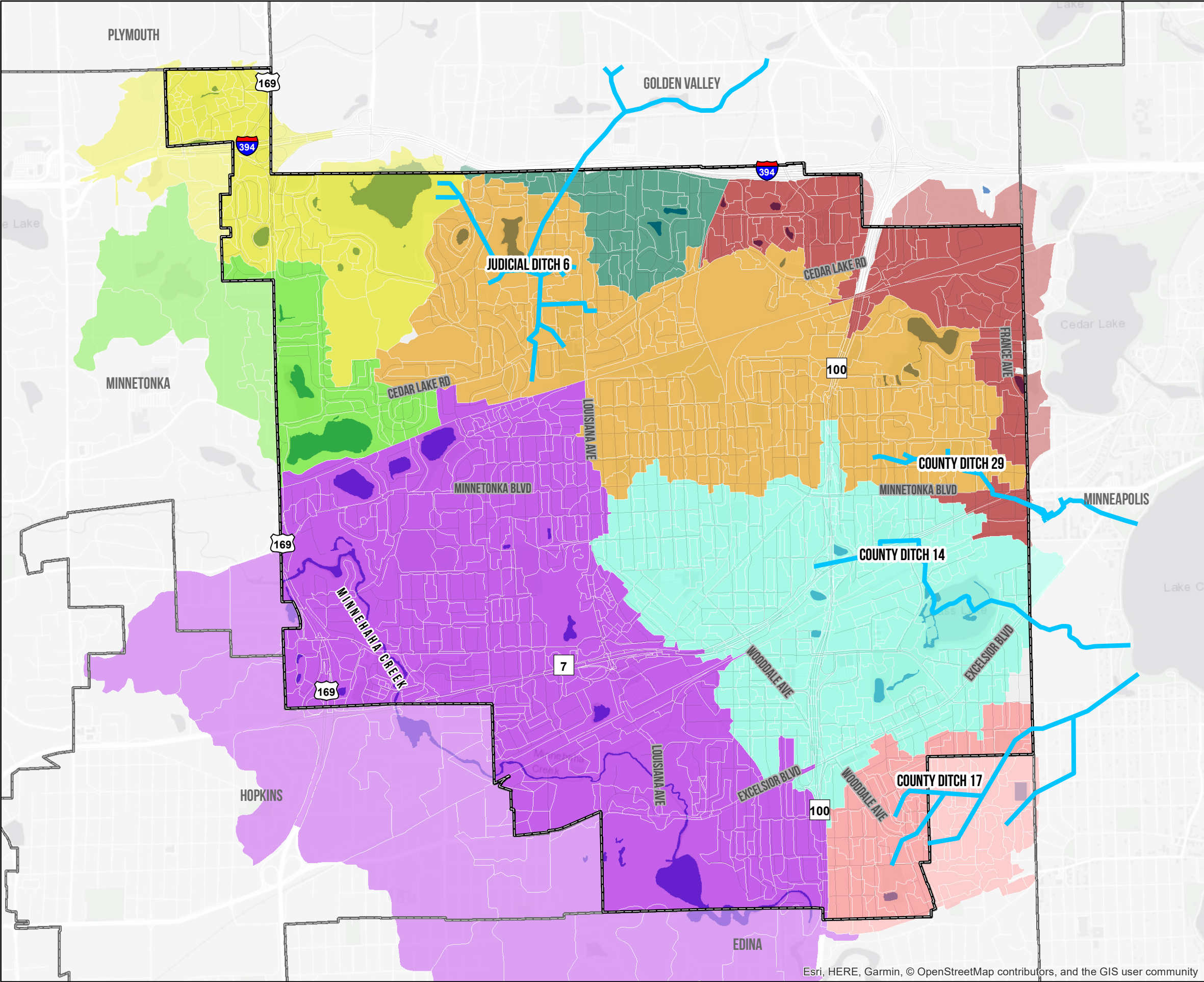
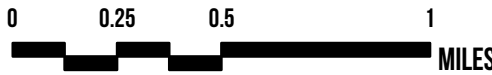


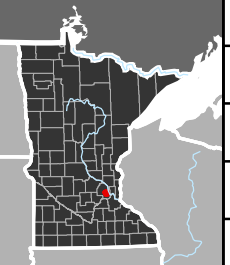


FIGURE 2-7: PUBLIC DITCHES

LEGEND

- Public Ditches
- Minnesota Public Waters
- 01-Westwood Lake District (740 acres)
- 02-Golden Valley District (219 acres)
- 03-Hannan Lake District (605 acres)
- 04-Minnehaha Creek District (3,783 acres)
- 05-Twin Lake District (1,636 acres)
- 06-Minneapolis District (649 acres)
- 07-Bass Lake District (1,362 acres)
- 08-Edina District (497 acres)
- City Boundary





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2.6.3 Streams

Minnehaha Creek is the primary stream within the city. The mainstem of the creek enters St. Louis Park from the west, just south of the intersection of Highway 169 and Minnetonka Boulevard. It flows through the southwest portion of the city before passing through Meadowbrook Lake and entering the City of Edina. Approximately 3.3 stream miles of Minnehaha Creek flow through St. Louis Park. Minnehaha Creek ultimately drains into the Mississippi River.

2.6.4 Wetlands

In 2001, WSB & Associates, Inc. developed a Wetland Management Plan (WMP) for St. Louis Park. The WMP provides a way for the city to manage its wetlands and ensure that wetlands are considered during development review and city-wide planning to balance protection of wetlands with the development and growth of the city.

Wetlands in the city are inventoried and classified into two management categories according to the function and value of the wetlands: Manage I and Manage II. Typically, Manage I wetlands are higher-quality wetlands, wetlands that serve a specific purpose, or wetlands located primarily on public lands. All other wetlands are classified as Manage II.

Management standards based on the wetland classifications were also developed. Most of the wetlands in St. Louis Park are subject to the WCA. MCWD, BCWMC, and MnDOT are LGUs under the WCA, which means they are the permitting authority for any draining or filling of wetlands.

More information about wetland policies and issues can be found in the City of St. Louis Park Wetland Management Plan (City of St. Louis Park (WSB), 2001) and is also in **Appendix D**.

2.7 Stormwater System

The St. Louis Park stormwater system consists of approximately 110 miles of underground pipe that range in size from 12 in. to 102 in., 11 stormwater lift stations, 22 lakes and ponds, and over 3,000 catch basins. Ninety percent of the city streets are serviced by curbs and gutters. The City is developing and maintains a GIS geodatabase of storm sewer coverage for the entire city. This process includes obtaining manhole, catch basin, and pipe information for the entire city. Figure 2-8 shows the city's surface and stormwater systems.

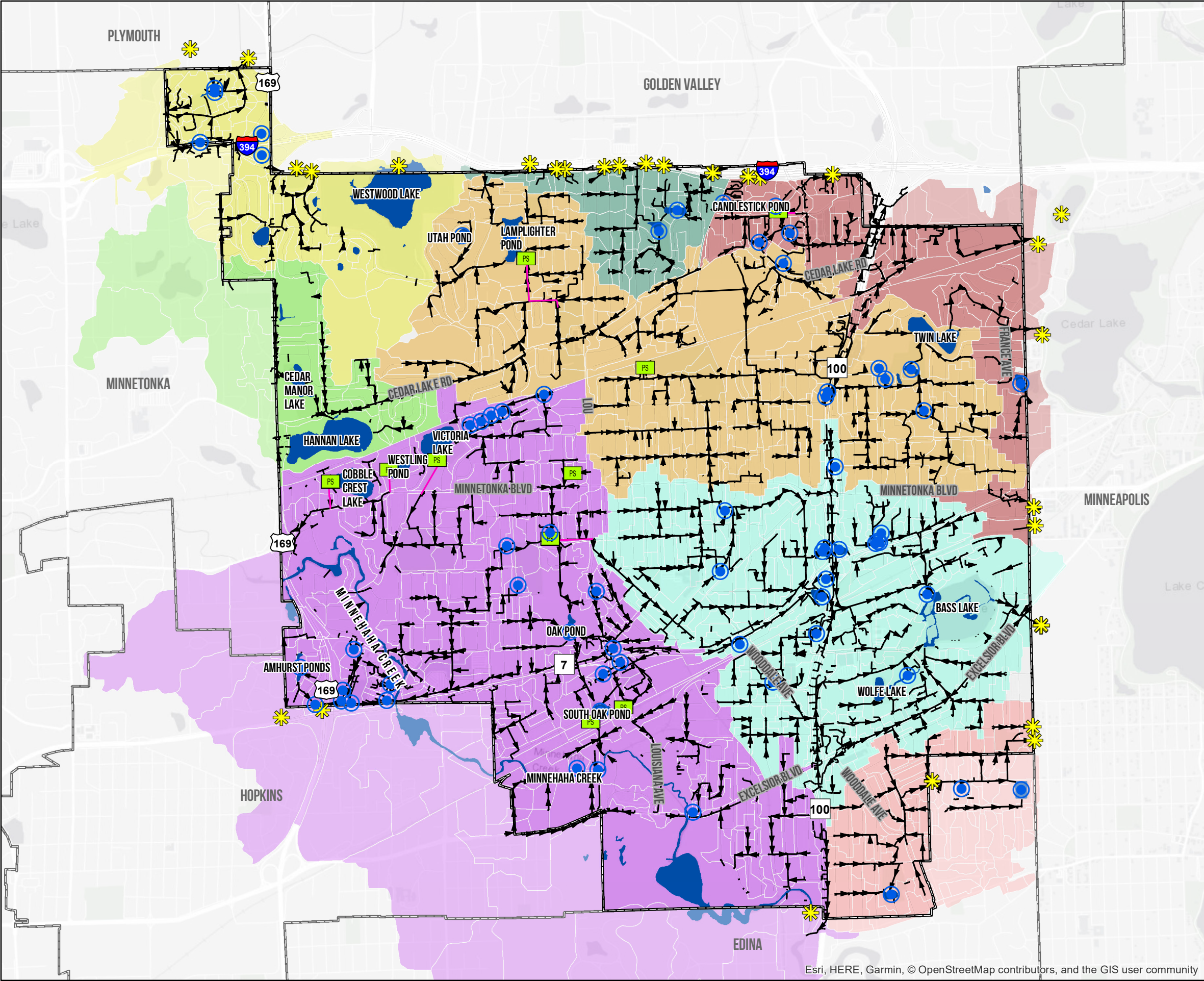


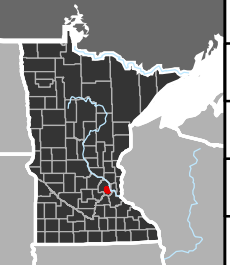


FIGURE 2-8: SURFACE WATER SYSTEM

LEGEND

-  Intercommunity Flow Locations
-  Stormwater BMPs and Wet Ponds
-  Stormwater Lift Stations
-  Stormwater Discharge Points
-  Storm Mains (Gravity)
-  Storm Mains (Pressure)
-  01-Westwood Lake District (740 acres)
-  02-Golden Valley District (219 acres)
-  03-Hannan Lake District (605 acres)
-  04-Minnehaha Creek District (3,783 acres)
-  05-Twin Lake District (1,636 acres)
-  06-Minneapolis District (649 acres)
-  07-Bass Lake District (1,362 acres)
-  08-Edina District (497 acres)
-  City Boundary





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2.8 Watersheds and Drainage Patterns

The natural drainage pattern for the City of St. Louis Park is fairly well-defined. There are two major watersheds within the city, Minnehaha Creek and Bassett Creek. These two watersheds are shown on Figure 2-9. Each of these watersheds are an active watershed management organization, as previously discussed.

These two major watersheds are subdivided into eleven drainage districts, based on the city's regional lakes, which are then further subdivided into smaller catchments (Figure 2-9). Figure 2-10 shows the major watersheds, drainage districts, developed during the most previous 2009 update to the surface water management plan, and based on surface drainage patterns, and major waterbodies in the city.

In addition to these internal drainage districts, the city receives and discharges runoff from neighboring communities (Minnetonka, Plymouth, Edina, Minneapolis), including MnDOT right-of-way (I-394, TH 5, TH 7, TH 100, and TH 169).

As part of this SWMP update, the drainage district boundaries have been updated based on newly available data, including the MnDNR LiDAR data for Hennepin County and recent topographic surveys by city staff.

2.8.1 Bass Lake Drainage District

The Bass Lake drainage district is a 1,362-acre watershed on the east side of the City, bounded by the Twin Lake district to the north and the Minnehaha Creek district to the west. It receives stormwater runoff from TH 100 and CP Railway corridors that bisect the watershed. Major water features include Bass Lake, Wolfe Pond, Cattail Pond, remnants of County Ditch 14, and several MnDOT stormwater ponds. The drainage district ultimately discharges to the City of Minneapolis via the Bass Lake outlet and storm sewer systems (County Ditch 14). The Bass Lake drainage district is connected to the Minnehaha Creek district by the stormwater lift station on Oregon Avenue. It also receives flow from the Twin Lake district via a 30-in RCP at Colorado Ave and Minnetonka Blvd.

Known flood-prone areas include: Problem Area 15 (SW corner of Brunswick Ave and 33rd St), Beltline Blvd & 35th St, 4725 Hwy 7, Bass Lake, City Hall, Cattail Pond.

2.8.2 Edina Drainage District

The Edina drainage district is a 497-acre watershed located in the southeast corner of the City, with roughly half the watershed located in the City of Edina. It is bounded to the north by the Bass Lake drainage district and the west by the Minnehaha Creek drainage district. It is primarily residential with several parks. Major water features include Browndale Pond and Weber Pond in the City of Edina and remnants of County Ditch 17. Stormwater enters the storm sewer system and the City of Edina at Yale Gardens Park, flows through the City of Edina's storm sewer (County Ditch 17) to Weber Pond and is outlet back into the City of St. Louis Park at Minikada Vista Park.

Known flood-prone areas include: Browndale Park and Morningside Road.

2.8.3 Golden Valley Drainage District

The Golden Valley watershed discharges to MnDOT right-of-way, storm sewer and to the City of Golden Valley. It is a 219-acre watershed comprising of primarily residential and commercial land uses, bounded by I-394 to the north and the Canadian Pacific (CP) Railway corridor to the east. Major water features in this drainage district include Otten Pond and Hampshire Pond and remnants of Judicial Ditch 6.

Known flood-prone areas include: Otten Pond

2.8.4 Hannan Lake Drainage District

The Hannan Lake drainage district is a 605-acre watershed which includes direct runoff from the City of Minnetonka and MnDOT right-of-way. This watershed is bounded by the Burlington Northern Santa Fe (BNSF) railroad to the south and the Westwood Lake Drainage District to the north and bisected by Trunk Highway 169. Major water features include Cedar Manor Lake and Hannan Lake. Uniquely this watershed has two land-locked features, the landlocked wetland to the east of TH 169 connected to a large wetland in the City of Minnetonka by a MnDOT culvert, and Hannan Lake itself.

The City provided the MCWD regional XPSWMM model as a basis for the development of this SWMP modeling in this watershed. The MCWD model has been refined within the City of St. Louis Park to reflect the city's stormwater infrastructure and updated topography (2013 MnDNR LiDAR), as well as to include any MnDOT drainage entering the city from TH 169 and stormwater from the City of Minnetonka. The City of Minnetonka was also contacted and provided input on the infrastructure entering the City of St. Louis Park.

Known flood-prone areas include: Land-Locked Wetland, Cedar Manor Lake, Hannan Lake

2.8.5 Minneapolis Drainage Districts

The Minneapolis drainage district is comprised of three subwatersheds in the City of St. Louis Park with a total area of 649 acres that discharge to the City of Minneapolis at several locations. The Minneapolis watersheds receive stormwater from TH 5, TH 7, TH 100, and TH 394, as well as outlet flows from Bass Lake and Twin Lakes. The Minneapolis watersheds ultimately discharge to Brownie Lake, Cedar Lake, Bde Maka Ska, and Weber Pond. In most cases, the Minneapolis drainage district discharges directly to the City of Minneapolis' storm sewer. The City of Minneapolis was contacted however is in the process of developing new hydraulic models at this time and does not have any information to provide to assist with the development of this SWMP modeling and identification of tailwater conditions in the storm sewer. It is assumed that the storm sewer is at capacity.

Major water features in this drainage district include Candlestick Pond, Cedar Meadows Pond, and several private stormwater ponds. There is one stormwater lift station in the Minneapolis

drainage district at Candlestick Pond to provide an artificial outlet for the pond and reduce flooding to neighboring homes.

Known flood-prone areas include: Candlestick Pond

2.8.6 Minnehaha Creek Drainage District

The Minnehaha Creek Drainage District is the largest watershed in the city with 3,783 acres that covers the southwest corner of the City and receives flows Minnehaha Creek, upstream municipalities, and stormwater runoff from MnDOT right-of-way. The watershed is bounded by Trunk Highway 100 to the east, BNSF railroad to the north, and bisected by MnDOT TH 169 and TH 7. The Minnehaha watershed ultimately discharges to the City of Edina via Minnehaha Creek at TH 100. Major water features include Minnehaha Creek, Cobble Crest Lake, Westling Pond, Victoria Lake, Oregon Pond, Sumter Sediment Basin, Oak Pond, and South Oak Pond. There are seven stormwater lift stations in the Minnehaha Creek drainage district to move pump stormwater runoff from low-lying areas to the creek.

The city provided the MCWD regional XPSWMM model as a basis for the development of the current SWMP modeling in this watershed. The MCWD model has been refined within the City of St. Louis Park to reflect the city's stormwater infrastructure and updated topography (2013 MnDNR LiDAR), as well as to include any MnDOT right-of-way drainage entering the City and stormwater from the City of Minnetonka. The City of Minnetonka was also contacted to provide input on the infrastructure entering the City of St. Louis Park.

Known flood-prone areas include: 34th Street Bridge, 36th Street Bridge, 6851 Oxford St, Boone Ave, Cobble Crest Lake, Lake St & Monitor St, Oak Hill Park, 3117 Hillsboro Ave/Minnehaha Creek Wetlands, Methodist Hospital Campus, Meadowbrook Golf Course, Oak Pond, Oregon Ave & Hwy 7 Frontage, Oregon Pond, Westling Pond; Victoria Way new development

2.8.7 Twin Lakes Drainage District

The Twin Lakes drainage district is a 1,636-acre watershed that is located in the northeast corner of the City. It is loosely bounded by the Westwood Lake and Bass Lake drainage districts and receives stormwater runoff from MnDOT TH 100 and the CP and BNSF railroad corridors. Major water features include Utah Pond, Lamplighter Pond, Boneyard Ditch, Twin Lakes Sediment Basin, and Twin Lake, as well as remnants of Judicial Ditch 6 and County Ditch 29. There are two stormwater lift stations in the Twin Lakes watershed; one at Lamplighter Pond and one at Nelson Park to alleviate surface flooding.

The Twin Lakes model interacts with the Bass Lake model by discharge via a 30-in RCP at Colorado Ave and Minnetonka Blvd. The Twin Lakes model also discharges to the Minneapolis models via the Twin Lakes outlet.

Known flood-prone areas include: Lamplighter Pond, Twin Lakes, Peace Presbyterian Church gardens, 2710 Monterey Ave, Northeast Boneyard Ditch.

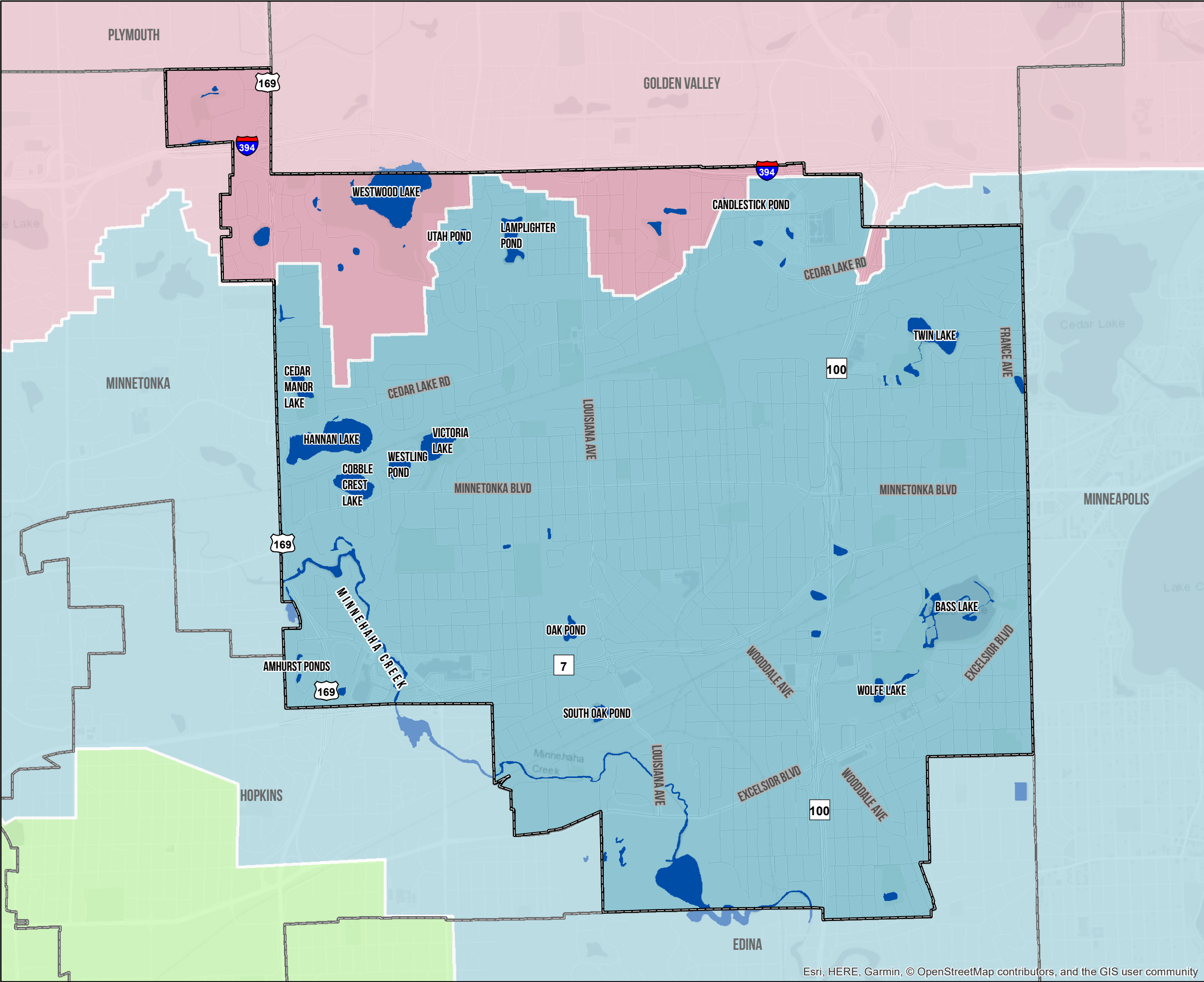
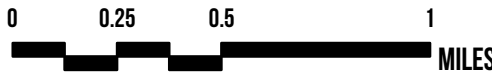


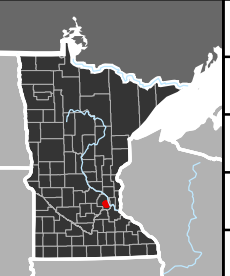


FIGURE 2-9: WATERSHEDS

LEGEND

-  Bassett Creek Watershed Management Commission
-  Minnehaha Creek Watershed District
-  Nine Mile Creek Watershed District
-  City Boundary
-  Lakes





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2.8.8 Westwood Lake Drainage District

The Westwood Lake drainage district is a 740-acre watershed located in the northwest corner of the City of St. Louis Park. It includes Kilmer Pond, Shelard Sedimentation Basin, and Westwood Lake as major water features. This watershed is one of two drainage districts entirely within the Bassett Creek WMC and flows into Bassett Creek directly in the north and indirectly via the Westwood Lake outfall to Golden Valley and their municipal storm sewer.

The City provided the Bassett Creek WMC regional XPSWMM model as a basis for the development of the current SWMP modeling in this watershed. The BCWMC model has been refined within the City of St. Louis Park to reflect the City's stormwater infrastructure and updated topography (2013 MnDNR LiDAR), as well as to include any MnDOT drainage from TH 169 and TH 394.

The Westwood Lake watershed model has been combined with the Plymouth watershed from the previous SWMP study. This is due to the fact there are several connections between these two watersheds that may affect water elevations.

The Westwood Lake model interacts with the BCWMC model on both the upstream and downstream boundaries. It also receives discharge from the MnDOT right-of-way and Cities of Golden Valley, Minnetonka, and Plymouth.

Known flood-prone areas include Kilmer Pond and Westwood Lake.

2.8.9 Intercommunity Flows

There are several intercommunity flows into and out of the City of St. Louis Park, summarized in the following table (Table 2-4).

Table 2-4: Intercommunity Peak Discharge Rates (cfs)

To	100-Year (ATLAS 14)	10-Year (ATLAS 14)	100-Year (TP40)	10-Year (TP40)
City of Minneapolis/ Bass Lake	127.2	70.5	150.0	0.0
City of Minneapolis/Edina	275.9	155.6	189.9	126.6
City of Edina	409.5	243.05	299.48	207.78
City of Golden Valley/ Bassett Creek	353.14	273.83	294.28	246.74
City of Golden Valley	142.89	83.11	99.49	68.85
City of Minneapolis	169.31	100.94	114.49	82.42
City of Minneapolis/ Brownie Lake	404.11	318.43	337.52	295.16
City of Minneapolis/ Cedar Lake	177.48	136.86	156.09	128.02
MnDOT	243.58	164.42	201.21	145.13

To	100-Year (ATLAS 14)	10-Year (ATLAS 14)	100-Year (TP40)	10-Year (TP40)
MnDOT/Golden Valley	322.32	218.3	256.43	176.77
City of Golden Valley	127.2	70.5	150.0	0.0
City of Minneapolis	275.9	155.6	189.9	126.6
City of Minneapolis/ Brownie Lake	409.5	243.05	299.48	207.78
City of Minneapolis/ Cedar Lake	353.14	273.83	294.28	246.74
MnDOT/Minneapolis	142.89	83.11	99.49	68.85
MnDOT/Golden Valley	169.31	100.94	114.49	82.42

2.9 Water-based Recreation Areas

The City of St. Louis Park has 52 parks and open space areas that cover more than 790 acres. About 50 percent of this area comprises open water or wetlands. Additionally, there are about 290 acres of privately-owned golf courses and another 165 acres of open spaces associated with schools and community centers.

Lakes, ponds, and creeks are often key attractions in public parks. Examples within St. Louis Park include Bass Lake, Isaac Walton League/Creekside Park, Minnehaha Creek, Twin Lakes Park, Westwood Hills Nature Center, and Wolfe Park Lake, all of which are presented below in Table 2-5. All water-based recreation in St. Louis Park is limited to noncontact, passive recreation activities, such as canoeing, fishing, hiking and walking on trails around the waterbodies, and wildlife and aesthetic viewing. Figure 2-11 shows the location of these recreational areas as well as the official public access points to lakes and creeks within the City of St. Louis Park.

Table 2-5: St. Louis Park Water-based Recreation Areas

Water and Natural Resource Recreation Areas in St. Louis Park
Bass Lake is a significant part of the city's stormwater system, acting as both a detention and water quality treatment pond. This waterbody also provides significant wildlife habitats and the walking and biking trails around the lake that provide recreation opportunities.
Isaac Walton League/Creekside Park is primarily used as a canoe landing and launching site along Minnehaha Creek.

Water and Natural Resource Recreation Areas in St. Louis Park

Minnehaha Creek and Parkway. Minnehaha Creek is not only a main drainageway through the city; it also offers a corridor of natural habitats within an urban setting, and it provides recreational opportunities such as hiking, canoeing, and nature observation. Throughout the city, much of the land bordered by the creek is publicly owned.

Minnehaha Creek Parkway provides two canoe landing and creek access locations. These access locations include crossings at Louisiana Avenue and at 37th Street. The city, along with other communities along Minnehaha Creek, has worked with the MCWD to create a detailed canoe map to increase public awareness and use of the creek.

Twin Lakes Park includes a lake and wetland that are major components of the drainage system in the northern portion of the city, providing flood control as well as water quality treatment. Water from the Twin Lakes eventually drains to Cedar Lake and the Minneapolis Chain of Lakes.

Westwood Hills Nature Center is owned and operated by the City of St. Louis Park. It encompasses a total of 150 acres, of which 90 acres are wetlands. Westwood Hills Nature Center is composed of 60 percent wetland (including one small lake), 35 percent woodland, and 5 percent grassland/prairie. The center conducts year-round programs for visitors of all ages to increase their understanding and appreciation of our natural world and aspects of surface water quality and quantity management. There are three miles of walking and hiking trails, including a loop around Westwood Lake.

Wolfe Park is part of the recent town center development called Park Commons. The park includes a variety of recreational opportunities, such as the REC Center, which offers indoor ice rinks, an outdoor recreation center known as the ROC, and an amphitheater. There are several ponds in the park that provide stormwater detention and create recreational opportunities such as outdoor ice skating in the winter. In addition, there are walking and biking trails throughout the park.

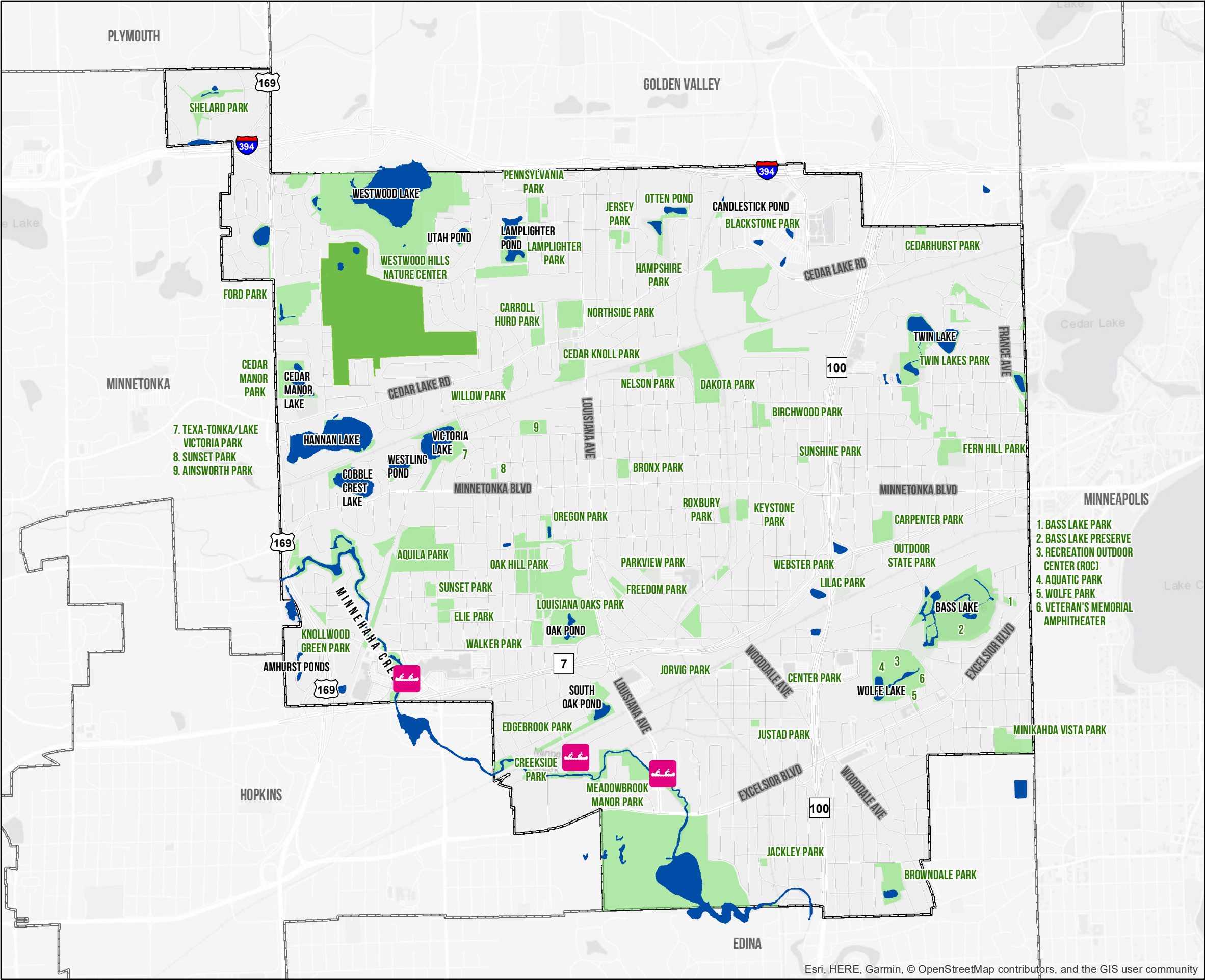




FIGURE 2-11: RECREATION AREAS AND PUBLIC ACCESS

LEGEND

-  Paddling Access
-  Golf Courses
-  Park and Open Space
-  Lakes
-  City Boundary



0

0.25

0.5

1

MILES



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2.10 Wildlife and Aquatic Habitat

The waterbodies and open spaces interspersed throughout the city provide habitats for numerous fish and wildlife species, including birds, mammals, and reptiles. Ducks and geese are present in large numbers in the lakes, wetlands, and open water areas. Vegetative cover in the undeveloped open areas support many mammalian species such as deer, raccoon, squirrels, chipmunks, and rabbits. The numerous wetlands in St. Louis Park provide habitats for a variety of aquatic species, including snakes, turtles, and frogs.

2.10.1 Fisheries

Wolfe Lake, Westwood Lake, and Lamplighter Pond are stocked regularly with several species of fish. Through a partnership with Fishing in the Neighborhood, an MnDNR program, the city can provide fishing piers and annually stock fish such as bluegills, crappies, northern pike, largemouth bass, and yellow perch. Wolfe Lake was stocked with black crappie and bluegill in 2015, yellow perch in the spring of 2016, and northern pike in the fall of 2016. Westwood Lake was stocked with bluegill in 2015 and 2016. Lamplighter Lake was stocked with black crappie and bluegill in 2015 and with bluegill and pumpkinseed in 2016 and 2017.

A fish survey was conducted in July 2017 at Wolfe Lake. Bluegill, pumpkinseed, and largemouth bass were found in high abundance. Northern pike and black crappie were moderately abundant. Black bullheads and white suckers were found in low abundance.

A fish survey was conducted in October 2009 at Meadowbrook Lake in the Minnehaha Creek corridor. A total of 12 fish species were sampled, including black crappie, dogfish, and pumpkinseed. Black bullheads were the dominant fish species, with a population well above the normal range. Overall, the survey was dominated by low-oxygen-tolerant species like bullheads, carp, and dogfish. This likely has an adverse impact on water quality in the creek and in shallow, connected lakes like Meadowbrook Lake.

2.10.2 Invasive Aquatic Species

Several lakes in St. Louis Park are considered “infested waters” by the MnDNR because they contain aquatic invasive species (AIS). AIS are introduced to new locations, where they are able to rapidly spread, outcompete native species and cause harm to the native habitats. For example, Twin Lake, Wolfe Lake, and Minnehaha creek contain Eurasian watermilfoil. Minnehaha Creek also contains flowering rush, and the creek between Minnetonka and Lake Nokomis contains zebra mussels.

In order to prevent their spread through local lakes, a rapid response plan has been created to contain AIS and eliminate them from threatening local lakes (Barr, 2018). This response plan only works when it is used for AIS which are detected early in their infestation or

before it is distributed widely in a lake (Barr, 2018). Barr, on behalf of the BCWMC, has prepared a report “BCWMC Aquatic Invasive Species Rapid Response Plan”, which identified “Priority 1” lakes – those with public access or adjacent public land – and lays out a framework for response to newly detected AIS (2018). Westwood Lake is a Priority 1 lake in St. Louis Park (Barr, 2018).

The AIS Rapid Response Plan for Westwood Lake developed by Barr is as follows:

1. Notify MnDNR of AIS infestation and MnDNR then verifies the infestation.
 - a. BCWMC/SLP/WHNC: The first entity to find or be notified of AIS infestation contacts MnDNR and other agencies (BCWMC/SLP/WHNC).
 - b. MnDNR: verifies infestation.
2. Communicate the infestation to stakeholders (including those downstream) and the public.
 - a. SLP/WHNC: In conjunction with or immediately following MnDNR press release, communicates infestation to all stakeholders and the public.
 - b. MnDNR: Issues press release prior to or in conjunction with stakeholder communication.
3. Monitor the extent of the infestation.
 - a. BCWMC/SLP/WHNC: The entity taking the lead depends on the scale of the project. For small projects, SLP performs the monitoring or hires a contractor. For larger projects, BCWMC hires a contractor to perform the monitoring.
 - b. MnDNR: Collaborates with SLP, BCWMC and MAISRC.
 - c. MAISRC: Collaborates with SLP, BCWMC and MnDNR on monitoring design.
4. Determine if isolation of the infestation is necessary and if so, isolate the AIS.
 - a. BCWMC/SLP/WHNC/MnDNR: Make a uniform decision after collaborating as needed with MAISRC. SLP implements quarantine for small projects; BCWMC implements for large projects.
5. Collaborate with MnDNR, MAISRC and stakeholders to determine what rapid response treatment or removal method is appropriate.
 - a. For small projects, SLP will make the decision after considering recommendations from BCWMC/MnDNR/MAISRC.

- b. For large projects, BCWMC will make the decision after considering recommendations from SLP/MnDNR/MAISRC.
- 6. Obtain a treatment/removal permit from MnDNR.
 - a. BCWMC: Works with MnDNR to obtain treatment/removal permit for large projects.
 - b. SLP/WHNC: Works with MnDNR to obtain treatment/removal permit for small projects.
 - c. MnDNR: Works with BCWMC/SLP/WHNC to issue treatment/removal permit.
 - d. MAISRC: Collaborates with BCWMC/SLP/WHNC/MnDNR to provide technical information.
- 7. If required (by MnDNR permit), perform additional pre-treatment monitoring.
 - a. For small projects, SLP/WHNC performs the monitoring or hires a contractor.
 - b. For large projects, BCWMC hires a contractor to perform the monitoring.
 - c. MnDNR: Collaborates with BCWMC/SLP/WHNC/MAISRC regarding monitoring requirements of the permit.
 - d. MAISRC: Collaborates with BCWMC/SLP/WHNC/MnDNR regarding monitoring design.
- 8. Hire a contractor to perform the AIS rapid response treatment or removal.
 - a. For a small project, SLP/WHNC hires the contractor to perform the treatment/removal.
 - b. For a large project, it will be a collaborative effort with BCWMC taking the lead.
- 9. Fund the AIS treatment/removal.
 - a. BCWMC: Partners with Hennepin County and SLP to fund larger projects.
 - b. SLP/WHNC: Seeks Hennepin County AIS rapid response monies if available. If they are not available and the project is small SLP funds it. For larger projects, SLP partners with BCWMC and Hennepin County to fund it.
 - c. Hennepin County: Considers providing AIS rapid response grand funding if available.

10. Perform, or hire a contractor to perform, post-treatment monitoring to determine the effectiveness of the treatment/removal.
 - a. For a small project, SLP/WHNC performs the monitoring or hires a contractor.
 - b. For a large project, BCWMC hires a contractor to perform the monitoring.
 - c. MnDNR: Collaborates with BCWMC/SLP/WHNC/MAISRC regarding monitoring requirements of the permit.
 - d. MAISRC: Collaborates with BCWMC/SLP/WHNC/MnDNR regarding monitoring design.
11. Communicate information about the treatment/removal and its effectiveness to stakeholders (including those downstream) and the public.
 - a. BCWMC: Collaborates with SLP/WHNC/MnDNR.
 - b. SLP/WHNC: Communicates about the AIS infestation and management after collaborating with BCWMC and MnDNR.
12. Design and implement an education program to help prevent future AIS infestation.
 - a. Collaboration between SLP/WHNC and BCWMC.
 - i. SLP/WHNC takes the lead to educate City staff.
 - ii. SLP/WHNC collaborates with BCWMC to obtain available education materials to disseminate.
 - b. MnDNR: Provides any available education materials to SLP.
 - c. MAISRC: May provide available education materials to SLP.

(Barr, 2018: “BCWMC Aquatic Invasive Species Rapid Response Plan”)

2.10.3 Unique Features and Scenic Areas

Westwood Hills Nature Center is a unique and scenic area in the City of St. Louis Park. The center, which is nestled in an urban setting, houses a large variety of wildlife including deer, raccoon, waterfowl, egrets, blue herons, mink, red fox, grey squirrel, red squirrel, flying squirrel, painted and snapping turtles, American toads, barred owls, great horned owls, Cooper’s hawks, and bats.

The MnDNR Natural Heritage Program and Nongame Wildlife Program maintain a database of rare plant and animal species and significant natural features. This database does not include any records of rare species or ecosystems found in St. Louis Park. Other

information was reviewed to determine whether other unique features are present in St. Louis Park. Based on this review, no “outstanding resource value waters” (Minnesota Rules, 7050.0180), no designated Scientific and Natural Areas (Minn. Stat. 86A.05), no State Wildlife Management Areas (Minn. Stat. 86A.05), and no State Aquatic Management Areas (Minn. Stat. 86A.05) are located within the city of St. Louis Park.

2.11 Pollutant Sources

2.11.1 Groundwater Contamination Hazards

There are currently two EPA superfund sites within the city that have resulted in significant groundwater contamination (MPCA, 2006). The first site is the Reilly Tar site. This 80-acre site was the location of the old Republic Creosote operation from 1917–1972. There, extensive soil and groundwater contamination occurred, resulting from the discharge of contaminated wastewater overland to wetlands adjacent to Minnehaha Creek as well as from spills. Six of St. Louis Park’s municipal wells were closed due to the contamination of the Prairie du Chien-Jordan aquifer by polynuclear aromatic hydrocarbons. The city continues to monitor the groundwater in several different aquifers.

Additionally, the city continues to run gradient control wells, to pump and treat the groundwater. Between 2011 and 2014, the EPA conducted an extensive study into possible vapor intrusion from site contamination on properties on and near the site. EPA and its contractors took samples from indoor air; soil gas beneath the basements and foundations; and off-site, background soil gas, and the results showed no danger to humans from vapor intrusion. All of the contaminants detected in the indoor air were graded to be within EPA’s acceptable ranges (EPA, 2015).

The second site is the Schloff Chemical site. This was the site of a chemical supply company that primarily distributed bulk 1,1,2,2, -Tetrachloroethylene. The soil, ground, and surface waters are contaminated with volatile organic compounds (VOCs). Interim remedial actions were implemented by Schloff Chemical, and the MPCA implemented the final remedial actions and conducted the operations and maintenance of the site. The Unterdruck-Verdampfer-Brunnen wells and equipment were removed, and several monitoring wells were abandoned. The MPCA is studying the site further to evaluate the effects of natural attenuation at this site.

2.11.2 Hazardous Waste and Materials

Figure 2-12 shows the approximate location of registered storage tanks, hazardous waste generators, leaking above- and below-ground tanks, dump sites, and Voluntary Investigation and Cleanup (VIC) sites, as obtained from the Hennepin County Department of Environmental Services. The original data source is the MPCA. The Hennepin County

Department of Environmental Services should be contacted for details about specific sites, because many of the sites have been cleaned up or are in the clean-up process now.

The MPCA VIC Program provides technical assistance and administrative and/or legal assurances for individuals or businesses seeking to investigate or clean up contaminated property and to bring contaminated land back into productive use. The City of St. Louis Park's Hazardous Materials Emergency Response Plan establishes procedures for the migration of hazardous material incidents (i.e., a spill, leak, or release of a hazardous material). The city's fire department is responsible for the implementation of this plan.

2.12 Water Quality

Historically, as the city developed, the city's lakes and ponds have been used for stormwater runoff detention in association with flood protection efforts. Unfortunately, the urbanization of a watershed often accelerates the degradation of waterbodies through a natural process known as eutrophication. Nonpoint source pollution associated with stormwater runoff creates adverse impacts; the degree of impact depends on the waterbody's natural ability to remove, absorb, or process the pollutants through chemical, physical, or biological processes. Poor water quality usually indicates a situation where the resource receives more nutrients or other pollutants than can be processed naturally.

The water quality management activities in the city have included the inventorying and monitoring of the water resources to provide an understanding of the water quality of the city's waterbodies. Waterbodies that are managed as lakes are classified based on the MPCA's shallow and deep lake criteria, which establish water quality goals and standards that, if met, will help prevent additional waterbodies from being listed on the MPCA 303(d) impaired waters list.

Additionally, the pollutant loading from all the key waterbodies within the city were modeled using the recently updated city-wide EPA SWMM modeling. This evaluation was used to estimate pollutant loads to the impaired waterbodies in the city as well as provide a baseline to determine the pollutant removal efficiencies of the waterbodies future water quality improvement projects and regional BMPs. Additionally, the model can be used to evaluate the impact of proposed development and BMPs on pollutant load reductions.

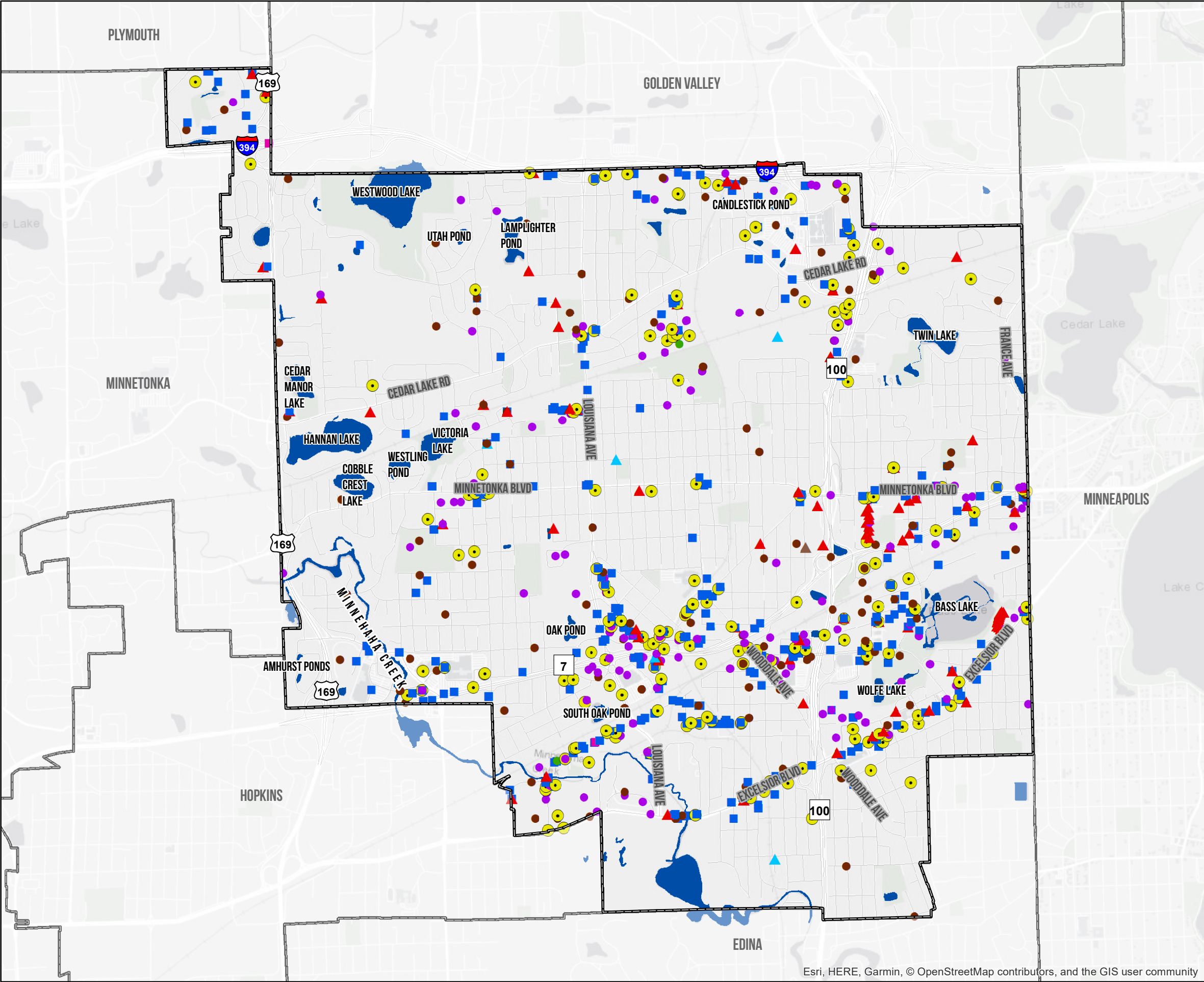
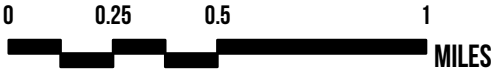




FIGURE 2-12: HAZARDOUS WASTE SITES

LEGEND

- Multiple Programs
- Air Quality
- Hazardous Waste
- Investigation and Cleanup
- Solid Waste
- Stormwater
- SSTs
- Tanks
- Water Quality
- Lakes
- City Boundary





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2.12.1 Water Quality Monitoring

The quality of water resources within the City of St. Louis Park has been monitored by a variety of agencies. These groups include BCWMC, MCWD, and the Metropolitan Council Citizen Assisted Monitoring Program (CAMP). Figure 2-13 shows the location of the various water quality (as well as water quantity) monitoring sites within St. Louis Park.

General information about lakes and monitoring data can also be found at the Mn <https://www.dnr.state.mn.us/lakefind/index.html>.

2.12.1.1 BCWMC

The BCWMC has performed detailed water quality monitoring of Westwood Lake. This detailed monitoring includes evaluation of chemically -based water quality parameters as well as biota such as zooplankton, phytoplankton, and macrophytes. Water quality samples were collected monthly from April through September. The water quality parameters that were monitored included dissolved oxygen, temperature, specific conductance, pH, Secchi disc transparency, total phosphorus, soluble reactive phosphorus, total nitrogen, and chlorophyll-a. Biota sampling for zooplankton and phytoplankton occurred monthly from April through September. Macrophyte surveys were completed in June and August. The most recent water quality data for Westwood Lake is summarized in the BCWMC 2015 Lake Water Quality Study: Westwood Lake (BCWMC, 2016). For more information related to the water quality monitoring performed by BCWMC, see www.bassettcreekwmo.org/projects/all-projects/westwood-lake-water-quality-improvement-project.

2.12.1.2 MCWD

MCWD does not monitor any of the lakes or wetlands within the City of St. Louis Park. However, the MCWD does monitor water quality at 10 stations along the length of Minnehaha Creek, including two within the City of St. Louis Park. The first station is located at the 34th Street crossing (MCWD ID: CMH02). The second station is at the Excelsior Boulevard crossing (MCWD ID: CMH11).

Each year, from mid-March through mid-October, MCWD staff collect weekly grab samples and analyzes them for a variety of parameters including dissolved oxygen, total phosphorus, total suspended solids, and chloride. The MCWD staff also performs biweekly testing for the presence of *E. coli* bacteria.

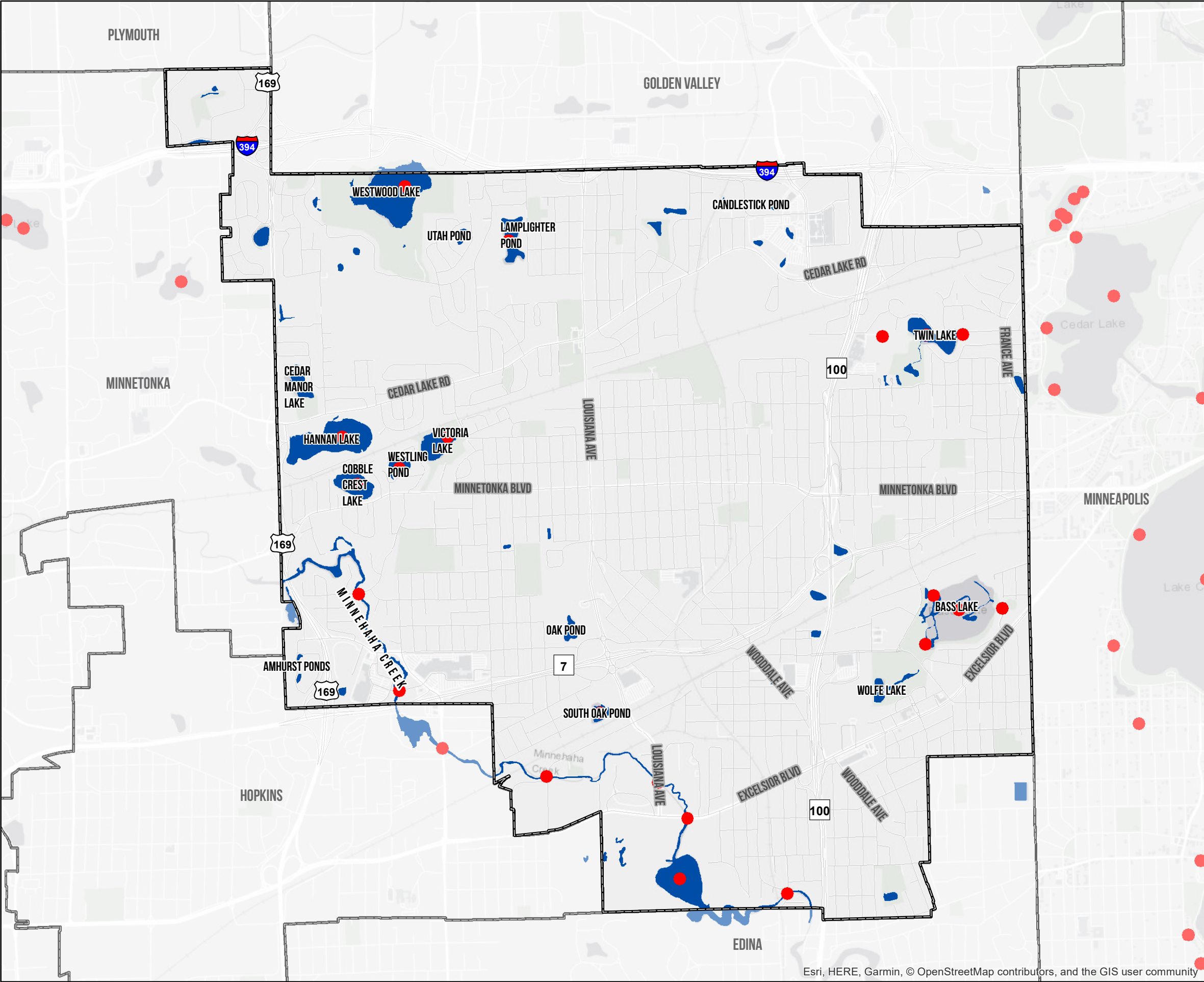
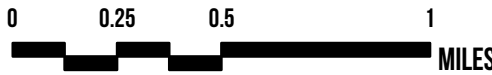


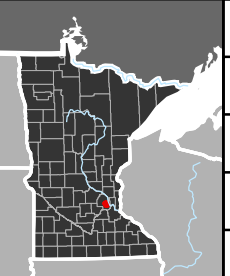


FIGURE 2-13: WATER QUALITY AND QUANTITY MONITORING

LEGEND

- Monitoring Sites
- Lakes
- City Boundary





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In 2013, the MPCA collected aquatic macroinvertebrates in Minnehaha Creek from Lake Minnetonka to the Mississippi River and from five tributary streams to Lake Minnetonka. These same sites were monitored in 2003 by MCWD.

In 2015, selected sites from Minnehaha Creek and the tributary streams to Lake Minnetonka were monitored again. The 2015 results had some variation from 2013 but overall were similar in showing the impact of urbanization and stream channelization in this area. The results of this study can be found in the Macroinvertebrate Assessment report (MCWD, 2015).

More information about the water quality monitoring the MCWD performs is available at www.minnehahacreek.org/project?field_city_tid=All&field_project_type_tid=781.

2.12.1.3 Other Monitoring Programs

The Metropolitan Council's CAMP has been collecting water quality data on several Twin Cities metropolitan area lakes since 1980. On a biweekly basis (April–October), citizen volunteers collect a surface water sample for laboratory analysis of total phosphorus, total Kjeldahl-nitrogen, chlorophyll-*a*, and a Secchi transparency measurement, and they provide some information about each lake's physical and recreational condition. Five lakes within St. Louis Park have been monitored as part of the CAMP program: Cobblecrest, South Oak, Twin, Bass, and Westwood Lakes.

For more information about the CAMP program, please see the following website: <https://metro council.org/Wastewater-Water/Services/Water-Quality-Management/Lake-Monitoring-Analysis.aspx>.

2.12.2 Water Quality Management Classification

MPCA, MnDNR, MCWD, and BCWMC have all established their own methods of classifying water resources based on their water quality. St. Louis Park will manage its waterbodies using the MPCA's criteria if they are stricter than the criteria outlined by the WMOs; otherwise, the WMO water quality criteria will apply. The City of St. Louis Park is located in the North Central Hardwood Forest (NCHF) ecoregion of Minnesota and manages its lakes based on the criteria for this ecoregion.

Table 2-6 provides a summary of the major waterbodies within the City of St. Louis Park, their physical characteristics, a summary of the most recent water quality data, and the water quality management classifications and goals set by the various agencies. More detailed information on each of the management classification systems is included in the following sections.

2.12.2.1 Watershed Management Organization Classification

Each WMO has developed its own method to classify waterbodies based on their water quality, desired uses, and water quality goals. Table 2-7 summarizes each of the WMOs' water quality classification systems. MCWD is in the process of revamping its waterbodies classification system to the ecosystem evaluation assessment program or E-Grade. The information presented is what currently exists for waterbodies in the City

Table 2-6: Summary of Physical Characteristics, Water Quality, and Management Classifications for Water Resources in St. Louis Park, MN

Waterbody Name	Waterbody Physical Characteristics		Most Current Water Quality Conditions	Waterbody Classification by Regulatory Agency				
	Surface Area (Acres)	Max Depth (feet)		City Water Quality Goals	Watershed Organization & Classification	MPCA Shallow Classification & Criteria	MPCA 303(d) Impaired Waters List	City Wetland Management Classification
Westwood	92.8	5.0	Year of Record: 2007 [TP] = 47 µg/L [Chla] = 11.6 µg/L SD = 1.3 m	TP < 45 µg/L Chla < 20 µg/L SD > 1.4 m	BCWMC Priority 1 - Shallow lake TP < 60 µg/L Chla < 20 µg/L SD > 1.0 m	NCHF -- Shallow TP < 60 µg/L Chla < 20 µg/L SD > 1.0 m	N/A	Manage I
Cobblecrest	8.5	N/A	Year of Record: 2007 [TP] = 168.5 µg/L [Chla] = 126.4 µg/L SD = 0.3 m	TP < 60 µg/L Chla < 20 µg/L SD > 1.0 m	MCWD/2006 F TP > 152 µg/L Chla > 77 µg/L SD < 0.7 m	NCHF - Shallow TP < 60 µg/L Chla < 20 µg/L SD > 1.0 m	Yes - See Table 2-8	Manage II
Twin	12.4	N/A	Year of Record: 2007 [TP] = 154.1 µg/L [Chla] = 62.1 µg/L SD = 0.5 m	TP < 60 µg/L Chla < 20 µg/L SD > 1.0 m	MCWD/2006 D TP = 62-152 µg/L Chla = 48 - 77 µg/L SD = 1.2 - 0.7 m	NCHF - Shallow TP < 60 µg/L Chla < 20 µg/L SD > 1.0 m	Yes - See Table 2-8	Manage II
Bass	52.2	N/A	Year of Record: 2006 ² [TP] = 195.5 µg/L [Chla] = 12 µg/L SD = 0.9 m	TP < 60 µg/L Chla < 20 µg/L SD > 1.0 m	N/A	NCHF - Shallow TP < 60 µg/L Chla < 20 µg/L SD > 1.0 m	N/A	Manage I
Hannan	34.6	N/A	Year of Record: 1991 ⁷ [TP] = 220 µg/L [Chla] = 205 µg/L SD = 0.25 m	TP < 60 µg/L Chla < 20 µg/L SD > 1.0 m	N/A	NCHF - Shallow TP < 60 µg/L Chla < 20 µg/L SD > 1.0 m	N/A	Manage II
Victoria	9.2	N/A	N/A	TP < 60 µg/L Chla < 20 µg/L SD > 1.0 m	N/A	NCHF - Shallow TP < 60 µg/L Chla < 20 µg/L SD > 1.0 m	N/A	Manage II
Lamplighter	7.6	N/A	N/A	TP < 60 µg/L Chla < 20 µg/L SD > 1.0 m	N/A	NCHF - Shallow TP < 60 µg/L Chla < 20 µg/L SD > 1.0 m	N/A	Manage II

Waterbody Name	Waterbody Physical Characteristics		Most Current Water Quality Conditions	Waterbody Classification by Regulatory Agency				
				City Water Quality Goals	Watershed Organization & Classification	MPCA Shallow Classification & Criteria	MPCA 303(d) Impaired Waters List	City Wetland Management Classification
	Surface Area (Acres)	Max Depth (feet)						
Wolfe	2.5	N/A	N/A	TP < 60 µg/L Chla < 20 µg/L SD > 1.0 m	N/A	NCHF - Shallow TP < 60 µg/L Chla < 20 µg/L SD > 1.0 m	N/A	Manage II
Meadowbrook ³	74.6	N/A	N/A	TP < 60 µg/L Chla < 20 µg/L SD > 1.0 m	N/A	NCHF - Shallow TP < 60 µg/L Chla < 20 µg/L SD > 1.0 m	N/A	Manage I
Unnamed	2.8	N/A	N/A	TP < 60 µg/L Chla < 20 µg/L SD > 1.0 m	N/A	NCHF - Shallow TP < 60 µg/L Chla < 20 µg/L SD > 1.0 m	N/A	Manage II
Unnamed	2.7	N/A	N/A	TP < 60 µg/L Chla < 20 µg/L SD > 1.0 m	N/A	NCHF - Shallow TP < 60 µg/L Chla < 20 µg/L SD > 1.0 m	N/A	Manage II
Unnamed	10.6	N/A	N/A	TP < 60 µg/L Chla < 20 µg/L SD > 1.0 m	N/A	NCHF - Shallow TP < 60 µg/L Chla < 20 µg/L SD > 1.0 m	N/A	Manage II
Minnehaha Creek	N/A	N/A	N/A	N/A	-	N/A	Yes - See Table 2-8	-

Table 2-7: Summary of the WMO Water Quality Classification Systems

Water Quality Category	Desired Recreational Use	Desired Total Phosphorus Concentration (µg/L)	Desired Chlorophyll- <i>a</i> Concentration (µg/L)	Desired Secchi Disc Depth (meters)
Priority 1 - Deep lake	N/A	40	14	1.4
Priority 1 - Shallow lake	N/A	60	20	1
Priority 2 - Shallow lake	N/A	60	20	1
Minnehaha Creek Watershed District				
A	Crystal clear, beautiful. These lakes are exceptional and are enjoyed recreationally without question or hesitation.	< 23	< 10	> 3
B	These lakes generally have good water quality, but algae may limit swimming, particularly toward the end of summer.	23 - 32	10 - 20	3.0 - 2.2
C	Average quality. Swimming, boating, and fishing may be undesirable relatively early in the season. Algae blooms occasionally.	32 - 68	20 - 48	2.2 - 1.2
D	These lakes have severe algae problems. People are generally not interested in recreation on these lakes.	68 - 152	48 - 77	1.2 - 0.7
F	Not enjoyable. Such a lake would have severe limitations to recreational use.	> 152	> 77	< 0.7

a. BCWMC

The BCWMC classifies waterbodies into four levels based on desired water quality goals and recreational uses. The degree to which a waterbody can support a particular recreational use is primarily controlled by the quality of the water. The BCWMC established goals for total phosphorus and chlorophyll-*a* concentrations as well as for Secchi depth, because these are the parameters that are typically used to determine water quality. Level -I waterbodies have good water quality that supports all recreational uses, whereas Level -IV classifications indicate very poor water quality with uses primarily for runoff management.

b. MCWD

The MCWD's lake water quality rating is based on the standards established by the Metropolitan Council. This system assigns a water quality grade to each waterbody based on the summer average total phosphorus and chlorophyll-a concentrations as well as the Secchi depth. The total grade for the waterbody is the average of the grades for each of the three parameters. Grades are an indicator of the perceived condition of the open waterbody but are not a water quality goal. A grade of A indicates very good water quality, whereas a grade of F indicates very poor water quality.

As mentioned, the MCWD is in the process of migrating to the E-Grade system for classifying waterbodies. The MCWD felt its current method of grading the health of its waters only provides a partial picture of lake health by looking only at three factors: phosphorus, chlorophyll and water clarity. The E-grade would consider biodiversity, habitat diversity, nutrient cycling, recreation potential and flood control. The E-grade release for resources within the City is unknown.

Several waterbodies in the City of St. Louis Park are included on the MPCA 2018 draft impaired waters [303(d)] list. These waterbodies include Twin Lake, Cobblecrest Lake, and Minnehaha Creek. Typically, impaired waters are listed as such when they exceed the MPCA ecoregion eutrophication criteria for a given waterbody. Waterbodies on the impaired waters list are required to have a total maximum daily load (TMDL) assessment completed that addresses the causes and sources of the impairment and provides a waste load allocation (WLA) needed to restore them. Figure 2-14 shows the location of the impaired waters within the City of St. Louis Park, and Table 2-8 includes a summary of the impaired lakes, including the reason for impairment. WLA for Twin and Cobberstone Lakes has not been assessed. Minnehaha Creek /Lake Hiawatha TMDL was done and the city's approximate WLA is 333 pounds per growing season or 2.7 pounds per day (Tetra Tech, 2013).

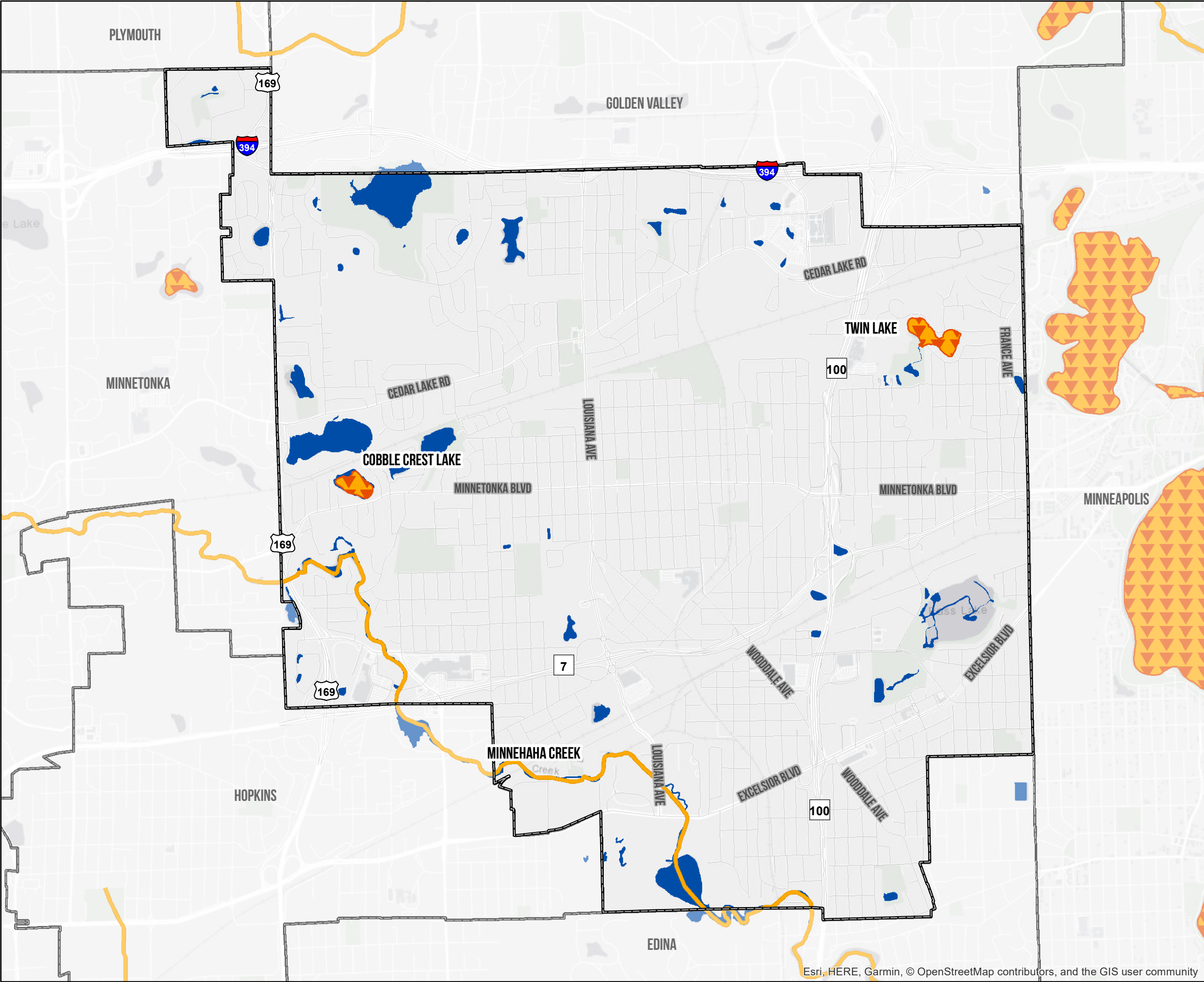




FIGURE 2-14: IMPAIRED WATERS

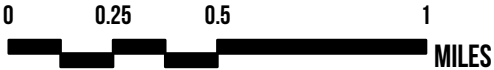
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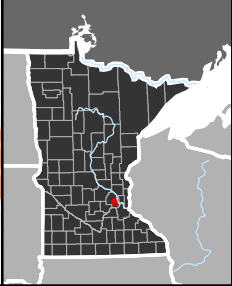
- Impaired Streams
- Impaired Lakes
- Lakes
- City Boundary

MINNEHAHA CREEK SUMMARY:
Impaired uses: Recreation
TMDL needed for: Dissolved Oxygen, Fish Bioassessments, Aquatic Macro-Invertebrate Bioassessments
TMDL Approved For: Chlorides, Fecal Coliform

TWIN LAKE SUMMARY:
Impaired Uses: Aquatic Recreation
TMDL Needed For: Nutrients

COBBLE CREST LAKE SUMMARY:
Impaired Uses: Aquatic Recreation
TMDL Needed For: Nutrients





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Table 2-8: Summary of Impaired Waterbodies in St. Louis Park, MN

Waterbody	Reach	Affected Use	Pollutant/ Stressor	Year Listed	Target Completion
Twin Lake	Lake	Aquatic Recreation	Nutrient/Eutrophication Biological Indicators	2006	2017
Cobblecrest Lake	Lake	Aquatic Recreation	Nutrient/Eutrophication Biological Indicators	2008	2017
Minnehaha Creek	Lake Minnetonka to Mississippi River	Aquatic Life	Fish Bioassessments	2004	2012
		Aquatic Recreation	Fecal Coliform	2008	2013
		Aquatic Life	Chloride	2008	2016
		Aquatic Life	Dissolved Oxygen	2010 ²	2012
		Aquatic Recreation	Nutrients	2004	2013

2.12.3 Water Quality Modeling

The City of St. Louis Park and WMOs have undertaken many water quality modeling efforts that have been used to estimate the water quality of stormwater runoff and water bodies within the city. Previous efforts have provided a patchwork of models across the city, including a P8 (Program for Predicting Polluting Particle Passage through Pits, Puddles, and Ponds) model developed by BCWMC for their 2015 Watershed Management Plan, which includes total flow and phosphorus loadings for Westwood Lake and northern portions of the City. The following sections summarize the most recent water quality modeling efforts.

2.12.3.1 City-Wide Water Quality Modeling

As part of the development of this SWMP, the entire City of St. Louis Park was modeled using EPA SWMM to estimate pollutant loading from each subwatershed as well as the pollutant removal efficiencies of the impaired waterbodies. The city provided all available hydrologic and hydraulic models for this SWMP update. As part of the modeling update, discussed in Section 2.13.3, a water quality component was included in the EPA SWMM models. Using monitoring data from MPCA and MCWD to verify results where available, these updated city-wide models may now be used to evaluate the current pollutant loads entering waterbodies and the effectiveness of potential water quality treatment projects. Using an open-source software such as EPA SWMM, will allow city staff to update the models as needed in the future. The results from the water quality analysis are provided in Appendix F.

2.12.3.2 City-wide MS4 Nondegradation Modeling

The MPCA requires select NPDES MS4s, including St. Louis Park, to complete a nondegradation analysis for the time periods between 1988 to the 2007 and between 2007 to 2020. St. Louis Park quantified the change in stormwater discharge loading during these time periods in terms of average annual flow volume, total suspended solids (TSS), and total phosphorus (TP). A simple method was used to estimate stormwater and pollutant loadings for 1988, current conditions (defined by land use data from 2000/2002), and 2020. This method analyzes land use and imperviousness to estimate water and pollutant loads. Additionally, a P8 water quality model was used to assess the benefits that expected future BMP implementation will have on flow volume, TSS, and total phosphorus loading.

The city developed the loading model to estimate the treatment required between 2007 and 2020 so that runoff volumes and pollutant loads from the city will not exceed that of the 1988 baseline loading conditions. For more information about this modeling, see the

City of St. Louis Park Nondegradation Report Submittal to the Minnesota Pollution Control Agency for Selected MS4 Permit Requirements (December 2007), which can be found in **Appendix E**.

2.13 Water Quantity/Flooding

This section discusses the water quantity monitoring programs that exist within the City of St. Louis Park. It also discusses the flood insurance studies that indicate flood levels along major water courses and WMO flood criteria that must be followed to meet regional flood control goals. The hydrologic modeling efforts of the city and the WMOs are also presented.

2.13.1 Water Quantity Monitoring

Water quantity monitoring programs include the operation of continuous flow gauging stations, manual flow measurements, and the measurement of water levels in lakes and wetlands. All water quantity monitoring data within the City of St. Louis Park are currently collected by the two WMOs within the city.

The BCWMC is responsible for the monitoring of water levels on the primary lakes within the Bassett Creek watershed. In the City of St. Louis Park, this includes Westwood Lake.

The MCWD maintains two monitoring stations within of St. Louis Park. The first station is located at the 34th Street crossing (MCWD ID: CMH02). The second station is at the Excelsior Boulevard crossing (MCWD ID: CMH11). Both stations monitor flow as well as water quality parameters. Information about the monitoring done by MCWD can be found here: www.minnehahacreek.org/data-center.

2.13.2 Flood Insurance Studies

The current effective FEMA Flood Insurance Study (FIS) for the City of St. Louis Park is dated November 6, 2016. The current effective Flood Insurance Rate Maps (FIRMs) for the City of St. Louis Park are dated November 4, 2016. The FIS and FIRMs are available on the FEMA Flood Map Service Center website: msc.fema.gov/portal/home.

2.13.3 Hydrologic and Hydraulic Modeling

The City of St. Louis Park has had numerous H&H models developed over the years, including HEC-2 models of Minnehaha Creek used by FEMA for the original Flood Insurance Study of 1979. More recently the WMOs have developed regional models using XP-SWMM, including modeling for the proposed Southwest Corridor Light Rail project. Unfortunately, despite this wealth of information, no single and comprehensive city-wide model existed until the development of this SWMP.

2.13.3.1 City Modeling

a. City-wide Model

For this SWMP, the disparate H&H models were combined, standardized, and updated with available as-built information, the city's GIS data, and recently completed MnDOT projects. The models were developed in EPA SWMM to allow city staff to update the models as new and redevelopment occurs, as well as to evaluate potential benefits and impacts of proposed stormwater projects. It is the city's goal to be able to use these models to support the continued update and maintenance of FEMA's Flood Insurance Rate Maps.

The city-wide models were used to quantify the 10-year and 100-year 24-hour design storm events using both NOAA's Atlas 14 and TP40 rainfall data for comparison. The modeling efforts included the delineation of watersheds and subwatersheds throughout the city. The results of the model are used to estimate flood elevations on waterbodies and low-lying areas within the city as well as to evaluate the capacity of the existing storm sewer conveyance system.

The results from these models are provided in **Appendix F**.

b. City Updates

Since the previous SWMP was completed, the city has undergone several major construction projects, including MnDOT reconstruction projects on TH 7, TH 100, and US 169. In 2017, the city installed a new underground stormwater treatment facility at Carpenter Park to provide water quality treatment for 40 acres of residential and commercial land, for the benefit of Bass Lake.

2.13.3.2 Watershed Management Organization Modeling

Both the BCWMC and the MCWD have performed hydrologic and hydraulic modeling within the City of St. Louis Park.

a. BCWMC

The BCWMC, in conjunction with the COE, developed a HEC-1 model of the entire Bassett Creek watershed decades ago. The district was broken down into several watersheds of a relatively large scale, focusing mainly on the contributing areas to the larger flood storage areas. In 2012 and 2013, the BCWMC converted and updated the HEC models to XP-SWMM.

In 2017 the XP-SWMM model was updated again to incorporate more detailed subwatershed, storage, and storm sewer information for the watershed, including the major ponds and wetlands. The updated model, referred to as the Phase-2 XP-

SWMM model update, increased the number of subwatersheds from 55 to approximately 1,160. This model was developed to fully capture and route the Atlas 14 100-year design storm event. The model was calibrated at several locations, and the calibrated model was used to estimate the Atlas 14 100-year flood elevations along the Bassett Creek system and within the contributing watershed.

The Phase-2 XP-SWMM model is intended for use by the BCWMC, member cities, and other entities to evaluate projects and make informed watershed management decisions.

b. MCWD

From 2001 to 2003, the MCWD completed its Hydrologic/Hydraulic and Pollutant Loading Study (HHPLS) of the existing conditions within the watershed. This study included the development of an XP-SWMM model for the entire Minnehaha Creek watershed to evaluate flows, hydraulics, flooding, and structures. The watershed was broken up into several large drainage districts, including much of the City of St. Louis Park. These drainage districts were further broken down into many smaller subwatersheds.

2.14 Land Use

St. Louis Park is designated by the Metropolitan Council as a “developed community” geographic planning area in the 2040 Regional Development Framework. In general, St. Louis Park is fully developed, with the major land use being residential. The population projections included in the city’s current comprehensive plan show slow, steady growth for the community. Growth will be accomplished primarily through redevelopment of certain sites. Existing and projected land use within the City of St. Louis Park are shown in Figure 2-15 and Figure 2-16, respectively.

St. Louis Park is committed to being a connected and engaged community. The city’s land use plan is guided by the idea of creating a “livable community” that uses the best design practices from the past and the present to build a connected community that contains housing, schools, shops, workplaces, water resources, parks, and civic facilities essential to the daily life of the city’s citizens. As stated in Metropolitan Council 2040 Water Resources Policy Plan, “Water resources has strategic importance in achieving economic growth, competitiveness and high quality of life”. To achieve this goal, the land use plan provides guidance for the community’s desired land use patterns, mix of uses, density, site and building design, and neighborhood planning. It also includes policies and encourages strategies that promote the livability of the city and region through access to adequate water supplies for drinking and promoting the protection and restoration of water resources for recreational use.

Although many redevelopment parcels and adjacent street patterns may not be conducive to the city's goals, there is a need to find ways to adapt these principles without compromising their general intent. Rather than just looking within the boundaries of the project, redevelopment will consider how pedestrians, residents, and nearby workers will be affected. The intent of the land use plan is for all development to add to and fit into the larger context of the street, neighborhood, and community.

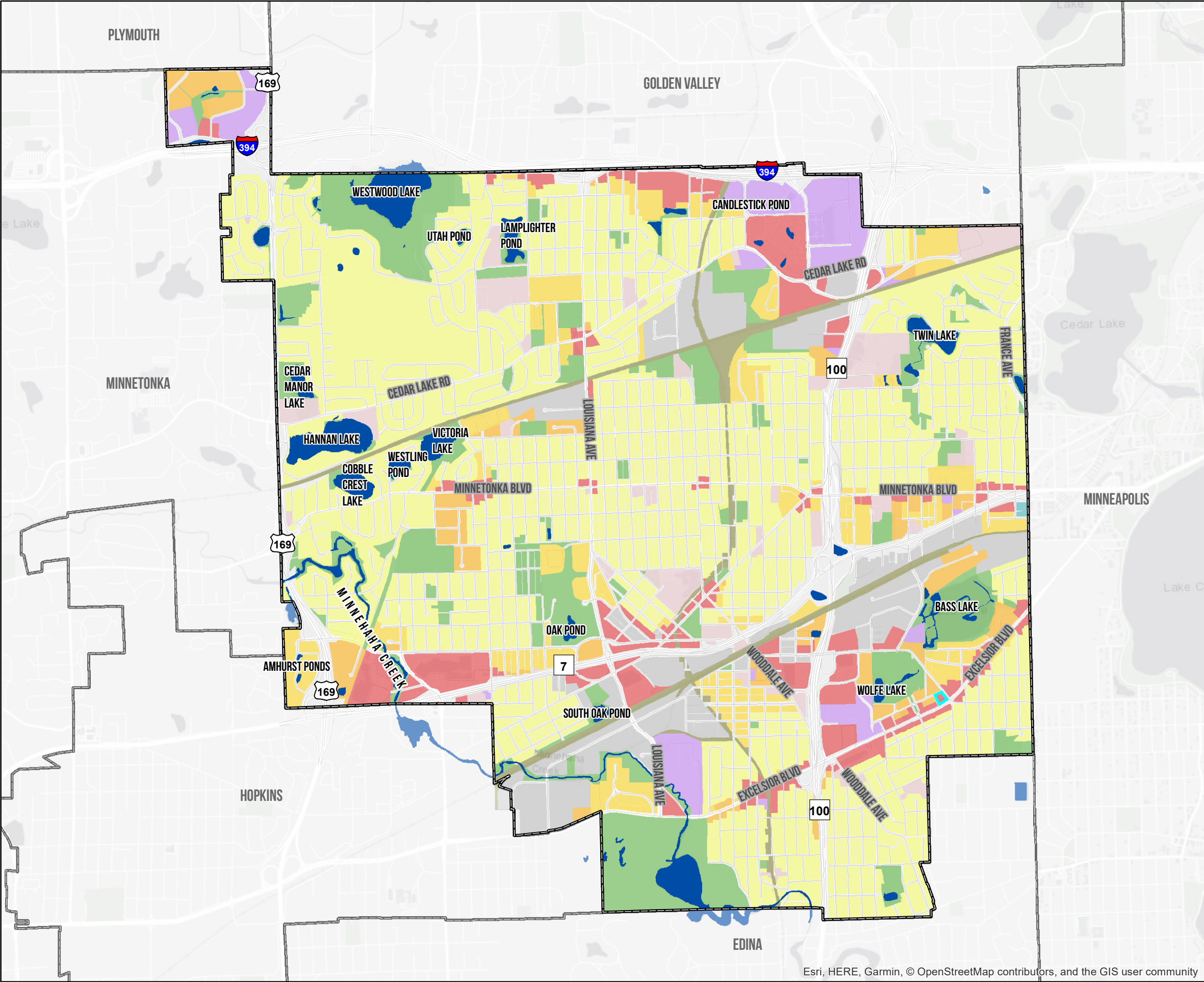
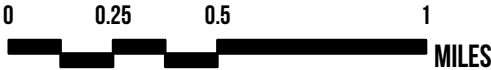




FIGURE 2-15: EXISTING LAND USE

LEGEND

- Civic
- Commercial
- Industrial
- Mixed Use
- Office
- Parks and Open Space
- Low Density Residential
- Medium Density Residential
- High Density Residential
- Right-of-Way
- Railroad
- Lakes
- City Boundary





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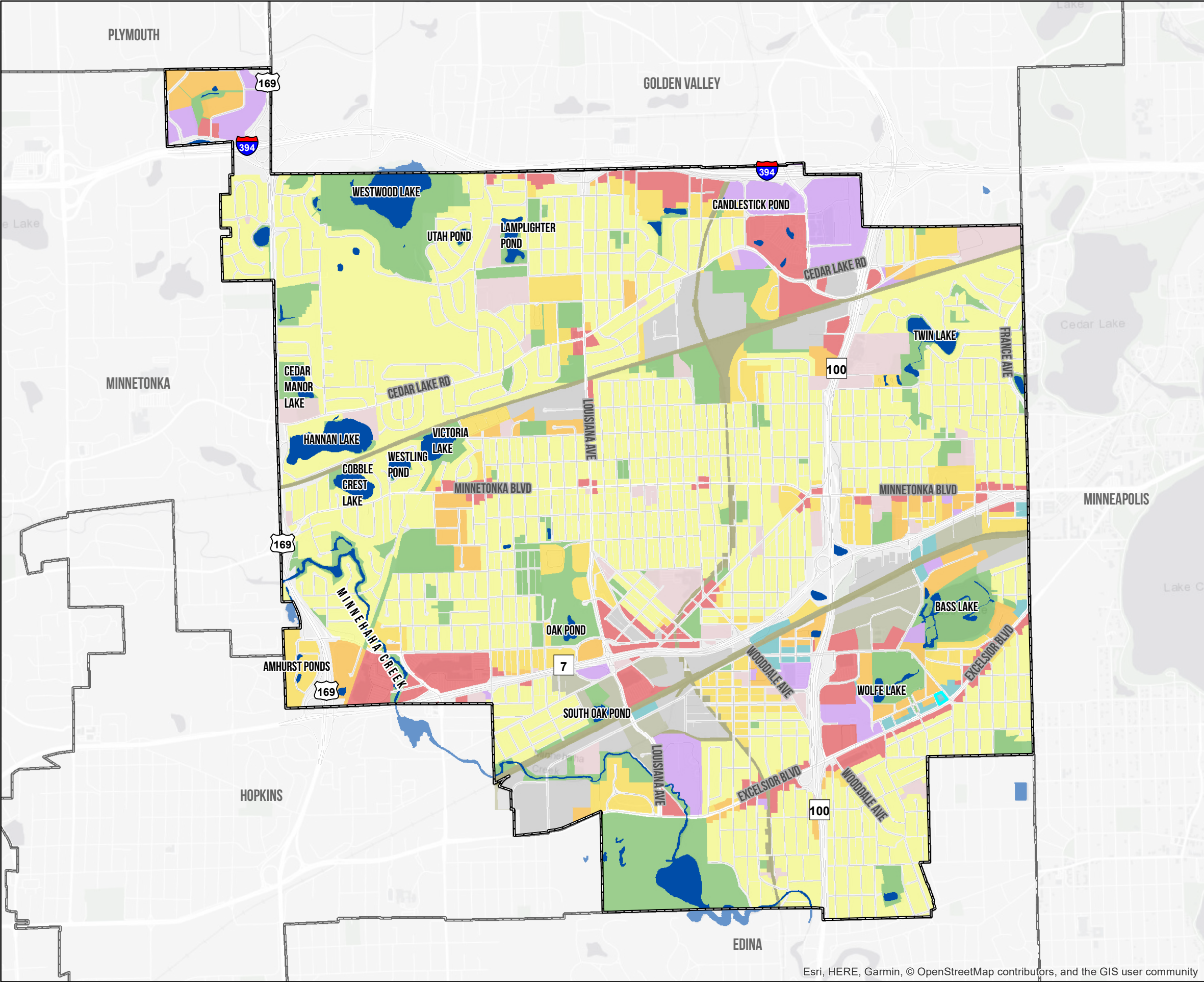
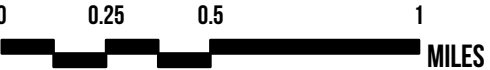




FIGURE 2-16: FUTURE LAND USE

LEGEND

- Business Park
- Civic
- Commercial
- Industrial
- Mixed Use
- Office Park
- Park and Open Space
- Low Density Residential
- Medium Density Residential
- High Density Residential
- Right-of-Way
- Railroad
- Lakes
- City Boundary





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