Introduction

Sustainable water resources are key to the well-being of the community. One of the greatest challenges facing a growing community is protecting ground and surface water resources, while ensuring the needs of residents and businesses are adequately met. This chapter addresses the planning and management of the three key water resource systems: wastewater, water supply and surface water.

Wastewater and Comprehensive Sewer Plan

Overview and Background

A Wastewater and Comprehensive Sewer Plan is a useful tool for defining the strategies the City will use to accomplish planning, construction, and maintenance of the wastewater system. Under the state Metropolitan Planning Act, local governments are required to submit a Wastewater and Comprehensive Sewer Plan element as part of their overall Comprehensive Plan.

Forecasts

According to the Metropolitan Council population, household, and employment forecasts, the City of Carver will have the following sewer demands, as detailed in Table W-1.

Table W-1 | Population, Housing and Employment Sewer Allocation Forecasts

<table>
<thead>
<tr>
<th>Forecast Component</th>
<th>2010</th>
<th>2020</th>
<th>2030</th>
<th>2040</th>
</tr>
</thead>
<tbody>
<tr>
<td>Population</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MCES Sewered</td>
<td>3,008</td>
<td>5,610</td>
<td>9,690</td>
<td>14,780</td>
</tr>
<tr>
<td>Unsewered</td>
<td>716</td>
<td>690</td>
<td>610</td>
<td>720</td>
</tr>
<tr>
<td>Households</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MCES Sewered</td>
<td>980</td>
<td>1,920</td>
<td>3,460</td>
<td>5,400</td>
</tr>
<tr>
<td>Unsewered</td>
<td>202</td>
<td>200</td>
<td>170</td>
<td>200</td>
</tr>
<tr>
<td>Employment</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MCES Sewered</td>
<td>182</td>
<td>650</td>
<td>1,030</td>
<td>1,690</td>
</tr>
<tr>
<td>Unsewered</td>
<td>5</td>
<td>0</td>
<td>0</td>
<td>10</td>
</tr>
</tbody>
</table>

Existing System

The existing wastewater collection and treatment system is shown on Figure W-1. This system serves the majority of the area within the existing city limits, although there are some undeveloped, agricultural areas still served by on-site individual septic systems.
Figure W-1 - Existing Wastewater System
Ultimate Sanitary Sewer System

The Comprehensive Sanitary Sewer Plan (CSSP) assumes sanitary sewer will ultimately serve the entire Carver growth area. The majority of areas yet to develop are isolated undeveloped or underdeveloped lots interspersed throughout the City.

The planning area consists of six (6) sewer districts. Each district contains several sub districts. In general, districts and sub district boundaries are established to encompass gravity sewer pipe networks that commonly flow to a single discharge location such as a lift station or trunk sewer main.

The proposed trunk sewer system is schematic in nature with regard to actual facility location. The actual location of facilities may vary with development, based upon platted right-of-way, and development configuration.

The proposed trunk sewer system is designed to convey the estimated peak flows from the planning area, considering the topography of the area, likely plat boundaries, constructability of the system, including maintaining a maximum gravity sewer depth of approximately 30 feet, buildable areas, wetlands and bluff locations.

In addition, trunk gravity sewers are sized to be approximately 50-70 percent full with the estimated peak flows from the planning area in order to provide excess capacity to accommodate adjustments in anticipated development phasing and configuration, and current unforeseen future connection possibilities.

Metropolitan Council Actual and Projected Wastewater Flow

Figure W-1 illustrates the regional wastewater system long-term service area. Carver is served by the Blue Lake Treatment Plant.
Figure W-2 – Regional Wastewater System Long-Term Service Area
Table W-2 shows actual and projected MGD flows for the city’s wastewater into Interceptor 8038-1.

**Table W-2 | Projected Community Wastewater Flows (MGD)**

<table>
<thead>
<tr>
<th></th>
<th>2018</th>
<th>2020</th>
<th>2030</th>
<th>2040</th>
</tr>
</thead>
<tbody>
<tr>
<td>City Projected Wastewater Flow</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The flow projections presented in Table W-2 are based on changes to the future land use plan from the 2030 Comprehensive Plan and to the City’s Comprehensive Sewer Plan. Figure W-3 shows the ultimate sanitary sewer system and sewer districts. The updated ultimate average sanitary flow rates for the five districts are shown in Table W-3.

**Table W-3 | Average Flows for the Full Development System**

<table>
<thead>
<tr>
<th>Sewer District</th>
<th>MGD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Northwest District</td>
<td></td>
</tr>
<tr>
<td>North Central District</td>
<td></td>
</tr>
<tr>
<td>Central District</td>
<td></td>
</tr>
<tr>
<td>East District</td>
<td></td>
</tr>
<tr>
<td>Southwest District</td>
<td></td>
</tr>
<tr>
<td>Augusta District</td>
<td></td>
</tr>
</tbody>
</table>
Figure W-3 – Ultimate Sanitary Sewer System
Existing/Proposed Pipe Capacities for the Ultimate System

Tables W-4 shows the updated pipe capacities based on the changes to the future land use for each of the sewershed districts. The ultimate build out of the Carver System will cause the need to increase the capacity of the system in a few locations. The City shall monitor these locations and address capacity issues as development continues to occur.

**Table W-4 | Existing/Future Pipe Capacities for the Ultimate System**

[Insert Table]

Inter-Municipal Agreement with the City of Chaska

There is a potential for the City of Carver to enter into an agreement with the City of Chaska to convey portions of the Augusta, North Central and Northwest Districts of the Carver planning area through the City of Chaska’s gravity sewer system to the MCES Chaska Interceptor System. Discussion regarding this potential inter-municipal agreement are underway.

Individual Sewage Treatment Systems (ISTS)

The City of Carver requires all new subdivisions connect to the municipal sewer system. Existing parcels not currently served by public sewer, and sewer service is more than 66 feet from the property line may either replace their existing system, or in the case of undeveloped lots of record, may install a new system with new home construction, provided the proposed ISTS meets the requirements of Carver County and the City Code. Once sewer service becomes available to the existing property (within 66 feet of the property line), the City requires the property connect to the sewer. Figure W-4 shows the location of ISTS within Carver.

The City of Carver has deferred the responsibility for tracking the operation, maintenance, and enforcement of ISTS in the city to Carver County. A copy of Chapter 52 of the Carver County Code of Ordinances (Subsurface Sewage Treatment Systems) and excerpts from the City Code related to the regulation of ISTS and “grey water” connections are included in Appendix 4.
Inflow and Infiltration (I/I)

The unit flow rates incorporate an allowance for an average of 10 gallons per capita per day of extraneous water entering the sanitary sewer system through inflow and infiltration. However, the City has taken numerous steps to minimize inflow and infiltration, including:

- Replacement of all old sanitary sewer within the City with PVC sanitary sewer pipe in 1986
- Inspection of approximately 1/3 of the sewer lines within the City annually
- Stringent testing of all new sanitary sewer lines
- Use of manholes with concealed pick holes
- Proper maintenance of the existing system
- Actively enforcing the City ordinance prohibiting the connection of roof drains and foundation drains to the sanitary sewer system (excerpts from this ordinance are provided in Appendix H)

The City Public Utilities Director, who is responsible for the maintenance and inspection of the City’s sanitary sewer system, is not aware of any issues with inflow and infiltration in the City’s existing system. The City is confident the current maintenance and inspection practices for the City’s existing sanitary sewer system and requirements for the installation and inspection of new sanitary sewer will prevent inflow and infiltration from becoming an issue for the City of Carver.
Water Supply Plan

Overview and Background

Providing potable water for Carver’s residents and businesses is one of the most important services the City provides. The potential impacts from water use must be considered when planning for development of new water sources or increased water withdrawals.

This chapter outlines the near and long-term water supply needs to satisfy the proposed growth of the City of Carver. Also, since the State requires a separate Water Supply Plan for communities with a public water system serving more than 1,000 people, the information included in this chapter is further outlined in Carver’s Water Supply Plan (WSP), approved in December 2017, and included in Appendix B to the Comprehensive Plan.

Growth and Water Demand

Carver has experienced rapid growth over the last twenty-four years, growing from a population of 572 in 1994 to an estimated population of 4,293 in 2018. Water needs will continue to increase as the City grows to the forecasted 2040 population of 15,500.

Water use has increased steadily as population has grown. In 2015, Carver pumped an average of 0.36 million gallons per day (MGD), while the maximum daily water usage was 0.83 MGD. The projected maximum day water demand in 2040 is estimated to be 4.62 MGD.

Existing Facilities

The existing water supply and distribution system is shown on Figure W-5. The City presently obtains its raw water from four wells with a firm capacity of 1,200 gallons per minute (gpm) or 1.73 MGD. Firm capacity is defined as the capacity with the largest well out of service. Additional information on the City’s wells can be found in Table 6 of the WSP in the Appendix.

An existing 1.0 MGD water treatment plant is located on Mt. Hope Road. This water treatment facility removes iron, manganese and radium from the well water before it is pumped to the distribution system. Three pressure zones exist within the City and the approximate maximum pressure supplied at ground elevation is shown on Figure W-6. There are two elevated storage reservoirs in the system to equalize pressures and supply peak demand; Tower 1 is a 100,000-gallon structure in the intermediate pressure zone, with a high water level of 1041 feet above sea level and Tower 2 is a 750,000-gallon structure in the northwest pressure zone of 1115 feet above sea level.

Additional information on the existing treatment capacity, storage capacity and water sources can be found in Tables 4-6 of the WSP in the Appendix.
Figure W-5 – Existing Water Distribution System

Figure W-6 – Existing Pressure Distribution
**Future Improvements**

Carver will need to serve approximately 15,500 people by 2040 with an expected average daily water demand of 1.54 million gallons and maximum daily water demand of 4.62 MG. To support this demand, storage should exceed average daily demand and supply should exceed maximum daily demand. The City will require an additional water tower of at least 700,000 gallons and wells with added firm capacity of 2,000 gpm.

Anticipated phasing is detailed in Table 12 of the WSP, although additional study is currently being conducted on well locations, capacities and water treatment. Based on the well study and treatment plant analysis, wells and treatment will be constructed in the northwest area.

Current plans are for the northwest area to expand first, followed by the creation of the southwest area. Phasing of water storage tanks must be done carefully, to avoid freezing problems in the winter due to low use when the tank is first placed into service.

As the southwest area is developed, the new southwest pressure zone should be created, which requires updating and installing new pressure reducing valves. The new tower should be installed within this area so the storage is available to meet the average daily demand in the event the zone needs to be isolated for repairs or maintenance.

This new zone will absorb some of the existing intermediate zone and homes that currently have individual pressure reducing valves may be able to remove them as the supplied pressure is already reduced at the mains to acceptable levels. The existing high pressure areas can be seen on Figure W-6 and proposed pressure on Figure W-7.
Ultimate Design Water System

The ultimate design water system, shown on Figure W-8, is capable of serving approximately 30,000 people, which is about twice the anticipated 2040 population. However, the system should be updated to evaluate the ability to serve the average land use density at full build out, which would be 71,000 people.

Figure W-8 – Planned Water Distribution System

Table W-5 details the difference in additional infrastructure required to support varying levels of the ultimate buildout population. The ultimate scenarios use 70 gallons per capita day for residential use, while commercial and industrial demands assume 1,200 gallons per acre and remain the same between the low and middle density ranges.

Table W-5 | Future Water Demand Requirements

<table>
<thead>
<tr>
<th>Density Scenario</th>
<th>Population</th>
<th>Avg. Day Demand (MGD)</th>
<th>Elevated Storage (MG)</th>
<th>Additional 0.75 MG Towers from Ex.</th>
<th>Max Day Demand (MGD)</th>
<th>Water Supply (GPM)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2040 MCES</td>
<td>15,500</td>
<td>1.54</td>
<td>1.6</td>
<td>1</td>
<td>4.62</td>
<td>3,208</td>
</tr>
<tr>
<td>Ultimate - Low Density Range</td>
<td>41,605</td>
<td>4.09</td>
<td>4.6</td>
<td>5</td>
<td>12.27</td>
<td>8,519</td>
</tr>
<tr>
<td>Ultimate - Middle Density Range</td>
<td>71,407</td>
<td>6.64</td>
<td>6.85</td>
<td>8</td>
<td>19.92</td>
<td>13,833</td>
</tr>
</tbody>
</table>

Infrastructure will need to be evaluated periodically during the ultimate growth stage and as densities increase to ensure adequate supply, treatment, storage and mains can meet demands and desired fire flows.
Local Surface Water Management Plan

Introduction

Water resources have played a critical role in the development of Carver, MN since its inception. The City was built on the banks of the Minnesota River in the 1850’s at an ideal location as a steamboat and barge terminal. During low river levels steamboats could travel upstream only a short distance beyond Carver, thus steamboat cargo would have to be offloaded in Carver and reloaded for continuing trips in either direction. From this location along the banks of the Minnesota River, the City has expanded up the bluffs of the Minnesota River Valley following the tributaries, Carver and Spring Creek. It is these three water bodies that have most dramatically shaped not only the topography, but also the growth of the City. They enrich the community by providing habitat and social, economic and aesthetic benefits.

Responsible and cost-effective water management is an important strategy for maintaining environmental quality, while supporting the City’s needs for water. The Metropolitan Land Planning Act requires that each community include a local water management plan as part of their comprehensive plan. This plan shows how the community will protect and improve water quality and quantity.

The primary purpose of this section is to provide guidance to City staff and elected officials regarding the implementation of effective, integrated storm water management practices and programs through the 2040 planning timeframe. This chapter is consistent with the regional requirements for surface water resources as outlined in the Metropolitan Council’s 2040 Local Planning Handbook. Also, since the State requires a separate surface water management document for communities located within the Twin Cities seven county metropolitan area, the information included in this chapter is further outlined in Carver’s Surface Water Management Plan (SWMP) which is included in Appendix B.

Carver Surface Water Management Plan

The City’s Surface Water Management Plan (SWMP) serves as a comprehensive document to guide the City in conserving, protecting and managing its surface water resources. The SWMP is a separate document related to the Comprehensive Plan and is written to meet the requirements of Minnesota Statute 103B and Minnesota Rule 8410 administered by the Board of Water and Soil Resources. This plan is also consistent with the goals and policies of the Metropolitan Council’s Water Resources Management Policy Plan, and the two watershed management organizations having jurisdiction within the City: Carver County Watershed Management Organization (CCWMO) and Lower Minnesota River Watershed District (LMRWD). The plan and its amendments will be adopted by the City as an element of this Comprehensive plan.

Through implementation of the City’s SWMP, Carver aims to manage that growth sustainably. The SWMP includes a detailed description of the City’s natural resources, including water resources, past studies and inventories, and current surface water management. An assessment of the existing and potential water resource and stormwater related concerns within the City and associated corrective actions are also provided. The SWMP includes goals and policies to address the long-term surface water management needs in the City, and outlines the regulations, standards, practices, projects and funding
that will be needed to implement the goals and policies. The SWMP also includes an inventory and classification of the City’s wetlands and a corresponding management plan.

**Watershed Districts**

Carver is located within the jurisdictional boundaries of two watershed districts: Carver County Watershed Management Organization (CCWMO), and the Lower Minnesota River Watershed District (LMRWD). The districts are special purpose units of local government, established under the Minnesota Watershed Act of 1955, with broad authority to regulate land use planning, flood control and conservation issues. As required under the Metropolitan Surface Water Management Act, both Districts have adopted a Watershed Management Plan, which contains the framework and guiding principles for the Districts in carrying out its statutory purposes.

The City regulates erosion control, wetlands, floodplain alteration, and stormwater management for all land development within the City limits in accordance with City Ordinance, the NPDES Permit, and the Wetland Conservation Act. The City has an agreement with the LMRWD and administers and enforces its rules within their regulatory area. Outside of the LMRWD boundary, the City relies on the Carver County Watershed Management Organization (CCWMO) to administer and enforce its rules. Figure W-9 presents the watershed districts and the HUC 12 Watershed Boundaries.

**Figure W-9 – Watershed Districts**

Amendments

This Surface Water Management Plan will be incorporated into the City’s 2040 Comprehensive Plan. Periodic amendments to this SWMP may be required to incorporate changes in local practices or changes to either the LMRWD or CCWMO Watershed Management Plans. Plan amendments will be incorporated by following the review and adoption steps outlined below.
Amendment Process

The SWMP is intended to extend approximately through the year 2028. In conjunction with the SWMP, the NPDES SWPPP activities will be reviewed and evaluated annually in a public meeting, and the permit program itself will be updated as required by the MPCA NPDES permit program. For the SWMP to remain dynamic, an avenue must be available to implement new information, ideas, methods, standards, management practices, and any other changes which may affect its intent and/or its results. Amendment proposals can be requested at any time, by any person or persons, either residing or having business within the City.

Requests for Amendments

Any individual can complete a written request for a SWMP amendment and submit the request to City staff. The request shall outline the specific items or sections of the SWMP requested to be amended, describe the basis and need for the amendment, and explain the desired result of the amendment towards improving the management of surface water within the City. Following the initial request, staff may request that additional materials be submitted in order for staff to make a fully-informed decision on the request. The City may also initiate an amendment to respond to amendment to a local watershed organization plan or following the completion and approval of a TMDL Implementation Plan.

Staff Review

Following a request for Plan amendments, staff will make a decision as to the completeness and validity of the request. If additional information is needed by staff to determine the validity of the request, staff will generally respond to the requestor within 30 – 60 days of receiving the request. Following receipt of sufficient information such that validity of the request can be evaluated, there are three options which are described below:

a. Reject the amendment. Staff will reject the amendment if the request reduces, or has the potential to reduce, the ability of the SWMP to achieve its overall goals and policies, or will result in the SWMP no longer being consistent with one or more of the watershed district’s plans.

b. Accept the amendment as a minor issue, with minor issues collectively added to the SWMP at a later date. These changes will generally be to clarify provisions in the SWMP or to incorporate new information available after its adoption in 2018. Minor changes will generally be evaluated on the potential of the request to help staff better implement and achieve the goals and policies of the SWMP. Minor issues will not result in formal amendments, but will be tracked and incorporated formally into the SWMP at the time any major changes are approved.

c. Accept the amendment as a major issue, with major issues requiring an immediate amendment. In acting on an amendment request, staff should recommend to the City Council whether or not a public hearing is warranted. In general, any requests for changes to the goals and policies or the development standards established in the SWMP will be considered major amendments.

Staff will make every attempt to respond to an amendment request within 30 – 60 days of receiving sufficient information from the requestor. The timeframe will allow staff to evaluate the request internally and gather input from the Watershed Districts/WMOs and other technical resources, as needed. The response will describe the staff recommendation and which of the three categories the request falls into. The response will also outline the schedule for actions, if actions are needed to complete the requested amendment.

Watershed District Approval

All proposed major amendments must be reviewed and approved by the appropriate Watershed
Districts prior to final adoption of the amendments. Major amendments would include changes to the goals and policies of the SWMP. Staff will review the proposed amendments with the Watershed Districts to determine if the proposed change is a major amendment, and if a proposal is determined to be major amendment, then City staff will assess the ability of the requested amendment to maintain consistency with Watershed District plans.

City Council Consideration

Major amendments and the need for a public hearing will be determined by staff, and if identified as a major amendment, the request will be considered at a regular or special City Council meeting. Staff recommendations will be considered before decisions on appropriate action(s) are made. The requestor will be given an opportunity to present the basis for, and intended outcomes of, the request at the public hearing and will be notified of the dates of all official actions relating to the request.

Public Hearing and City Council Action

The initiation of a public hearing will allow for public input or input based on public interest in the requested amendment. City Council, with staff recommendations, will determine when the public hearing should occur in the process. Consistent with other formal City Council actions and based on the public hearing, City Council would adopt the amendment(s), deny the amendment(s), or take other action.

City Council Adoption

Final action on any major amendments, following approval by the watershed Districts, is Council adoption. Prior to the adoption, an additional public hearing may be held to review the SWMP changes and notify the appropriate stakeholders.

Physical Environment

The City of Carver has been a long-standing rural community. Located within the bluffs of the Minnesota River Valley, there is a considerable amount of relief within the City. Land surface elevations range from roughly 1000 ft. in the west to 700 ft. at the Minnesota River, forming the eastern border of the City. A significant portion of the drainage is directed into either Carver Creek or Spring Creek which drain into the Minnesota River. The Carver Creek watershed incorporates the southern and western portions of the City. The Spring Creek watershed incorporates the northeastern portion of the study area. The very northeast corner of Carver drains overland directly to the Minnesota River and the northwest portion of the study areas drains to West Chaska Creek. Figure W-10 shows the surface and groundwater interaction in Carver.
Figure W-10 – Surface and Groundwater Interaction

Surface Water and Groundwater Interaction
City of Carver, Carver County

Karst Features (DNR)
- Spring
- Sinkhole
- Calcareous Fens
- Trout Streams (DNR)

Surface water type (regional screening by Met Council)
- Disconnected from the regional groundwater system
- Recharges aquifers
- Receives and discharges groundwater
- Supported by upwelling groundwater

County Boundaries
City and Township Boundaries
NCompass Street Centerlines
Other Open Water Features
Figure W-11 shows development constraints for the City, including information on PWIs, NWIs and steep slopes.

**Figure W-11 – Development Constraints**

Spring Creek drains through the study area from the northwest to the southeast, traveling through the center of the downtown area before discharging into the Minnesota River. This creek is very vulnerable to channel erosion. The City has taken measures to help protect Spring Creek in the fully developed downtown area and desires to do additional stream restoration work within the creek. To help maintain the integrity of Spring Creek, it is critical to provide both rate and volume control within new developments within the Spring Creek watershed.

Carver Creek drains through the western and southern portion of the study area prior to discharge into the Minnesota River. Carver Creek is a main means of conveyance for a large portion of the City’s trunk stormwater service area and the SWMP includes funds to restore and protect sections of Carver Creek as necessary.

Timber Creek is a tributary of Carver Creek. The Timber Creek watershed includes primarily agricultural land uses atop the rolling hills and forested land uses within the steeper sloped ravine down to Timber Creek. Timber Creek is highly susceptible to erosion due to its relatively steep grade, well established tree canopy, and sparsely vegetated banks. City rate and volume control measures will help stabilize Timber Creek as development within the watershed proceeds. This SWMP also includes funds to restore portions of Timber Creek as necessary.

A significant portion of the study area consists of loam type soils as identified in the Carver County Soil Survey. These soils are generally classified as Natural Resources Conservation Service (NRCS) Hydrologic Soil Group (HSG) B soils. HSG B soils typically yield a moderate runoff potential. Figure 5 in Appendix...
presents a soils map showing soils classified by hydrologic group. Pockets of poorly drained soils appear primarily within existing depressions and upland drainageways. This type of silty clay loam soil typically yields low infiltration rates. Unless these areas are drained, periodic ponding of water following storm events will occur. Because this soil type is generally found in existing depression areas, many of the proposed stormwater detention areas utilizing these depressions will likely have low rates of infiltration.

Land Use

As development has occurred in the metro area including the expansion of Highway 212, Carver has experienced an influx of new development, drawing suburban commuters to the area. Recent development has been occurring to the west of the downtown area toward County State Aid Highway 11 (CSAH 11) and north of Trunk Highway 212. Future development will continue in this direction as infrastructure is continually added to serve the undeveloped areas.

According to the 2040 Land Use Map (Figure L-3), future development will be primarily commercial and industrial along TH 212 and along CSAH 11, north of the TH 212 intersection. The remaining portions of the study area will consist mainly of low and medium density residential development.

Existing and Potential Water Resource-Related Problems

The City of Carver was divided into 9 Drainage Districts, as shown in Figure W-12.
The Drainage District names and the abbreviation for each district are presented in Table W-6 below.

**Table W-6 | Drainage Districts**

<table>
<thead>
<tr>
<th>Major Drainage District</th>
<th>Abbreviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chaska Creek</td>
<td>CC</td>
</tr>
<tr>
<td>Lower Carver Creek</td>
<td>LCC</td>
</tr>
<tr>
<td>Minnesota River</td>
<td>MR</td>
</tr>
<tr>
<td>South Carver</td>
<td>SC</td>
</tr>
<tr>
<td>Southwest Carver</td>
<td>SwC</td>
</tr>
<tr>
<td>Spring Creek</td>
<td>Scr</td>
</tr>
<tr>
<td>Upper Carver Creek</td>
<td>UCC</td>
</tr>
<tr>
<td>Upper Spring Creek</td>
<td>USC</td>
</tr>
<tr>
<td>West Carver</td>
<td>WC</td>
</tr>
</tbody>
</table>
Table W-7 is a list of the current stormwater management issues or concerns identified in the City’s SWMP. It is not intended to be a comprehensive list, but a list of issues with possible corrective actions that directly affect the City.

**Table W-7 | Stormwater Issues and Possible Corrective Actions**

<table>
<thead>
<tr>
<th>Sub-District ID</th>
<th>Stormwater Issue</th>
<th>Potential Funding Partners</th>
<th>Possible Corrective Actions</th>
</tr>
</thead>
<tbody>
<tr>
<td>LCC-A17, MR-A5, SCR-A12, SCR-A20, SCR-A22, SCR-A23</td>
<td>Carver downtown area discharges directly to Carver Creek, Spring Creek, and the Minnesota River without water quality treatment</td>
<td>CCWMO, LMRWD</td>
<td>Add structural pollution control devices such as sumps, SAFL Baffles, tree boxes, pervious pavement to future reconstruction projects. Construct water quality (infiltration/filtration) retrofit BMPs in downtown area where feasible. Provide education to residents and businesses on proper lawn care practices and other good housekeeping practices</td>
</tr>
<tr>
<td>MR-A1</td>
<td>Pond MR-P1 not currently sized to accommodate future development</td>
<td>LMRWD</td>
<td>Expand the existing pond MR-P1 as adjacent development occurs. Include additional treatment for surrounding runoff not routed through treatment device</td>
</tr>
<tr>
<td>SCR-A12, SCR-A23, MR-A7</td>
<td>Channel degradation and instability in Spring Creek and Carver Creek near downtown Carver</td>
<td>CCWMO, LMRWD</td>
<td>Restore and stabilize the degraded sections of these creeks upstream of 4th Street.</td>
</tr>
<tr>
<td>SCR-A20</td>
<td>Stormwater runoff from the Lenzen’s 1st and 2nd Additions discharges untreated to Spring Creek</td>
<td>LMRWD</td>
<td>Retrofit structural treatment devices into existing storm sewer systems in these developments</td>
</tr>
<tr>
<td>SCR-A22</td>
<td>Gully erosion issue (LMRWD Gully Study) in the ravine north of 4th St. and Elm Dr. intersection is contributing sediment to Spring Creek</td>
<td>LMRWD</td>
<td>Repair and stabilize the active gully erosion issues.</td>
</tr>
<tr>
<td>SCR-A22</td>
<td>Gully erosion issue (LMRWD Gully Study) downstream of the northeast end of Diedrich Dr. is contributing sediment to Spring Creek</td>
<td>LMRWD</td>
<td>Repair and stabilize the active gully erosion issues</td>
</tr>
<tr>
<td>SCR-A22</td>
<td>Erosion issues in the ditch sections adjacent to 6th Street are contributing sediment to Spring Creek</td>
<td>LMRWD</td>
<td>Stabilize existing ditch sections or replace with storm sewer conveyance</td>
</tr>
<tr>
<td>UCC-A6</td>
<td>Erosion issues downstream of existing culvert under County Road 43</td>
<td>CCWMO</td>
<td>When development occurs, construct a new discharge to Carver Creek to avoid the erosion area</td>
</tr>
<tr>
<td>LCC-A2, LCC-A3</td>
<td>Erosion issues and excess flow routed along surface of existing Dahlgren Road</td>
<td>CCWMO</td>
<td>Add additional stormwater management features to ensure runoff does not encroach onto Dahlgren Road</td>
</tr>
<tr>
<td>City-wide</td>
<td>Multiple gully erosion issues located on private property in City, as identified in LMRWD Gully Study</td>
<td>LMRWD</td>
<td>Where gully erosion is located on private property, address specific issues as future development allows</td>
</tr>
<tr>
<td>City-wide</td>
<td>Degraded wetlands within the study area, as identified in the 2002 Wetland Inventory and Assessment</td>
<td>CCWMO, LMRWD</td>
<td>Restore priority wetlands identified as having medium or high restoration potential as development allows</td>
</tr>
<tr>
<td>City-wide</td>
<td>Development activities occurring in areas beyond the City’s trunk stormwater conveyance system</td>
<td>CCWMO, LMRWD</td>
<td>Coordinate interim conveyance measures with the CCWMO to protect downstream properties. Construct the City’s trunk conveyance system</td>
</tr>
</tbody>
</table>
Three watercourses (Carver Creek, Spring Creek, and the Minnesota River) listed on the state impaired waters list receive discharge from the City of Carver. This list is known as the 303(d) list from the applicable section of the federal Clean Water Act, these waters do not currently meet their designated use due to the impact of a particular pollutant or stressor. If monitoring and assessment indicate that a waterbody is impaired by one or more pollutants, it is placed on the list. Information for impaired waters receiving discharge from Carver is presented in Table W-8. Figure W-13 identifies the watercourses in Carver and their approved TMDL pollutant.

Table W-7 | Impaired Waters Receiving Discharge from Carver

<table>
<thead>
<tr>
<th>Waterbody / Watercourse</th>
<th>AUID#</th>
<th>Listed Pollutant</th>
<th>Impaired Use</th>
<th>TMDL Approved / Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carver Creek</td>
<td>07020012-806</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Fecal Coliform</td>
<td>Aquatic Recreation</td>
<td>Yes / 2007</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Turbidity</td>
<td>Aquatic Life</td>
<td>Yes / 2012</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Nutrient / Eutrophication</td>
<td>Aquatic Life</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>Unnamed Creek</td>
<td>07020012-528</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Spring Creek)</td>
<td>Fecal Coliform</td>
<td>Aquatic Recreation</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>Minnesota River</td>
<td>07020012-501</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Bevens Creek to Sand Creek)</td>
<td>Turbidity</td>
<td>Aquatic Life</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Mercury in Water Column</td>
<td>Aquatic Consumption</td>
<td>Yes / 2008</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Mercury in Fish Tissue</td>
<td>Aquatic Consumption</td>
<td>Yes / 2008</td>
<td></td>
</tr>
<tr>
<td></td>
<td>PCB in Fish Tissue</td>
<td>Aquatic Consumption</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Fecal Coliform</td>
<td>Aquatic Recreation</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>Minnesota River</td>
<td>07020012-532</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Sand Creek to Carver Creek)</td>
<td>Mercury in Water Column</td>
<td>Aquatic Consumption</td>
<td>Yes / 2008</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Mercury in Fish Tissue</td>
<td>Aquatic Consumption</td>
<td>Yes / 2008</td>
<td></td>
</tr>
<tr>
<td></td>
<td>PCB in Fish Tissue</td>
<td>Aquatic Consumption</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>Minnesota River</td>
<td>07020012-506</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Carver Creek to RM 22)</td>
<td>Turbidity</td>
<td>Aquatic Life</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Mercury in Water Column</td>
<td>Aquatic Consumption</td>
<td>Yes / 2008</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Mercury in Fish Tissue</td>
<td>Aquatic Consumption</td>
<td>Yes / 2008</td>
<td></td>
</tr>
<tr>
<td></td>
<td>PCB in Fish Tissue</td>
<td>Aquatic Consumption</td>
<td>No</td>
<td></td>
</tr>
</tbody>
</table>
Wetland Inventory & Assessment Report

In 2002, the City completed a Wetland Inventory and Assessment detailing the wetland classification and management standards for wetlands within the majority of the Study Area. A copy of this report is included in Appendix E for reference. This 2002 report includes a functions and values assessment for the wetlands within the study area, as well as stormwater pretreatment standards, water quality and quantity protections requirements, and buffer standards for all wetlands based on wetland classification. The City is the responsible LGU for management of wetlands in Carver, and will administer the Minnesota WCA, Local watershed management organization requirements will be applied to wetlands included in their management plans. Figure W-14 identifies the wetlands and DNR public waters in Carver.

Figure W-14 – Wetlands and DNR Public Waters

Goals and Policies

The following are the City’s goals for Surface Water Management. They reflect a commitment by the City to protect its natural resources and sustain a high quality of life for its residents. They are consistent with Minnesota Rules 8410 and local watershed requirements and have been developed to avoid conflict with existing State, Regional, and County goals and policies, and to be generally consistent with the Lower Minnesota River Watershed District (LMRWD) plan. As part of the City’s SWMP, policies that support each goal are included. They provide clear guidance to City staff and to developers what is required of them to ensure that the following goals are achieved.

A. Floodplain Management

Goal: Provide adequate storage and conveyance of runoff and manage development in flood prone areas to protect the public safety and minimize property damage.
B. Water Quality
   Goal: To maintain or improve water quality of surface waters throughout the City by reducing sediment and nutrient loading.

C. Water Quantity
   Goal: To minimize downstream impacts by maintaining peak runoff discharge rates and providing runoff volume reduction.

D. Erosion and Sediment Control
   Goal: To prevent erosion and sedimentation to the maximum extent practical through construction site permitting, inspection and good municipal housekeeping.

E. Wetlands
   Goal: To protect wetland value and ensure conformance with the requirements of the Minnesota Wetlands Conservation Act (WCA), MCWD Rules, and other State and Federal regulations.

F. Public Ditch Systems
   Comments: There are no known county or judicial public ditch systems within the City.

G. Groundwater
   Goal: To protect groundwater through prudent management of surface waters and areas of potential contamination.

H. TMDL and Impaired Waters
   Goal: Address target pollutants identified for impaired waters and those in TMDL studies to improve water quality

I. Conservation Design
   Goal: Encourage development activities to incorporate conservation design approaches.

J. Resources Management
   Goal: Protect the City’s wetlands, lakes, streams, groundwater, and natural areas to preserve the functions and values of these resources.

K. Public Education and Outreach
   Goal: Provide educational and outreach opportunities for City residents and business owners, elected officials, City staff, and the development community that address stormwater management and water quality.

L. Municipal Housekeeping
   Goal: To conduct operations and maintenance of City facilities and infrastructure as necessary to keep systems operating adequately and limit potential for discharge of pollutants. Additional information regarding municipal housekeeping can be found in the City’s MS4 Storm Water Pollution Prevention Plan (SWPPP).

Local Implementation Plan/Program

The City’s SWMP includes a list of surface water management related activities that the City needs to continue or commence implementation of and their related costs. The following section is taken from the SWMP.

The SWMP provides a plan for expanding and managing the City’s surface water system, and protecting key water resources in the City. The real measure of success of the SWMP will be in its implementation. Implementation of the SWMP covers a number of aspects, including:

- Administering official controls and programs
- Operating and maintaining the surface water system
- Managing surface water as redevelopment and new development occur
- Implementing a public education program regarding stormwater management
• Constructing prioritized capital improvements
• Financing projects and programs

Official Controls

Codes and ordinances (official controls) are necessary tools to support the implementation of this surface water management plan. Over time, codes must be updated to remain consistent with City goals, policies and practices. To address the need to review and update City Code, certain goals and policies specifically reference city codes that exist or need to be created. In addition, the City’s SWPPP identifies a set of ordinances required to comply with the MS4 permit requirements.

Stormwater System Operation and Maintenance

Carver’s existing stormwater management system represents a major investment for the City. The ongoing inspection and maintenance of this system is critical to protecting this investment, as well as the water and natural resources the system is designed to manage. In accordance with the City’s SWPPP, City stormwater system operation and maintenance responsibilities and schedule are provided in Table W-9.

Table W-9 | Stormwater System Inspection and Maintenance Schedule

<table>
<thead>
<tr>
<th>Responsibility</th>
<th>Schedule</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inspect and clean out catch basins, sumps, and structural pollution control devices</td>
<td>Twice Annually</td>
</tr>
<tr>
<td>Stormwater pond inspection, including pond slopes, accumulated sediment, inlets, outlets, and identifying illicit discharges</td>
<td>Twice annually, and after heavy rainfalls or large snow melt events</td>
</tr>
<tr>
<td>Trunk storm sewer inspection</td>
<td>Twice annually during catch basin inspection and clean out</td>
</tr>
<tr>
<td>Remove accumulated sediment in stormwater</td>
<td>5 to 25-year cycle, as needed</td>
</tr>
<tr>
<td>Street Sweeping</td>
<td>At least twice annually, or as needed</td>
</tr>
<tr>
<td>Repair channel erosion issues</td>
<td>As needed</td>
</tr>
</tbody>
</table>

As new development brings more trunk stormwater facilities for the City to operate and maintain, these duties will require more staff time and a larger maintenance budget. It is important to quantify the extent of this future commitment so that the funds necessary for system maintenance activities can be collected via the City’s stormwater utility. Per Policy 5 in Section 7. J, it is recommended that the City regularly review the cost and staff commitment to stormwater system operation and maintenance and evaluate if the current structure needs to be adjusted to accommodate future development.

NPDES Implementation

The MPCA has designated Carver as an NPDES Phase II MS4 community (MN Rules 7090). Carver recently completed a partial audit by the MPCA of the current SWMPP and incorporated the necessary resolutions. The existing permit was extended in 2018 while the MPCA develops the new permit, which is expected to be released in 2019 at which time the City will be required to apply for. A copy of the City’s current SWPPP can be viewed at City Hall. Modifications to the City’s current SWPPP could include, but are not limited to the following:

• Ordinance updates, specifically the post construction, erosion and sediment control, and illicit discharge and connection ordinances
• Increased public education and public involvement efforts, likely to involve more partnerships with CCWMO and LMRWD
• Stormwater system mapping and inventory updates
• Municipal facilities inventory
• Stormwater system treatment effectiveness evaluation and field assessment

As the City moves through their current SWPPP evaluation process, specific SWPPP update tasks and associated costs will be identified. Until these tasks are identified, only general implementation actions are included in Table W-10.

With the rising cost of the City’s SWPPP implementation responsibilities, it is recommended the City regularly evaluate the cost of this implementation to determine if the current funding structure needs to be adjusted.

TMDL Implementation

The City recognizes that the responsibility for completion and implementation of the TMDL studies lies with the primary stakeholders contributing to the impairment. The City intends to cooperate with the watersheds in the development of the TMDL studies, acknowledging that the watersheds will take the lead on these studies. It is the intention of the City to fully implement the actions identified in future TMDL Implementation Plans, funding the implementation actions as necessary. The City also recognizes that as TMDL Implementation Plans to address impaired waters are developed the City’s current stormwater management program may need to be revised to reflect the findings in the Implementation Plan.

To date, TMDL Implementation Plans for three of the impaired waters within Carver have been approved. These plans are as follows:

• Lower Minnesota River Dissolved Oxygen TMDL Implementation Plan - The TMDL implementation area for this TMDL does not include the City of Carver.
• Carver, Bevens, and Silver Creek Bacterial TMDL Implementation Plan - The TMDL implementation area for this TMDL includes the western portions of Carver. The City is willing to work with Carver County to work toward the goals identified in this TMDL Implementation Plan; however, no specific urban stormwater management implementation items are identified.
• Carver Creek Turbidity Implementation Plan – This implementation plan states the following: “Comparing [the current MS4 TSS Loadings – TMDL Implementation Plan Table 3.2] to allowable loadings ([TMDL Implementation Plan] Table 2.2) indicates that no reductions appear to be needed from MS4 areas. The regulated MS4 communities will need to maintain at least the existing level of treatment of their stormwater discharges to ensure continued compliance with the conditions of the MS4 general permit. At the time of permit application, permittees will indicate that a WLA was assigned to them in this TMDL project, they are currently meeting that WLA since no reductions were called for, and they will continue to maintain the current BMPs on the landscape to ensure compliance with their permit.”

To comply with this statement, the City will implement the following:
  o As development proceeds within the Carver Creek TMDL tributary area, the City will enforce our construction site stormwater runoff control ordinance to control sediment loading during construction.
  o All development activities must meet the City’s post-construction stormwater standards. City development standards require significant stormwater rate control, volume control/water quality measures, and the construction of a trunk conveyance system

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including a significant stormsewer network and ravine/stream restoration activities to minimize erosion and control sediment transport to Carver Creek.

- The City will maintain all current City owned and maintained BMPs in accordance with the requirements of the current MS4 permit and City SWPPP.

### Project Review and Approval Process

The City has established and fully implemented both a preliminary and final platting process according to Article V of the City of Carver Code of Ordinances. The implementation of applicable Goals and Policies and the City’s design standards included in the SWMP is addressed throughout the project review and approval process.

The City will enforce its design standards while incorporating the following documents:

- The City will default to CCWMO Chapter 153 of Carver County Code of Ordinances (approved by County October 15, 2016) within in the CCWMO’s jurisdictional boundary.

Early in the project review and approval process, typically the concept review stage, the City will coordinate with the jurisdictional watershed as follows:

- **Lower Minnesota River Watershed District**

  It has been the City’s experience that the Lower Minnesota River Watershed District has made a concerted effort to encourage cities within their jurisdiction to adopt local SWMPs and assume the regulatory responsibility for stormwater management and other related issues. The City assumes that with the adoption of this SWMP, the primary regulatory responsibility will rest with the City.

  An existing agreement between the Lower Minnesota River Watershed District and the City of Carver is already in place giving the City the authority to implement the stormwater goals and policies of the LMRWD for the LMRWD, unless otherwise described in the agreement. A copy of this agreement is included in the SWMP Appendices.

- **Carver County Watershed Management Organization**

  At this time, the City performs development review and approval activities side-by-side with the CCWMO, with both the City and watershed operating their own approval processes. With the adoption of this SWMP, Carver County will assess the ability of the City to implement this plan as it relates to regulatory responsibility. In the future the City may desire to take on principle responsibility for enforcement of the Counties rules. At that time, if the CCWMO deems that the City has performed adequately in implementing the County’s rules, an individual agreement between the City and the County could be negotiated to determine principle review and enforcement responsibility. However, at this time, the City will not actively be pursuing this option.

### Stormwater Education and Outreach

Stormwater education and outreach plays an important role in any effort to implement the City’s stormwater management program, as outlined in the SWMP. The framework for the City’s stormwater education and outreach program is provided in the NPDES MS4 permit, and the implementation plan for this program is presented in the City’s SWPPP Document.
The objectives of the City’s stormwater education and outreach program vary, depending on the target audience, which includes City staff, elected officials, City residents and business owners, and the development community. The program focus for each of these groups is described in the following sections.

A complete list of stormwater related education and outreach activities can be found in the City’s SWPPP Document.

City Staff and Elected Officials

City staff and local government officials have a wide range of responsibilities for implementing this plan and the activities identified in the City’s SWPPP Document. The City will implement education and outreach activities for City staff and elected officials, including the following:

- Annual stormwater public meeting – this meeting will take place at a City Council meeting and will provide the Council and City staff in attendance with a summary of the prior year’s stormwater management program implementation efforts.
- Carver County WMO presentation – every 2-3 years, the City will invite Carver County WMO staff to a special meeting to educate City staff and elected officials on water resources issues with the County.
- Staff training – this City will conduct regular training for new/seasonal staff and on-going staff as is relevant to their job responsibilities. This training could include general all staff training sessions, staff specific training sessions, and the distribution of training materials to staff.
- SWMP Update presentations – Updates to the City’s SWMP are presented to both the Planning Commission and City Council prior to adoption of the SWMP. This presentation covers the framework of the plan, plan contents, and the updates to the plan, and would occur on an as-needed basis.
- Periodic stormwater related presentations and training materials – As relevant stormwater related topics emerge (e.g. NOAA Atlas 14, MS4 Permit, Carver County Rule Updates, etc.), the City will take the appropriate measures (e.g. presentations, internal memos, etc.) to educate City staff and elected officials.

City Residents and Business Owners

To meet the requirements of the MS4 permit and the City’s goal of improving the quality of Carver water resources, the City will engage residents and business owners in stormwater related education and outreach. The City will implement education and outreach activities for residents and business owners, including the following:

- Annual stormwater public meeting – this meeting provides an opportunity for residents and business owners to hear about the City’s efforts to implement our stormwater program. This meeting also provides an opportunity for residents and business owners to provide feedback and input on the City’s stormwater program.
- Regular stormwater related publications – include stormwater related information in a minimum of 4 City publications (City newsletter, utility billing mailings, etc.) annually. The content will be derived from both internal City sources and partnerships with other entities, such as the CCWMO or LMRWD.
- Coordination with CCWMO – starting in 2018, the City will seek to formalize an agreement to coordinate public education activities with CCWMO’s Education Coordinator, based on the City’s available budget. As part of this agreement, the City will provide the CCWMO with the following:
  o City staff contacts responsible for City media communication, along with information on the media communication methods available to the City.
A list of stormwater related issues of concern and topics about which the City would like to increase public awareness.

- The City will annually review their public education and outreach program and determine a focus for the upcoming year. This review will be provided to the CCWMO to coordinate education and outreach opportunities.

- Social media communications – use the City’s social media outlets (City blog, Facebook, and Twitter) to notice upcoming stormwater related events, highlight stormwater related happenings in the area, or provide stormwater related educational materials. The City aims for a minimum of 4 stormwater related communications per year via the City’s social media outlets.

- Annual Spring cleanup day – City-wide annual curbside cleanup day accepting mixed solid waste and yard waste.

Development Community

The City seeks to engage the development and redevelopment applicants early in the project submittal process to help guide stormwater mitigation efforts for new and redevelopment projects. It is the City’s expectation that potential developers will know what is required of them to appropriately assess the site from the beginning. The City will implement education and outreach activities for the development community, including the following:

- Pre-application meeting – The initial guidance related to stormwater mitigation efforts will be provided at the pre-application meeting with developers (see Policy 28). This meeting provides an opportunity to discuss how the project will incorporate Conservation Design practices into the site layout. The City is committed to working with developers to incorporate suitable Conservation Design techniques into site layouts.

- City website – The City makes ordinances and design standards available on our website for developers to review.

- Plan review process – Throughout the plan review process, the City is in communication with developers regarding the implementation of the City’s stormwater related policies, stormwater system maintenance requirements, and general site layouts that promote water quality.

Stormwater System Implementation Projects and Activities

Based on the assessment of the City’s current stormwater management program and the implementation items in the preceding sections, a list of recommended system improvement projects and activities has been identified. The system improvements identified range from those being driven by regulatory requirements, to others driven by the functionality of the City’s stormwater system. Table W-9 presents a summary of recommended stormwater and water resource management projects and activities, listed in no particular order. The budget amounts included in this table should be considered planning-level cost estimates, with more specific cost estimates to be determined as the project or activity approaches.

The items listed in Table W-10 will be used as a reference when the City selects specific stormwater and water resources management projects and activities to be included in the capital improvement planning process. This planning process is updated periodically by city staff and reviewed and approved by the City Council.
Table W-10 | Stormwater System Implementation Projects and Activities

<table>
<thead>
<tr>
<th>Item Number</th>
<th>Project Description</th>
<th>Est. Start</th>
<th>Est. Cost ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>6th St Drainage Study: Study best management practices that can be incorporated to provide water quality while managing increasing flow rates</td>
<td>2020</td>
<td>$650,000</td>
</tr>
<tr>
<td>2</td>
<td>Ravine stabilization – 4th St &amp; Elm Drive: Repair and stabilize the active gully erosion at this location</td>
<td>2020</td>
<td>$250,000</td>
</tr>
<tr>
<td>3</td>
<td>Diedrich Dr &amp; Kirche Hill Dr. Stormwater Improvements: Include structural BMPs including sumps, SAFL Baffle, etc. in the proposed storm sewer system.</td>
<td>2019</td>
<td>$25,000</td>
</tr>
<tr>
<td>4</td>
<td>Downtown Water Quality Improvements: Continue to install structural BMPs such as sumps, SAFL Baffle, etc. as reconstruction projects occur</td>
<td>TBD</td>
<td>TBD</td>
</tr>
<tr>
<td>5</td>
<td>Spring, Carver, and Timber Creeks stream bank stabilization: As stream rehabilitation funds become available, restore and stabilize selected sections of Spring, Carver, and Timber Creeks.</td>
<td>TBD</td>
<td>TBD</td>
</tr>
<tr>
<td>6</td>
<td>6th Street Railroad Embankment Drainage Improvements: Restore functionality of outlet serving upstream drainage area</td>
<td>2019</td>
<td>$100,000</td>
</tr>
<tr>
<td>7</td>
<td>Community Park Drainage Improvements: Add BMPs to provide water quality and quantity improvements.</td>
<td>TBD</td>
<td>TBD</td>
</tr>
<tr>
<td>8</td>
<td>Dahlgren Road: Construct BMPs to provide water quality and quantity improvements along Dahlgren Road to prevent flooding during heavy rainfall events</td>
<td>TBD</td>
<td>TBD</td>
</tr>
<tr>
<td>9</td>
<td>Old Carver Road Stormwater Basin: Construct Stormwater Basin on Parcel #: 02393762, Provide water quality for Mount Hope Road Storm Sewer System</td>
<td>TBD</td>
<td>$200,000</td>
</tr>
<tr>
<td>10</td>
<td>Stormwater system inspection and maintenance: Inspection and maintenance of the City’s stormwater system</td>
<td>Ongoing</td>
<td>Varies</td>
</tr>
<tr>
<td>11</td>
<td>Annual Street sweeping: Sweep streets at least twice annually</td>
<td>Ongoing</td>
<td>$15,000</td>
</tr>
<tr>
<td>12</td>
<td>Annual MS4 reporting: Prepare and submit MS4 annual report</td>
<td>Ongoing</td>
<td>Varies</td>
</tr>
<tr>
<td>13</td>
<td>Stormwater education and outreach: Stormwater education coordination, outreach events, staff training, website updates, mailings, etc.</td>
<td>Ongoing</td>
<td>Varies</td>
</tr>
<tr>
<td>14</td>
<td>Update city code: Review and update as necessary to address new MS4 permit requirements</td>
<td>2014</td>
<td>10,000</td>
</tr>
<tr>
<td>15</td>
<td>Develop a Shoreland Ordinance: Prepare a shoreland ordinance compliant with DNR shoreland regulations</td>
<td>2019</td>
<td>10,000</td>
</tr>
</tbody>
</table>

Note: The City may seek partnerships from the CCWMO or LMRWD, or financial assistance from outside sources to implement the activities.

Stormwater Area Charges

The City’s proposed surface water system is presented on Map 1 and in Appendices A-D. New surface water facilities will be constructed in conjunction with new development, redevelopment and street reconstruction. One of the basic objectives of the SWMP was to lay out a surface water system to meet the needs of Carver moving forward and to generate a cost for the construction of this system.

A detailed breakdown of the total stormwater system cost (regional conveyance system cost, regional pond construction cost, and regional land costs) is included in the SWMP. However, following the adoption of the 2008 SWMP, the City made the decision to base their stormwater area charge on the regional conveyance system cost amount only. The City assumes that all the costs associated with pond construction (regional pond construction cost) and land cost for onsite ponding (pond land cost) are borne completely by the developer, as these ponding costs are necessary in order to meet the City’s stormwater requirements.

Table W-11 below identifies the regional conveyance system cost per developable acre broken up by major land use type. This is the cost the City is using for their stormwater area charge amount. The Table cost per developable acre by major land use in Table W-11 applies a higher cost per acre value for land...
uses with more impervious surface than those with less. This is due to the fact that higher impervious land uses require larger, more expensive infrastructure.

The total system cost estimates presented in the SWMP are based on 2013 construction costs and can be related to the value of the Engineering News Record (ENR) Index for Construction Costs of approximately 9,552 (July 2013). Future changes in this index are expected to fairly accurately describe cost changes in the proposed facilities. During interim periods between full evaluation of projected costs, capital recovery procedures can be related to this index. The system cost estimates are assumed to cover construction, legal, engineering, and administrative costs.

Table W-11 | Regional Conveyance System Cost per Developable Acre Summary

<table>
<thead>
<tr>
<th>Land Use</th>
<th>Developable Acreage (acres)</th>
<th>Runoff Depth 10-yr, 24-hr Event (inches)</th>
<th>Land Use Factor</th>
<th>Equivalent Area (acres)</th>
<th>Cost per Developable Acre ($/acre)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low Density Residential</td>
<td>1,602</td>
<td>1.75</td>
<td>1</td>
<td>1,602</td>
<td>$3,145</td>
</tr>
<tr>
<td>Medium Density Residential</td>
<td>855</td>
<td>2.05</td>
<td>1.2</td>
<td>1,026</td>
<td>$3,775</td>
</tr>
<tr>
<td>Mixed Density Residential</td>
<td>487</td>
<td>2.05</td>
<td>1.2</td>
<td>584</td>
<td>$3,775</td>
</tr>
<tr>
<td>High Density Residential</td>
<td>162</td>
<td>2.92</td>
<td>1.7</td>
<td>275</td>
<td>$5,347</td>
</tr>
<tr>
<td>Commercial / Industrial 1</td>
<td>422</td>
<td>3.11</td>
<td>1.8</td>
<td>760</td>
<td>$5,662</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>3,528</strong></td>
<td><strong>4,247</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| Total Regional Conveyance System Cost | $13,350,100 |
| Cost per Equivalent Acre            | $3,145      |

1 Commercial/industrial land use incorporates areas on Figure 7 identified as commercial, commercial/industrial, and mixed commercial/industrial.
2 Runoff depth from a 10-year storm event used to weigh the amount of runoff generated by each land use (based on City storm sewer design event).
3 Land use factor is calculated by dividing the 10-year runoff depth for the given land use by the 10-year runoff depth generated by LDR.
4 Equivalent area calculated by multiplying the developable acreage for a given land use by associated land use factor.
5 The cost per developable acre is calculated by multiplying the cost per equivalent acre by a specified land use factor.
6 See SWMP Appendices for details on this cost amount.

**Financing**

Several methods of financing the implementation items identified in this SWMP are available to the City. Some of the financing methods are as follows:

- **Area Charges**: These are fees charged to developments on an area (cost per acre) basis. These charges are frequently used in developing communities to ensure that new development pays for facilities required to serve it. Charges could be levied against redevelopment in a similar manner. An area charge calculation could be based on methodologies similar to those presented in Table W-10 above.
- **Special Assessments**: Assessments against benefiting or responsible properties can be used to finance surface water improvements.
• Stormwater Utility: This is a fee charged to existing properties based on an estimate of runoff generated and discharged to the City’s system. The revenues collected are dedicated to the surface water system, frequently used to pay for operation and maintenance of the system.
• Grants: Though subject to budgetary constraints, a number of state and other grant programs are available for surface water management.

Typically, an area charge is the most effective way of financing new stormwater trunk system improvements driven by development.

The other financing mechanisms mentioned above are generally more appropriate for the retrofit improvements within developed portions of the City identified in the SWMP Appendices.