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TO: Mayor and Council

FROM: Craig Hupy, Acting City Administrator

CC: Tom Crawford, City Administrator  
Nick Hutchinson, City Engineer  
Marti Praschan, Financial & Administrative Services Area Administrator  
Colin Spencer, Purchasing Manager

SUBJECT: July 20, 2021 Council Agenda Responses

DATE: July 15, 2021

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**CA-2 - Resolution to Ratify an Emergency Change Order with Cadillac Asphalt LLC for the Reconstruction of Jackson Ave and N. Maple Rd. Damaged by the June 22nd Water Main Break (\$1,116,782.00) \$7,391,782.00 and to Appropriate Funding in the Amount of \$1,398,650.00 from the Water Supply System Fund Balance (8 Votes Required)**

**Question:** Is it typical for a road reconstruction of this scale to be allocated entirely to the Water Supply System budget? Looking at the budget allocation for the Dunmore/Waverly/Weldon/Hartford water main project, allocation of cost appears to be shared across a couple other budgets (stormwater, bridge/road repair millage). Is there a reason why there is no split/shared allocation for this project? (Councilmember Nelson)

**Response:** For planned projects, road and utility work is scheduled in advance such that they are built at the same time, and costs are split between the funds accordingly. In the case of Maple Road, the watermain break was the cause of the damage to a road that was otherwise not scheduled for work for some years, and was the sole reason that the pavement needed to be fully reconstructed. Therefore, the Water Fund is responsible for the full cost of the work.

**Question:** How much is the sum -- \$1,116,782 -- as a proportion of the whole fund balance in the Water Supply System? (Councilmember Nelson)

**Response:** \$1,116,782 represents approximately 11% of the June 30, 2020 unrestricted Water Supply Fund Balance.

**Question:** On July 6, 2020, Council approved an Administrative Consent Order with EGLI that included a commitment to develop a Sewage Collection System Asset Management Program. Does the City have an asset management program for its drinking water system? If it does, please attach a copy in the response. If not, are there any plans to develop such a program and when will it be completed? (Councilmember Nelson)

**Response:** Attached is the City's Water Asset Management Plan. Section 4 is the applicable section describing how water mains are analyzed for replacement/rehabilitation. This effort is done annually.

**Question:** The staff memo notes, " This reach of the water system did not have a history of breaks or leaks. One of the difficulties of operating a water system is having accurate information of the condition of its pipes. With current technologies, detailed assessment of condition is invasive and require prolonged outages for the pipes. This is difficult and expensive to undertake, particularly on larger transmission mains." Could staff please elaborate a bit more about how the City assesses the condition of water system infrastructure and when this area was last assessed? Is there anything staff is planning on doing differently in the future that may protect from future breaks of this type? (Councilmember Briggs)

**Response:** Attached is the City's Water Asset Management Plan. Section 4 is the applicable section describing how water mains are analyzed for replacement/rehabilitation. The analysis utilizes a comprehensive risk model which determines the probability and consequence of failure for each pipe in the distribution system. This effort is done annually. Staff also views emerging technology for condition assessments.

### **DC-3 – Resolution to Order Election and to Determine Ballot Question for Amendment to Section 14.3 of the City Charter Related to Best Value Purchasing (7 Votes Required)**

**Question:** In the final WHEREAS clause regarding value, several of the six factors listed are familiar. I would like a staff response re: which of those six factors are already considered in our bidding process and which of those six factors are not currently taken into account. Please include a brief explanation of scoring sheets currently used in bidding processes (weight of factors currently considered). Implementation of this will require staff to specifically assess "the adequacy of benefits the bidder provides to its employees." I would like staff explanation of how they anticipate measuring this. Given current procedures for scoring contracts (i.e. specific weight given to different considerations), I would like staff explanation of how this factor would likely be weighed against other factors (Councilmember Nelson)

**Response:** All six factors (which are illustrative; not exhaustive) are included in Construction formal solicitations per the changes approved by Council to Chapter 14 in July 2020. Since construction projects are typically issued as an Invitation to Bid (ITB - which is primarily based on lowest responsible bidder as required in the Charter) where the City is restrained by the current Charter language and unable to assign points (assigning specific weights) to the six factors and perform a traditional evaluation of responses received similar to what would be found in an Request for Proposal (RFP) where evaluation criteria is developed and weights for factors are assigned in the form of evaluation points. If this measure is approved, it would allow the City to transition our Construction procurement process from one based primarily on Invitation to Bid (lowest responsible bid with the ability to reject non-responsive or non-responsible bids) to a Request for Proposal which would allow for a more formal and clear evaluation process.

Should this change be approved by City Council and subsequently by the voters, a multifaceted project team would be established to develop and standardize construction contract solicitation scoring and weighting factors.

**DC-4 – Resolution to Order Election and to Determine Ballot Question for Amendment to Section 14.2 of the City Charter Related to Emergency (7 Votes Required)**

**Question:** What are recent examples of situations relevant to this particular proposal? (Councilmember Nelson)

**Response:** Item CA-2 on the July 20<sup>th</sup> Council agenda is the most recent example of this situation.

**DC-5 – Resolution to Order Election and to Determine Ballot Question for Amendment to Section 14.2 of the City Charter Related to the \$25,000 Dollar Limit (7 Votes Required)**

**Question:** I appreciate the staff estimate that this proposal would reduce by 48% the number of budget items seen by Council on a public agenda (4% of the yearly value of city contracts). What is the total amount of 4% of all contracts that the city enters into in a year, i.e. the dollar amount? (Councilmember Nelson)

**Response:** \$3,286,000

**Question:** Does the change from \$25,000 to \$75,000 reflect the 75% cumulative rate of inflation cited? If not, what change would reflect that 75% cumulative rate of inflation? (Councilmember Nelson)

**Response:** The proposed \$75,000 amount reflects an annual average assumption of 4.3% for the rate of inflation. The actual annual average rate of inflation for the period of 1979 to 2020 is 3.5%, which equates to \$61,150.

**Question:** What are the “limited circumstances” when contracts under \$25,000 and over \$3,000 do not need to be competitively bid by the less costly process of getting three quotes? (Councilmember Nelson)

**Response:** “Limited Circumstances” would include: Sole/Best Source (which are reported to Council every month), Exemptions per APP# 204 where competition is scarce (e.g. Conference & Training, dues, licenses, postage), emergencies and use of an existing competitive price agreement (e.g. MiDEAL – State of Michigan purchasing program, cooperatives).

**Question:** How many contracts in the last year qualified under those “limited circumstances”? (Councilmember Nelson)

**Response:** The City does not currently track all of the purchases that would fall under “limited circumstances” but based on the Sole/Best Source data tracked for FY21 the City issued 189 Sole/Best Source PO’s.

**Question:** How many contracts in the last year would have qualified under those “limited circumstances” if the limit were \$75,000? (Councilmember Nelson)

**Response:** There were 12 Sole/Best Sourced PO’s for FY21 between \$25k and \$75k.

**Question:** How does this ‘less costly process of whereby staff obtains at least three quotes’ happen under the current charter requirements (i.e. how are contracts chosen among the quotes received)? (Councilmember Nelson)

**Response:** The quoting process is done informally by the City Unit where the project or item specifics are communicated to at least three potential sources and awarded to the lowest responsible firm who provided a quote.

**Question:** How would that process change for contracts under \$75,000 if we implement the proposed changes in DC-4? (Councilmember Nelson)

**Response:** Resulting changes are to be determined, but it is likely that the \$25k threshold to require the issuance of a formal solicitation (Bid or Proposal) will remain. However, if the dollar-limit increase is approved, then it would be possible for the new ordinance to allow purchases of personal property of \$75,000 or less to be made without competitive bidding.

**Question:** Is the requirement for competitive bidding linked to the requirement for Council approval? (Councilmember Nelson)

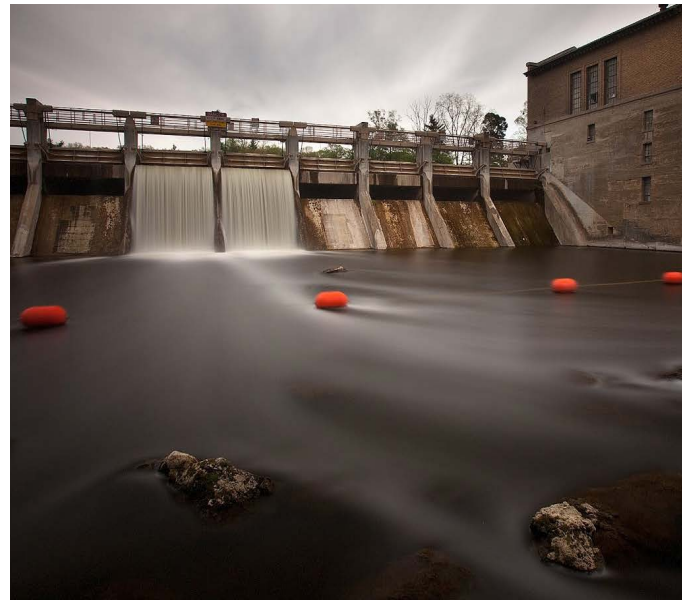
**Response:** Currently, yes.

**Question:** I am referencing the contemplated savings in “significant city resources” in staff time spent on competitive bidding process and seeking Council approval in preparing resolutions. Of the resources spent on this process, what approximate proportion is allocated to the bidding process versus the preparation of a resolution for (likely) the Consent Agenda of a Council meeting? (Councilmember Nelson)

**Response:** The resources spent for a formal solicitation can vary depending on what’s being requested but I would generally estimate the time to be 70% for the bidding process and 30% for preparation of a resolution.

**Question:** Is it possible to increase the ceiling for this, increase the amount that triggers a requirement for competitive bidding, but still see those contracts on a public Council Agenda? (Councilmember Nelson)

**Response:** Yes, it is possible to do this by setting separate and different dollar limits that trigger the requirement for competitive bidding and for Council approval. As indicated above, the current (and proposed) requirement for competitive bidding is linked to and the same as the requirement for Council approval.



# WATER ASSET MANAGEMENT PROGRAM



City of Ann Arbor  
Water Treatment Services Unit  
December 2017

# **Water Asset Management Program**

**Prepared For:  
City of Ann Arbor Water Treatment Services Unit  
Ann Arbor, Michigan**

**December 2017  
Project No. 170049PS**

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Appendix 4	Sustainability Framework
Appendix 5	2018-2023 Capital Improvements Plan Executive Summary

## List of Abbreviations/Acronyms

AMP	Asset Management Program
BRE	Business Risk Exposure
CIP	Capital Improvements Plan
City	City of Ann Arbor
COF	Consequence of Failure
FTCH	Fishbeck, Thompson, Carr & Huber, Inc.
GIS	Geographic Information System
gpm	gallons per minute
LOS	level of service
MDEQ	Michigan Department of Environmental Quality
MGD	million gallons per day
PAN	Prioritization Action Number
POF	Probability of Failure
WAMP	Water Asset Management Program
WTP	Water Treatment Plant
WTSU	Water Treatment Services Unit

# Document Revision History

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An Asset Management Program is a living document, meaning the intent is for it to be reviewed and updated on a regular basis to reflect changes in the water system.

Version	Author	Date	Revision summary
1.0	FTCH	12/18/2017	Final 2017 Report

# Executive Summary

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The City of Ann Arbor (City) water system supplies water to approximately 125,000 people and is comprised of a water supply, treatment and distribution infrastructure. The City Water Treatment Services Unit (WTSU) also owns and operates four dams along the Huron River. The City's water system assets are managed by different entities within the Public Services Area. The Systems Planning and Public Works Units manage assets associated with the distribution system and Water Treatment Services Unit manages assets associated with supply, treatment and dam facilities. These units work collaboratively to develop, implement and maintain an asset management program that strives to maintain an established level of service to its customers. The City's mission is to provide safe, reliable, and affordable water service to their customers, as detailed in a set of level of service goals.

This report summarizes the comprehensive water asset management program (WAMP) the City has in place to meet the Michigan Department of Environmental Quality (MDEQ) asset management and capital improvements plan requirements for community water supplies as defined in the Michigan Drinking Water Act, Part 399, R 325.10102. The framework of the City's WAMP is comprised of five core components: asset inventory, level of service (LOS), criticality, capital improvements plan (CIP), and revenue structure.

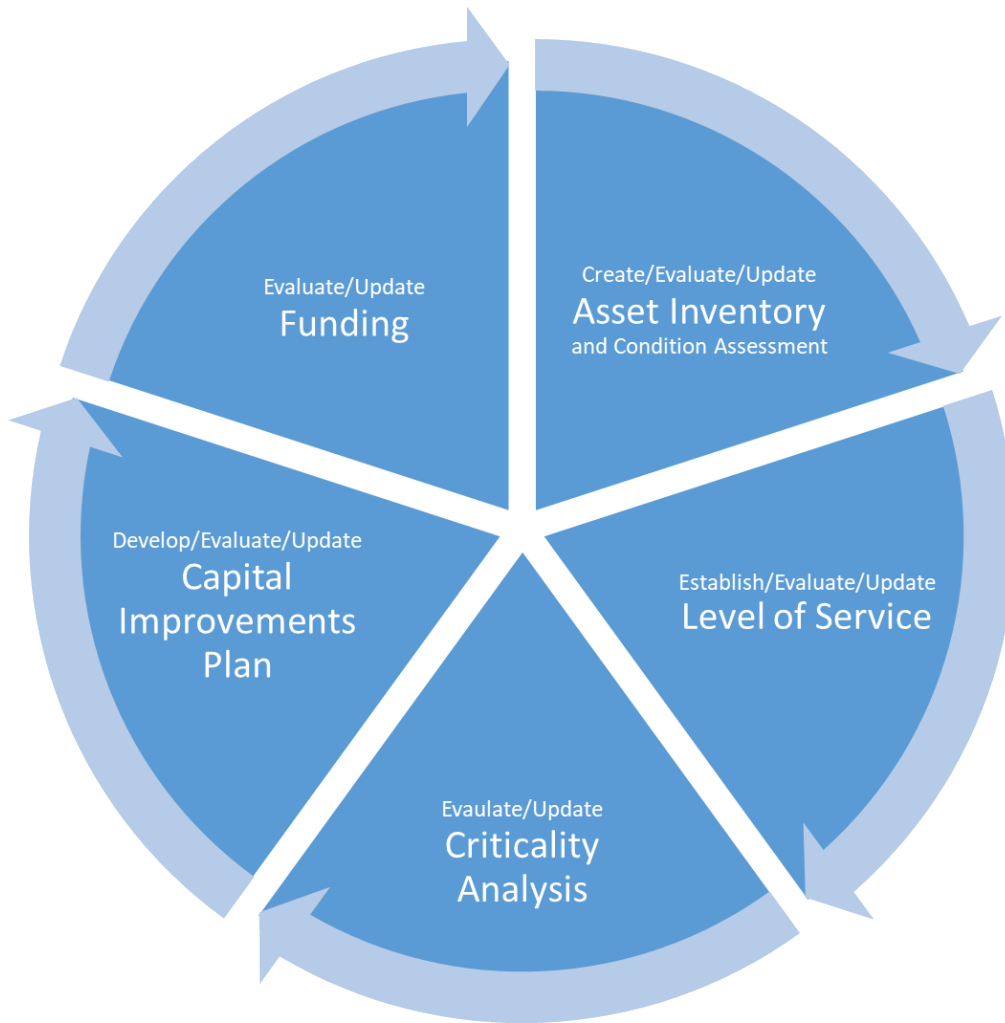
Systems Planning and Public Works maintain an inventory of distribution system horizontal assets, while WTSU maintains a separate inventory of vertical assets. Each unit stores and manages their asset inventory in a computerized management database. The inventories include information on all water system assets, including description, location, age, condition, complaint history, expected remaining life and replacement cost. Results of asset condition assessments are maintained within the inventory databases and updated when necessary. The data stored in the inventory is used to determine which assets are most critical, calculate the probability of failure (POF), consequence of failure (COF) and overall assessment of risk. The asset inventory and criticality components are critical steps in identifying deficiencies within the water system's infrastructure to help recognize where replacement and rehabilitation projects are needed to address the deficiencies.

Using the principles of asset criticality analysis, and various efforts such as studies and master plans, project needs are regularly reviewed and updated based on needs identified by the water system managing units. These projects and their estimated implementation costs are entered into the City's Water System Prioritization Model. Projects are ranked based on several evaluation criteria and weighting factors for entry into the City's water system CIP. Some of these factors include safety, regulatory compliance, coordination with other projects, operations and maintenance costs, asset reliability and consequences of asset failure and level of service (user experience). The CIP is prepared by the Systems Planning Unit to meet requirements of Municipal Planning Act (PA 33 of 2008) and to provide a methodology for turning infrastructure needs into projects by outlining anticipated funding sources and schedules for study, design and/or construction of these projects based on prioritization, as well as the availability of funding and staffing resources.

The City's level of service is one of the core WAMP components and a criteria considered in the CIP process. Individual units within the Public Services Area have established a LOS that they intend to provide to the City's customer community. This report includes a combined LOS, consolidating key performance targets that the water system strives to provide. Consideration of the selected LOS is continuously given as the City makes decisions on projects, performance targets and establishing water rates to customers. The City utilizes a rate structure based on a cost of service study, customer input, the desired LOS, and other factors. Customer rates and fees are adjusted as need is dictated by the City's long-term financial plan. The City is in the midst of a cost of service study to evaluate updates to the current water and sewer rate structures.

Further detail on how the City has been managing assets, including inventory, condition assessment and criticality, as well as establishing standards for LOS, developing a CIP and using these tools to set a fair and equitable funding structure and rate methodology is included in the corresponding sections within this report.

The figure below illustrates the overall process that the City has in place to implement and maintain their WAMP.



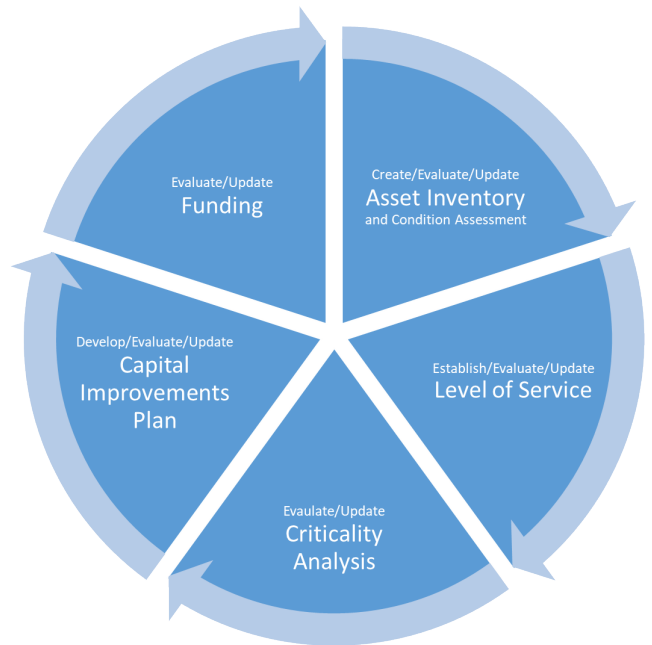
**Figure 1 - Water Asset Management Program Cycle**

# 1.0 Introduction

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## 1.1 Asset Management Program Overview

The purpose of an asset management program is to ensure the long-term sustainability of a water utility by implementing a set of procedures to manage assets through their life cycles based on principles of life cycle costing. The City of Ann Arbor (City) has implemented such procedures into their Water Asset Management Program (WAMP) to use as a tool to decide where best to allocate resources to restore, maintain and improve the City’s water system infrastructure. The program is the result of collective efforts by the Systems Planning, Public Works, and Water Treatment Services Units within the City’s Public Services Area. The five core components of an asset management plan: asset inventory, level of service (LOS), criticality analysis, capital improvements planning (CIP), and revenue structure (funding methodology) are defined below. Figure 1 illustrates how each of the core components fits into the overall lifecycle of the City’s WAMP. While there are sequential steps to developing the program, the steps are interrelated and the process of implementing, evaluating, and refining the program is ongoing and cyclical.



### 1.1.1 Asset Inventory

The Asset Inventory is a detailed list of all water system assets, including asset description, location, age, condition, estimated remaining life, and replacement cost. The results of condition assessments are updated in the asset inventory as they are conducted. Further description of the City’s asset inventories and how they are managed is included in Section 2.0.

### 1.1.2 Level of Service

Level of service (LOS) defines the performance of water system components over time and sets a standard that the water system strives to achieve. LOS is established by defining concrete, achievable, and trackable goals and performance targets to be used as a tool to capture customer expectations about cost, as well as other operational and management services provided by the utility. A description of the City’s LOS and how it plays into the City’s WAMP is described in Section 3.0.

### 1.1.3 Criticality Analysis

The criticality analysis involves ranking the water system assets that are most critical to the system and consists of two parts: the likelihood/probability of failure (POF) and the consequence of failure (COF). Generally, a numerical value is assigned to each of these two parts, and the two numerical values are multiplied together, with the resulting number representing the overall “criticality”, or risk factor, of the asset. The POF score is determined based on the results of the condition of the asset, defined in the Asset Inventory step; assets that are in poor condition generally have a higher POF. The COF represents the impact the failure of a given asset would have on other equipment, processes, public health, environment, property, and/or revenue. A higher

score is given to assets whose failure would have a greater impact than others. How the City assigns criticality and uses this information to identify projects is described in Section 4.0.

#### **1.1.4 Capital Improvements Plan**

The City's Capital Improvements Plan (CIP) identifies water system replacement and rehabilitation needs for 6-year and 20-year planning horizons. The CIP process includes identifying projects to replace, rehabilitate or improve deteriorated assets because of the asset inventory, regulatory compliance, planned development, condition assessment, and criticality analyses. The CIP is adopted through a formal approval process by the water system's leadership and the City Planning Commission. The WAMP requirements include a formal methodology to prioritize projects based on criticality assessment, as well as other factors. Project costs and implementation schedules are revisited and reprioritized annually to incorporate current conditions, data, and needs of the water system. Further detail on the City's CIP is discussed in Section 5.0.

#### **1.1.5 Funding**

The cost component of the WAMP is intended to demonstrate how the City will position itself financially to implement the CIP. The City's rate methodology ensures rates and charges are adequate to provide sufficient revenue to fund operation, maintenance, capital improvement projects, debt services, and other financial commitments of the utility. The City's rate structure and funding methodology are described in Section 6.0.

### **1.2 Water System Overview**

Approximately 85% of the raw water supplied to the Water Treatment Plant (WTP) is sourced from the Huron River at Barton Pond, which is an impoundment created by the Barton Dam. Two raw water intake pipelines supply water from Barton Pond to Barton Pump Station, which then pumps raw water to the WTP. The remaining 15% of the raw water is sourced from groundwater wells at the Steere Farm wellfield located on the south side of the City. The proportion of surface water and groundwater varies, typically based on season. Surface water and groundwater are blended at the WTP.

The WTP uses the following processes to treat raw water prior to delivery to customers: lime softening, ozone disinfection, filtration, and chloramination. Treatment facilities include two separate water plants: an older facility built in 1938 and a newer facility built in the 1960s and 1970s. The Michigan Department of Environmental Quality (MDEQ) rated capacity of the City's WTP is currently 44.5 million gallons per day (MGD). The WTP services approximately 125,000 people and provides an average day demand of 14 MGD. Around 10% of the average demand is sold to Ann Arbor and Scio Townships. See Appendix 1 for a general process flow diagram of the WTP.

The water distribution system consists of five pressure districts. Water pressure is maintained by high service pumps at the WTP, four remote pumping stations, two elevated storage tanks, three underground storage tanks, and one ground storage tank, all located throughout the distribution system. See Appendix 2 for a schematic overview of the distribution system, including pressure districts, reservoirs, and pump stations.

The assets managed by the Water Treatment Services Unit (WTSU) also include four dams: Barton, Argo, Geddes, and Superior. Barton Dam provides the impoundment of the City's surface water supply to the WTP. Both Barton and Superior dams produce hydroelectric power. Argo and Geddes dams are solely recreational dams and provide impoundments used for fishing, boating, rowing, and other recreational uses.

## 1.3 Reference Report Summary

Several planning studies have been completed for the City's Water System over the last 12 years, which are pertinent to the WAMP. Throughout this document there are descriptions of and references to portions of the analyses previously completed for the City, highlighting how these studies have helped build the framework of the WAMP. The studies, and their abbreviated titles in parentheses, are described below and will be referenced throughout the document as they relate to the MDEQ Water Asset Management Program Requirements.

- Water Treatment Facilities and Water Resources Master Plan (WTSU Master Plan), CH2MHill, 2006.
  - The WTSU Master Plan includes both a comprehensive review of the existing vertical water system assets and of the ability of the system to meet future projected demands. Several components of the project are applicable to this study:
    - Condition assessments were completed for the critical infrastructure at the WTP.
    - A Water Project Prioritization Model was developed to rank projects based on several criteria. This tool is currently used to rank projects against one another for CIP implementation.
    - Several capital improvement projects were recommended for future implementation.
- Water Distribution System Master Plan (Distribution System Master Plan), CDM, 2010.
  - This master plan included an update and recalibration of the existing water system hydraulic model in InfoWater software, using field measurements and customer water demand information. The model was used to evaluate the system operation in varying demand conditions under existing and future scenarios based on population projections. The model results identified several areas in the system that are fire flow deficient, several valves that operate poorly, and areas within the system that do not meet the current guidelines for hydrant spacing. Recommended improvements were developed based on these evaluations for long-term implementation in the CIP. Some of the improvements have since been implemented and others remain in the CIP to be completed in the future.
- Water Distribution LOS and Capital Reinvestment Study (LOS Study), AECOM, 2014.
  - The purpose of this project was to establish a sustainable LOS for the City's water distribution system in consideration of an associated level of reinvestment in water main replacement. The project scope also included an analysis of water mains in the system to determine the probability of failure (POF) and consequence of failure (COF) for every segment of pipe in the City. A Prioritization Action Number (PAN) score was calculated for each segment of water main based on the POF and COF scores. These calculations were embedded into a computer model, which can be run with GIS data to calculate the Prioritization Action Number (PAN) scores for future analyses. The PAN scores developed during this study are used to prioritize water main replacement for CIP planning efforts. As a result of the study, the City has set a goal to replace 1% of the water main in the system annually, beginning in fiscal year 2018 (FY18), and has committed funds to this goal.
- Water and Sewer Capital Cost Recovery Study (CCR Study), Black & Veatch, 2015.
  - This study was completed to determine if the fee program for customers connecting into the City's water system generates enough revenue to fund past and current capital investment in the water and sanitary sewer systems. The study estimated that the total replacement cost of the City's water system was determined to be approximately \$1.25 billion. This study provides a key financial data point that can be used for long-term financial planning for water system capital improvements. The City's rate structure was adjusted, with revisions approved by City Council, to be consistent with the recommendations of this study.

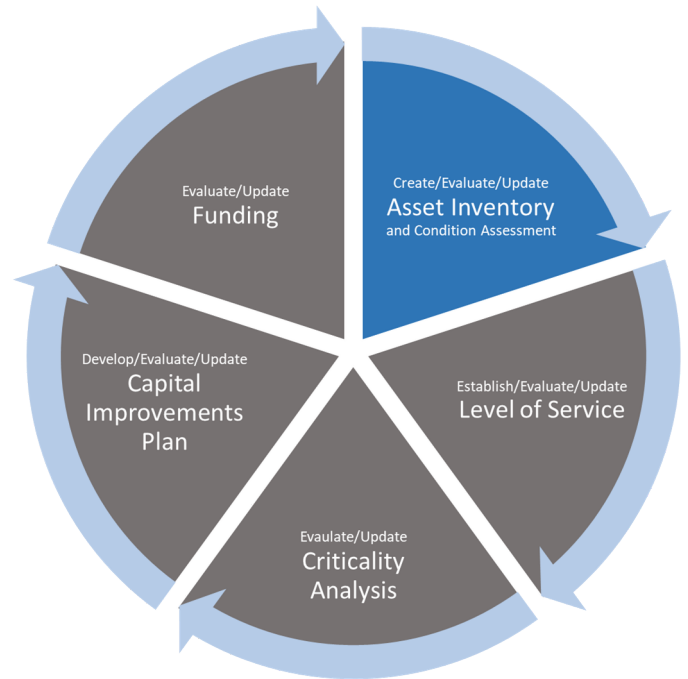
- Cost of Service Study (COS Study), Stantec Consulting, (In Progress 2018).
  - A cost of service study is currently being conducted by Stantec to determine an equitable rate structure that reflects the variable cost to provide water services to different customer classes. This study will appropriate the revenue required to operate and maintain the utility, as well as the financial resources to support capital investment among customer classes. It is anticipated that the COS Study will be completed in 2018; therefore, it was not available for reference for the WAMP.



## 2.0 Asset Inventory

As part of the WAMP, an inventory is taken of all assets within the City’s water system including supply, treatment, and distribution, as well as assets associated with Barton, Argo, Geddes, and Superior Dams. This section includes a summary of the processes and databases used to develop and maintain the inventory of assets for the City’s water system. Any asset integral to reliably supplying, treating, or delivering drinking water to customers, generally with a replacement value as set by the managing unit, is assessed.

There are two types of assets as defined by asset management guidelines: horizontal and vertical assets. Horizontal assets are managed by Systems Planning and Public Works Units and include assets used to distribute water to the system’s customers such as water mains, valves, and hydrants. Vertical assets are managed by the WTSU and include components of surface and well water supply facilities, treatment facilities, pump stations, water storage facilities, and dam facilities.



### 2.1 Horizontal Asset Inventory

#### 2.1.1 Geographic Information System (GIS) Database and InfoWater

The City maintains an inventory of horizontal assets throughout the system in a GIS database that is updated as needed. The information in the GIS database doubles as a means to hydraulically model the City system using the InfoWater software. The horizontal assets inventoried include water mains, hydrants, and valves in the system.

The City owns over 500 miles of water main, and has assessed approximately 429 miles of water main that range in size from 4- to greater than 42-inches in diameter. Approximately 50% of pipe in the distribution system is greater than 50-years old. Approximately 56% of this system is constructed of ductile iron pipe, and an additional 42% of the system is constructed of cast iron pipe. The remaining 2% is split between concrete, copper, plastic, and steel pipe materials. There are currently 3,171 hydrants and 7,403 valves within the distribution system.

The GIS database and InfoWater model track the following parameters for each **water main** in the system and the information is used as a way to track asset condition:

- Facility ID
- Installation Date
- Material
- Diameter
- Length
- Roughness (Hazen Williams C-Factor)
- Owner
- General Location

The following parameters are tracked for each **hydrant** in the system:

- Facility ID
- Installation Date
- Turn Direction
- Lateral Length
- Lateral Size
- Water Main Size (lateral connected to)
- General Location

The following parameters are tracked for each **valve** in the system:

- Facility ID
- Valve Type
- Installation Date
- Diameter
- Number of Turns
- Typically Open/Close
- Currently Open/Close
- Percentage Open
- Owner General Location

In addition, the City's GIS database houses information regarding criticality metrics, such as Probability of Failure (POF), Consequence of Failure (COF), and Prioritization Action Number (PAN), described further in Section 4.

## 2.1.2 CityWorks

For horizontal assets, the City also utilizes CityWorks as a computerized maintenance management system (CMMS). CityWorks connects to the GIS database to link all regular maintenance operations to the associated water system assets. The City currently tracks all service requests, work orders, and inspections performed on the water distribution system. An example list of the operations and maintenance activities tracked in CityWorks is shown below:

- Water Main Breaks
- Water Main Repairs
- Customer Complaints (water quality and pressure)
- Valve Operation
- Valve Replacement
- PRV Maintenance
- Hydrant Flushing
- Hydrant Painting
- Hydrant Repair
- Backflow Inspections
- Various Customer Service Oriented Work including new services, disconnects, water meter operations, etc.

## 2.2 Vertical Asset Inventory

Vertical assets within the City's water system include water treatment and delivery assets, wells, reservoirs, pumping stations, and assets associated with Barton, Argo, Geddes, and Superior Dams.

### 2.2.1 MainSaver

The City WTSU maintains a database of vertical assets using MainSaver, a CMMS software. The MainSaver database includes information on over 2,200 assets comprising the water supply and treatment systems, remote

facilities (water storage tanks and pumping stations), and dams, and is used for tracking the assets and planning preventative maintenance. MainSaver maintains an assigned asset number, description, and general location for each vertical asset in the system.

The relevant MainSaver program parameters are as follows:

- Asset Number
- Asset Type
- Asset Description
- Asset Location
- Parent Asset
- Replacement Cost
- Asset Group

MainSaver has a hierarchy for assets, linking assets that are part of a larger system to that asset. The larger asset is referred to as the “parent asset”. Parent assets associated with supply and treatment facilities and dams include:

- WTP (including all process, storage, reservoirs, and dam infrastructure)
- Raw Water Intake in Barton Pond and Barton Pump Station
- Barton Dam and Hydroelectric Facility
- Steere Farm Well Houses and Pumping Equipment
- East High Service Pump Station
- West High Service Pump Station
- Solids handling systems
- Chemical feed systems
- Argo Dam
- Geddes Dam
- Superior Dam and Hydroelectric Facility

Parent assets associated with distribution facilities include:

- South Industrial Road Pump Station
- Glen and Fuller Pump Station
- North Campus Pump Station
- North Campus Reservoir
- Liberty Road Pump Station
- Liberty Road Reservoir
- Manchester Road Elevated Storage Tank
- Plymouth Road Elevated Storage Tank
- South Industrial Road Ground Storage Tank

## **2.2.2 WTSU Master Plan Critical Assets**

An inventory, along with a condition assessment and valuation of critical vertical assets in the system, was completed as part of the WTSU Master Plan (2006) for the City. Though this inventory is over a decade old, information on the vertical assets in the system is still relevant. A list of nearly 800 critical assets was formulated and reviewed as part of the WTSU Master Plan. It should be noted that the dam infrastructure was not included as a part of the WTSU Master Plan asset inventory.

The WTSU is in the process of updating the list of critical vertical assets, as well as conducting condition assessments for the assets. The process planned for updating the condition assessment is discussed further in Section 4.2.3 of this report.

The WTSU Master Plan inventory of assets includes the following parameters:

- Asset Number
- Asset Description
- Asset Location
- Manufacturer (for Equipment)
- Installed Date
- Expected Life
- Replacement Cost

## 3.0 Level of Service

The City's established LOS is used to set the fundamental framework for how the water system is operated and to help guide the City with its capital planning. This section describes the level of service (LOS) the City intends to provide its customers, as well as the process used to establish the LOS and how it affects the WAMP process.

### 3.1 LOS Philosophy

The City's LOS plays an important role in capital improvements planning. LOS goals are used to prioritize capital investment and guide decision-making. A higher LOS generally corresponds to a higher cost. LOS incorporates public health goals and community values, and balances these expectations with available staff, funding and other high priority water system needs. The City's LOS helps set reasonable standards to maintain a balance between customer expectations, and their tolerance for service interruptions and their willingness to pay for corresponding capital

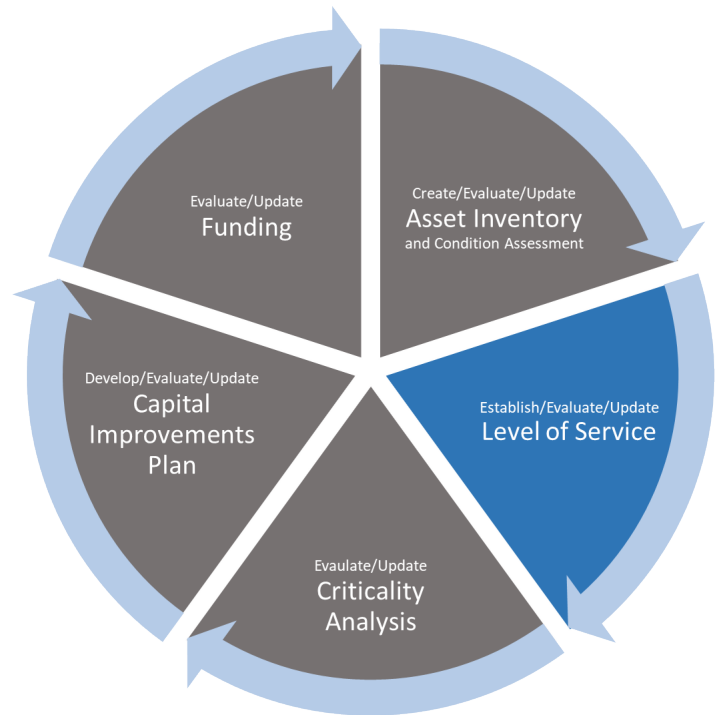
investment. For example, the City has selected a performance target to replace or rehabilitate 1.0% of the water distribution system per year, on average, which matches industry best practice based on our average life expectancy of 100 years for buried infrastructure. While portions of the public may wish to see a target to replace more than 1.0% of the water distribution piping each year, that would require a greater level of investment, higher water rates and more inconvenient construction around the City.

The established LOS also provides the City with a way to document customer expectations of their customers, quantify performance targets and track progress.

### 3.2 LOS Selection

The City's selected LOS includes a general goal to deliver a reliable supply of safe drinking water in compliance with local, state and federal regulations, in addition to several technical, managerial and financial goals. The units within the City's Public Services Area that manage the water system (Water Treatment Services, Systems Planning, Public Works and Administration) have developed their own unit-specific LOS. Establishing the overall water system LOS for inclusion in the WAMP was an iterative process. The process started with compiling and reviewing the unit-specific LOS goals, as well as the various resources, documents, and references from where these goals were derived. A workshop, including managers and key staff from each unit, was held to review and discuss revisions, additions and set specific performance targets. Each goal was reviewed to make sure it is achievable, trackable, and important to the water system managers and/or customers. Consideration was given to regulatory requirements, operational limitations, staff capacity, funding, and public engagement input.

Because of this collaborative effort, a sustainable LOS was established for inclusion in the City's WAMP. Appendix 3 includes a comprehensive summary of the water system's LOS goals. Units within the Public Services Area will meet annually to revisit these goals, assess their ability to achieve them, and modify them as needed. The City's selected LOS is expected to change over time because of changing conditions and priorities.



### 3.2.1 LOS Parameters

The LOS table includes categories, LOS goals, metrics to measure progress in achieving goals, and specific targets. The table includes facts, values, policies, and references to guide the Public Services Area’s strategies in operating and managing the water system.

The LOS table is organized by categories of service. These categories cover the following eight service attributes that are important in meeting customer expectations:

- Reliable and Responsive Water Service
- Adequate Capacity
- Recovering Full Cost of Service
- Protection of Public Health and Safety
- Protection of the Environment
- Customer Service
- Workplace Safety
- Optimal Water Treatment Plant Performance

Within each service category are LOS goals that identify how the City strives to meet the service goal. For each goal, there is a Performance Indicator defining how the service is experienced or received, and a Performance Measure defining the criteria by which each goal/indicator can be measured. The Specific Performance Target is a detailed metric the City targets for each performance indicator. An example is included in Figure 2 below:

<b>Level of Service/ Service Attribute</b>	<b>Level of Service Goal</b>	<b>Performance Indicator</b>	<b>Performance Measure</b>	<b>Specific Performance Target</b>
<i>What is the overall category of Service?</i>	<i>What does the City strive to provide to its customers?</i>	<i>In what ways is the Service experienced or received?</i>	<i>How can the indicator be measured?</i>	<i>What is the City’s target for the measure of the performance indicator?</i>
Reliable and Responsive Water Service	Provide a continuous supply of safe drinking water to citizens of Ann Arbor and the City’s two customer supplies (neighboring).	Water main breaks.	Number of main breaks per 100 miles of water main per year.	15 water main breaks per 100 miles annually.

**Figure 2 – Example LOS Breakdown**

### 3.2.2 LOS References and Resources

Resources and individual LOS metrics for each department relating to the water system are included as footnotes to the table and are summarized below:

- LOS Study (described in the Introduction)
- Partnership for Safe Water Phase III Self-Assessment
- Water Treatment Services Goals and Performance Measures for FY 2018 (Crosswalk Goals)
- Distribution System Master Plan (described in the Introduction)
- CCR Study (described in the Introduction)
- Proposed policy on system pressure for the City (in Draft form)
- Ten State Standards

## 4.0 Criticality Analysis

The criticality analysis component of the WAMP utilizes information contained within the asset inventories to prioritize assets by criticality scores, allowing the City to plan asset replacement/rehabilitation projects well into the future and set adequate funding structure and water rates to cover the corresponding investment. The purpose of this section is to summarize the methods used within the City's water system to assess criticality of assets as required by the MDEQ.

### 4.1 Horizontal Assets

As part of the LOS Study, a criticality analysis for the horizontal assets in the system was completed. The criticality analysis was different from that adopted by the MDEQ in that the scale for both probability of failure (POF) and consequence of failure (COF) goes from 1 to 100 rather than 1 to 5. There was also some variance in terminology, but the analysis meets the intent of the MDEQ guidance. The following section describes the methods by which the criticality of the horizontal assets was determined.

#### 4.1.1 Probability of Failure (POF) Metrics

The POF was scored using a number of metrics that were developed as part of the LOS Study. After determination of the metric scores for each water main, a weighting factor was used to determine the final POF score. The greatest weight corresponded to a high number of breaks or leaks.

The metrics included in the LOS Study and descriptions of each are included below:

1) Breaks and Leaks

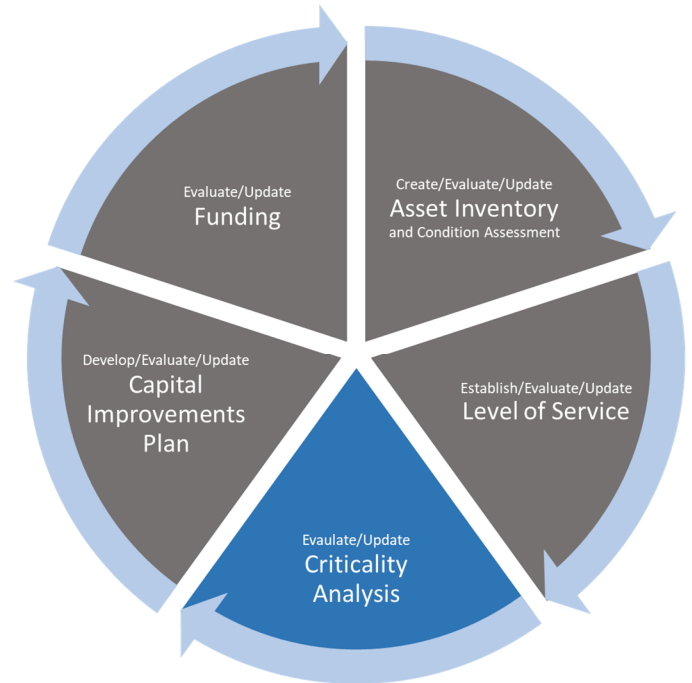
A history of water main breaks or leaks is maintained by the City. A higher number of breaks and leaks indicates that the water main is more likely to fail. The score for breaks and leaks was based on the number of breaks or leaks per 100 miles of main per year.

2) Remaining Useful Life

As a water main ages, its structural integrity deteriorates due to a variety of factors. Deterioration increases the probability that the water main may fail. Thus, remaining useful life is used as a metric for probability of failure. The score for remaining useful life is determined by taking the difference of the expected useful life and the age of the water main.

3) Soil Type

Underground utilities can be greatly affected by the type of soil in which they are buried. Aggressive soils can greatly lower the life expectancy of a water main. The score for soil type was based on the USDA corrosivity rating for soils, either low, moderate, or high.



- 4) Headloss/Velocity  
The velocity and corresponding headloss in a water main indicate whether the main is reaching its hydraulic capacity. When a water main is near its hydraulic capacity, it has a greater probability of failure. The score for the Headloss/Velocity Metric was based on the velocity and headloss predicted by the 2035 maximum day demand scenario in the City's hydraulic model.
- 5) Complaints  
Water quality and pressure complaints from water users can indicate that a water main is close to failing. The metric for complaints is based on the number of complaints over the last 10 years.
- 6) Hydraulic Performance  
The hydraulic model for the system was calibrated using a series of flow tests. The flow tests can be used to determine the "roughness" on the inside of the pipe, called the Hazen Williams C-factor. C-factor can be a surrogate for hydraulic performance and represents another metric used to assess water main POF.
- 7) Pressure  
Water in a distribution system is constantly under pressure as it is conveyed to customers. The water subjected to higher pressure creates more stress on the main. The pressure metric score is based on the pressure in pounds per square inch (psi) typically seen in the water main.

#### **4.1.2 Consequence of Failure (COF) Metrics**

A number of metrics for the scoring of COF were developed as part of the LOS Study. After determination of the metric scores for each water main, a weighting factor was added to each metric to determine the final COF score. The greatest weight was given to critical users supplied by a water main.

- 1) Critical Users  
The failure of a water main and subsequent loss of service to surrounding customers can have a much greater consequence depending on the user. Critical users in a system are typically schools, hospitals, and other users with a population that would be greatly affected by a loss of water. The score for mains near to critical users was determined by the number of connections to that user. The less connections available, the greater the score.
- 2) Large Users (Consumption)  
Large users can also be disproportionately affected by a water service outage. Large users are also a major source of revenue for the water system. The large users' score for mains in close proximity to those large users was based on the average flow in gallons per minute (gpm) required by the customer.
- 3) Land Use  
Land use is another means of identifying the effect of loss of service on a particular customer, and also the potential damage caused by a main break. Land use is scored based on the use of the area around a water main.
- 4) Flow  
The amount of flow passing through a water main can be a good indicator of the importance the water main has to the system. The flow score is based on the flow in gpm through a water main predicted by the 2035 maximum day demand scenario in the City's hydraulic model.
- 5) Diameter  
In general, the larger the diameter of the water main, the more important it is to the water system and subsequently its customers. The diameter score was based on the diameter in inches for each water main.



### 4.1.3 Horizontal Asset Criticality

The final step of a criticality analysis is to combine the POF and COF scores to calculate Business Risk Exposure (BRE). The BRE is a calculated value identified in the MDEQ guidance used to prioritize the replacement of water mains. The overall POF and COF scores for mains in the City system were combined and weighted to generate a Prioritization Action Number (PAN), which is used to prioritize the replacement of water mains in the system. The PAN is similar to the BRE, and meets the requirements for the MDEQ criticality analysis.

The POF, COF, and PAN scores were all recorded into a GIS database that the City continues to maintain, which summarizes the criticality of all water main in the system. These scores are used by the City in determining the water main replacement projects in the CIP.

## 4.2 Vertical Assets

As part of the WTSU Master Plan, a criticality analysis for vertical assets was completed to be used as a criteria for evaluating candidate Capital Improvement Plan (CIP) projects. There was also some variance in terminology between the City’s study and MDEQ suggestions, but the analysis meets the intent of the MDEQ guidance. In the WTSU Master Plan, the “CriticalityScore” (similar to BRE) represented an asset’s reliability and was calculated using the following formula:  $CriticalityScore = Severity \times Likelihood$ . The scale used for both Severity (essentially COF) and Likelihood (essentially POF) went from 1 to 4 rather than 1 to 5 as suggested by the MDEQ. The scores were weighted and calibrated before being input into the capital project prioritization model.

### 4.2.1 Consequence of Failure (COF) Metrics/Methods

The WTSU Master Plan included as part of its condition assessment a “Severity” score, which measures the consequence to the system of an asset failing. This score is similar to a COF score, being based on the COF to the system of the asset at the time of evaluation. This score measured the consequence of failure using the descriptions in the Table 1.

**Table 1 - Severity Scoring from WTSU Master Plan**

Severity Score	Score Description
4	Component of a critical process, comprises at least 33% of process capacity.
3	Component of a critical or secondary process, comprises at least 25% of process capacity.
2	Component of a critical or secondary process that comprises less than 25% of process capacity, or component of a non-process that comprises at least 25% of process capacity, or involves a building component in poor condition.
1	Component of a non-process comprising less than 25% of process capacity.

This step in the criticality analysis will typically not change with time, as the consequences of an asset’s failure to the water system, unless there have been changes, such as added redundancies, in the system.

### 4.2.2 Probability of Failure (POF) Metrics

The WTSU Master Plan included as part of its condition assessment a “Likelihood” score, which measures the probability of an asset failing. This score is similar to a probability of failure score, being based on the condition of the asset at the time of evaluation. The description and range of scores to evaluate the likelihood of an asset failing over its remaining useful life are described in the Table 2.

**Table 2 - Likelihood Scoring from WTSU Master Plan**

Likelihood Score	Score Designation	Score Description
4	Frequent	Occurs multiple times over the life of the system or greater than once per year.
3	Likely	May occur several times over the life of the system. Less than once per year, but more than once in 5 years.
2	Seldom	May occur over the life of the system, but less than once in 5 years.
1	Unlikely	Unlikely to occur over the life of the system.

Likelihood scores are based on the evaluators' assessment of the condition of the asset. It is expected that these score will change over time as assets age and undergo wear and tear. Thus, reevaluation of each asset's cost and condition information is recommended to take place annually.

### **4.2.3 Future Criticality Analysis of Vertical Assets**

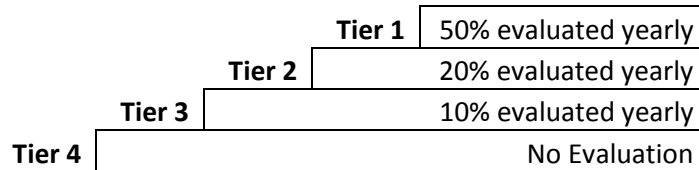
In line with the principle that the City's WAMP is a living document, the criticality analysis is updated periodically to reflect changing conditions in the water system. The criticality analysis of the City's vertical assets done as part of the WTSU Master Plan was completed over ten years ago and is due for an update. The MDEQ does not provide specific expectations on the frequency of criticality analysis update, and the WTSU Master Plan recommendations included updating information at least every ten years. This process involves the Asset Inventory and Criticality components of the WAMP and is an on-going process. The City plans to complete the update of the criticality analysis using similar methodology as described in Sections 4.2.1 and 4.2.2. However, going forward the City will use the terminologies COF instead of Severity and POF instead of likelihood of failure to align with MDEQ terminology. The timeline for completing the updated analyses is projected to take place over the next year.

It is expected that the COF scores will be largely the same, as there have been few major changes to the water system and the consequences of each asset's failure since the WTSU Master Plan. The criticality updates will depend mostly on the reevaluation of the vertical assets condition, which affects the asset's POF score. Thus, in order to complete the criticality analyses, the City will begin a prioritized condition assessment of its critical assets. Each year, a portion of the vertical assets in the system will have its condition evaluated until the condition of every vertical asset in the system has been assessed. The reevaluation process will start again based on this cycle, unless additional condition assessments are deemed necessary. The order in which the vertical assets will be assessed will be based on each asset's importance to maintaining system operations.

To prioritize which vertical assets will be assessed first, assets will be grouped into tiers, or groups of assets, using the likelihood of failure and severity scores determined in the WTSU Master Plan as a guide for assigning assets to tiers. If a vertical asset was added after 2006, it will be given a COF and POF score using the scoring methodology from the WTSU Master Plan as described in Section 4.2.1 and 4.2.3. The City will evaluate the most critical (important, high COF) assets more frequently than assets with lower COF and POF scores. The initial plan for asset tiers and their respective periods of evaluation are described below. An asset's tier placement will be reevaluated periodically.

- The first tier will contain only the most critical vertical assets to system performance (single points of failure, failure causes process shutdown, health risks, etc.). These assets will generally correspond with a CriticalityScore of 12 or 16. The assets in the first tier will be evaluated every two years.
- The second tier will contain vertical assets that are critical to system performance, but have some redundancy or means to avert disaster if they were to fail. These assets will generally correspond with a CriticalityScore of 6, 8 or 9. The second tier will be evaluated every five years.

- The third tier of assets are not critical to the performance of the system, with their failure easily mitigated operationally or by other assets in the system. These assets will generally correspond with a CriticalityScore of 2, 3 or 4. These assets will be evaluated every ten years.
- The fourth tier of assets will contain those assets not involved with the performance of the water system. These will be replaced on an as-needed basis, as their failure has no bearing on the performance or operation of the water system. These assets will generally correspond with a CriticalityScore of 1, and the likelihood of failure and severity scores of 1.



**Figure 3 – Vertical Asset Evaluation Tiers**

The WTSU is in the process of updating the list of critical vertical assets. The methodology and schedule for updating criticality will be evaluated and refined throughout the process. The City will begin this assessment starting in 2018 by assigning the vertical assets to an appropriate tier.

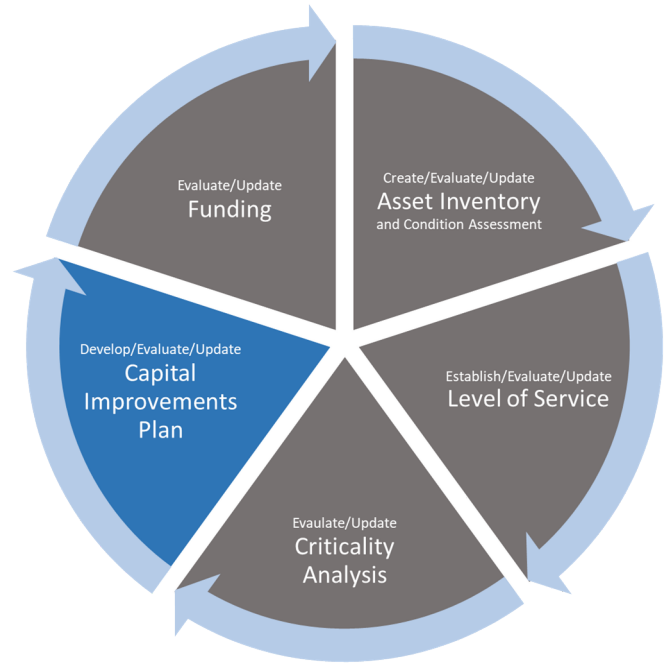
## 5.0 Capital Improvements Plan

This section summarizes the City’s current Capital Improvements Plan (CIP) and the methods by which the CIP is developed.

### 5.1 Development of Potential CIP Projects

Potential water system capital projects are compiled from the different units within the Public Services Area that manage the water system. Proposed capital projects are identified in several different ways, including review of criticality analyses, determination of system needs by staff, input from customers, regulatory requirements, project managers, and results of recent planning studies. The proposed projects are evaluated against one another for priority, which will be discussed in Section 5.2 when determining order of implementation in the CIP.

A lower priority list of capital improvement projects for the Water System is also maintained for longer-term implementation in the CIP. The long-term project list was initially compiled as a part of the WTSU Master Plan, but there is an ongoing process of adding to the list as projects are developed. The list is reevaluated annually to determine if projects should be moved into the 6-year CIP Plan when compared to active projects.



### 5.2 Water System Prioritization Model

The Water System Prioritization Model (Prioritization Model) is a tool that was developed as a component of the WTSU Master Plan to rank the water system projects for entry into the CIP. The Prioritization Model is a database that tabulates a priority score for a project based on a set of eleven evaluation criteria and pre-determined weighting factors for each criterion.

Once the list of projects for consideration in the CIP is developed, a team of staff members from Systems Planning, Public Works, Water Treatment Services, and other City units meet to review and assign scores for all of the evaluation criteria. After each project is evaluated by the team, the data is entered into the Prioritization Model database, which calculates a total ranking for the project based on internal weighting for each of the individual criterion. The final output from the Prioritization Model is a prioritized list of all projects that can be used to help support the CIP decision making process. The City Planning Commission holds a public hearing and approves the final CIP plan.

The Prioritization Model is run once every two years in the fall with input from Public Services Administration financial analysts as to the available funds for each of the plan years. Based on the prioritization score, coordination of scheduling with street improvements and other projects, as well as funding availability, higher priority projects are included in the six-year CIP Plan. Lower priority projects are added to a long-term CIP list.

A summary of each criterion used to assess capital projects is provided below.

- 1) **Sustainability Framework:** In 2012, the City passed a resolution to incorporate Sustainability Goals into the City's Master Plan. The Sustainability Framework consists of 16 goals grouped into 4 broader categories that consist of Energy and Climate; Community; Land Use and Access; and Resource Management. This criteria is in place to determine the extent to which a proposed project contributes to the City's Sustainability Framework Goals. A copy of the City's Sustainability Framework is provided in Appendix 4.
- 2) **Safety/Compliance/Emergency Preparedness:** This category relates to water quality, regulatory compliance, public safety, fire protection goals, customer satisfaction, and emergency response. Projects with high scores in this category are needed to comply with regulatory or public health requirements. A project with a low score in this category means that the outcome of the project will not significantly influence compliance or public health.
- 3) **Funding:** The funding category is in place to boost the ranking of projects with funding from outside sources such as drinking water revolving fund, low-interest loans, or grant funding.
- 4) **Coordination with Other Projects:** The coordination category represents projects with the potential for shared construction costs or projects that may be driven by high priority projects in other departments. For example, a water main extension project may be given a higher score if construction can be coordinated with a high priority road repair project.
- 5) **Master Plan Objectives:** This criterion is in place to determine the project's impact on the City's Master Plan and strategic planning goals. It also helps advance projects that are specifically identified in a planning document such as the WTSU Master Plan.
- 6) **User Experience (Level of Service):** Projects in this category receive a high score if the outcome significantly improves the level of service or benefits a large portion of the water system service area.
- 7) **Innovation:** The innovation category is in place to encourage infrastructure projects to keep abreast of latest techniques and practices. A high score in the innovation category is awarded to projects that demonstrate best management practices, innovative techniques, or unique funding strategies.
- 8) **Partnerships:** The partnerships criteria is in place to evaluate projects based on the potential for public-private, interjurisdictional, or interagency planning. Projects with partnerships receive a higher score in this category as they have the potential for shared staffing resources and promote regional coordination.
- 9) **System Influence/Capacity:** This category represents the ability of the project to meet existing and future demand in the system. Higher scores are given to projects that address an immediate deficiency and benefit a large portion of a service area.
- 10) **Operations and Maintenance:** This category incorporates the project's impact on Operation and Maintenance (O&M) and whether the project will increase or decrease overall O&M costs.
- 11) **Reliability:** The reliability category reflects the likelihood of failure and COF (severity) of the existing system assets associated with the project. Water plant projects are classified using distinct criteria. For example, severity is given one of three rankings based on whether the project is related to primary, secondary, or non-essential plant processes. Likelihood is based on the condition assessment of the assets. The likelihood of failure and COF scores are calculated through the PAN model for distribution system assets.

### **5.3 CIP Overview**

The City has designated a six-year funding plan for establishing a capital projects budget. The City Planning Commission adopts the CIP considering a six-year cycle, the first two years of which represent the City's present budget cycle. In the second year of each budget cycle, the plan considers modifications only to projects in the

first and second year of the CIP to keep the plan in alignment with the budget cycle. For example, the fiscal year (FY)2018 to FY2023 CIP was adopted in December 2016, and modifications to the FY2018 and FY2019 projects only will occur in December 2017. Projects in the first two years of the CIP cycle form the basis of the City's capital budget.

Projects in the first year of the CIP have authorized budgets, while projects in the second through sixth year in the CIP are included as a budgeting forecast. There is flexibility to reprogram projects in the second through sixth years of the CIP if there is an emergency that requires a project to be implemented earlier. In these cases, projects in the second to sixth years of the CIP can be moved into the first year of the CIP by reallocating funding. These adjustments are determined during programming and budget discussions that take place during bi-weekly CPAN meetings, an internal oversight group.

Proposed construction projects over \$100,000 or infrastructure planning studies greater than \$50,000 in cost are included in the CIP. Projects with lower projected costs are not considered in the CIP and are incorporated in the Water System annual operating budget.

### **5.3.1 Short Term CIP Projects**

There are currently 95 new water system projects in the FY2018 to 2023 CIP which will, during that cycle, require \$129,142,000 of funding. The projects include capital improvements to the WTP, distribution system, and other components of the water system that were ranked based on Prioritization Model results. Since some of the projects will continue to spend funds beyond 2023, the total actual cost of those 95 projects is \$182,353,000.

The most significant capital project included in the CIP is the Water Treatment Plant 1 Replacement Project. A copy of the FY2018 to 2023 CIP Executive Summary is included in Appendix 5.

### **5.3.2 Long Term CIP Projects**

An initial list of potential projects was developed in 2006 based on the results of the WTSU Master Plan. Additional projects have since been identified in the LOS Study, Distribution Master Plan, and CCR Study. The list continues to be updated as additional long-term projects are determined.

Projects that are anticipated to occur after the active six-year cycle of the active CIP are memorialized in the plan as beyond the cycle (2023+). An additional 42 projects totaling \$44,847,000 are already identified in the FY2018-FY2023 plan for the years beyond 2023.

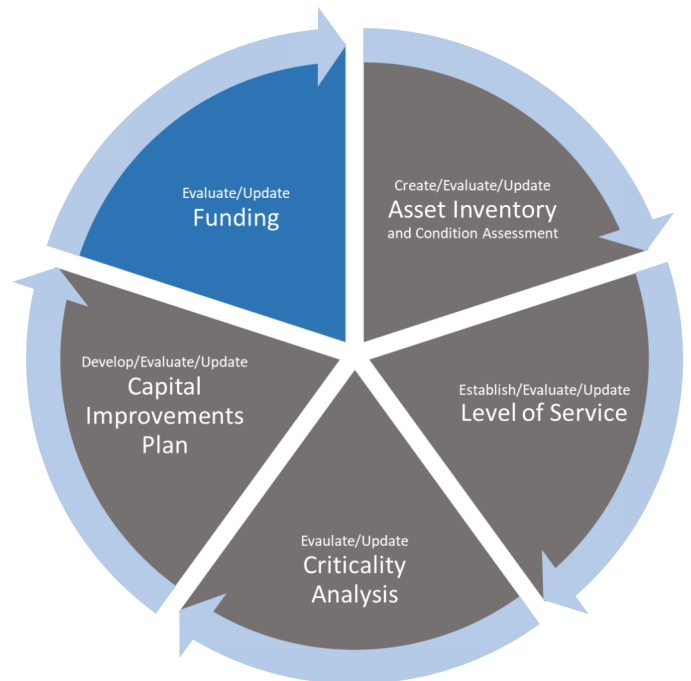
## 6.0 Funding and Rate Development

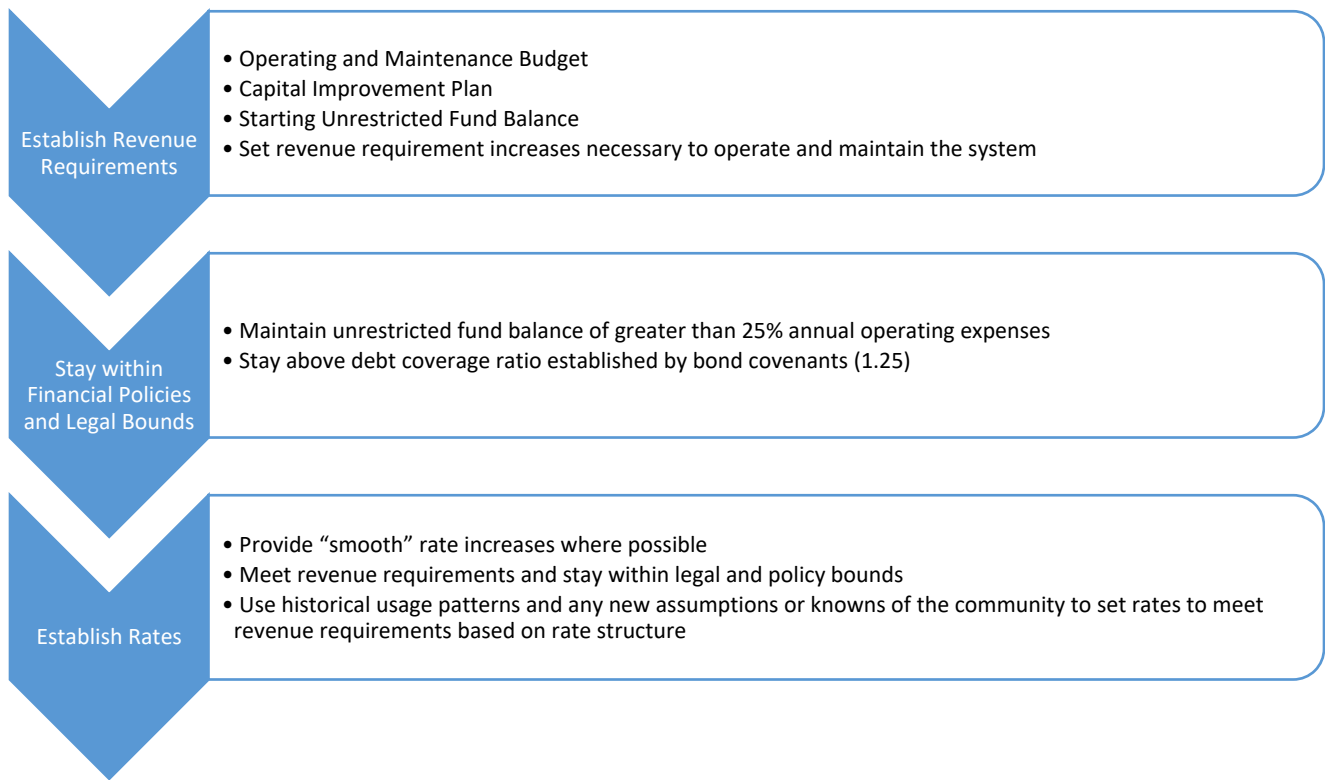
### 6.1 Rate Setting Process

The City currently funds the water system, including supply, water treatment and distribution, using the approach as laid out in the American Water Works Association Manual of Water Supply Practices M1 Manual. Rates are developed by incorporating operations, maintenance, capital improvements, and debt service costs into a financial model in accordance with City financial policies. In accordance with the State of Michigan's statutes and constitution (Mich. Comp. Laws sections 486.315 and 123.141(2), and Mich. Const. article VII, section 24), the City is granted rate-setting authority with few limitations on the ability to utilize different rate structures and shall be based on the actual cost of service. The City's water rates are codified in the City of Ann Arbor Code or Ordinances, Ordinance No. ORD-17-04.

The existing rate structure has evolved from the 2003 Water and Wastewater Cost of Service Study completed by a third party. This study included evaluation of revenue sufficiency, cost allocation and rate structure alternatives. The resulting rate structure is an inclining block rate structure for residential customers and tiered structure for commercial customers, charging a flat rate based on the tier initially placed in. The volumetric charge (price per CCF rate) is evaluated and adjusted annually.

The City utilizes a comprehensive water fund financial plan which is the repository for all information related to the financial health of the fund and is used to calculate the required revenue to fund the water system budgets. On an annual basis, the revenue requirements of the operating and maintenance budget, as well as the projects identified in the CIP, are input into the financial plan model to assess whether the rates are sufficient to cover the required budgets. The financial plans take into consideration several factors and constraints. Constraints to the financial plan include the City's financial policies, bond covenants and the desires of the public to limit the amount of drastic increases in favor or more gradual changes to rates. After the establishment of any revenue-required rate increases, historical usage and assumptions of future consumption from customers are input into the financial model to establish the fixed charges and volumetric charges for each of the different customer classes. Figure 4 below depicts the overall process the City undergoes to establish rates, including budgetary input, constraints and public desires.





**Figure 4 – Annual Rate Setting Process Flowchart**

The City undergoes this process on an annual basis. Results from this process may adjust the cost per CCF, but do not modify the rate structure in place.

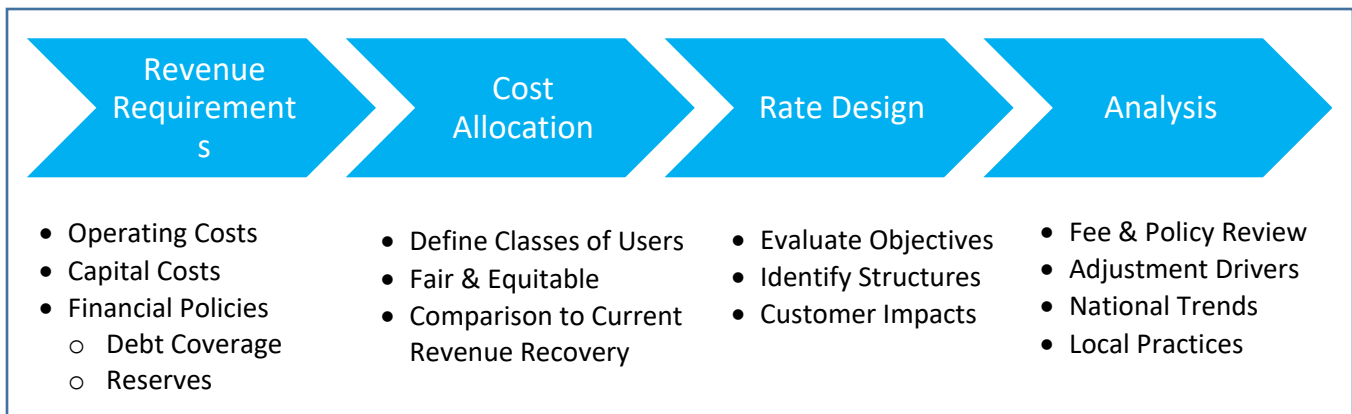
The City’s annual operating budget is publicly available on their website at the following location:

<https://www.a2gov.org/departments/finance-admin-services/accounting/Documents/FY18%20Adopted%20Budget%20Book%20-6.20.17%20FINAL.pdf>

## 6.2 Cost of Service

In July of 2017, the City began conducting an updated cost of service study (COS Study) for its drinking water and wastewater rates. The objectives of the study include projecting the full cost of service and developing a multi-year financial management plan that integrates capital improvement needs, and also incorporates asset management needs. As part of this study, the City is evaluating customer class to cost allocations and rate structures, and engaging community stakeholders to solicit input and desires regarding community expectations related to water and sewer rates. Ultimately, the goal is to update the current financial model and develop a fair, equitable and socially acceptable rate structure based on cost of service principles. The City has contracted a third party to conduct the cost of service study and provide data-driven recommendations to City Council on structure and pricing. Figure 5 illustrates the study process being implemented.





**Figure 5 – Cost of Service Study Flowchart**

The Cost Allocation and Rate Design components are where the structure recommendations are established. From here, recommendations go to City Council for review and approval prior to implementing. Public hearings on these recommendations are projected to start in spring of 2018.

### **6.3 How Rates Offset Future CIP Costs**

Asset management needs are input when the CIP is updated, whereby the managers of the water system (Water Treatment Services, Systems Planning and Public Works) work collaboratively to gather established needs and the most critical improvements and prioritize them against the funding availability.

Some key performance targets include replacing or rehabilitating 1.0% of the water distribution system per year on average, in accordance with the CIP and maintaining a ratio of Total Capital Expenditures/Budgeted Capital Expenditures between 0.85 and 1.0.

#### **6.3.1 Horizontal Assets**

The LOS Study detailed the general infrastructure investment required for the distribution system’s horizontal assets. To ensure funding was sufficient to meet the reinvestment requirements, and after factoring in staff availability, community wherewithal and tolerance level for concurrent construction, approximately half of the full amount identified in the study was allocated for improvements to the distribution system. The allocated portion reflected that more aggressive reinvestment is necessary, and is taken into consideration in adjusting future rates.

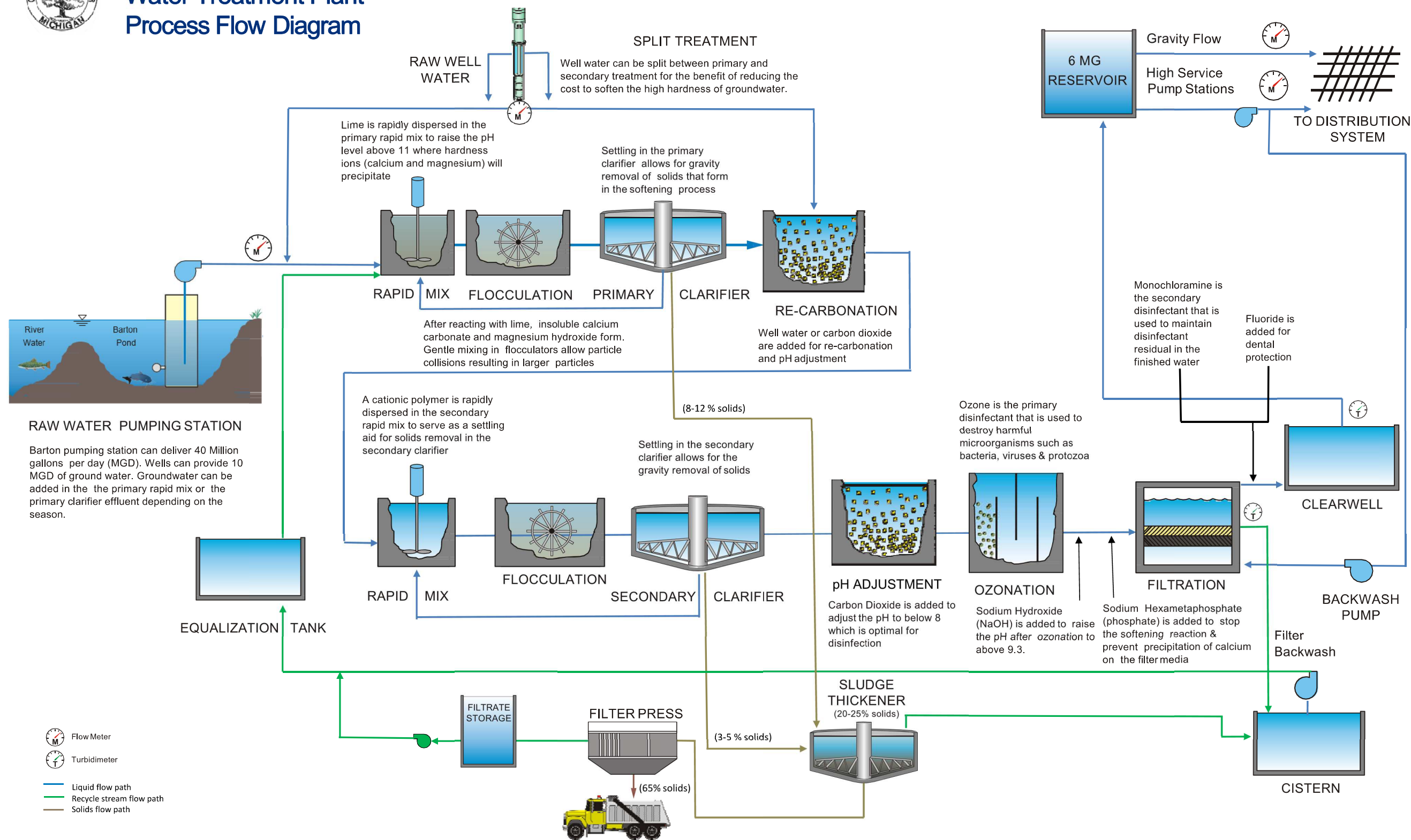
#### **6.3.2 Vertical Assets**

The WTSU Master Plan identified the need for various capital projects, as well as the associated investment requirements, to maintain the critical assets managed by the WTSU. The required project costs originally entered are used as a forecasting tool for setting rates. During the budget process, new and emergent projects are identified, and the yearly budget and CIP are adjusted accordingly.

# Appendix 1



# City of Ann Arbor Water Treatment Plant Process Flow Diagram



# Appendix 2

# Appendix 3

CITY OF ANN ARBOR WATER ASSET MANAGEMENT PLAN  
LEVEL OF SERVICE

LEVEL OF SERVICE/ SERVICE ATTRIBUTE	LEVEL OF SERVICE (LOS) GOAL	PERFORMANCE INDICATOR	PERFORMANCE MEASURE	SPECIFIC PERFORMANCE TARGET
What is the overall category of Service?	What does the City strive to provide to its Customers?	In what ways is the Service experienced or received?	How can the indicator be measured?	What is the City's target for the measure of each performance indicator?
<sup>1</sup> Reliable and Responsive Water Service	<sup>3</sup> Provide a continuous supply of safe drinking water to citizens of Ann Arbor and the City's two customer supplies (neighboring townships).	Unplanned service interruptions/disruptions.	Number of unplanned service interruptions/disruptions per year.	NA
		Planned service interruptions/disruptions.	Number of planned service interruptions/disruptions per year.	NA
		Regulatory Compliance.	Number of regulatory violations.	<sup>3</sup> Maintain 100% Compliance with drinking water regulations.
		Water Quality.	Laboratory detection of treatment parameters and contaminants.	<sup>5</sup> Water Treatment Plant (WTP) Operational and Water Quality Goals <sup>3</sup> Detection in 1500 drinking water samples per year: Total Coliform (TC) = 0 Detection of E. Coli = 0
		Water Quality complaints.	Number of customer reports on water quality issues.	<sup>3</sup> Less than 38 customer reports on water quality issues per quarter.
		Water main breaks.	Number of main breaks per 100 miles of watermain per year.	15 water main breaks per 100 miles annually.
		Maintenance of Distribution System valves.	Number of broken valves repaired or replaced per year. Ability to isolate portions of the system.	Repair/replace 30 broken valves per year. Test valves as soon as possible prior to isolating portion of system. Document the correct number of valve turns.
	Emergency and fire flow available to all customers at all times.	Hydrant availability.	Number of days a hydrant was available.	Maintain hydrant operation for 99% of the available hydrant operating days annually.
		Hydrant coverage.	% hydrant coverage.	99% hydrant coverage for all customers in the system. Review hydrant coverage on all capital projects and install necessary hydrants to bring coverage to 100% within project limits.

LEVEL OF SERVICE/ SERVICE ATTRIBUTE	LEVEL OF SERVICE (LOS) GOAL	PERFORMANCE INDICATOR	PERFORMANCE MEASURE	SPECIFIC PERFORMANCE TARGET
What is the overall category of Service?	What does the City strive to provide to its Customers?	In what ways is the Service experienced or received?	How can the indicator be measured?	What is the City's target for the measure of each performance indicator?
	<sup>3</sup> Improve efficiency of Water Treatment Services Maintenance Operations.	Monthly preventative maintenance (PM) planned and performed.	% Completion of Monthly PMs within specified time Ratio of Preventative Maintenance Hours/Corrective Maintenance Hours	<sup>3</sup> Complete 75% of monthly PMs on time. <sup>3</sup> Ratio of Preventative Maintenance Hours/Corrective Maintenance Hours = 1.1
	<sup>3</sup> Develop a Sustainable Capital Improvements Plan for replacement and rehabilitation of water system assets as necessary to maintain an effective water system.	Main rehabilitation/replacement.	As a percentage of the length of main in the distribution system being replaced or repaired annually.	Replace or rehabilitate 1.0% of the water distribution system per year on average, in accordance with Capital Improvements Plan.
		Accurate financial planning to sustain capital infrastructure.	Ratio of Total Capital Expenditure/Budgeted Capital Expenditures.	<sup>3</sup> Maintain ratio of Total Capital Expenditure/Budgeted Capital Expenditures between 0.85 and 1.0.
	Maintain adequate pressures throughout the water system.	Maintain pressures within regulatory standards and/or Citywide standards.	Number of customer account water pressure complaints.	<sup>1</sup> Less than 1 customer account water pressure complaints per 1,000 customer accounts (~27 complaints per year). <sup>7</sup> Maintain pressures between 35 and 110 psi. <sup>6</sup> Target of 60-80 psi for majority of system as measured by the City in accordance with Ten State Standards and City policy (currently under review).
<sup>1</sup> Adequate Capacity	Ensure that treatment plant and pump stations have adequate capacity to supply the water system.	Plant has the capacity to meet demand at all times.	Verify that plant capacity exceeds maximum day demands.	Quantify changes in population, industry, and meters every 5 years in order to project changes in demand.
		Equipment is adequately sized.	Periodic pump capacity testing.	Test the capacity of pumps every 5 years.
		Condition of equipment is adequate to maintain capacity. Prioritize critical and/or low-scoring assets in Capital Improvements Plan.	Periodic equipment condition assessment. Useful life remaining for equipment in service.	<sup>3</sup> Complete condition assessment of 20% of critical assets annually, or as required based on performance/repair. Equipment is replaced/rehabilitated according to CIP. Perform scheduled maintenance and replacement according to manufacturer guidelines in Computerized Maintenance Management System (CMMS), like Mainsaver, CityWorks, etc.
		Pump stations have the capacity to meet demand at all times.	Verify that pumping capacity exceeds maximum demands. Evaluate customer demand.	Verify that 80% of WTP pumping capacity is greater than maximum day demands in the system annually. Evaluate changes in population, industry, and meters every 5 years in order to project changes in demand.

LEVEL OF SERVICE/ SERVICE ATTRIBUTE	LEVEL OF SERVICE (LOS) GOAL	PERFORMANCE INDICATOR	PERFORMANCE MEASURE	SPECIFIC PERFORMANCE TARGET
What is the overall category of Service?	What does the City strive to provide to its Customers?	In what ways is the Service experienced or received?	How can the indicator be measured?	What is the City's target for the measure of each performance indicator?
	Ensure the water system has adequate water storage to meet emergency and fire flow demands.	Storage is available for emergency and fire flow conditions.	Evaluation of system water storage needs.	Water storage sufficient to meet at least average day demands and provide for any fire flow.
<sup>1</sup> Recovering Full Cost of Service	Customers are charged proper water rates to pay for water services.	Meter condition/accuracy.	% of metering system being replaced annually.	<sup>1</sup> Residential Meters: replace all meters over 20 years, but prioritize based upon water usage and/or testing results. <sup>1</sup> Larger (commercial) meters: replace based upon regular testing.
		Capital Improvements Planning (see also "Reliable and Responsive Water Service") combined with Rate Study.	Development, implementation and adjustment of Capital Improvements Plan.	Maintain ratio of Total Capital Expenditure/Budgeted Capital Expenditures between 0.85 and 1.0. Perform rate adjustment annually.
	Non-Revenue water.	<sup>3</sup> Minimize non-revenue water.	Complete annual water audit/plant water balance.	Evaluate treatment processes annually and optimize efficiency. Maintain non-revenue water loss to < 15%.
		Minimize unmetered water loss.	Account for loss during main breaks. Account for loss during hydrant flushing and testing. % Customer base with functional meters.	Have quantity estimates developed for 100% of watermain breaks and hydrant flushing activities. 100% of customer base with functional meters throughout system.
		Calibration of meters.	Time between calibration of key meters in the plant.	Calibrate key meters at plant and to customer communities annually.
<sup>1</sup> Protection of Public Health and Safety	Backflow Prevention.	Routine inspections and elimination of all violations.	Complete MDEQ-required inspections and enforcement for non-compliant customers.	100% of MDEQ-required inspections are complete. Corrective actions are complete within 60 days for all non-compliant customers.
	Meet Environmental Protection Agency (EPA) Consumer Confidence Report Rule.	Water Quality Report available for review.	Provide customers an annual report on the water supply system.	Deliver annual water quality report to customers by July 1 every year.
<sup>1</sup> Protection of the Environment	Promote water efficiency.	Evaluate annual water consumption.	<sup>3</sup> Raise public awareness of drinking water.	Minimize unaccounted for water (discussed in "Recover Full Cost of Service"). <sup>3</sup> Schedule and hold at least one open house and accompanying facility tour during FY (>250 attendees). <sup>3</sup> Complete and publish Annual Water Quality Report by June 1. <sup>3</sup> Partner with public schools and universities to provide tours for students (>400 people/quarter). <sup>3</sup> Raise public awareness on water conservation techniques. Maintain information on City website.



LEVEL OF SERVICE/ SERVICE ATTRIBUTE	LEVEL OF SERVICE (LOS) GOAL	PERFORMANCE INDICATOR	PERFORMANCE MEASURE	SPECIFIC PERFORMANCE TARGET
What is the overall category of Service?	What does the City strive to provide to its Customers?	In what ways is the Service experienced or received?	How can the indicator be measured?	What is the City's target for the measure of each performance indicator?
		Reduction in carbon footprint.	Consider green infrastructure and energy efficiency as part of CIP projects.	Incorporate green infrastructure and/or energy efficient improvements into capital projects when there is an appropriate return on investment (ROI).
<sup>1</sup> Customer Service	Respond quickly and effectively to issues in the water system and customer complaints.	Staff receiving complaint is polite, knowledgeable, and proposes solution and timeframe.  Solution is in place within timeframe.	Duration between complaint and solution.  Adequate staff available to respond.	Response times not actively tracked, but strive to <sup>1</sup> provide responses as follows: 1 hour response for emergencies. 2 weeks response for meter reading correction. 12 hour response for unplanned water interruption. Instant response/information for water quality issues.  Emergency Action Plans are developed, available, and staff trained in how to respond.
<sup>1,3</sup> Workplace Safety	<sup>3</sup> Maintain a safe work environment for staff and those who work on or around water treatment system facilities <sup>3</sup> .	Loss of work due to injuries.	Work days lost due to injuries.	<sup>3</sup> Zero loss of work days/quarter.
		Accidents for contractors working at water treatment facilities.	Number of accidents reported by contractors.	<sup>3</sup> Zero accidents/quarter.
		<sup>3</sup> Complete all Michigan Occupational Safety and Health Administration (MIOSHA) required safety trainings for relevant Water Treatment Services Unit (WTSU) staff.	Number of staff members current on MIOSHA required trainings.	<sup>3</sup> Three trainings/quarter.  <sup>3</sup> Weekly "Tailgate" Safety Meetings.
	<sup>1</sup> Provide a Safe Workplace.	NA (Performance indicators should be tracked as a management objective measure).	Number of accidents Number of near misses Accident Severity (measure by total lost time due to accidents) Accident statistics are reported to MIOSHA.	NA

LEVEL OF SERVICE/ SERVICE ATTRIBUTE	LEVEL OF SERVICE (LOS) GOAL	PERFORMANCE INDICATOR	PERFORMANCE MEASURE	SPECIFIC PERFORMANCE TARGET
What is the overall category of Service?	What does the City strive to provide to its Customers?	In what ways is the Service experienced or received?	How can the indicator be measured?	What is the City's target for the measure of each performance indicator?
Optimal Water Treatment Plant Performance (See also treatment goals under "Reliable and Responsive Water Service")	Set and meet treatment performance goals for plant processes.  Optimize plant operations, processes, and performance.	Evaluate plant operations and processes to meet treatment performance goals.	Use Operational and Water Quality goals as a tool/reference for optimal treatment performance.	Operational and Water Quality Turbidity Goals, measured by Nephelometric Turbidity Unit (NTU):  <sup>5</sup> Secondary basin turbidity < 5 NTU. <sup>5</sup> Combined Filter Effluent turbidity < 0.2 NTU. <sup>5</sup> Clearwells and reservoir turbidity < 0.1 NTU. <sup>5</sup> Distribution system turbidity < 0.5 NTU.
		Periodically re-evaluate operational and water quality goals to optimize performance.	Compare SCADA and laboratory turbidity data for Secondary Basin, Combined Filter Effluent, Clearwells/Reservoirs and Distribution with goals.	
	Meet all regulatory requirements for treatment plants.	Optimize chloramination/maintaining residual in distribution system, ensure disinfection requirements are fulfilled at plant.	Maintain sufficient ozone contact time (CT) at plant at all times.	Meet contact time as specified by Michigan Department of Environmental Quality (MDEQ) at all times.  <sup>5</sup> % CT for Ozone of 150% as reference level.
			Sample finished water for adequate chlorine residual.	Monitor chlorine residual daily. <sup>5</sup> Use reference level ≤ 0.25 ppm excess ammonia in reservoir as goal.  In Secondary Basin: Chlorine (Cl <sub>2</sub> ) to ammonia-nitrogen (NH <sub>3</sub> -N) ratio of < 4.0:1 Chlorine (Cl <sub>2</sub> ) to ammonia (NH <sub>3</sub> ) ratio of < 5.0:1
		Assess reliability, quality, and risks associated with water source.	Periodically do a source water assessment and protection plan.	Complete Source Water Protection Plan (SWPP) every 5 years.
			Have an up-to-date emergency response plan in place if source water is compromised in some way.	Update Emergency Response Plan annually.

### References and Resources

- <sup>1</sup> Water Level of Service by AECOM (AECOM Report)
- <sup>2</sup> Partnership for Safe Water Phase III Self-Assessment Template (PSW)
- <sup>3</sup> Water Treatment Services Goals and Performance Measures for FY 2018
- <sup>4</sup> City of Ann Arbor Water Distribution System Master Plan by CDM, 2010 (Distribution Master Plan)
- <sup>5</sup> Water Treatment Plant Alternatives Evaluation by Black & Veatch
- <sup>6</sup> Proposed Policy for City of Ann Arbor
- <sup>7</sup> Ten State Standards  
2006 Master Plan CH2M Hill  
2016-2035 Water System Capital Improvements Plan  
Drinking Water Quality Report

# Appendix 4

<p><b>CLIMATE AND ENERGY</b></p>
<p><b><u>Sustainable Energy</u></b> – Improve access to and increase use of renewable energy by all members of our community  <b><u>Energy Conservation</u></b> – Reduce energy consumption and eliminate net greenhouse gas emissions in our community  <b><u>High Performance Buildings</u></b> – Increase efficiency in new and existing buildings within our community</p>
<p><b>COMMUNITY</b></p>
<p><b><u>Engaged Community</u></b> - Ensure our community is strongly connected through outreach, opportunities for engagement, and stewardship of community resources  <b><u>Diverse Housing</u></b> - Provide high quality, safe, efficient, and affordable housing choices to meet the current and future needs of our community, particularly for homeless and low-income households  <b><u>Human Services</u></b> - Provide services that meet basic human needs of impoverished and disenfranchised residents to maximize the health and well-being of the community  <b><u>Safe Community</u></b> - Minimize risk to public health and property from manmade and natural hazards  <b><u>Active Living and Learning</u></b> - Improve quality of life by providing diverse cultural, recreational, and educational opportunities for all members of our community  <b><u>Economic Vitality</u></b> - Develop a prosperous, resilient local economy that provides opportunity by creating jobs, retaining and attracting talent, supporting a diversity of businesses across all sectors, and rewarding investment in our community</p>
<p><b>LAND USE AND ACCESS</b></p>
<p><b><u>Transportation Options</u></b> - Establish a physical and cultural environment that supports and encourages safe, comfortable and efficient ways for pedestrians, bicyclists, and transit users to travel throughout the city and region  <b><u>Sustainable Systems</u></b> - Plan for and manage constructed and natural infrastructure systems to meet the current and future needs of our community  <b><u>Integrated Land Use</u></b> - Encourage a compact pattern of diverse development that maintains our unique sense of place, preserves our natural systems, and strengthens our neighborhoods, corridors, and downtown</p>
<p><b>RESOURCE MANAGEMENT</b></p>
<p><b><u>Clean Air and Water</u></b> - Eliminate pollutants in our air and water systems  <b><u>Healthy Ecosystems</u></b> - Conserve, protect, enhance, and restore our aquatic and terrestrial ecosystems  <b><u>Responsible Resource Use</u></b> - Produce zero waste and optimize the use and reuse of resources in our community  <b><u>Local Food</u></b> - Conserve, protect, enhance, and restore our local agriculture and aquaculture resources</p>

# Appendix 5

# FY2018-2023 CIP SUMMARY

## OVERVIEW

This Capital Improvements Plan (CIP) outlines a schedule of public service expenditures over the ensuing six-year period (fiscal years 2018–2023). The CIP does not address all of the capital expenditures for the City, but provides for large, physical improvements that are permanent in nature, including the basic facilities, services, and installations needed for the functioning of the community. These include transportation systems, utilities, municipal facilities and other miscellaneous projects.

To qualify for inclusion into the CIP, a project must:

- Constitute permanent, physical or system improvements greater than or equal to (GTE) \$100,000; or
- A “program” of projects whose total is GTE \$100,000 (e.g. Playgrounds and Neighborhood Parks); or
- Significant equipment purchases in excess of \$100,000 with a useful life of at least ten years; or
- A study of at least \$50,000 that will lead to such projects;
- Add to the value or capacity of the infrastructure of the City.

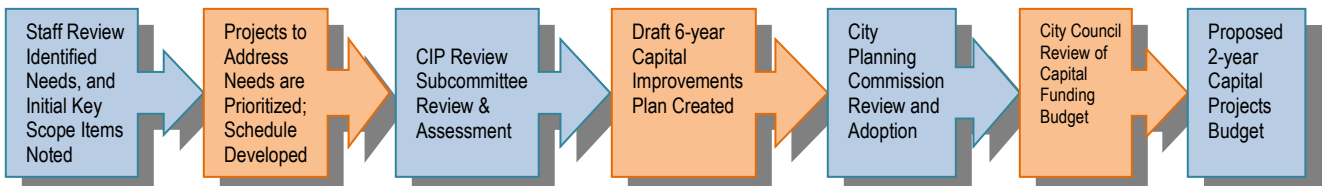
Projects that are considered operational or routine maintenance are excluded.

Preparation of the Capital Improvements Plan is done under the authority of the Municipal Planning Commission Act (Act 33 of the Public Acts of 2008). It is the City Planning Commission’s goal that the CIP be used as a tool to implement the City Master Plan and assist in the City’s financial planning.

The Capital Improvements Plan proposes project funding relative to the anticipated availability of fiscal resources and the choice of specific improvements to be achieved throughout the six-year plan. The first two years of the Capital Improvements Plan serve as the basis for establishing the City’s Capital Projects Budget (CPB), programming the implementation of the planned projects for the upcoming two fiscal years. The CIP and CPB make up the City’s Capital Improvements Program.

## THE CAPITAL IMPROVEMENTS PROGRAM PROCESS

The Capital Improvements Program process begins with a review of identified system needs and concludes with the proposed CPB as outlined below:



## THE TOTALS

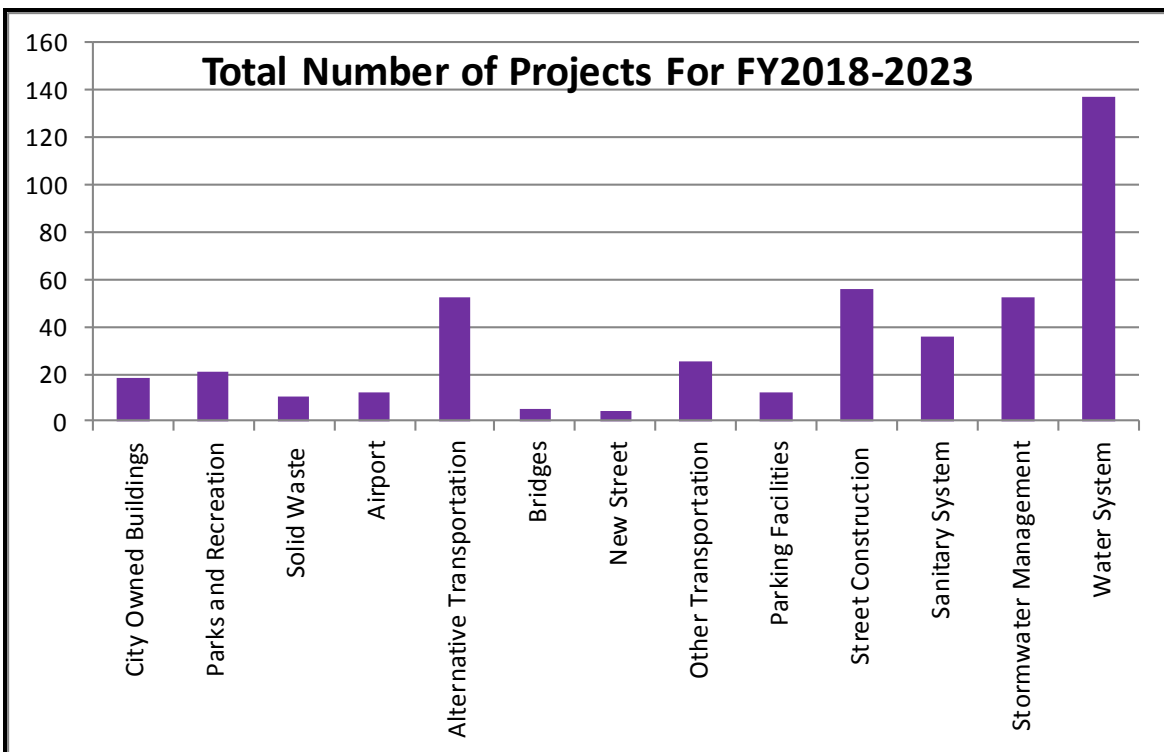
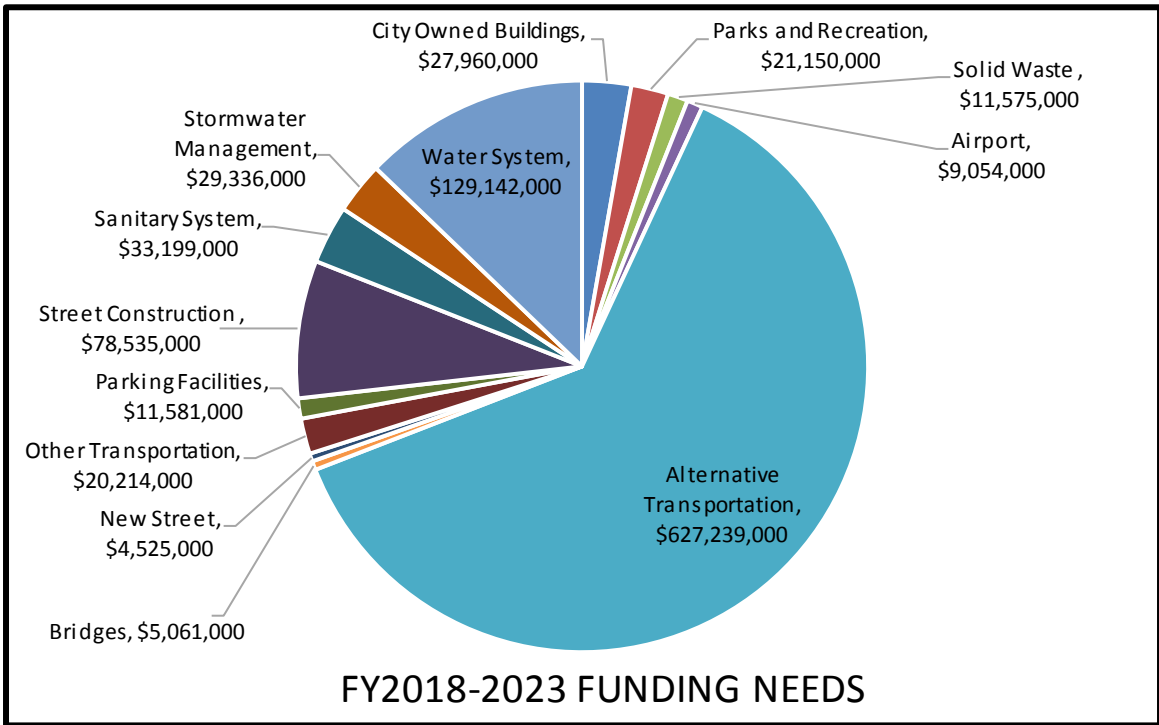
A total of 440 projects are included in this year’s CIP with a six-year funding need for fiscal years FY2018–FY2023 of \$1,008,571,000. This is a 12% increase from the FY2016–2021 CIP document, which anticipated \$901,207,000 in funding need for fiscal years 2016-2021.

The total anticipated funding need for all projects is \$1,601,795,000. This total includes project funds spent prior to fiscal year 2018 and required funds needed after fiscal year 2023 for the projects contained in the plan. This is a 36% increase over the previous plan and reflects the City’s continued progress in long-term asset management. Most of the increase simply reflects identification of capital needs further in advance based on that asset planning.

The charts below indicate the total number of projects for each category, the total costs by asset category, the six-year funding need, and first-year and second-year funding needs (i.e. the two years of the next capital budget cycle)

### FY2018-2023 CIP SUMMARY FUNDING

Category	Number of Projects	Total Funding All Years (Inc. Prior and 2023+)	FY 2018-2023 Total Funding Need	FY2018 Total Funding Need	FY19 Total Funding Need
City Owned Buildings	18	\$30,328,000	\$27,960,000	\$18,185,000	\$880,000
Parks and Recreation	21	\$79,174,000	\$21,150,000	\$4,040,000	\$3,185,000
Solid Waste	10	\$12,944,000	\$11,575,000	\$3,950,000	\$800,000
Airport	12	\$10,739,000	\$9,054,000	\$3,662,000	\$328,000
Alternative Transportation	52	\$812,177,000	\$627,239,000	\$5,441,000	\$101,244,000
Bridges	5	\$5,781,000	\$5,061,000	\$320,000	\$1,921,000
New Street	4	\$5,983,000	\$4,525,000	\$100,000	\$450,000
Other Transportation	25	\$24,951,000	\$20,214,000	\$1,359,000	\$1,550,000
Parking Facilities	12	\$20,577,000	\$11,581,000	\$3,117,000	\$2,532,000
Street Construction	56	\$107,035,000	\$78,535,000	\$13,342,000	\$9,555,000
Sanitary System	36	\$199,847,000	\$33,199,000	\$9,092,000	\$7,784,000
Stormwater Management	52	\$65,059,000	\$29,336,000	\$5,844,000	\$5,586,000
Water System	137	\$227,200,000	\$129,142,000	\$13,612,000	\$13,280,000
<b>Totals:</b>	<b>440</b>	<b>\$1,601,795,000</b>	<b>\$1,008,571,000</b>	<b>\$82,064,000</b>	<b>\$149,095,000</b>





## FUNDING ISSUES AND SOURCES

### A. Funded versus Unfunded Projects for the Two-Year Capital Budget Period of FY2018-FY2019

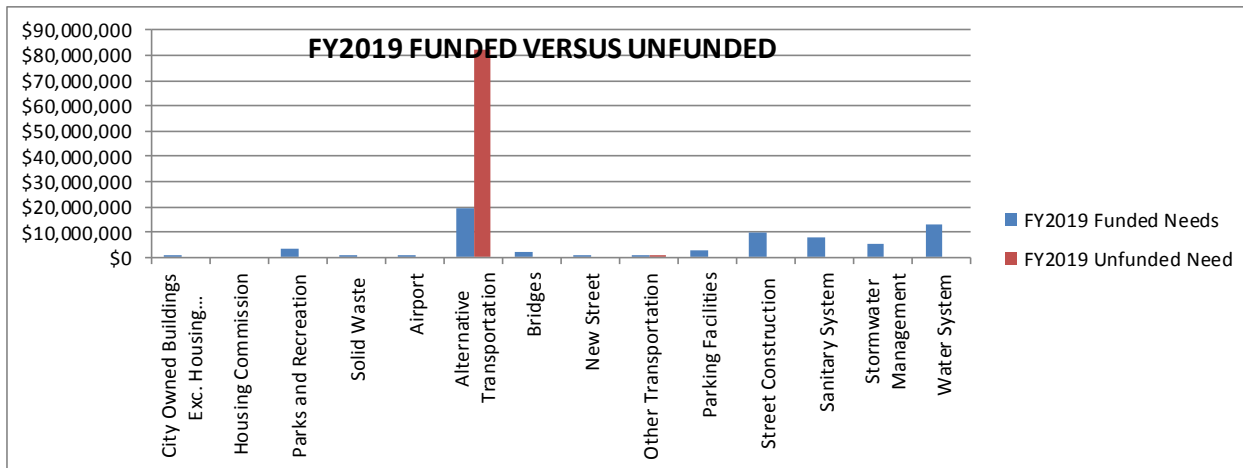
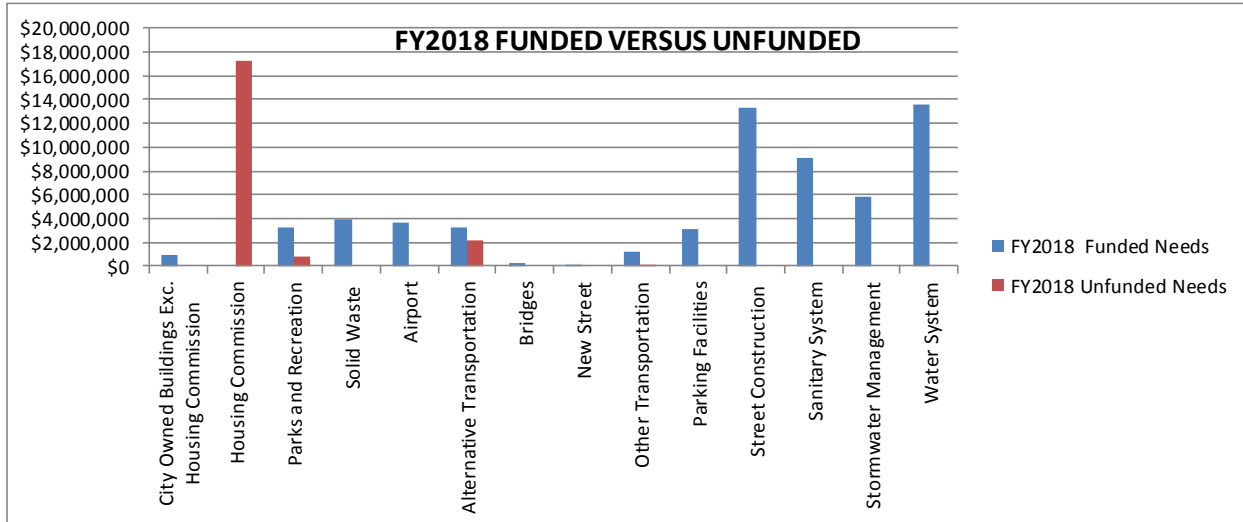
As is often the case with governmental agencies, the total funding need identified in the CIP exceeds the available funding. There are projects contained in this CIP that do not have an established, secure source of funding at this time. Projects in the first two years of the CIP form the basis for the City’s Capital Budget and generally require secure funding. That funding may include specific limited General Fund requests (see Section C. below). Therefore, projects that do not have secure funding are generally programmed for the third year or later in the plan. However, some higher priority unfunded projects (generally anticipated to be funded via grants or outside funding) are included in years 1 or 2 of the plan in the event funding is obtained and the projects can then be implemented. For example, the Ann Arbor Station Final Design in FY2018 and Construction in FY2019 are unfunded and represent a significant portion of unfunded needs.

For purposes of the “FY2018-FY2019 Funding” chart below, Housing Commission projects have been extracted out from the City Owned Buildings category totals and will be discussed in the Discretionary Outside Funding Section B following.

### FY2018-FY2019 FUNDING

Category	FY2018 Total Funding Needs	FY2018 Funded Needs	FY2018 Unfunded Needs	FY2019 Total Funding Needs	FY2019 Funded Needs	FY2019 Unfunded Need
City Owned Buildings Exc. Housing Commission	\$885,000	\$885,000	\$0	\$880,000	\$880,000	\$0
Housing Commission	\$17,300,000	\$0	\$17,300,000	\$0	\$0	\$0
Parks and Recreation	\$4,040,000	\$3,220,000	\$820,000	\$3,185,000	\$3,185,000	\$0
Solid Waste	\$3,950,000	\$3,950,000	\$0	\$800,000	\$800,000	\$0
Airport	\$3,662,000	\$3,662,000	\$0	\$328,000	\$328,000	\$0
Alternative Transportation	\$5,441,000	\$3,258,000	\$2,183,000	\$101,244,000	\$19,344,000	\$81,900,000
Bridges	\$320,000	\$320,000	\$0	\$1,921,000	\$1,921,000	\$0
New Street	\$100,000	\$100,000	\$0	\$450,000	\$450,000	\$0
Other Transportation	\$1,359,000	\$1,242,000	\$117,000	\$1,550,000	\$1,145,000	\$405,000
Parking Facilities	\$3,117,000	\$3,117,000	\$0	\$2,532,000	\$2,532,000	\$0
Street Construction	\$13,342,000	\$13,342,000	\$0	\$9,555,000	\$9,555,000	\$0
Sanitary System	\$9,092,000	\$9,092,000	\$0	\$7,784,000	\$7,784,000	\$0
Stormwater Management	\$5,844,000	\$5,844,000	\$0	\$5,586,000	\$5,586,000	\$0
Water System	\$13,612,000	\$13,612,000	\$0	\$13,280,000	\$13,280,000	\$0
<b>TOTALS</b>	<b>\$82,064,000</b>	<b>\$61,644,000</b>	<b>\$20,420,000</b>	<b>\$149,095,000</b>	<b>\$66,790,000</b>	<b>\$82,305,000</b>

Funded versus unfunded status is also depicted graphically in the following charts for FY2018 and FY2019.



**B. Discretionary Outside Funding**

Of the \$1,601,795,000 needed to fund the total FY2018–2023 CIP program, monies for particular projects (such as the alternative transportation funds mentioned above) may come in part or in whole from discretionary fund sources outside the City. Such dollars are included in totals shown because they fund improvements to assets which belong to the City, will become so upon project completion, or are part of an intergovernmental or interagency project in which the City is a participant. Discretionary funds are defined here as those which require specific application to obtain or which come from other non-City sources at the discretion of others.

Examples of discretionary outside funds include STP-U (Surface Transportation Program – Urban) and CMAQ (Congestion Mitigation and Air Quality Improvement) federal transportation funds, participation in costs by Washtenaw County, AATA, or other governmental or agency

entities, developer contributions, and various grant sources such as Airport Improvement Program Grants, FEMA, and MDNR. Although the newly enacted County millage funds are not truly discretionary, they are included here as they are managed by an outside entity.

Certain projects may receive funding from non-City sources which the City receives by formula and so are not considered discretionary. Those include Act 51 transportation monies and DDA tax revenues allocated to the City.

Certain projects also utilize special financial funding mechanisms that allow capital improvement costs to be spread over time at favorable interest rates. Examples include SRF funding for stormwater (State Revolving Funds), DWRF funding for water, (Drinking Water Revolving Funds), bond financing, and SAD (Special Assessment District) funding.

In some of those cases, there may be elements of loan forgiveness (e.g. for SRF funds) or full or partial repayment by citizens (for SAD). However, for purposes of the chart below, those funding mechanisms are *not* treated as outside discretionary funding even though some may ultimately reduce the City's net outlay on a project. Because the Housing Commission receives funds from a variety of state and federal sources, such funds are treated as discretionary, but are extracted out from the remainder of the City Owned Buildings category for clarity.

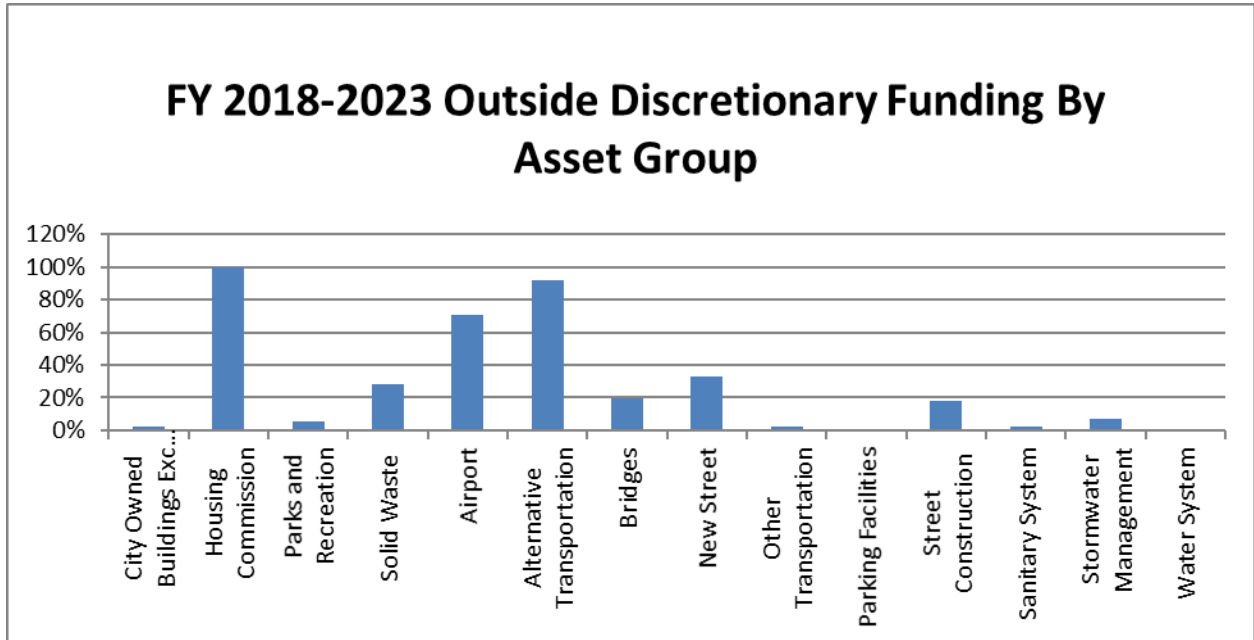
Per the chart below, Housing Commission, Airport, and Alternative Transportation capital improvement projects most heavily utilize outside discretionary funding.

Due to the inclusion of several major projects related to the City's Transportation Plan, the Alternative Transportation category's outside discretionary funding accounts for nearly 92% of all such funding. Those projects seek to provide improved transportation systems to serve the city and our growing population and employment base. They include prospective commuter rail projects, and the locally based Connector project.

Funds are also earmarked for community-wide improvements to the pedestrian and bicycle mobility system. These large projects are anticipated to be funded in large part by Federal or other State funds.

**FY2018–2023 OUTSIDE DISCRETIONARY FUNDS BY ASSET GROUP**

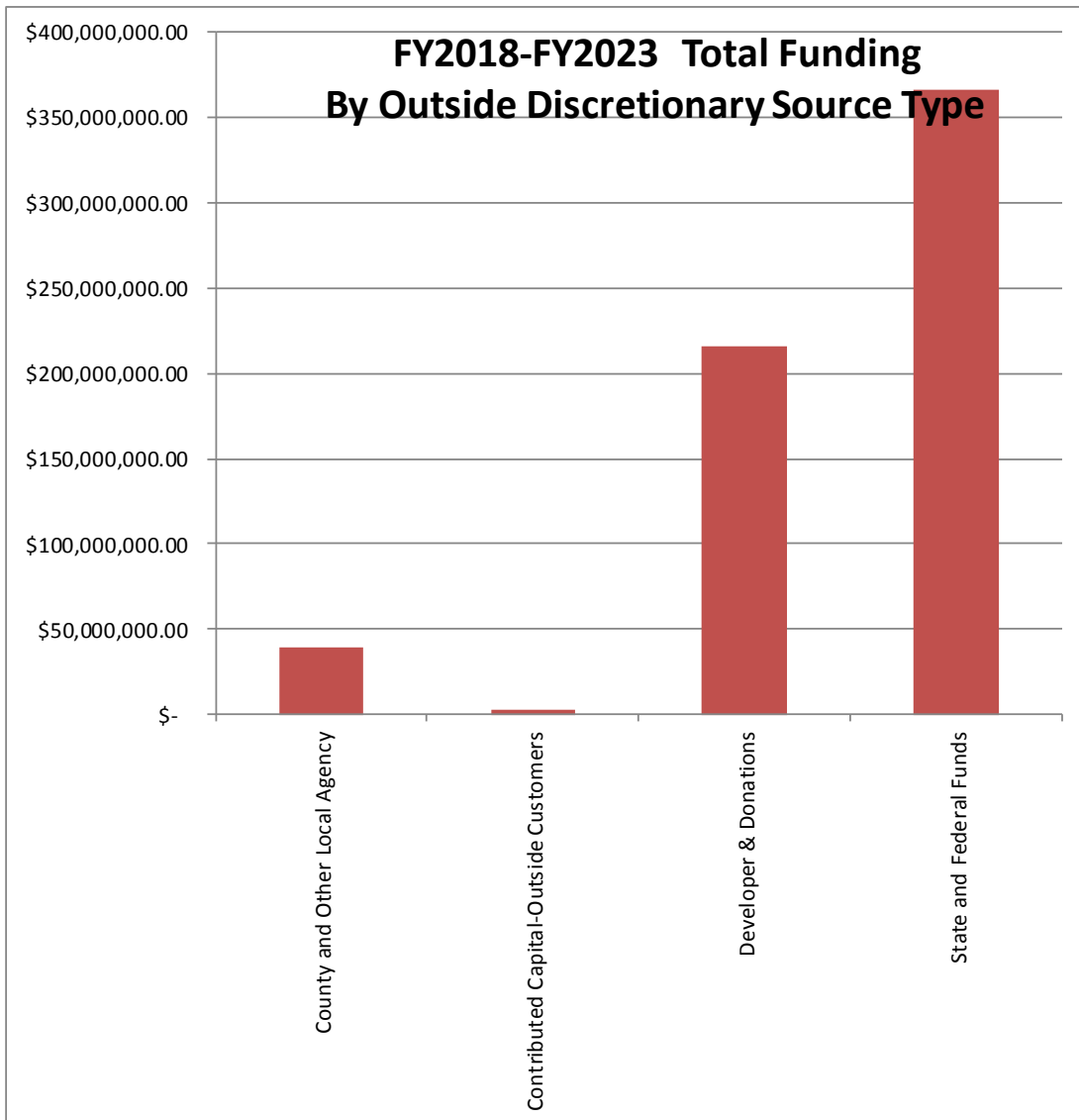
Category	FY 2018-2023 Total Funding Need	Outside Discretionary Funding	% Outside Discretionary Funding
City Owned Buildings Exc			
Housing Commission	\$ 10,660,000.00	\$ 225,000.00	2%
Housing Commission	\$ 17,300,000.00	\$ 17,300,000.00	100%
Parks and Recreation	\$21,150,000	\$ 1,120,000.00	5%
Solid Waste	\$11,575,000	\$ 3,240,000.00	28%
Airport	\$9,054,000	\$ 6,387,800.00	71%
Alternative Transportation	\$627,239,000	\$ 577,294,650.00	92%
Bridges	\$5,061,000	\$ 1,000,000.00	20%
New Street	\$4,525,000	\$ 1,500,000.00	33%
Other Transportation	\$20,214,000	\$ 522,000.00	3%
Parking Facilities	\$11,581,000	\$ -	0%
Street Construction	\$78,535,000	\$ 14,440,600.00	18%
Sanitary System	\$33,199,000	\$ 880,000.00	3%
Stormwater Management	\$29,336,000	\$ 2,032,845.00	7%
Water System	\$ 129,142,000.00	\$ -	0%
Totals:	\$ 1,008,571,000.00	\$ 625,942,895.00	62%



Sources of outside discretionary funding are depicted by type in the table and chart below:

**FY2018-FY2023 OUTSIDE DISCRETIONARY FUNDS BY SOURCE CATEGORY**

Outside Discretionary Fund Category	FY2018-2023 Total Funding By Outside Discretionary Category	FY2018 Funding By Outside Discretionary Category	FY 2019 Funding By Outside Discretionary Category
County and Other Local Agency	\$ 39,732,000.00	\$ 2,685,000.00	\$ 5,005,000.00
Contributed Capital-Outside Customers	\$ 3,240,000.00	\$ -	\$0
Developer & Donations	\$ 216,196,000.00	\$ 780,000.00	\$ 12,000,000.00
State and Federal Funds	\$ 366,774,895.00	\$ 26,910,095.00	\$ 71,330,350.00
	\$ 625,942,895.00	\$ 30,375,095.00	\$ 88,335,350.00



**C. General Funded Projects**

The FY2018-FY2023 CIP includes 24 projects that are anticipated to be funded in whole or in part by general funds. This represents about 5.5% of all projects and about 1.8% of all funding needed. However, per discussions of discretionary funding above, if grants or other outside funding are obtained for any or all of the major alternative transportation projects, significant matching general funds might be needed. General fund matches for such projects are not included in the table below given the discretionary nature of the funding itself.

For example, the potential general fund match for a federal grant to construct the proposed Ann Arbor Station in the Alternative Transportation asset group is not included in the figures. It is covered as a “discretionary funded” project in Section B. above.

Predominant in number in the general funded project group are city owned building projects such as projects to rehabilitate or replace the City’s aging fire stations that are necessary for the safe and efficient function of such facilities.

The chart below summarizes the number and funding needs of such projects for each asset group. Totals are shown both for the total six-year cycle and individually for FY2018 and FY2019.

**GENERAL FUND NEEDS**

Category	Total FY2018-FY2023 Number of Projects	FY2018-FY2023 Total General Funds Needed	FY2018 Number of Projects	FY2018 General Funds Needed	FY2019 Number of Projects	FY2019 General Funds Needed
City Owned Buildings	11	\$ 10,255,000.00	5	\$ 780,000.00	4	\$ 880,000.00
Parks and Recreation	0		0	\$ -	0	\$ -
Solid Waste	0		0	\$ -	0	\$ -
Airport	0		0	\$ -	0	\$ -
Alternative Transportation	3	\$ 1,603,000.00	0	\$ -	0	\$ -
Bridges	0	\$ -	0	\$ -	0	\$ -
New Street	0	\$ -	0	\$ -	0	\$ -
Other Transportation	3	\$ 2,625,000.00	2	\$ 625,000.00	2	\$ 550,000.00
Parking Facilities	0		0	\$ -	0	\$ -
Street Construction	0		0	\$ -	0	\$ -
Sanitary System	0		0	\$ -	0	\$ -
Stormwater Management	0		0	\$ -	0	\$ -
Water System	7	\$ 3,765,000.00	3	\$ 560,000.00	5	\$ 265,000.00
<b>TOTALS</b>	<b>24</b>	<b>\$18,248,000.00</b>	<b>10</b>	<b>\$ 1,965,000.00</b>	<b>11</b>	<b>\$ 1,695,000.00</b>

## PROJECTS, PRIORITIZATION, AND PROGRAMMING: “THE THREE P’s”

The initial task for the CIP Category Teams is to generate a list of identified capital needs (the “Projects” step).

The next, and most critical process component, is rating the relative merits of each project (the “Prioritization” step). This crucial step, while constrained by the amount of funding anticipated to be available for capital projects and timing of availability of funds when more than one asset category is involved in a project, nonetheless provides invaluable information in the CIP decision-making process. Shrinking funds and rising costs incurred in maintaining and rehabilitating deteriorating infrastructure make the process of selecting the most vital capital projects even more crucial and difficult. The merits of each identified capital need must be judged against the policies and criteria of the CIP process and the goals of each component of the master plan, as well as against the other competing needs in that particular asset category.

For example, within the limited budget of the water asset group, is the rehabilitation of an aging component at the water treatment plant, or the replacement of a failing water distribution main, or the modification of a treatment process for greater efficiency of greater importance?

While asset groups utilize a set of common prioritization criteria, a limited number of asset-specific criteria are utilized as well (see chart below). While rating scales for each criterion are the same, each group may assign different relative weights to each.

<i>Prioritization Criteria Items</i>
<b>Criteria Common to Most Asset Categories:</b>
Sustainability Framework Goals
Safety/Compliance/Emergency Preparedness
Funding
Coordination with Other Projects
Master Plan Objectives
User Experience (Level Of Service)
Innovation
Economic Development/Retention
Partnerships
System Influence/Capacity
O & M (Operation & Maintenance)
Energy
<b>Criteria Specific to Selected Asset Categories Only:</b>
Parks & Recreation Only: SCRA - Social, Cultural, Recreational, and Aesthetic
Bridges Only: Daily Users Carried
Bridges Only: Criticality (e.g. critical to systems operation or a specific site)
Bridges Only: Impacts Other Infrastructure items
New Streets Only: User Demand
New Streets Only: Surface Water Quality
New Streets Only: Natural Features Impacts
Stormwater Management Only: Water Quality
Water System Only: Reliability

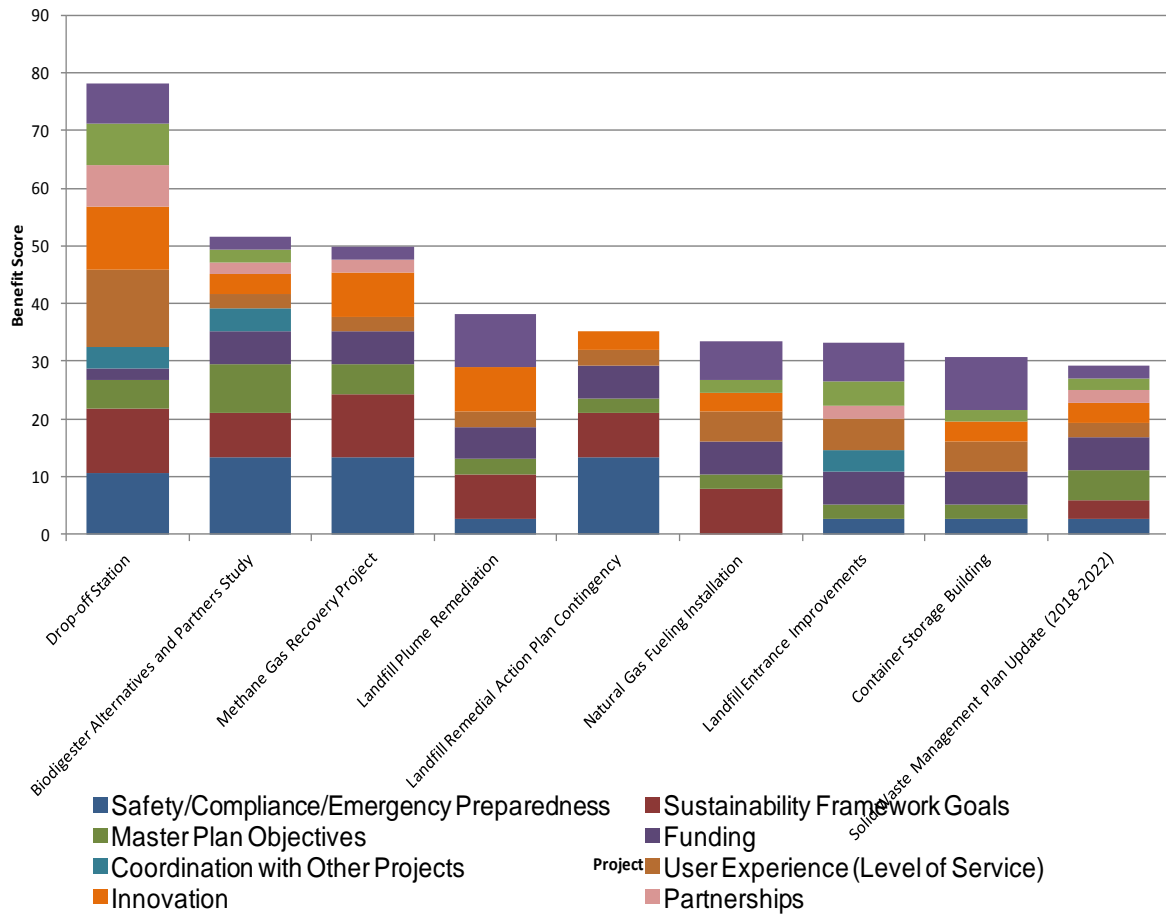
Each project is then rated using a scoring scale for each criteria. This scoring process takes place with teams of staff members providing broad cross-unit input and involving staff from unit

mangers to project managers to field operations personnel. Staff from other entities such as the DDA, UM, and the Washtenaw County Water Resources Commissioner’s Office (WCWRC) are also involved where appropriate.

Upon completion of Prioritization of capital projects for each asset category, the prioritization model then produces information (both in graphic and in tabular form) showing the scores for each project. Results for the Solid Waste asset group are shown below as an example:

## SAMPLE SOLID WASTE PRIORITIZATION MODEL GRAPHIC RESULTS

**FIGURE 1**  
Benefit Score by Criteria Weight Composition





**SAMPLE SOLID WASTE PRIORITIZATION MODEL TABULAR RESULTS**

<b>Project Number</b>	<b>Project Description</b>	<b>Total Benefit Score</b>
1	Drop-off Station	<b>78.03</b>
7	Biodigester Alternatives and Partners Study	<b>51.62</b>
4	Methane Gas Recovery Project	<b>49.93</b>
8	Landfill Plume Remediation	<b>38.07</b>
5	Landfill Remedial Action Plan Contingency	<b>35.16</b>
9	Natural Gas Fueling Installation	<b>33.55</b>
3	Landfill Entrance Improvements	<b>33.28</b>
2	Container Storage Building	<b>30.69</b>
6	Solid Waste Management Plan Update (2018-2022)	<b>29.32</b>

These prioritization scores then become one of the principal tools in establishing the order in which projects are programmed (the “Programming” step). It is noted however, that fund availability and constraints, the need to coordinate with projects involving other asset groups, required interactions with other outside agencies, and other similar factors dictate that this scoring alone does not set the programmatic order in which projects are undertaken.

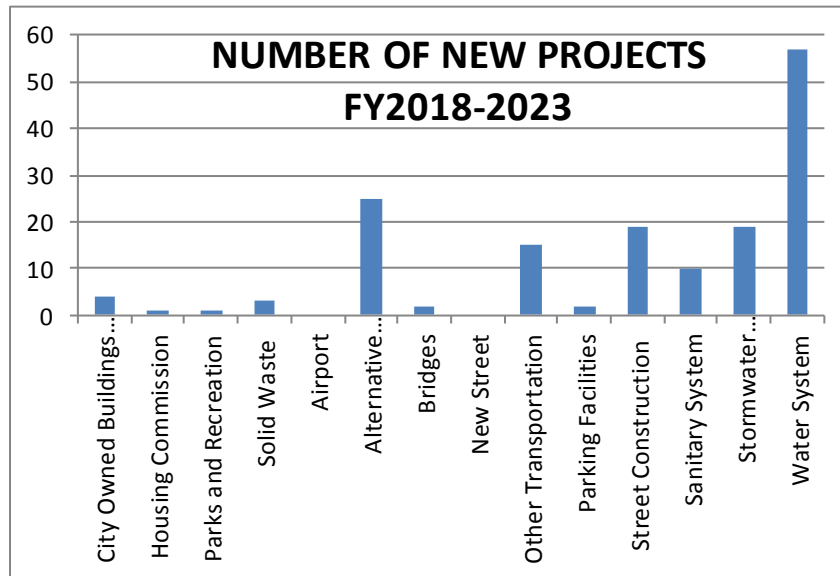
The final result of the “Three P” process was the FY2018-FY2023 plan presented in tabular form by asset group to the City Planning Commission with prioritizations scores, year programmed, and projected funding needs for each.

## NEW PROJECTS

There are 158 new projects in the FY2018-FY2023 CIP. The total cost of all new projects is \$157,224,000 representing approximately 15.6% of all project costs. New projects are shaded on the CIP Plan tabular data sheets.

### NEW PROJECTS FY2018- FY2023

Category	# of New Projects	FY2018-2023 Funding Needed
City Owned Buildings Exc. Housing Comm.	4	\$ 7,300,000.00
Housing Commission	1	\$ 1,300,000.00
Parks and Recreation	1	\$ 150,000.00
Solid Waste	3	\$ 2,370,000.00
Airport	0	\$ -
Alternative Transportation	25	\$ 14,969,000.00
Bridges	2	\$ 2,047,000.00
New Street	0	\$ -
Other Transportation	15	\$ 21,584,000.00
Parking Facilities	2	\$ 3,321,000.00
Street Construction	19	\$ 24,452,000.00
Sanitary System	10	\$ 5,375,000.00
Stormwater Management	19	\$ 18,803,000.00
Water System	57	\$ 55,553,000.00
<b>TOTALS</b>	<b>158</b>	<b>\$ 157,224,000.00</b>



## COMMUNITY INPUT AND INFORMATION SHARING

As the City's focus on community engagement efforts is increasingly embedded into the fabric of interaction with the community, many new capital improvement projects are being generated from such interactions.

The City has engaged in several intensive infrastructure related planning and evaluative studies that have involved citizen advisory groups and/or community-wide engagement efforts. The results of such studies have generated capital improvement projects that were heavily driven by such citizen input.

As an example, the recently completed Stormwater Modelling project resulted in the identification of several needed capital projects. This Plan includes several new projects that arose as a result of that effort as, for example, the Edgewood/Snyder SWMM Area Stormwater project.

Resident requests concerning specific locations have also generated a number of capital improvement projects. For example, citizen requests to fill the sidewalk gap on the south side of Jackson from Wagner to Park Lake contributed to inclusion of a project to meet that need.

Requests are also received from the University of Michigan (UM), local interest organizations such as the Washtenaw Biking and Walking Coalition, etc. For the first time, in Fall 2016, staff from UM were directly included in CIP asset group discussions, fostering shared knowledge and smoother capital planning where both the City and the university's plans intersect.

Examples of other projects that were added to the FY2018-FY2023 CIP based in whole or in part upon community input include the Border-to-Border trail connection under Fuller Road, other sidewalk gap-filling projects, Chalmers Drive improvements, and water quality improvement projects based on citizen's reporting of water issues such as rusty water.

Local streets that are slated for resurfacing under the CIP's Annual Local Street Resurfacing often result from placement on an initial candidate list based on direct resident request for evaluation.

One final new opportunity for gathering community input, which can lead to inclusion of new capital improvement projects in the CIP, has come about due to the highly successful launch in 2014 of the City's new *A2 Fix It* system. This system permits community members to report on issues related to the City's capital assets as well as its operations. The primary purpose of the system focuses on addressing issues such as pothole repair or a missed trash pick-up which can be addressed in the short term. However, the system is also beginning to generate requests which would require longer-term capital improvement project creation to properly address.