WATER SYSTEM ASSET MANAGEMENT PLAN

PREPARED FOR:

THE CITY OF

WHITE CLOUD

A TRAIL FOR EVERY SEASON

MICHIGAN

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PROJECT NO. 4058

TABLE OF CONTENTS

I. INTRODUCTION

The City of White Cloud is in Newaygo County, Michigan. The City owns, operates and maintains a Type 1 Community Public Water Supply System that serves a population of approximately 1,407 people.

The City's Water System consists of supply assets, storage assets and distribution system assets. The water supply consists of 3 groundwater wells and pumps, 3 well houses and electrical controls at each well house to allow the pumps to be started and stopped remotely from a master controller located at the DPW offices. The water storage components consist of 2 elevated storage tanks and the electrical controls at each tank to allow monitoring of water levels within the tanks. The water distribution consists of over 15 miles of water distribution lines, ranging in size from 1-inch diameter to 12-inch diameter, water service line ranging from 5/8-inch diameter to 6-inch diameter, isolation valves, and fire hydrants.

The City`s 3 supply wells provide a total pumping capacity of 1095 gallons per minute. The firm capacity of the City's supply is 625 gallons per minute. Firm Pumping Capacity is defined as the total pumping capacity with the largest well out of service. Well 4 has the largest capacity at 470 gallons per minute. Thus, Firm Pumping Capacity is 1095 gallons per minute minus 470 gallons per minute.

The two elevated storage tanks have a total storage capacity of 300,000 gallons. The distribution piping provides water to approximately 1,407 citizens and approximately 520 water service connections and provides fire protection to facilities within the water service area.

II. ASSET MANAGEMENT TEAM

The Asset Management Team consisting of the City Manager, the staff of the Department of Public Works, and a representative of the City Engineering firm. The members of the team worked together to prepare the Level Of Service Statement, identify the components of the asset inventory, determine the attributes of the inventory items, assess their condition and evaluate the impacts to the water system and the system customers if the components were to fail.

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III. LEVEL OF SERVICE STATEMENT

The Asset Management Team has developed the following level of service statement for the City of White Cloud Water System:

1. Safe drinking water will always be provided to all customers under normal operating conditions. Water quality is monitored throughout the year as required to meet Federal and State Drinking Water Regulations.
2. The City DPW staff will make every effort to investigate and promptly repair problems with water mains and customer water service lines. Every effort will be made to correct any problems or accomplish repairs within 48 hours. Service calls will be reviewed annually to determine if the 48-hour repair/correction period is being met.
3. The City DPW staff will respond to customer complaints within one workday. In the event of a planned water system outage, customers will be given a minimum 48-hour advance notice. Service calls will be reviewed annually to determine if the 1 workday goal is being met for response to customer complaints.
4. In the event of a power outage, the water service will be maintained by using portable emergency generators to power the supply wells #2 and #4. Well #1 is maintained by a dedicated on-site generator in the event of a power outage. Also, due to their locations, well #4 is supplied power from Great Lakes Energy while wells #1 and #2 are supplied power from Consumers Energy which adds some reliability in that it is less likely that both power supplies would have power outages simultaneously.
5. The City DPW staff will perform all required monitoring to demonstrate that the system is always meeting Federal and State drinking water quality regulations. The results of the water quality testing will be reported to the customers annually.
6. Under normal operating conditions the water system will maintain a minimum working water pressure of 45 psi.
7. A minimum fire flow of 900 gpm will always be provided to each fire hydrant. Fire flows are reviewed every 5 years during updated of the Water Reliability Study.
8. The City of White Cloud will employ a full-time certified water system operator and will encourage all staff of the Department of Public Works to work towards obtaining water system operator certification.
9. Water system facilities will always be secured.

These goals will be tracked and assessed utilizing normal reporting procedures which DPW staff prepare. The reports will allow the City to track and report upon the status of all work within the system at any point in time and to track and analyze trends in the type and location of work required on the system.

IV. ASSET INVENTORY SYSTEM

In order to assess the condition of all the components of the water system a database or spreadsheet was developed that lists all components and their attributes. A small portion of the distribution system database is shown in Appendix A. System inventory will be kept current by maintaining records of water system construction and maintenance. System map and spreadsheet will be updated on a yearly basis or as improvements are made or condition changes are noted.

Distribution System

The spreadsheet includes each section of distribution pipe within the system listed block by block. The distribution pipe is listed by location, and each pipe section includes information on the year of construction, the age, pipe size, pipe material, and intersecting streets. The spreadsheet ties each section of distribution system piping to a specific location. The location also ties to the Water System General plan for the City of White Cloud and the computer modeling system used by the City Engineering firm.

Supply and Storage System

The components of the water supply and water storage system were also listed in their spreadsheet. The information in these spread sheets include the year of construction, age and pertinent information on the mechanical components of the system.

V. ASSESMENT OF CRITICALITY OF ASSETS

Not all assets are equally important to the operation of the system. Some assets are highly critical to operation while other are not critical at all. Criticality of an asset is determined by assessing how likely it is that the asset will fail and the consequence of failure of that asset.

To determine the criticality, the team first reviewed the condition of the system assets so it could evaluate the probability of failure.

Condition of Assets

To determine the condition of the assets, the following information was reviewed for each component of the system and a numerical value was assigned based on the table 1 below:

- Age of the Asset
- General Plan of the Water System
- Historical knowledge of the system
- Asset inventory spreadsheets
- Failure history of components of the system
- Maintenance records

Table 1 - Condition of the Asset

Condition Rating	Description
5	Asset Unserviceable - should be replaced soon
4	Significant deterioration - above average maintenance is required
3	Moderate deterioration - Some routine maintenance required
2	Minor Deterioration - Minor maintenance required
1	New and in Excellent Condition - very little maintenance required

Condition Ratings

Supply components.

For the water supply system, a condition rating of 1 or 2 was assigned for all components. The oldest portions of the water supply system are Wells No. 1 and 2, which were installed in the late 1940's and 1950's Both wells were originally fitted with turbine pumps. The screen in well No.1 was replaced in the late 1980's. The pump in Well No.1

was replaced in 2017 with a new submersible pump. The well No.2 pump has been used as a backup supply. Well No.2 has been inspected and maintained regularly and the equipment remains in good condition.

Well No.3 was removed from the system in the 1980's and well No.4 was installed to replace the firm pumping capacity. The equipment at well No.4 is in good condition and is given a rating of 2. The submersible pump motor for well No.4 was replaced in 2009, after being damaged by a lightning strike.

Ongoing maintenance and annual inspection records for all three of the supply wells do not indicate any likelihood of failure.

Storage components.

Water storage for the system is provided with two single pedestal elevated storage tanks. A 100,000-gallon storage tank on Newell St is the oldest tank and was constructed in 1978; A 200,000-gallon single pedestal elevated storage on Pine Hill was constructed in 2000 and replaced a smaller and older multi leg tank.

Maintenance has been ongoing as needed on both storage tanks. The asset inventory for the storage tanks lists the tank and the paint surfaces on the tank as separate assets so each could be accessed and given different life expediency. The condition level of all the water storage assets are currently rated as a 2 or 3, since repainting of the tank will be needed within the next several years.

Distribution components.

The distribution system assets are inventoried in a very detailed database. In general, the water distribution system assets are in good condition and have been given a rating of 2 or 3. The 4-inch through 12-inch water mains in the system is cast iron or ductile iron pipes with an expected life of 100 years. The smaller 2-inch pipes also have been given an expected life of 100 years.

The DPW staff have not found any portions of the system that have required repeated or significant repairs, and when repairs were required, they have not seen any significant pipeline deterioration.

Probability (likelihood) of Failure Ratings

After the assets were assigned a condition rating, the team reviewed the asset age, failure history, historical knowledge, maintenance records and knowledge of the asset is likely fail to assign a probability (likelihood) of failure to each system asset based on Table 2 below.

Table 2 - Probability (likelihood) of Failure	
Performance Rating	**Description**
5	Imminent - Asset is in poor condition and failure is imminent
4	Probable - Asset is in fair condition, and failure could occur at any time
3	Occasional - Asset is in good condition, and failure is not anticipated
2	Remote - Unlikely but possible to occur
1	Improbable - failure is very unlikely and not expected

Supply components

The probability of failure rating for the water supply system was assigned a rating of 1 or 2 for all assets except for the pump in well No.2, which was given a rating of 3 only because of age.

Records have shown that failures of equipment are rare.

Storage components

For the water storage tanks, the probability of failure rating was given as a 1or 2 for the structural parts of the tanks such as the steel walls and the concrete foundations. Inspections find these components to be in excellent or good condition and very unlikely to fail. The painted surfaces were rated 2 or 3. These paint surfaces are showing some signs of failure and the probability of more significant failure is likely.

Distribution components

Historical records do not show areas of repeated failures, indicating that no part of the system has a greater probability of failing then any other parts of the system.

Consequence of Failure Ratings

The consequence of failure rating for the various assets of the water system was assigned based on the complete cost of the failure including cost of repair, social cost of loss of the asset, repair/replacement costs, legal costs, environmental costs, loss of business revenue, etc. The layout of the system, redundancy, looping, etc. were also factored into the assessment to give each asset a consequence of failure rating per Table 3 below.

Most of the water main pipes in the distribution system are looped and the removing of a single block of pipe will only have an impact to a few customers. Therefore, many of the water main pipes were given a consequence of failure rating of 2 or 3. Certain sections of the 12-inch transmission mains serving key customers or located in areas that would be difficult to assess and repair are given ratings of 4.

For the water supply wells, the consequence of failure rating was assigned a value of 3 for wells No.1 and 4 and a value of 2 for well No.2. Each well serves as a redundant source of water supply for the other wells so loss of an individual well will cause a minor or moderate disruption of the system. The loss of well No.2 would have less impact to the system, as it is typically a standby supply.

The failure of the water storage tanks was assigned a consequence factor of 3. The tanks have been taken out of service several times in the past for routine maintenance and tank inspections and these short duration removal from service caused little or no disruption to the customers.

Table 3 - Consequence of Failure (consider safety/social, economic and environmental factors)

Performance Rating	Description
5	Catastrophic disruption
4	Major disruption
3	Moderate disruption
2	Minor disruption
1	Insignificant disruption

Assessing Criticality

Criticality Assessments were completed by examining the probability (likelihood) of failure and the consequence of failure as discussed above. The assets with the greatest probability of failure and the greatest consequences of failure will be the assets that are the most critical.

A criticality factor was calculated for each asset by multiplying the probability of failure asset rating by the consequence of failure asset rating. An asset with a criticality factor of 1 to 8 is not considered critical. An asset with a criticality factor of 9-16 will be important and an asset with a criticality factor above 16 will be considered critical.

VI. CAPITAL IMPROVEMENT PLAN

Based on the assessment of criticality of assets completed during preparation of the Asset Management Plan as well as information in the latest Water System Reliability Study, the following 5 year and 20 year Capital Improvement Plan (CIP) was created. The plan below has been approved by the City Manager and Water Administrator.

5-year plan

Place 8" water main from Charles Street to Washington Court in an easement and Airway Avenue completing a loop in the Industrial Park.

Estimated Cost $209,155
Est. Completion: 2020

The city plans to continue the program, which started in 2015, to install upgraded water meters to be the radio read type meters. The target for each year is to install between 10 and 20-meter transmitters

Cost per year = $2000
Est Completion: 2024

Make improvements at the Newell St 100,000-gallon storage tank. An inspection of this tank in 2015 resulted in recommendation to make numerous improvements. These recommended improvements include spot repairs, cleaning of the dry surfaces, recoating some surfaces and many safety improvements.
(The city might consider a bond issue for this item of work)

Estimated Cost $116,000
Est. Completion: 2025

20-year plan

Replace 4" water main in Charles St from Pine Hill north 500 feet

Estimated Cost $ 50,000
Est. Completion: 2030

Replace 4" water main in North St from James St to Wilcox St with 8" water main to boost fire flow in the area of the Newaygo County office facilities and to provide improvements to looping in the SW areas of the water system.
(The city might consider a bond issue for this item of work)

Estimated Cost $118,800
Est. Completion: 2035

Replace 4" & 2" water main in Williams St from 200 feet north of Newell St to Townline Rd

Estimated Cost $ 90,000
Est. Completion: 2035

Replace under sized hydrants (7 at $2,000 each)

Estimated Cost $ 14,000
Est. Completion: 2035

Improvements at the Pine Hill 200,000-gallon Single Pedestal Water Storage Tank include spot repairs, cleaning of the dry surfaces and recoating some surfaces.

Estimated Cost $60,000
Est. Completion: 2040

Replace the 4" water main in James St from Charles St to North St with 8" water main to boost fire flow in the area of the Newaygo County office facilities.
(The city might consider a bond issue for this item of work)

Estimated Cost $264,600
Est. Completion: 2040

VII FUNDING, REVENUE AND RATES

In the past 5 years, the City of White Cloud has made numerous reviews of the water system Capital Improvements Plan (CIP) and has adjusted the items of work in the plan. These adjustments to the priority of items in the CIP were made to provide for maintenance of the supply wells and the storage tanks and to make improvements to the distribution system to increase fire flows within the developing Industrial Park.

These adjustments to the CIP were accompanied by reviews and adjustments of the water charge rates. The current water rates were approved by council on April 2, 2019 and were effective July 1, 2019. A copy of the current rates and council meeting minutes can be found in the Appendix B.

The current charge rates were a little short of replacing cash reserves used to fund the improvements and are not providing funds to go forward with the updated CIP. Based on this, the City is proposing a 1% annual increase on the rate for water used and the rate for debt service for the next 5 years. This increase over 5 years should adequately fund the replacement of critical assets resulting from this Asset Management Plan and the planned system improvements for the next 20 years and beyond as shown in the Water System Revenue and Expenses worksheet in Appendix B.

VIII. CONCLUSION AND ONGOING EFFORTS

Conclusion

This assessment of the assets of the White Cloud water system has determined that the system is in good condition. The oldest portions of water distribution system still have an estimated remaining useful life of more then 25 years. The system does not have any portions that exhibit a poor condition or high probability of failure. The water supply system, consisting of wells, pumps, motors, valves and controls all of which and are in good condition and have a low probability of failure. The water storage tanks are in good condition but will need to be repainted and some safety improvements are recommended at the Newell St tank.

The Asset Management Plan is an Ongoing Effort

The asset management team has determined that the asset management plan is an ongoing and constantly developing process. The asset inventory list remains under development and will be continually added to and upgraded. The process allows decision makers to better identify problem areas and direct investment to maintain the water system assets of the White Cloud water system. As a result of this process, the asset management database, the asset management plan, and the capital improvement plan should be reviewed and updated regularly.

APPENDIX A
Asset Inventory and Criticality Criteria