Exhibit No.:	
Issues:	Capital Investment Program, Description of Plant Additions, Water Storage Tank Rehabilitation, Risk Associated with Providing Public Water and Wastewater Services
Witness:	Jeffrey T. Kaiser
Exhibit Type:	Direct
Sponsoring Party:	Missouri-American Water Company
Case No.:	WR-2020-0344 SR-2020-0345
Date:	June 30, 2020

MISSOURI PUBLIC SERVICE COMMISSION

CASE NO. WR-2020-0344
CASE NO. SR-2020-0345

DIRECT TESTIMONY

OF

JEFFREY T. KAISER

ON BEHALF OF

MISSOURI-AMERICAN WATER COMPANY

AFFIDAVIT

I, Jeffrey T. Kaiser, under penalty of perjury, and pursuant to Section 509.030, RSMo, state that I am Director of Engineering for Missouri-American Water Company, that the accompanying testimony has been prepared by me or under my direction and supervision; that if inquiries were made as to the facts in said testimony, I would respond as therein set forth; and that the aforesaid testimony is true and correct to the best of my knowledge and belief.

Jeffrey T. Kaiser

June 30, 2020
Dated

DIRECT TESTIMONY
JEFFREY T. KAISER
MISSOURI-AMERICAN WATER COMPANY
CASE NO. WR-2020-0344
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DIRECT TESTIMONY

JEFFREY T. KAISER

I. INTRODUCTION

Q. Please state your name and business address.

A. Jeffrey T. Kaiser. My business address is 727 Craig Road, Creve Coeur MO 63141

Q. By whom are you employed and in what capacity?

A. I am employed by Missouri-American Water Company (MAWC or the Company) as the Director of Engineering.

Q. Please summarize your educational background and business experience.

A. I received a Bachelor of Science degree in civil engineering from Washington University in St. Louis, Missouri in 1986. I am a registered professional engineer in the states of Missouri and Indiana. I have over 33 years of experience in the water and wastewater design and construction industry. From 1986 until April 2018 I held various roles of increasing responsibility for large nationally based engineering firms including positions as project engineer, senior engineer, project manager, and office/ branch manager. In these roles, the primary focus of my work was the water and wastewater industry. In these roles, I was involved in or oversaw the completion of numerous planning, design, and construction projects, ranging in size and scope from small sewer and water main extension projects to water and wastewater system planning studies, and the design and construction administration of treatment plant improvement projects of up to $280 million in value. In April of 2008 I was employed by American Water Works Service Company (the Service Company) to serve as the

Director of Engineering for Illinois American Water Company, Iowa American Water Company, and Lake Water Company. In January 2017, my position changed to Director of State Procurement, overseeing the purchasing of all state subsidiaries of American Water. In December 2019, I became an employee of MAWC serving as the Director of Engineering for MAWC, the position I currently hold.

Q. Are you a member of any professional organizations?

A. Yes. I am a member of the American Water Works Association.

Q. What are your current employment responsibilities?

A. As Director of Engineering I oversee and manage the planning, design, and construction of water, wastewater, and other general facilities for MAWC, the development and updating of the Geographic Information System (GIS), and developer related services. My responsibilities include: administering the capital program for the Company; ensuring compliance with state and federal requirements related to the planning for and delivery of the capital investment program; coordinating the procurement of all project design and construction services; providing comprehensive system planning for use in developing system needs and projecting capital spending; and supporting MAWC operations staff in performing plant/system troubleshooting.

Q. Are you generally familiar with the operations, books and records of MAWC?

A. As Director of Engineering, I am familiar with the facilities and operations of the Company in each of its operating areas.

Q. Have you previously testified before a regulatory body?

A. I have previously testified before the Missouri Public Service Commission, the Illinois Commerce Commission, the Illinois Pollution Control Board, and the Iowa Board of Public Utilities.

Q. What is the purpose of your Direct Testimony in this proceeding?

A. My Direct Testimony addresses four topics. First, I generally discuss MAWC's capital investment needs and capital planning process. Second, I describe the significant capital projects (defined as those placed in-service and having a Company investment greater than $1,000,000 for water and $500,000 for wastewater) by MAWC since the conclusion of the last rate proceeding test year, through the completion of the test year for this rate proceeding (January 1, 2018 through May 31, 2022). Additional project information such as in-service dates, and final costs are included as an attachment to this Direct Testimony as Schedule JTK-1 - Confidential. Third, I discuss the treatment of water storage tank rehabilitation and specifically the capitalization of tank coating systems. Lastly, I discuss the risk of providing public water and wastewater services.

Q. Are you sponsoring any Schedules with your Direct Testimony?

A. Yes, I am sponsoring the following Schedules:

Schedule JTK-1 – Confidential: Significant capital investments, January 1, 2018 through May 31, 2022

Schedule JTK-2: Water storage tank inventory

Schedule JTK-3: Sample water storage tank inspection reports

<u>II. Capital Investment PROGRAM</u>

Q. Does MAWC have significant capital investment requirements?

A. Yes, MAWC's water and wastewater infrastructure investment needs are substantial. MAWC investment needs are primarily related to non-revenue producing infrastructure replacement and compliance with new drinking water or wastewater standards as promulgated and enforced by the Missouri Department of Natural Resources (MDNR). MAWC's systems must comply with ever increasing and more strict regulatory requirements for drinking water (e.g. the Safe Drinking Water Act) and wastewater (e.g. the Clean Water Act). Further, as is the case with much of the water and wastewater industry, MAWC's infrastructure is aging and in need of replacement. This aging infrastructure, our pipes, plants, etc., must be continually replaced so that MAWC can continue to provide our customers with safe, adequate, efficient, and reliable utility service without interruption. In addition, MAWC is working to acquire small and struggling water and wastewater systems throughout Missouri. These small systems often require significant investment to meet the basic drinking water and wastewater regulatory requirements of the State of Missouri.

Q. How do aging infrastructure replacement needs affect MAWC?

A. As the largest investor owned water and wastewater utility in Missouri, MAWC bears a considerable portion of the state's aging infrastructure investment burden. Much of the pipe, treatment, storage, supply, and other plant that are used to provide water and wastewater services are nearing the end of their life expectancy. In 2019 for example, MAWC placed in service improvements worth more than $226 million just to keep pace with the replacement needs of its aging water distribution and sewer collection infrastructure. In 2020, MAWC plans to place in service an additional $291 million to replace these aging systems. These levels of capital investment are anticipated to continue for the foreseeable future as more of MAWC's infrastructure reaches the end of its useful life. Moreover, while MAWC must continually invest in its aging infrastructure, it does so at rising costs. Costs are rising because material and labor costs are increasing, but also because municipalities and government agencies are increasing their right of way restoration requirements. For example, utilities historically were required to restore pavement to a standard of two foot wider than the width of the trench required for pipe replacement, or typically four to six feet. Now, it is typical for pavement replacement to include the full width of the traffic lane (twelve feet) and in some cases, the full width of the street (24 feet or more). This has driven replacement costs upward considerably as restoration is now often more than 50 percent of the cost of water main replacement. As discussed later in this Direct Testimony, MAWC has invested or has planned investment of approximately $919 million in water facilities and $30 million in wastewater facilities from January 1, 2018 through May 31, 2022. The projects I describe clearly illustrate the types of aging infrastructure issues as well as changing regulatory requirements MAWC faces.

Q. What is the amount of MAWC's planned investment in this case for the replacement of water and sewer distribution and collection mains and services?

A. MAWC plant additions in this case include more than $400 million for water and sewer infrastructure replacement for pipes that are near the end of their useful lives. From the perspective of long-term sustainable customer service and water rates, replacing pipes that are near the end of their useful life in a systematic responsible manner will result in lower costs to customers over time as compared with deferring needed replacements and addressing problems, such as leaks and main breaks, as they arise. Planned pipe replacements are much less costly on a unit cost basis than the costs of increasing pipe breaks, service disruptions, property damages, health risks from potential drinking water contamination exposure during pipe breaks, related community opportunity costs related to community health and economic development, and the steep increase in future pipe replacements resulting from prior deferrals of the replacements.

Q. Will the main replacement projects have any impact on operation and maintenance costs?

A. In the absence of main replacement, the number of main breaks and associated repair costs will increase, and operation and maintenance O&M costs will increase accordingly. While weather, system demands and pumping pressure, and other factors can contribute to main breaks, the age of the mains is typically a common factor. The main replacement program will help to mitigate the increase in breaks the Company would otherwise expect as the mains continue to age and deteriorate.

Q. Does MAWC have a planning process for capital investment projects?

A. Yes. MAWC had a comprehensive capital planning process that assesses capital investment needs for all aspects of operations and assigns funding to capital programs on a prioritized basis.

Q. Please describe MAWC's comprehensive capital planning process.

A. MAWC develops a Comprehensive Planning Study (CPS) for each operating district. The planning process begins with the development of anticipated demand projects and regulatory requirements of the system, the identification of improvements needed to meet those demands, and adoption of strategies to correctly prioritize and distribute capital spending for the various needs of the Company. Specific capital planning needs are addressed in both the short term (one year) and longer term (five years) and included in the CPS completed for each service area. This CPS development process is repeated approximately every five years depending on the growth of the service area, changes in regulations, etc. and is one of the parameters used to set the baseline for the preparation of the annual capital budgeting process. A key component of the planning technique is that it is flexible and be adjusted as necessary to address new needs such as unplanned equipment failures, large or sudden growth of a service area, or a new regulatory requirement. Project prioritization is done using objective criteria that validate the need for the project and the risk of not doing the project.

MAWC prioritizes capital investment using a risk-based approach known as the High Risk Asset Management or HRAM process. Through this process, identified system needs are assigned a relative rating based on the likelihood of an asset failure and consequence(s) of that failure. Projects that mitigate risks in the highest tiers of likelihood and consequence of failure, as defined by the HRAM process, are given high priority in Capital Plans. In addition, MAWC utilizes a Geographic Information Systems (GIS) to track and analyze main breaks and other relevant information such as pipe materials and age, and municipal paving schedules in order to prioritize main replacements and minimize costs.

Based upon the results of the CPS and other specific needs of the service areas (such as meter replacements and other life cycle replacements) MAWC develops a proposed annual strategic capital expenditure plan (SCEP) in which capital expenditures are prioritized within the service districts and as part of a state-wide capital budget. This SCEP projects spending for specific projects and blanket expenditures for a five year period. This capital budget is then reviewed by American Water Engineering for the reasonableness of the proposed projects and their forecasted costs. This process is repeated every year to update the SCEP to reflect any changes in need or prioritization, and to maintain a five year forward looking budget projection.

<u>III. DESCRIPTION OF PLANT ADDITIONS</u>

Q. Please describe MAWC's plant additions.

A. The projects that comprise the Company's plant additions in this case vary from what may be characterized as routine, recurring projects, such as the installation of individual distribution mains and services and hydrants, to substantially larger discrete projects, such as replacement of transmission mains, safety and reliability upgrades at water production facilities; installation of emergency power generation equipment; water storage tank projects; and system acquisition improvements, which I discuss in greater detail below.

Q. How are you presenting MAWC's plant additions in your Direct Testimony?

A. Plant additions included in this case are separated into two groups for discussion purposes. The first includes plant investment from January 1, 2018 through December 31, 2019. The second includes investment from January 1, 2020 through the future test year (12 months ending May 31, 2019).

Q. Please summarize MAWC's total plant additions from January 1, 2018 through December 31, 2019.

A. For water facilities, MAWC invested approximately $380 million for plant placed in service between January 1, 2018, and December 31, 2019.

For wastewater facilities, the Company invested approximately $6.4 million for plant placed in between January 1, 2018, and December 31, 2019.

Q. Please summarize plant additions anticipated to be placed in service from January 1, 2020 through May 31, 2022.

A. For water facilities, MAWC plans to invest approximately $538 million for plant placed in service from January 1, 2020 through May 31, 2022.

For wastewater facilities, MAWC plans to invest approximately $23.8 million for plant placed in service from January 1, 2020 through May 31, 2022.

Q. Can you describe these plant additions?

A. Yes. I describe the significant capital projects (defined herein to include those projects with a cost of more than $1 million for water systems and $0.5 million for wastewater) below and in Schedule JTK-1 - Confidential.

Q. Do the total plant additions include additional investments in water and wastewater facilities that are not specifically described in this Direct Testimony?

A. Yes. In addition to the capital projects listed below and in Schedule JTK-1 - Confidential, the Company will also enhance or maintain current levels of service, quality, reliability, and efficiency through numerous projects that do not fit within the definition of "significant capital projects" as I have defined the term above. These projects relate in part to extension or replacement of water or wastewater distribution and collection mains, minor plant and pump station improvements, installation or replacement services, hydrants, and meters, and other capital expenditures such as vehicles, backhoes, building improvements and computers.

Q. Please describe the significant capital projects placed in service during the period January 1, 2018 through December 31, 2019.

A. The significant capital projects completed are as follows:

- **Parkville Water Treatment Plant Replacement (I17-040003)**

  The new Platte County/Parkville water treatment plant was placed in service in December of 2017. However, additional work on related infrastructure remained to be completed. The work placed in service after January 1, 2018 included miscellaneous site work and paving, security systems, interior office finishes, equalization basin mixers, a bulk water dispenser, and demolition of the old water plant.

- **St. Louis County Central Plant Generator Project (I17-020110)**

  The Central Plant is the largest of the four treatment plants in the Metro St Louis system and is a critical facility. Prior to 2017, there was no standby power available in the event of a complete loss of electrical power. An initial project completed in 2017 added two of three planned 3 Megawatt standby generators and associated switchgear to the plant. This work completed in 2018 included the installation of the third of the three permanent generators and associated switchgear at the Central Plant. This installation of standby power was necessary to provide reliable service to our customers during emergency power outage scenarios.

- **St. Louis County North Plant East Intake Switchgear (17-020097)**

  This project was necessary to replace the existing motor control center for the North Plant East Intake pumps that had reached the end of its useful life. The original motor control center was installed in the mid-1960s with additional electrical equipment added almost 30 years ago. This equipment was no longer supported by the manufacturer and repair parts are not available. This project consists of a new climate/weather protected building housing a new motor control center, VFD, and related equipment to control and monitor pump performance at the east intake pump station.

- **St. Charles County Relocate 18-inch Asbestos Cement Pipe on Westwood (I17-090011)**

  This project relocated approximately 6,000 feet of 18" AC pipe on Westwood Drive by installing 6,000 feet of new 20" ductile iron main. The pipeline work was done in conjunction with a St. Charles County Highway Reconstruction Project. Approximately 5,000 feet of the proposed 6,000 feet was in direct physical conflict with the St. Charles County Highway Improvements. The remaining 1,000 feet of 50 plus year old AC pipe was replaced to avoid breaks and maintenance issues adjacent to and underneath the new roadway construction as this pipe was reaching the end of its useful life.

- **Anna Meadows Replace Storage Tank (I17-360001)**

  This project replaced a leaking 225,000 gallon bolted steel standpipe with a 150,000 welded steel standpipe to provide storage for pressure stabilization to residents/customers in the Anna Meadows Subdivision. The new standpipe was resized to 150,000 gallons and the decrease in stored water quantity will reduce water age and provided improved water quality for the customers in this service area. The project included a land purchase for construction of the new tank while maintaining service via the existing tank until work was completed. Improvements to the water production facility included the addition of a second chemical feed pump, replacement of chemical feed piping and sample piping, replacement of damaged interior walls and access doors and expansion of perimeter fencing for site security. Demolition of the leaking bolted tank was also included in the project.

- **Parkville Well #3 Replacement (I17-040007)**

The Parkville/Platte County 5 MGD WTP was placed in service in December of 2017 to replace the existing 3 MGD plant. Well #3 was installed in 1942 as a supply for the old facility. Well #3 had reached the end of its useful life, was too shallow, and had a capacity less than that needed to maintain a firm supply for the expanded treatment plant. Well # 8 was installed in the Parkville wellfield area in 2018 as a replacement for Well # 3. The capacity of Well #8 is 5 MGD. New SCADA controls for remote operations of the well and a flowmeter were also installed as part of this project.

- **Clayton Road Main Replacement (R17-02B1.16-P-0044)**

This 2,800 linear foot (LF) project is replaced an existing 8” cast iron water main with a new 12” ductile iron water main. This project was necessary due to high break count, causing pavement damage and service interruptions in a heavily congested area. The project will provide a more reliable water service to this service areas well as improved fire flows and service pressure to the customers in the area.

- **West Florissant Road Main Replacement (R17-02B1.17-P-0029)**

  This 3,482 LF project water main project replaced existing 12" and 16" parallel cast iron water mains with a new 20" ductile iron water main. This project was required due to recurring breaks and generally deteriorated condition of both parallel water mains. The project will provide a more reliable water service to this service areas well as improved fire flows and service pressure to the customers in the area.

- **North Hanley Road Main Replacement (R17-02B2.18-P-0061)**

  This 2,378 LF project replaced an existing 8" cast iron water main with a new 12" PVC water main. This project was completed in conjunction with St Louis County Transportation Department project on this same roadway. This project was necessary to replace the main prior to new pavement work in the area and addressed a high break count and general deterioration of the existing main which would cause damage to the planned roadway work. This main replacement has increased service reliability and improved service pressures and fire flows for the customers in the service area.

- **Hayselton Drive Main Replacement (R17-12B1.18-P-0002)**

  This project included the installation of approximately 5,500 LF of 8-inch PVC and ductile iron water main on the west and south side of Hayselton Dr in Jefferson City to replace existing 6-inch main on Hayselton from E. Circle to Booneville Road. This project was required due to high break count, and general deterioration that caused damage to pavements. The project will reduce service outages from breaks, improve service pressures and fire flows for the customers in this service area.

- **Hampton Place Main Replacement (R17-11B1.19-P-0008)**

  This project installed approximately 4,700 LF of 8-inch ductile iron water main to replace existing water main on Hampton Place in Joplin. This project was required due to high break counts, and deterioration of the pipe that caused pavement damage. The new main will provide reduced service outages from breaks and improve service pressures and fire flows for the customers in this service area.

- **Redman Avenue Main Replacement Phase 1 (R17-02B1.18-P-0037)**

  This first phase of the project included replacement of approximately 2,570 LF of existing 8" cast iron water main with a new 16" ductile iron water main. This project was completed in coordination with a St. Louis County Transportation Department road project and was required due to high break count, and deterioration of the existing pipe that caused damage to existing pavement. The pipe size was increased due to high head loss and has increased service reliability, peak usage period pressures, and fire flows for the customers in the service area.

- **Vickie Place Main Replacement (R17-02B2.18-P-0128)**

  This 2,600 LF project replaced an existing 6" cast iron water main with an 8" PVC water main. This project was required due to high break count, and general deterioration casing breaks and water main leaks damaging pavement. This project has increased service reliability, and improved pressures and fire flows for the customers in the service area.

- **Redman Avenue Main Replacement Phase 2 (R17-02B1.18-P-0038)**

This second phase of the project included replacement of approximately 2,440 LF of existing 8” cast iron water main with a new 16” ductile iron water main. This project was completed in coordination with a St. Louis County Transportation Department road project and was required due to high break count, and deterioration of the existing pipe that caused damage to existing pavement. The pipe size was increased due to high head loss and has increased service reliability, peak usage period pressures, and fire flows for the customers in the service area.

- **Lorna Lane Main Replacement (R17-02B2.18-P-0125)**

This 2,420 LF project replaced an existing 6” cast iron water main with an 8” PVC water main. This project was required due to high break count, and general deterioration casing breaks and water main leaks damaging pavement. This project has increased service reliability, and improved pressures and fire flows for the customers in the service area.

- **Big Bend Blvd Main Replacement Phase 3 (R17-02B2.19-P-0098)**

This 3,100 LF project replaced an existing 8” cast iron water main with a 12” PVC water main. This project was in coordination with a St Louis County Transportation Department Project roadway project and was necessitated by recurring main breaks and a deteriorated water main causing damage to roadway pavement. The pipe size was increased due to high head loss for the service area and increased service reliability, improved pressure, and increased fire flows for the customers in the service area.

- **Circleview Drive Main Replacement (R17-02B2.18-P-0183)**

This 2,125 LF project replaced an existing 6” cast iron water main with an 8” PVC water main. This deteriorated water main had a high break count. This project has increased service reliability, improved service pressures and fire flows for the customers in the service area.

- **Lyndover Place Main Replacement (R17-02B2.18-P-0021)**

This 2,450 LF project replaced an existing 6” cast iron water main with an 8” PVC water main. This project was required due to high break count, and generally deteriorated condition of the existing water main. The project has increased service reliability, improved service pressures and fire flows for the customers in the service area.

- **Big Bend Blvd Main Replacement Phase 4 (R17-02B2.19-P-0099)**

This 1,900 LF project replaced an existing 8” cast iron water main with a 12” PVC water main. This project was in coordination with a St Louis County Transportation Department Project roadway project and was necessitated by recurring main breaks and a deteriorated water main causing damage to roadway pavement. The pipe size was increased due to high head loss for the service area and increased service reliability, improved pressure, and increased fire flows for the customers in the service area.

- **Jennings Station Road Main Replacement Phase 2 (R17-02B2.18-P-00154)**

This 2,050 LF project was completed in coordination with St Louis County Transportation Department roadway project and replaced an existing 12” cast iron water main with a 12” PVC water main. This project was required due to the generally deteriorated condition of the main and a high break count. This project has increased service reliability, improved pressures and fire flows for the customers in the service area and will avoid repairs beneath the new roadway pavement.

- **Enterprise Solutions (R17-01K3)**

  Enterprise Solutions investments consist of recurring investments in hardware, software and related appurtenances that provide the core information technology systems infrastructure across of all of the American Water enterprise for use by the Service Company and all American Water regulated subsidiaries, including MAWC.

Q. Please describe the significant capital projects planned for completion during the period January 1, 2020 through May 31, 2022.

A. The significant capital projects planned for completion are as follows:

- **St. Louis County Stratmann Pump Station Improvements (I17-020069)**

  This project replaces the existing pump station, parts of which date back to the original construction in 1926. Age and the deteriorated condition of the facility have created difficulties maintaining the Stratmann Pump Station and a failure of the Stratmann Pump Station would significantly reduce the level of service to large portions of St. Louis County. The new Stratmann Pump Station will provide reliable pumping capacity, reduce daily power usage, reduce the operation and maintenance (O&M) associated with the aging facility, and increase the operating efficiency of the overall distribution system.

- **Jefferson City Water Treatment Plant Clearwell and High Service Pump Station (I17-120007)**

  This project replaces a below grade 0.88 MG clearwell constructed in 1888 with a new 1 million gallon baffled clearwell divided into two sections for operational flexibility plus additional 162,000 gallons for filter backwashing. Improvements in water quality and a reduction in water loss are two major benefits of the new clearwell. The project also includes a new electrical building that will replace outdated equipment and change primary plant power to 480 volts in lieu of the current 12.5 kilovolts which will improve reliability and benefit employee safety benefit. A new high service pump station will be located adjacent to the new clearwell and each pump will have a variable frequency drive (VFD) to provide redundancy and more controllability of discharge flows and pressures. A new emergency standby generator will also be installed to improve plant reliability and allow for continuation of treatment and finished water pumping operations in the event of an extended outage from the electric service provider.

- **St. Louis County Central Plant A High Service Switchgear and Station Service (I17-020134)**

  This project replaces the Central Plant 3A high service electrical switchgear as well as the station service switchgear for the control building. CP-3A has six individual pump and motor combinations ranging from 700 to 1,200 horsepower with a nominal pumping capacity of 66 million gallons per day (mgd) and was originally put into service in 1971. The electrical switchgear (motor starters, etc.) and cabling are currently 47 years old and replacement is necessary due to age, reliability, and obsolescence of the equipment. The project will replace the outdated electrical equipment as an electrical failure (fault) could take one or more pumps out of service for weeks or months depending on the amount of damage and the time to fabricate or procure repair parts.

- **St. Louis County Service Center Relocation (I17-020173)**

  Currently there is one Distribution Service Center located at 1050 Research Blvd. The facility houses approximately 300 field employees and is the location from which all St Louis County field work crews are dispatched. Due to the size of the facility, number of employees reporting to this location, site congestion, and travel distance to work sites across the County, the safety, training of employees, and operational efficiency of their work are a regular challenge. Managing a workforce in smaller segments with personnel located near their work zone allows for a safer and more efficient operation. To accomplish this distribution of MAWC field staff, this project adds a new Distribution Service Facility in the northern portion of the St Louis County service area located at 9040 Frost Ave. This site located in Berkeley MO will be the reporting location for approximately 65 field employees and their supervisors and is near where a significant portion of the service orders and distribution system repairs occur each day. This new reporting site is anticipated to significantly reduce travel time to work sites and alleviate the challenges associated with a single congested reporting site.

- **St. Charles County Elevated Tank (I17-090013)**

  This project to construct a 2 million gallon elevated storage tank will improve and stabilize distribution pressures in the western area of the main St. Charles pressure zone as well as provide increased supply for the new Knaust Road Booster pump station serving the St. Charles high pressure zone. The project's addition of 2 MG of water storage reduces the current equalization storage deficit during peak demand periods and increases available fire flows by as much as 1500 gpm depending on location within the main pressure zone.

- **Jefferson City Service Center (I17-120010)**

  MAWC is constructing a new distribution service center in Jefferson City. As the service area and number of customers in the Jefferson City service area have grown, this facility is needed to provide adequate workspace for an expanded staff, parking for company vehicles, and additional storage for distribution materials and equipment. The new service center replaces a building on the land locked water treatment plant site that will be demolished to provide space for treatment improvements in upcoming projects. The new service center also consolidates work locations for four activities including wastewater laboratories, high bay garage for equipment storage, work areas for welding and fabrication, and additional meeting space in the state capital region.

- **Tri-States Well and Standpipe (I17-330003)**

  The current firm well capacity in the Tri-States system does not meet current or projected average day demands for the Tri-States service area. ("Firm" or "reliable" capacity is defined as treatment or pumping capacity with the largest unit out of service.) Additionally, the total production capacity with both wells in service does not meet current or projected maximum day demands. This project is adding a 1,000 gpm supply well with standby power generation and a 500,000 gallon storage tank to address these production/storage deficits and ensure customer demands are adequately addressed.

- **St. Joseph Parallel 16-inch Phase 1 Faraon Booster Discharge (I17-030015)**

  The Industrial Pressure Zone demand has grown since the original Faraon Boosters Station was installed in 1968. Peak demands are expected to surpass the station capacity within the next 5 years. This project is Phase 1 of a 3 phase series of projects to meet the anticipated demand for this service area. This Phase 1 project will include installation of approximately 5,500 LF of 16" main to improve the supply and discharge capabilities of the existing pump station. Future work in Phase 2 will expand the booster station pumping capacity and Phase 3 will provide further improvement to the zone's transmission mains.

- **St. Charles County Knaust Road Booster (I17-090014)**

  The St. Charles service area has experienced tremendous growth in recent years. The project replaces the existing booster pump station, which was constructed in 1998, and increases available flow to meet current and projected system needs in the higher pressure zone within the St. Charles District. The new pump station will include 4 pumps with a VFD on each unit allowing a wider operational pumping capacity ranging from 330 gpm to 4,200 gpm. The new station will have interconnectivity to a new 2 million gallon St. Charles tank, and will include suction and discharge piping arrangements allowing future pump station expansion to a capacity of up to 7,000 gpm.

- **Warrensburg Supply Sustainability (I17-060001)**

  The Warrensburg WTP has been dealing with a sulfur oxidizing, white filamentous bacteria, Thiothrix, for at least the last 20 years. This bacterium is known to cause biofouling in groundwater systems. There is little public safety or regulatory compliance risk, but inert matter can be observed in the clearwell and this condition potentially impacts the aesthetic quality of the finished water delivered to customers. To alleviate this issue, treatment alternatives will be evaluated, and process modifications implemented to effectively address the presence of the bacteria and the resultant aesthetic impacts. Additional plant improvements including rehabilitation or replacement of the existing ozone treatment system, and well refurbishment or replacement will also be evaluated and included in this project.

- **Pevely Farms Water Treatment Plant Upgrade (I17-510001)**

  This project will upgrade the water treatment plant for the Pevely Farms service area. Currently, maximum day demand exceeds aeration/detention capacity as well as firm filtration capacity requiring restriction for lawn watering and non-essential water usages. This project will add an additional aeration tank, new pressure filter, and replace existing low service and high service pumps. The new equipment will allow for better water treatment during peak demand as well as provide reliability in order to maintain service to customers during periods of high demand and seasonal maintenance.

- **Pevely Farms Storage Tank (I17-510002)**

  This project will add a second distribution storage tank to the Pevely Farms water system to provide adequate storage for peak hour usage and fire flow. The currently is only one storage tank which is inadequate to meet peak hour demands as the residential development in this system reaches full build out. Currently seasonal water restrictions are in place with customers assigned specific day and time watering schedules. In addition, during peak hour demands, additional storage is needed for fire flow. These improvements will alleviate the need to build additional supply and treatment facilities by providing equalization to the overall system demands.

- **St. Louis County Lucas & Hunt Pump Station Replacement (I17-020135)**

  The Lucas and Hunt Booster Station is an underground pump station originally built in 1957. The station is used to transfer water from the North County pressure gradient to the Central County HSH pressure gradient. There are difficulties maintaining the pumps and related equipment due to age, deteriorated conditions, and lack of available replacement parts. In addition, there are significant safety challenges including confined space concerns when working at the station. The current station is located on the shoulder of a heavily traveled roadway with little to no room for vehicles to park or workers to safely perform their duties. This project will replace the 60 year old underground station with a new above ground station located away from the roadway with adequate room to access the station for routine service checks and maintenance.

- **Jefferson City Schell Ridge Pressure Zone Reconfiguration (I17-120011)**

  This project involves installing 1,850 LF of new 12-inch water main and an 8-inch check valve to increase system pressure and fire flow under maximum day demand conditions to customers west of Highway 179. This project also provides a second crossing of the highway to serve these customers. Previously customers west of

Highway 179 were supplied with a single 8-inch main that had excessive head loss reducing pressure during high demand periods and negatively impacting fire flows to those customers. If that 8-inch failed under the highway, customers west of Highway 179 would likely have experienced a service outage duration of several days due to coordination for lane closures and detours with the Missouri Department of Transportation (MoDOT).

- **Joplin 32nd Street Pump Station Upgrades (I17-110022)**

  This project will replace the four pumps located in the 32nd St Pump Station within the Joplin service area. The pumps have been in operation for nearly 25 years and have experienced component deterioration leading to decreased performance and no longer meet the flow requirements of the service area. Replacing these pumps will allow more flow into the South High pressure zone to accommodate increased demands in that area and reduce maintenance requirements for the pumping equipment.

- **St. Joseph Water Treatment Plant Clarifier Launder Replacement Phase II (I17-030000)**

  Similar to work previously completed in clarifier 1, this second phase of clarifier improvements at the St. Joseph Water Treatment Plant will modify the clarifier launders in clarifiers 2 and 3. The launders are in poor condition, unlevel, and become submerged during peak demand periods. The poor condition of the launders is resulting in an increase in the clarifier effluent turbidity, which increases loading on the filters and negatively impacts finished water quality.

- **Rogue Creek Wellhouse and Storage Facility (I17-490001)**

This project replaces the existing well house and temporary storage tank with a new well house and permanent storage capacity for the Rogue Creek water system. The new well house includes softeners for lead removal, water quality and process monitoring equipment, and standby power. The storage facility provides an additional 13,350 gallons of potable water storage with associated piping and booster pumping system. The Rogue Creek system was acquired in December of 2018. These upgrades are needed to bring the facility into compliance with Missouri Department of Natural Resources (MDNR)requirements and provide a more reliable drinking water source for the customers.

- **Hickory Hills Well House and Well Upgrades (I17-430001)**

The Hickory Hills water supply system currently includes only 1000 gallons of pressurized potable water storage. This minimal level of storage does not accommodate continued service when main breaks or equipment failures occur. This project will upgrade the existing well house and increase the total storage capacity in the system to 10,000 gallons improving reliability of the water supply for the customers.

- **Joplin 26th Street Main Extension (I17-110024)**

This project will include the replacement of approximately 2500 LF of existing 8-inch water main with a new 16-inch water transmission main feeding the suction side of the 32nd St Booster Station. Several related segments of transmission main from the Blendville Water Treatment Plant to this area have already been completed ranging from 12-inch to 24-inch diameter pipe. The 26th Street transmission main upgrade will be completed in conjunction with increasing pump capacity at the 32nd Street Booster Station to meet customer needs by providing increased flow and pressure to the South High pressure zone which has experienced significant growth and demand increases.

- **Manchester Road Water Main Replacement Phase 1 (R17-02B2.19-P-0306)** This 2400 LF main replacement project was Phase 1 of 5 project phases completed in coordination with MoDOT reconstruction of Manchester Road in St. Louis County. MAWC replaced an existing 12" cast iron water main originally constructed in the early 1900s with a new 12" ductile iron water main. The significant age of the existing main, numerous relocations necessary to avoid grade changes and road drainage structures, as well as recurring breaks on the existing main necessitated replacement of the main in advance of the MoDOT project.

- **Manchester Road Water Main Replacement Phase 2 (R17-02B2.19-P-0307)** This 2400 LF main replacement project was Phase 2 of 5 project phases completed in coordination with MoDOT reconstruction of Manchester Road in St. Louis County. MAWC replaced an existing 12" cast iron water main originally constructed in the early 1900s with a new 12" ductile iron water main. The significant age of the existing main, numerous relocations necessary to avoid grade changes and road drainage structures, as well as recurring breaks on the existing main necessitated replacement of the main in advance of the MoDOT project.

- **Manchester Road Water Main Replacement Phase 3 (R17-02B2.19-P-0308)** This 2400 LF main replacement project was Phase 3 of 5 project phases completed in coordination with MoDOT reconstruction of Manchester Road in St. Louis County. MAWC replaced an existing 12" cast iron water main originally constructed in the early 1900s with a new 12" ductile iron water main. The significant age of the existing main, numerous relocations necessary to avoid grade changes and road drainage structures, as well as recurring breaks on the existing main necessitated replacement of the main in advance of the MoDOT project.

- **Manchester Road Water Main Replacement Phase 4 (R17-02B2.19-P-0309)**
  This 2800 LF main replacement project was Phase 4 of 5 project phases completed in coordination with MoDOT reconstruction of Manchester Road in St. Louis County. MAWC replaced an existing 12" cast iron water main originally constructed in the early 1900s with a new 12" ductile iron water main. The significant age of the existing main, numerous relocations necessary to avoid grade changes and road drainage structures, as well as recurring breaks on the existing main necessitated replacement of the main in advance of the MoDOT project.

- **Manchester Road Water Main Replacement Phase 5 (R17-02B2.19-P-0310)**
  This 2800 LF main replacement project was the final Phase 5 of 5 project phases completed in coordination with MoDOT reconstruction of Manchester Road in St. Louis County. MAWC replaced an existing 12" cast iron water main originally constructed in the early 1900s with a new 12" ductile iron water main. The significant age of the existing main, numerous relocations necessary to avoid grade changes and road drainage structures, as well as recurring breaks on the existing main necessitated replacement of the main in advance of the MoDOT project.

- **Joplin Grand Falls Main Replacement (R17-11B1.19-P-0014)**
  This project included the installation of approximately 8000 LF of 12-inch ductile iron water main on Grand Falls in Joplin to replace existing 6-inch and 8-inch main.

This project was required due to high break counts, and pipe deterioration that caused damage. The project will provide reduced outages from breaks, improved service pressures and fire flows for the customers in this service area.

- **Jefferson City Lake Carmel Wastewater Treatment Plant Ammonia Upgrade (I17-270008)**

  This project will upgrade an existing wastewater treatment facility to meet new ammonia discharge limits in the facility's National Pollutant Discharge Elimination System (NPDES) permit. MDNR issued ammonia effluent limits for Lake Carmel of 1.4 mg/L in summer and 2.8mg/L in winter effective July 1, 2019. After review of treatment options MAWC installed a_TriplePoint NitrOx system as it had the lowest anticipated lifecycle cost and can meet the current ammonia limits as well as potentially lower future limits. This project also included repairs to the existing lagoon berms, and installation of a HighTide monitoring system to provide site flowrate, power, and blower status in real time to operations staff.

- **Cedar Hill Wastewater Lagoon Ammonia Treatment Upgrade (I17-070003)**

  This project is required to meet regulatory requirements for ammonia effluent per the NPDES permit issued by the MDNR. Currently, the Lagoon is a two-cell aerated lagoon meeting Biochemical Oxygen Demand (BOD) and Total Suspended Solids (TSS) permit limits with no requirements for ammonia. On July 1, 2019, a new NPDES permit went into effect which added ammonia limits that cannot be met by the current lagoon treatment process. This project adds a third cell to the lagoon along with the addition of a new ammonia removal system to provide a level treatment that is compliant with the new ammonia limits.

- **Warren County Wastewater Plants #1 and #2 Expansion (I17-150001)**

  Both existing plants include 60,000 gpd and 20,000 gpd package treatment units. At both plants, the 60,000 gpd units are extensively deteriorated, and the 20,000 gpd treatment units are deteriorated beyond cost effective repair. Additionally, Plant #2 current flow rates exceed the permitted rate for that facility and Plant #1 is near capacity with additional connections anticipated in the development. MAWC will repair the existing 60,000 gpd treatment units at each plant and add capacity through the addition of a second 60,000 gpd treatment unit at Plant #2 and 40,000 gpd treatment unit at Plant #1. These improvements will allow continued wastewater service meeting current and anticipated customer demands and NPDES permit requirements.

- **Arnold Wastewater Little Muddy Interceptor Sewer (I17-400003)**

  Due to growth in the area and Inflow and Infiltration (I&I) of stormwater into the sewer during wet weather events, the quantity of flow in the Little Muddy Creek interceptor has exceeded its capacity and has caused overflows of sewage into yards and the adjacent creeks. This project includes the installation of approximately 3600 LF of new sewer trunk main, ranging in size from 15” to 24”, to reduce I&I into the sewer and subsequently reduce the likelihood of sanitary sewer overflows (SSO) in the Little Muddy watershed.

- **Maplewood Wastewater Lagoon Ammonia Removal (I17-2600002)**

  This project is required to meet regulatory requirements for ammonia effluent per the NPDES permit issued by the Missouri Department of Natural Resources. The project includes new aeration equipment within the existing lagoon cells and a new bioreactor. Additional project components include standby power generation, an influent bar screen and a maintenance building. These improvements will allow the facility to meet the requirements of its NPDES permit, provide continuous operation in the event of a power outage, provide for the removal of non-degradable solids that can foul the treatment equipment and provide a location for local maintenance of the equipment and facility.

- **Cedar Hill Wastewater El Chaparrel Main Connection (I17-070001)**

  This project includes the installation of new sewers to connect the recently purchased El Chaparrel sewer system to the Company's existing Cedar Hill sewer system. The El Chaparrel sewer system currently has a lagoon system for wastewater treatment that does not provide treatment necessary to meet the NPDES permit effluent limits. This project will eliminate the need for the El Chaparrel lagoon and the potential expense of upgrading the lagoon treatment process to meet the stricter NPDES standards.

- **Lawson Wastewater Treatment Lagoon Disinfection (I17-540002)**

  The 2020 NPDES permit renewal for the Lawson wastewater treatment lagoon system imposed new E. Coli effluent limits on system discharges during the recreation season from April through October. In order to comply with the new permit limits an Ultraviolet (UV) disinfection treatment system will be installed. The improvements include the installation of a pump station for conveyance of the treated lagoon effluent, a disc filtration unit for removal of suspended solids, and the UV disinfection system for eradication of the E. Coli. SCADA and electronic controls are also to be installed for remote operating and monitoring of the system.

- **Hickory Wastewater Treatment Plant Improvements (I17-440001)**

  In response to new MDNR imposed effluent ammonia limits on the existing lagoon wastewater treatment system, MAWC will install a TriplePoint moving bed bioreactor (MBBR) system. MAWC evaluated several options including a new extended aeration wastewater treatment facility. The TriplePoint option allows MAWC to meet the new stringent MDNR effluent ammonia limits with the lowest anticipated life cycle cost. MAWC will also repair lagoon berms and install a HighTide monitoring system to provide real time site flowrate, power status, and blower status to operations staff.

- **Jefferson City Wastewater Cedar Valley Lagoon Improvements (I17-270007)**

  MDNR required this three-cell lagoon wastewater treatment system to meet new ammonia effluent and disinfection limits by the end of 2020 per the facility's renewed NPDES permit. MAWC evaluated several options and will install the TriplePoint NitrOX process as the least life cycle cost option. This process allows MAWC to continue using two existing lagoon cells for BOD and TSS reduction, flow equalization, and sludge storage and close the third lagoon cell meeting the NPDES permit requirements.

- **Enterprise Solutions (R17-01K3.XX)**

  MAWC continues to invest in its core information technology systems infrastructure, including upgrades and enhancements to our existing foundational technologies. In addition, our continuing Enterprise Solutions investments support the development of a services framework that integrates MAWC's foundational technologies, applications, and third-party hosted services. Please see the Direct Testimony of Grant Evitts for discussion of some of the operational technologies supported by these investments.

IV. WATER STORAGE TANK REHABILITATION

Q. What are water storage tanks?

A. In terms of a potable water system, water storage tanks are reservoirs typically located at a water treatment plant or within the distribution system. These reservoirs hold potable water so that it is available to meet short term customer demands that may exceed the instantaneous capacity of the water treatment facility or the distribution system. These tanks are constructed of steel or concrete and are generally classified as ground storage tanks, standpipes, or elevated storage tanks. Each interacts with the water distribution systems through their unique hydraulic properties but serve the same general purpose of holding water for our customers.

Q. Why are water storage tanks critical to the operation of water systems?

A. Unlike electric power generation, water treatment plants are not constructed to meet instantaneous peak demands of the customers. Water storage tanks are the key piece of infrastructure that allows water systems to meet peak demands and provide significant cost savings in the design and construction of water treatment facilities. They accomplish this by acting like a battery for the water systems, storing water treated during non-peak usage periods that is then returned to the system for use during peak usage periods. Peak demands can result from typical customer usage patterns, which may be one or two times greater than the average rate of usage, or from emergencies such as firefighting which may be many times greater than typical potable water usage. These tanks also provide a back-up supply of water in the event of a main break or other interruption in the production or distribution of potable water, helping to maintain service until the problem can be resolved. Without adequate storage, periods of low pressure and boil orders due to low pressure conditions would be common, interruptions of service would be much more frequent, and treatment plants would have to be constructed much larger to meet these peak demands.

Q. Please describe the Company's steel water storage tank refurbishment program.

A. MAWC owns and operates 106 steel water storage tanks across the Company's service areas. These tanks range in size from 100,000 gallons to 11,000,000 gallons. The integrity of these structures is crucial to protecting public health and providing safe, adequate and reliable water service to customers. To maintain that integrity, the Company invests approximately $2 million to $3 million each year for water storage tank refurbishment which significantly extends the service life of these critical distribution system assets. These refurbishment investments may include the replacement or repair of corroded steel components, the addition of safety and security upgrades such as new access ladders and manways, the replacement of vents and overflows, and the renewal or replacement of existing coating (paint) systems. This work is followed by disinfecting the tank and returning the tank to service. This work is bid to qualified licensed contractors, inspected during and after the performance of the work, and inspected again after a one-year warranty period to ensure the coatings were properly applied and are performing as specified.

The program entails periodic detailed inspection of the interior and exterior structure of the tanks and a prioritization to determine the annual program. Depending on service conditions and other variables, this entire refurbishment routine is repeated on a 15 to 20 year cycle for each tank, as that is the expected lifespan of the coating systems utilized in the refurbishment.

Q. Please describe the service life considerations for water storage tanks in distribution systems.

A. Water storage tanks are generally constructed of steel or concrete, and can be configured as ground level storage tanks, elevated tanks or standpipes. Materials of construction and type of tank are dictated by service requirements and cost. Of MAWC's tank inventory of 106 tanks, 102 are steel and 4 are concrete. More than one third of these tanks have been in service for over 50 years. The oldest was originally constructed in 1936 and has been in service for more than 80 years. A complete listing of MAWC's water storage tanks is included in Exhibit MAWC-X.03. If properly designed, constructed and refurbished on a regular basis, these tanks can be expected to have service lives of well over 50 years and approaching 100 years despite exposure to harsh environmental conditions. If not properly refurbished, a steel tank may last no more than 30 years. Most of these tanks are exposed to a wide range of air temperature, humidity, water temperatures, wind loading, and seasonal weather conditions. Steel tanks need to be protected from exterior corrosion that can result from the harsh outdoor environment and interior corrosion that can result from the effects of chlorinated water. Interior corrosion is a special problem for areas where winter ice formation in the tank can damage the steel and coating systems. Corrosion, if left unattended, can lead to structural damage and leaks, as well as poor aesthetic conditions. These damaged areas can potentially result in a breach of the tank, which can lead to contamination of the tank contents from infiltration. Under severe circumstances, tank structural failure can occur. Proper inspection, ongoing routine care to address spot corrosion, and major refurbishment projects can therefore extend the service life of steel tanks.

Q. Please describe the importance of structural steel coating systems.

A. As discussed, steel tanks require occasional, but significant investment in the protective coating system. MAWC utilizes a high-performance engineered coating system on both interior and exterior surfaces of tanks. The service life of the interior and exterior coatings varies depending upon several conditions, but typical high-performance coatings can last from 15 years to about 20 years. Installation of new coating systems on existing tanks typically requires removal of existing coatings to bare metal through abrasive blasting and then installation of a new, three-coat engineered coating system that will protect the structural metal and extend its useful life significantly. Work site containment systems are often constructed around the tank in order to control dust and overspray during abrasive blasting and the application of coatings. Some existing steel structures may have previously been coated with lead-based paint systems. For those facilities, the project activities are supplemented with lead abatement efforts to contain, collect, and properly dispose of possible lead-based residuals to ensure protection of workers, neighboring properties, the general public, and the environment.

Q. Have Engineered Coating Systems proven their value in protecting the Company's investment in tanks?

A. Yes. More than one third of MAWC's storage tanks were built prior to 1970 and have been in service for more than 50 years. Our oldest tanks are nearing 85 years in service. These tanks would have failed or required extensive structural repairs without the installation, maintenance and regular refurbishment of effective coating systems.

Q. How many tanks will reach or exceed a 20-year coating life between 2020 and 2030?

A. Approximately one half of the Company's storage tanks or 53 tanks either have or will have reached or exceeded a 20-year coating life between 2020 and 2030. Many of these tanks have been inspected or will be scheduled for inspection and based on the results of the inspection will be scheduled for repair or refurbishment during this timeframe.

Q. Please discuss any new innovations in tank coating systems.

A. Over time, the industry has provided significant innovation. From the introduction of polyurethane coatings, to organic zinc-rich primers, to the development of fluoropolymer coatings and Volatile Organic Carbon (VOC) free coatings, these innovations extend the lives of the tank coating systems, meet current environmental and safety regulations, and help with aesthetic properties such as reducing color fading and retaining a high gloss durable finish for an extended period of time. The latest innovations allow for coating of tanks during periods of cold weather. While tanks can be more easily removed from service during cold periods due to lower water demands, the coating technology did not allow for application during colder temperatures. This latest innovation will allow more tanks to be coated during the off-peak demand season. The current window available for performing this work falls during higher demand periods (like the summer) and, in many instances, does not allow for tanks to be removed from service.

Q. How are the tank rehabilitation projects prioritized?

A. Tanks are prioritized based on inspection results and projected service lives. Notwithstanding this prioritization of the tanks in most urgent need of rehabilitation, MAWC estimates that it will need to rehabilitate the entire inventory of 107 steel water storage tanks, as well as any tanks added through acquisitions, over the next 20 years, or an average of about five to six tanks per year.

Q. Please discuss the cost to rehabilitate these tanks over the next five years.

A. Over the next five years, the estimated total cost to rehabilitate 25 to 30 steel water storage tanks is between $10 million and $15 million.

Q. What factors are taken into consideration when determining this cost?

A. The cost to rehabilitate a tank can vary greatly based on size, type of construction, physical condition and damage, site constraints and working room, environmental considerations, and other factors. The detailed tank inspections and subsequent report and recommendations will weigh heavily in determining the actual tank rehabilitation needs and priorities. Further, any operational considerations may drive up costs. For instance, small systems that may have only one storage tank may require the use of portable hydropneumatic tanks to maintain pressure and safe operation of the system while the storage tank is out of service. These tanks are typically rented and temporarily piped to the distribution system to help address instantaneous changes in demand that cannot typically be addressed through pumping alone.

Q. Does the Company have detailed inspection reports, bids or other materials to support the cost of tank rehabilitation?

A. Yes. The Company is required by the Missouri Department of Natural Resources to inspect each water storage tank on a three year cycle. The Company has numerous detailed inspection reports that include cost estimates for necessary refurbishment. Copies of the recently completed reports for Brunswick Hills and Carmen Road tanks have been included in Schedule JTK-3 as examples of typical reports.

Q. Are plans and specifications for bidding purposes prepared for these projects?

A. Yes. Plans and specifications are prepared for bid.

Q. And were bids solicited and received for the projects planned for 2020?

A. Yes. As of June 30, 2020, the Company received detailed bids for four tanks. The anticipated costs for the rehabilitation of these tanks are as follows:

Tank Name	MAWC District	Project Budget
Norwood	St. Louis	$672,800
Afton	St. Louis	$424,000
Clayton	St. Louis	$348,000
Sunset	Mexico	$162,000
	TOTAL	**$1,609,000**

Q. Does the Company expect to complete additional tank refurbishment work in 2020, 2021, and 2022?

A. Yes, the Company expects to receive bids and refurbish up to five tanks in 2020 In both 2021 and 2022, the Company expects to complete at least five tank refurbishing projects depending on bid values. Should bids received be favorable to budget, (i.e. come in lower than budget), specifications will be available to bid and refurbish additional tanks. It is anticipated that this approximate level of tank rehabilitation work will be made annually going forward to properly maintain and operate our storage tanks, and that this investment could likely grow as the Company acquires more water systems across the state

Q. In summary, why should this rehabilitation work be considered capital expenditure?

A. The rehabilitation of water storage tanks is essential to extending the life of a critical water system asset, the storage tanks. Without this work, the structural and environmental integrity of tanks would degrade quickly after the initial coating systems begin to fail and the service life of the tanks would be much shorter. Significant risk to the service level and safety of our customers would be introduced as these assets deteriorate. Similar to other capital work on long lived assets such as rehabilitation of a high service pump, the tank coating has a significant service life of 15 to 20 years of its own and it ensures the continued functioning of the original asset. Lastly, the rehabilitation is a significant expenditure and can be individually accounted for, tracked, and depreciated at a specific location in the Company's property records.

V. RISKS OF PROVIDING PUBLIC WATER & SEWER SERVICES

a. Public Water Supply Service

Q. Please provide an overview of the risks associated with furnishing safe and adequate water quantity and water quality and complying with drinking water and environmental regulations that apply to MAWC's water supply facilities and operations.

A. Water supply utilities are subject to a complex array of regulations at the federal, state and local levels with respect to water quantity, water quality and other environmental aspects of their facilities and operations.

With respect to water sources and the quantity of water that can be withdrawn, Missouri in general does not currently suffer serious constraints on its supply of usable water. However, that assessment does not apply uniformly to all parts of the state. Limited surface water supplies, the legacy of mining and other industrial activities, run-off from agricultural land use, depleting ground water sources, brackish (saline) groundwater, and contamination of groundwater with various compounds such as hydrocarbons from fuel supplies, and perchloroethylene (PCE) or trichloroethylene (TCE) used in dry cleaning and metal degreasing, create challenges to obtaining adequate supplies of water in various areas of Missouri.

These factors add to the costs of treating existing water sources as well as the costs and uncertainty of obtaining new or increasing existing water resources to meet new demand. These are additional risk factors that directly affect MAWC's ability to furnish safe, adequate and reliable service, and can potentially increase the costs

MAWC incurs to provide that service.

Drinking water quality is controlled by a combination of federal regulation established under the Safe Drinking Water Act of 1973 and state regulation under the Missouri Safe Drinking Water Act. The federal act established the EPA as the federal regulatory authority on drinking water. Under that authority, EPA has created standards for contaminant levels in drinking water[1] and a series of mandatory treatment method standards, coupled with monitoring and reporting requirements, and public notification mandates, in the event of contaminant level or treatment method non-compliance.[2] In turn, Missouri has adopted the federal regulatory standards, plus certain other rules, which are administered by the Missouri Department of Natural Resources (MDNR).

In recent years, there has been an increase in public concern over potential contaminants that laboratories can now identify at levels that, in the past, could not be detected, and which research suggests might have health effects. The EPA and state drinking water regulators have responded by increasing their own research and, in some cases, imposing or proposing more stringent regulatory standards. In other cases, where regulators have not provided clear guidance on either the risks involved or how water suppliers should respond, there has been an increase in public concern that is driving public demand for significantly higher levels of water treatment that the existing science does not warrant. An example of this dynamic exists with the family of compounds known as per- and polyfluoroalkyl substances (PFAS), which include

[1] See: https://www.epa.gov/sdwa/drinking-water-regulations-and-contaminants#List
[2] See 40 C.F.R. Parts 141-143.

the chemicals perfluorooctanesulfunic acid (PFOS) and perfluorooctanoic acid (PCOA). These chemicals, which had a number of commercial applications, have generated interest in the popular press that, in turn, has raised concerns by the public generally.

The Company is monitoring these situations and intends to proceed cautiously based on the best available information and prepare to achieve treatment levels for PFAS compounds that can reasonably be anticipated based on current research and actions contemplated by regulators. Concern over PFAS compounds is a current example of how evolving research and regulatory responses can drive the need for higher levels of treatment and impose demands for increased investment in new and more intensive forms of treatment. Furthermore, the fact that these regulatory demands are, in effect, a "moving target" for water suppliers make them another significant risk factor for MAWC.

As a result of conditions that arose in Flint, Michigan and other jurisdictions across the country, there is increasing scrutiny by all levels of government of the presence of lead in the water customers use and consume. As a result, legislatures and regulators are focused on adopting more stringent requirements for enforcing the federal "Lead and Copper Rule." The lead problem does not typically arise from constituents in the water that a supplier introduces to its distribution system, but rather from lead that leaches into the water from customer service lines made of lead and from homeowners' interior piping that is joined by lead solder. Both of these conditions are commonly present in older homes.

While controlling the corrosivity of the water can, in many cases, avoid excessive lead concentrations, in many older communities (such as those throughout much of MAWC's service territory), customers have lead service lines and interior piping that contains the type of copper and galvanized pipes with solder joints that raise the risk of lead contamination. Recent class-action litigation against the City of Chicago and other similar litigation involving the presence of lead service lines have become an industry-wide concern. As explained below, the Company has instituted a program to proactively reduce the risks associated with the presence of lead in customers' drinking water.

Significantly, proposed revisions to the Lead and Copper Rule are currently pending before the EPA for approval. The proposed revisions would include a mandate that water systems replace lead service lines and, as part of that mandate, would require water suppliers to "encourage [customers] to share appropriately in fully removing [lead service lines] …." This proposal reflects the fact that, in many jurisdictions (including Missouri) the water supplier typically owns the portion of the service line from its main to the curb box or meter located at the property line, while the customer owns the service line from the property line to the customer's point of use. Because of that division in ownership, EPA acknowledges that its proposal raises "substantial economic, legal, technical, and environmental justice challenges." EPA's proposed changes would also require more stringent corrosion control treatment and lower the permitted levels of lead and copper at the customer's tap.

The Company, using authority granted by the Missouri Public Service Commission, has initiated a program that addresses the concerns addressed by the EPA about the presence of customer-owned lead service lines. Under its program, the Company replaces customer-owned lead service lines across its service territory at no cost to the customer and without MAWC taking ownership of the new customer service line. The Company has also implemented initiatives to educate its customers about the risks of lead in drinking water and provides them the information they need to participate in the Company's customer-owned lead service line replacement program.

The Company is at the forefront of the water industry in proactively eliminating the risks that might accompany the presence of lead service lines. However, these efforts also require the dedication of management time and resources and the commitment of significant investment of capital to achieve the intended results. These factors, in addition to the demands the Company already faces to rehabilitate, replace, and enhance aging infrastructure and meet evolving regulatory demands, add to risk factors that MAWC faces to assure that it meets its statutory obligation to furnish safe, adequate and reliable water service.

The EPA has continued to make its regulations concerning disinfection byproducts more stringent. Disinfection byproducts are produced by the interaction of disinfection agents (such as chlorine) with constituents (such as organic compounds) that naturally occur in source water. The Stage 2 Disinfectants and Disinfection Byproducts Rule adopted in 2006, coupled with increasingly stringent disinfection regulations, requires a very careful balancing of treatment processes and source water monitoring to meet the twin goals of killing microbes (such as giardia and e-coli) while avoiding unacceptable concentrations of disinfection byproducts such as chlorite, bromate, trihalomethanes, and halogenic acetic acids. These evolving standards require the Company to evaluate and modify its treatment processes, which, in turn, requires the Company to invest in new plant and equipment to enable revised disinfection treatment methods. This is another example of the need for the Company to study, monitor, and comply with new and evolving standards that are accompanied by higher costs and increased demands for new investment.

b. Public Wastewater Service

Q. Provide an overview of the risks that environmental regulation poses for MAWC as the owner and operator of public wastewater systems.

A. Like the provision of public water supply service, the operation of wastewater collection and treatment systems entails a range of environmental regulatory risks.

Wastewater operations are also regulated at both the federal and state levels pursuant to several statutes and voluminous regulations. At the federal level, wastewater systems are regulated pursuant to the Clean Water Act and numerous regulations adopted by the EPA under that law. At the state level, the MDNR has adopted and enforces those standards under the Missouri Code of State Regulations Title 10, Division 20. These regulations set standards and requirements for virtually every aspect of wastewater system operation.

One risk associated with operating wastewater systems is that effluent limitations imposed on WWTP discharges are stringent and can become more stringent over time. The Clean Water Act requires wastewater systems to obtain and comply with National

Pollutant Discharge Elimination System (NPDES) permits, which, in Missouri, are issued by MDNR. NPDES permits establish stringent effluent limits based upon the stricter of: (1) technology-based effluent limits; and (2) water quality-based effluent limits.

Technology-based limits are set by EPA (or, in the absence of EPA guidelines for effluent limits, by the permit writer's best professional judgment) at levels that reflect (depending on the parameter) best conventional control technology (BCT), best practicable control technology currently available (BPT), or best available technology economically achievable (BAT). Determinations of BCT, BPT and BAT can change over time, becoming more stringent as technology evolves.

Water quality-based effluent limits (WQBEL) are established to avoid discharges to water bodies that exceed instream water quality criteria, which are set to protect existing and designated uses, such as recreation and various categories of fisheries. WQBEL limits are usually based on the assimilative capacity of a stream to receive and dilute the discharge during extremely low flow – that is, when stream flow is at the 7-day, 10-year low flow (Q7-10). By definition, WQBELs may require treatment beyond technology-based values, even beyond what is considered best available technology. Moreover, as streams become cleaner, there exists a possibility that their classifications may be upgraded such that their protected uses are deemed to be more sensitive, which, in turn, leads to even more stringent WQBEL calculations.

As just one example, many of the Company's small wastewater treatment systems are now required to meet ammonia discharge limits. A notable risk in wastewater operations is that limits for some parameters may have conflicting impacts on treatment efforts or may not be attainable with existing treatment systems. Such is the case with respect to fecal coliform standards on the one hand, and limits on treatment residuals (residual chlorine and dichlorobromomethane) on the other – where a delicate balancing is required to concurrently meet all applicable standards.

Thus, more stringent effluent limits may be imposed when technology evolves or stream conditions change, engendering requirements for significant capital improvements and/or increased operating costs for enhanced treatment performance. Every five years, NPDES permits are up for renewal, and in any such renewal more stringent limits may be triggered.

Another risk for MAWC is that a number of Missouri streams, including those where MAWC is operating wastewater systems, are parts of watersheds that are classified as "impaired" (meaning their instream quality does not meet state standards). Such impaired waters are subject to the development and imposition of Total Maximum Daily Loads (TMDLs) for parameters that contribute to the instream conditions. Where TMDLs are established by EPA or MDNR, stringent waste load allocations are made to point-source discharges (such as WWTPs), and allocations are also made to non-point sources, such as agriculture and urban runoff. Where any cap loading exceedance irrespective of the cause (such as increased flows and loadings from system customers or high stormwater flows entering the system) – can potentially lead to penalties and other enforcement actions.

Wastewater systems also face significant regulatory and environmental liability risks.

Non-compliance with wastewater system effluent limits and other permit conditions can result in severe penalties. Regulatory violations expose the operator to the risk not only governmental agency enforcement actions, but also citizen suits in which both injunctive relief and civil penalties can be imposed.

Other potential liability risks from wastewater system operations arise from backups, overflows or releases that may occur from the collection system onto private property or into the environment. As an example, some wastewater system operators have been confronted with claims under the federal Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) for cleanup of contamination that occurred when wastewater containing "hazardous substances" leaked from sewer lines into soils or groundwater. While not as extreme, liabilities resulting from sewer backups into buildings or other unplanned discharges are an inherent part of wastewater system risks.

Another risk arises from the fact that a substantial number of public sewer systems in the U.S. are combined sewer systems, meaning that both storm water and sanitary/industrial wastewaters are flowing in the same sewer lines. Combined sewer systems incur high flows during and after storms, which may exceed the system conveyance and/or treatment capacity, with excess untreated wastewaters discharged to receiving streams through a combined sewer overflow (CSO). In many cases, separation of combined sewer systems into separate sanitary and storm systems is logistically and economically infeasible.

The EPA's CSO Control Policy[3], which applies to publicly owned treatment works (POTWs) (i.e., those systems owned or operated by state or local governmental agencies), while recognizing that CSOs cannot be entirely eliminated, seeks to reduce them. Although the federal Clean Water Act generally requires that all wastewater be treated with at least secondary treatment prior to discharge, the CSO Control Policy provides an exception for POTWs. Currently, the CSO Control Policy, by its terms, does not provide similar exceptions for non-publicly owned sewage systems. However, some utilities have obtained EPA's agreement to continue to apply the CSO Control Policy's exception to systems that were formerly POTWs and were acquired by non-public entities. EPA's recognition of such exceptions must be obtained by negotiation on a case-by-case basis and typically entails entering into court-approved consent decrees or agency consent orders that impose stringent capital improvement and operating obligations on the non-public owner of the wastewater system.

Under the CSO Control Policy and applicable NPDES permits, operators of combined sewer systems must develop and implement a Long Term Control Plan (LTCP), consisting of collection system and treatment plant improvement projects designed to reduce CSOs to no more than four (4) events per year and/or capture and treatment of 85-90% of annual storm water flows. These LTCP requirements often involve very substantial multi-year capital expenditure programs. The impact of LTCP mandates on customers' rates can also be significant and, in what are often economically depressed communities, may require rate increases that approach or exceed EPA's "affordability"

[3] See:https://www.epa.gov/npdes/combined-sewer-overflows-policy-reports-and-training

criteria for water/wastewater system rates.

Combined sewer system operators must also adopt and implement a Nine Minimum Controls Plan,[4] consisting of a series of actions that address the management of storm water and constituents in storm water runoff, including regulation of storm water connections, regulation of land development/erosion and sedimentation activities, control of industrial and other dischargers, catch basin maintenance, and street sweeping, etc.

Moreover, even where systems being acquired do not involve combined sewers, high rates of Inflow and Infiltration (I&I) during wet weather can surcharge the system and exceed the hydraulic or treatment capacity of the WWTP. System upgrades to reduce I&I may require major capital expenditures.

c. Challenges Climate Change May Create

Q. Does climate change pose additional risks for water supply and wastewater system utilities such as MAWC?

A. Yes. Whatever the causes of climate change may be, water supply and wastewater utilities face the reality of changing climatic conditions and attendant stresses on water resources. Although climate models for the midwestern U.S. generally predict overall annual precipitation amounts to remain similar to average historic experience, the EPA has indicated a likelihood for increasingly intense storms and repeated, extended dry

[4] U.S. Environmental Protection Agency, Combined Sewer Overflows Guidance for Nine Minimum Controls, EPA 832-B-95-003 (May 1995), available at: https://www3.epa.gov/npdes/pubs/owm0030.pdf.

periods are anticipated.[5] That means we can expect more droughts of varying degrees of severity and more frequent and intense high-flow events and floods – all of which impact water and wastewater utilities.

Water supply systems are fundamentally resource-dependent and, therefore, the effects of climate change pose a significant on-going risk and create challenges with regard to maintaining a reliable water supply during the full range of potential future conditions, including even what might be assumed to be "normal" periods. The safe yields of water supply sources have historically been evaluated based on historical climatic patterns, data from so called "droughts of record" or dry period frequency analysis. However, changing climatic conditions suggest that historical hydrologic data (which in many cases only reflect 50-100 years of rainfall and stream flow measurement data collection – a quite short period in geologic or climatic time) may not accurately predict future conditions. Thus, the calculated safe yield of streams, reservoirs and groundwater wells are put in question as the effects of climate change are experienced across the midwestern United States. Thus, in response to climate change, water supply systems must address the risks posed to the reliability and resilience of their sources.

While droughts are the major challenge for water supply systems, heavy precipitation and high-flow events are the concern of wastewater systems. As mentioned previously, wastewater systems of all types are impacted by storm water – directly in the case of combined sewer systems and indirectly (but nevertheless significantly) by I&I in "sanitary only" systems. The prediction of increased intensity of strong storms and

[5] https://19january2017snapshot.epa.gov/sites/production/files/2016-09/documents/climate-change-mo.pdf

high rainfall events in the midwestern United States portends challenges to wastewater systems which must, in turn, cope with and treat higher peak flows while avoiding exceedance of effluent limitations and reducing the potential for untreated overflows. An additional challenge related to high intensity rain events is higher levels and frequency of flooding. Flooding has the potential to impact both water and wastewater treatment facilities which are often located in proximity to water ways.

VI. SECTION 393.358

Q. Are you familiar with Section 393.358, RSMo, concerning qualification processes for contractors?

A. Yes. Section 393.358, RSMo, requires water utilities that serve more than 1,000 customers to develop and utilize a contractor qualification process in certain circumstances.

Q. Has MAWC established a qualification process in accordance with the requirements of Section 393.358 that is used for ten percent or more of the Company's external expenditures for planned infrastructure projects on the distribution system?

A. Yes, it has.

VII. CONCLUSION

Q. Does this conclude your Direct Testimony?

A. Yes.

Schedule JTK-1 has been marked CONFIDENTIAL in its entirety.

Tank Common Name	Tank Style	Material	Capacity (MG)	Year Erected	Lead on Ext	Height	Diameter	Int Sq Ft	Ext sq ft	Last Int. Painting	Last Ext Painting
St Louis Affton #2 (dome)	Ground Storage	Steel	1.520	1953	N	50	72	15,376	11,304	2016	2013
St Louis Affton #3	Ground Storage	Steel	4.000	1967	Y	50	117	45,820	35,069	2020	2020
St Louis Baxter	Ground Storage	Steel	8.000	1968	N	45	175	72,833	48,780	2015	2015
St Louis Carman	Ground Storage	Steel	4.000	1975	Y	50	117	45,820	29,120	2008	2008
St Louis Cherry Hills	Ground Storage	Steel	4.000	1987	N	50	117	45,820	29,120	2014	2014
St Louis Clayton	Ground Storage	Steel	2.540	1962	Y	32	116	38,640	22,224	2012	2020
St Louis Crestview (elevated)	Single Ped	Steel	0.500	1998	N	146 HWL		9,000	12,750	1998	2016
St Louis Fee Fee	Ground Storage	Steel	8.000	1966	Y	46	172	84,171	48,079	1995	2012
St Louis Ferguson (elevated)	Elevated	Steel	0.250	1939	N	143 HWL		6,700	12,700	2016	2016
St Louis Florissant	Ground Storage	Steel	2.500	1961	y	35	110	31,877	22,375	2000	2014
St Louis Foerster	Ground Storage	Steel	4.000	1968	N	50	117	45,557	30,014	2013	2013
St Louis Hawkins	Ground Storage	Steel	2.460	1968	Y	50	92	31,417	21,091	2019	2019
St Louis Hazelwood #1 (dome)	Ground Storage	Steel	4.000	1960	Y	47	120	29,019	17,709	2019	2019
St Louis Hazelwood #2	Ground Storage	Steel	4.000	1965	Y	49	118	45,809	30,000	2000	2000
St Louis Incline Village	Elevated	Steel	0.200	2005	N	100		5,900	11,100	2005	2005
St Louis Kehrs Mill #1 (elevated)	Elevated	Steel	0.250	1955	Y	102' LWL		6,700	12,700	2017	2017
St Louis Kehrs Mill #2 (dome)	Ground Storage	Steel	2.460	1960	N	50	92	21,091	14,444	2012	2012
St Louis Mehlville #2 (dome)	Ground Storage	Steel	2.000	1956	N	60	75	25,409	18,547	2016	2016
St Louis Mehlville #3	Ground Storage	Steel	2.000	1970	Y	60	75	18,547	25,409	1994	2016
St Louis Norwood	Ground Storage	Steel	2.460	1963	Y	49	92	31,128	20,802	2020	2020
St Louis Oakville #1 (elevated)	Elevated	Steel	0.150	1951	N	29	32	5,100	9,900	2013	2013
St Louis Oakville #2	Ground Storage	Steel	1.500	1967	Y	50	72	21,700	15,376	1992	1998
St Louis Old Halls Ferry	Ground Storage	Steel	8.000	1971	N	44	175	85,592	48,230	2012	2012
St Louis Paradise Valley	Standpipe	Steel	0.152		N	65	20	4,568	4,344	2016	2016
St Louis Pevely Farms	Standpipe	Bolted	0.110	2001	N	21	40			Acquired/Unknown	Acquired/Unknown
St Louis Rockwood (elevated)(!)	Elevated	Steel	0.050	1967	Y	120' HWL	20	3,150	6,500	2018	2018
St Louis Sappington #1 (dome)	Ground Storage	Steel	2.460	1954	Y	49	92	20,810	17,155	1998	2014
St Louis Sappington #2 (dome)	Ground Storage	Steel	2.460	1968	y	49	92	20,810	17,155	1992	2015
St Louis Stratmann #1	Ground Storage	Steel	11.000	1960	Y	33	240	143,272	73,000	2009	2009
St Louis Stratmann #2	Ground Storage	Steel	11.260	1965	Y	27	264	162,150	77,121	1998	1996
St Louis Sunset (elevated)(dome)	Elevated	Steel	0.250	1936	N/A	122' HWL		4,030	6,500	2020	2020
St Louis Tesson Ferry #1	Ground Storage	Steel	3.000	1967	y	33	125	44,285	25,223	2017	2017
St Louis Tesson Ferry #2 (dome)	Ground Storage	Steel	3.000	1996	N	33	125	25,223	12,952	2019	2019
St Louis Valley Park	Ground Storage	Steel	0.750	N/A	N	50	52	12,585	10,462	2006	2006
St Louis Walton	Ground Storage	Steel	4.000	1979	Y	50	117	45,557	30,014	2011	2011
St Louis Wild Horse Creek	Ground Storage	Steel/Bolted	0.500	1967	N/A	41	35	6,995	5,604	1967	1998
St Louis WW. CP #1 (elevated)	Elevated	Steel	0.250	1969	N/A	58.5' HWL		6,700	12,700	2019	2019
St Louis WW. CP #2 (dome)	Standpipe	Steel	1.290	1999	N	60	61.5	14,563	11,593	1999	1998
St Louis WW. CP #3	Ground Storage	Steel	1.330	1967	N/A	28	90	23,999	14,802	2010	2010
St Louis WW. MP	Ground Storage	Steel	1.000	1971	Y	40	65	16,556	11,759	1999	2012
St Louis WW. NCP (east)(dome)	Ground Storage	Steel	0.500	1963	Y	35	57	8,819	6,267	2000	1995
St Louis WW. NCP (west)(dome)	Ground Storage	Steel	0.500	1996	N	35	52	7,841	5,718	1996	1995
St Louis WW. SCP	Ground Storage	Steel	1.000	1986	N/A	51	59	16,364	12,412	1998	1998
St Charles Ehlmann Rd	Ground Storage	Steel	0.500	1964	N/A	41.5	35	6,995	5,604	2006	2006
St Charles Harvester Rd (1.5MG)	Standpipe	Steel	1.465	1977	N/A	100	50	20,672	17,833	2009	2009

Tank Common Name	Tank Style	Material	Capacity (MG)	Year Erected	Lead on Ext	Height	Diameter	Int Sq Ft	Ext sq ft	Last Int. Painting	Last Ext Painting
St Charles Harvester Rd (3.5MG)	Standpipe	Steel	3.500	1990	N	99	78	36,339	29,431	2009	2009
St Charles Towers Rd	Ground Storage	Steel	2.000	1981	N/A	90	62	25,162	20,798	2008	2008
St. Charles Anna Meadows	Standpipe	Bolted	0.226	2006	N	113	18.5	7,100	6,833	2006	2006
St. Charles Jaxson Estates	Standpipe	Bolted	0.585	2007	N	112'	29'			Unknown	Unknown
Jefferson City Lake Carmel	Standpipe	Steel	0.226	2003	N	100	8	2,564	2,513	unknown	Unknown
Jefferson City Ellis	Ground Storage	Steel	1.500	2004	N	25	105	30,136	17,618	2004	2004
Jefferson City Clear Well #2	Ground Storage	Steel	1.200	1984	N/A	19.5	103	27,373	15,328	2006	2006
Jefferson City Plant Standpipe	Standpipe	Steel	0.300	N/A	N/A	125	20	8,648	8,194	2006	2006
Jefferson City 179th St	Hydropillar	Steel/Con	1.500	2014	N	159' HWL				2014	2014
Jefferson City Redfield	Standpipe	Steel	N/A	N/A	N	110'	8'	2,863	2,813	2016	2016
Wardsville Elevated	Elevated	Steel	0.150	1998		128' HWL					
Brunswick Brunswick Hill	Elevated	Steel	0.100	1963	N	67 LWL		3,350	5,350	2006	2006
Mexico East Tank (elevated)	Elevated	Steel	0.250	1987	N	98	40	6,700	12,700	2005	1998
Mexico Plant Tank (elevated)	Elevated	Steel	0.500	1962	N/A	129	56	10,000	19,600		2019
Mexico West Tank (elevated)	Elevated	Steel	0.250	1988	N	110	40	6,700	12,700	2006	2006
Warrensburg North (elevated)	Elevated	Steel	0.300	N/A	N/A	123 HWL		7,500	16,100	2010	2010
Warrensburg South (elevated)	Elevated	Steel	0.500	N/A	N/A	125 HWL		10,000	19,600	2008	2008
Warrensburg Maplewood	Standpipe	Steel	0.087	N/A	N/A	119	11	4,300	4,205		
Joplin Crossroads	Hydropillar	Steel	1.000	2003	N	105		198,950	33,250	2003	2003
Joplin Eland	Single Ped	Steel	0.400	2005	N	136' HWL	51.5	8,750	17,820	2006	2006
Joplin 32nd St	Ground Storage	Steel	2.000	1997	N	33	102	31,433	18,740	2011	2011
Joplin 4th St (elevated)	Elevated	Steel	1.000	1962	N/A	108 LWL	67	17,000	36,900	2010	2010
Joplin Hill St	Ground Storage	Steel	1.000	1980	N/A	40	66	17,025	11,711	2006	2006
Joplin Rex (elevated)	Elevated	Steel	0.500	1955	N/A	125 HWL	50	10,000	19,600	2000	2011
Joplin WW.	Ground Storage	Steel	0.360	N/A	N/A	80	26	7,887	7,062	1983	2008
Parkville Crooked Rd	Ground Storage	Steel	0.500	1969	N	32	52	9,646	7,523	1997	2006
Parkville Parkville College	Ground Storage	Steel	1.000	1999	N	37.6	68	15,568	11,937	2000	2000
Parkville Platte Woods (elevated)	Elevated	Steel	0.310	1957	N/A	100 LWL		7,600	16,100	2010	2010
Parkville Riverside (elevated)	Single Ped	Steel	0.500	1987	N/A	82.5 LWL		9,000	12,750	2018	2018
St Joseph Agency	Standpipe	Steel	0.070	N/A	N/A	120.5	10	3,941	3,863	2018	2018
St Joseph Huntoon Rd #1	Ground Storage	Steel	3.300	N/A	N/A	40	110	38,081	23,319	2008	2018
St Joseph Huntoon Rd #2	Ground Storage	Steel	4.000	N/A	N/A	50	117	45,821	29,120	2014	2013
St Joseph Industrial Park (elevated)	Elevated	Steel	1.000	N/A	N/A	137 HWL		17,000	36,900	2011	2011
St Joseph Karnes Rd (elevated)	Elevated	Steel	0.750	N/A	N/A	115 LWL		13,600	29,100	2010	2010
St Joseph King Hill #1	Ground Storage	Steel	2.000	N/A	N/A	35	100	31,044	18,844	2006	2019
St Joseph king Hill #2	Ground Storage	Steel	2.000	N/A	N/A	35	100	31,044	18,844	2006	2018
St Joseph Landis Rd	Standpipe	Steel	0.060	N/A	N/A	110.6	10	3,671	3,549	2012	2012
St Joseph S. 22nd St (elevated)	Elevated	Steel	0.500	1965	N/A	103 LWL		10,000	19,600	1987	1987
St Joseph Union Rd	Standpipe	Steel	0.040	N/A	N/A	110	8	2,864	2,786	2012	2012
Tri County Lake Taney Como Acres	Standpipe	Steel	0.034	N/A	N/A	36	12	1,583	1,470	Acquired/Unknown	
Tri County Lakewood Manor	Ground Storage	Steel	0.012	2003	N	30	12	1,356	1,243	Acquired/Unknown	
Tri County Ozark Mountain #1	Standpipe	Steel	0.030	N/A	N/A	36	12	1,582	1,469	Acquired/Unknown	
Tri County Ozark Mountain #2	Standpipe	Steel	0.058	2003	N	100	10	3,297	3,218	Acquired/Unknown	
Tri County Ozark Mountain #3	Standpipe	Steel	0.038	2003	N	101	18	6,217	5,963	Acquired/Unknown	
Tri County Rankin Acres	Ground Storage	Steel	0.018	N/A	N/A	48	8	1,206	1,206	Acquired/Unknown	

Tank Common Name	Tank Style	Material	Capacity (MG)	Year Erected	Lead on Ext	Height	Diameter	Int Sq Ft	Ext sq ft	Last Int. Painting	Last Ext Painting
Tri county Spokane Well	Standpipe	Steel	0.010	N/A	N/A	18'	12'			2018	2018
Tri County Stonebridge (elevated)	Single Ped	Steel	0.400	1994	N	69 LWL	40	8,000	10,000	Acquired/Unknown	2012
Tri County Stonebridge (Ground)	Ground Storage	Steel	0.250	2003	N	44	22	3,800	3,420	Acquired/Unknown	2018
Tri County White Branch	Standpipe	Steel	0.087	N/A	N/A	119	11	4,300	4,205	Acquired/Unknown	
Tri County Saddlebrook	Single Ped	Steel	0.250	2003	N	80 HWL		5,700	8,700	Acquired/Unknown	
Tri County Skyview	Standpipe	steel	0.300	1987	N	88	30	9,722	9,006	2015	2015
Tri County Vineyard	Standpipe	steel	0.300	N/A	N	93	29	9,790	9,129	Acquired/Unknown	2014
Tri County Emerald Point	Standpipe	Steel	0.175	1994	N	110	15.83	5,861	5,665	Acquired/Unknown	2015
Kimberling City Bayfront North	Standpipe	Steel	0.020	N/A	N/A	18'4"	10'	10,500		Acquired/Unknown	2017
Kimberling City Bayfront South	Standpipe	Steel	0.020	N/A	N/A	18'4"	10'	10,500		Acquired/Unknown	2017
Kimberling City Bayfront Middle	Standpipe	Steel	0.020	N/A	N/A	18'4"	10'	10,500		Acquired/Unknown	2017
Kimberling City Cardinal Ln	Standpipe	Steel	0.018	2016	N	18'4"	10'	10,500		2016	2016

Visual Sanitary Inspection Report

Project Information
Brunswick Hill

Prepared For
Lisa Schneider

Prepared On
3-13-2020

Prepared By
Brad Huebner

Coating Inspection Services
PO Box 133 Eureka, MO 63025
coatinginspectionservices.net

CERTIFIED COATING INSPECTOR

Phone: 314-369-3087

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Phone: 314-369-3087

General Information

Tank Details

Capacity:	100,000 Gallon.
Construction Style:	Single Pedestal.
Builder:	Horton / CB&I.
Construction Date:	1963.
Exterior Coating:	Acrylic / Overcoat.
Interior Coating:	Epoxy.
Inspector:	B. Huebner.
Inspection Date:	3-6-2020.
Height:	67' LWL

Phone: 314-369-3087

General Information

Exterior Coatings Condition

Exterior coating condition: Exterior coatings are in good condition with an average of 11.0-16.0 mils DFT. Multiple spots of top coat delamination of overcoat on roof, stem, and along weld seams on pedestal. Isolated spots of peeling paint on lower flange.

Foundation :	Concrete, good condition.
Overflow Pipe:	Concrete vault.
Overflow Screen:	None.
Flap Gate:	None, tide flex valve.
Splash Pad:	concrete vault to barried pipe.
Exterior ladder:	N/A.
Safety Climb:	Safety bar.
Ladder Gate:	None, locking pedestal door.
Vent:	Aluminum, frost free.
Manway:	(1) 12"x18" oval in dry riser, (1) 24" round portside in stem.
Catwalk:	N/A.
Cables:	Two conduit attached to overflow pipe.
Roof Hatch:	24"x24" with 5" curb (Wet), 24" round with 5" curb (Dry Riser).
Aviation Light:	None.
Roof Ladder:	N/A.
Cellular Carriers	None.

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General Information

Interior Coating Condition

Interior Coating Condition: Interior coatings appear to be in good condition with an average of 13.0 mils DFT. Minor rusting on overlapping seams and weld seams of bowl roof. Approx 8-10 spot failures on sidewalls visible through water.

Interior Wet Ladder: Good condition.

Safety Climb: None.

Interior Riser Ladder: Good condition, conduit attached to portion of ladder in dry riser.

Cathodic Protection: None.

Dry Riser: Fair condition with isolated spots of rust bleed through coatings in dry riser, on bottom of bowl, and both condensation plates.

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General Information

Security

Gates and Fences: Chain link fence with locked gate.

Ladder Gate: Pedestal with locked entry door.

Roof Hatch: Locked.

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Exterior Coating Photos



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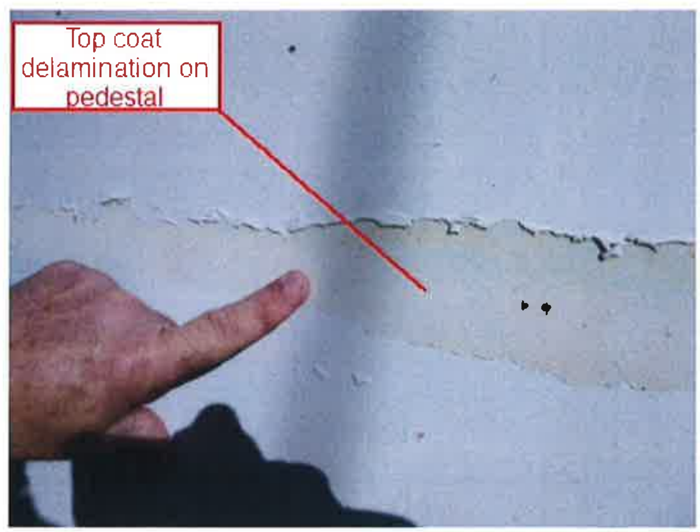

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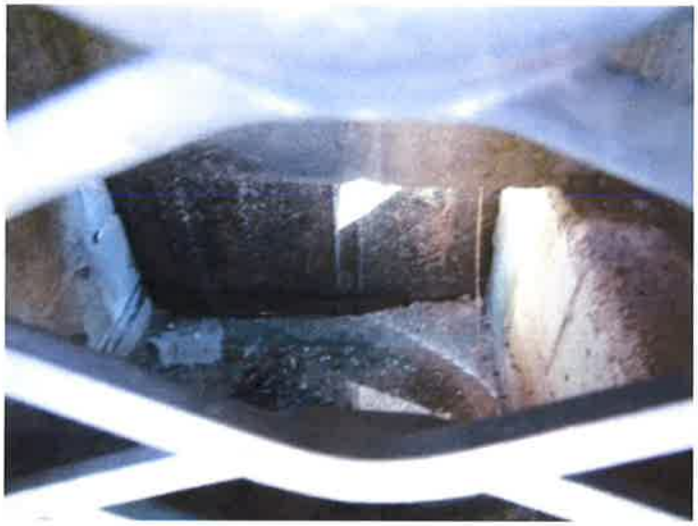

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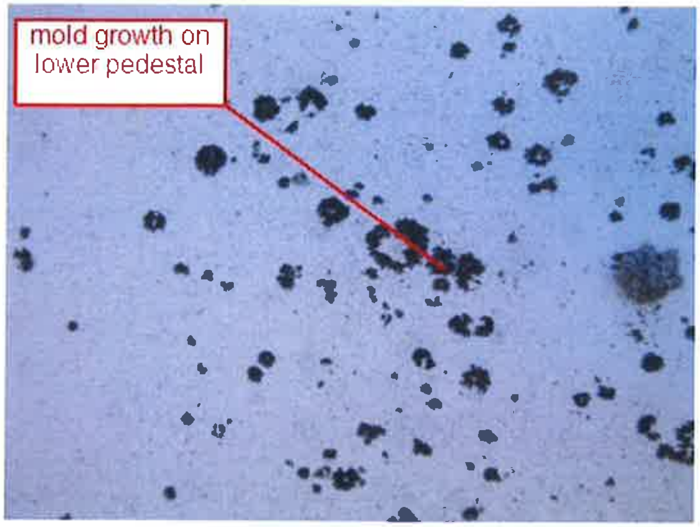

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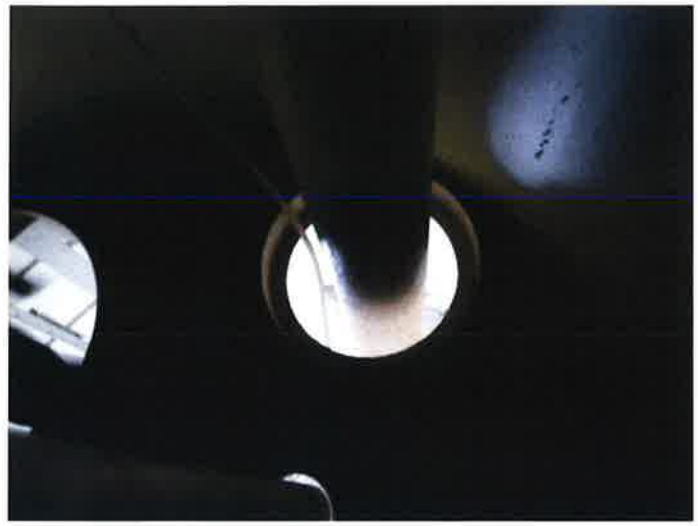

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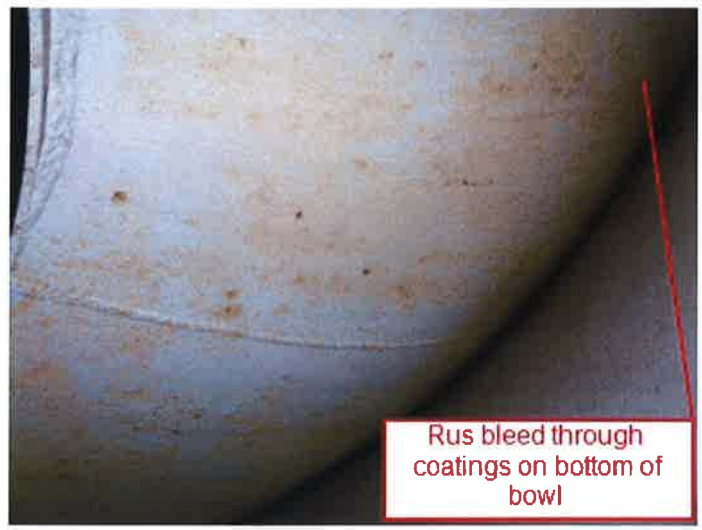

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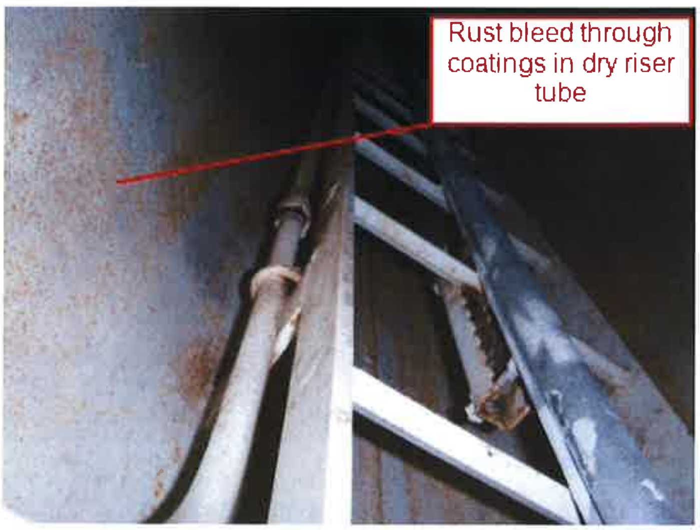

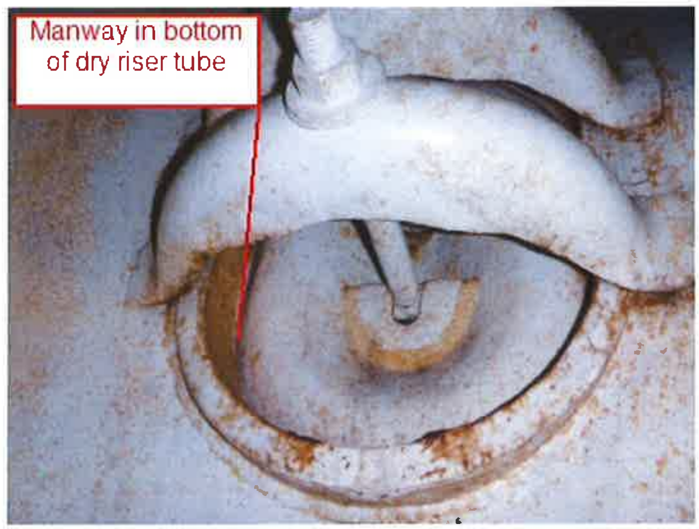

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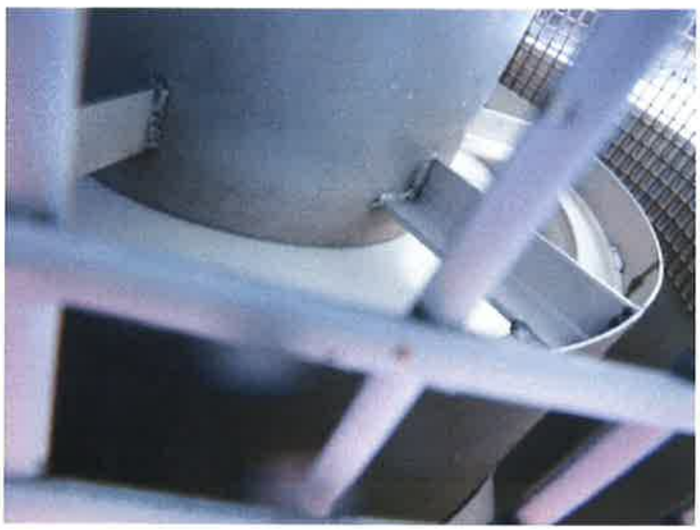

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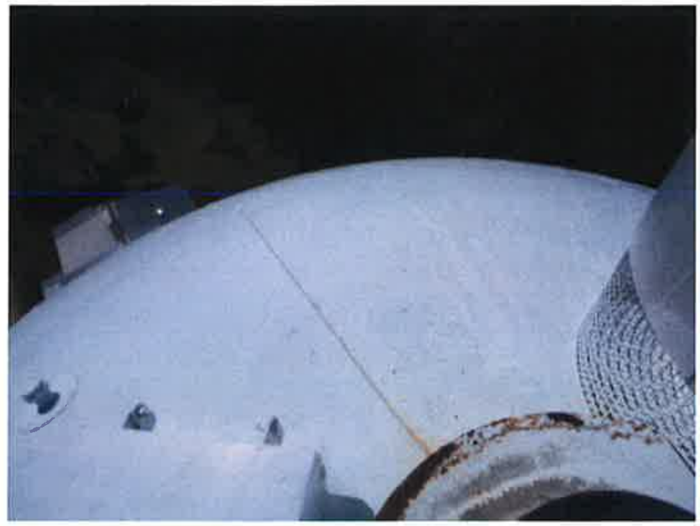
NACE CERTIFIED COATING INSPECTOR

Phone: 314-369-3087



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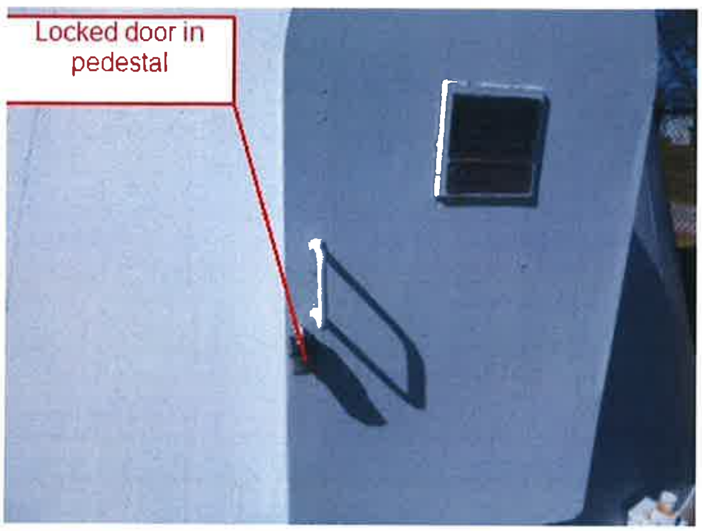

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Interior Coating Photos

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Tank Recommendations

Recommendations

- Relocate conduit from ladder standoffs in dry riser tube.
- Monitor rust bleed on coatings in dry riser section to avoid future damage.

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Carmen Rd
4,000,000 Gallon Ground Storage
Visual Sanitary Inspection Report

Prepared for: Lisa Schneider
727 Craig Rd
St Louis, MO 63141

Prepared by: Brad Huebner
Coating Inspection Services, LLC
PO Box 133 * Eureka, MO 63025

Tank Details:

Capacity:	4,000,000 Gallon	Design:	Flat Bottom
Inspection Date:	7-24-2019	Inspector:	B. Huebner
Construction Style:	Ground Storage	Construction Date:	1975
Builder:	Chicago Bridge & Iron	Height:	50'H / 117' Dia
Exterior Coating:	Urethane	Interior Coating:	Epoxy

Tank Exterior Coatings Condition

Coatings are in good to fair condition with an average of 10.0-11.0 mils DFT. Random spot failures on sidewalls and roof with isolated spots of topcoat delamination on roof panels. One 3" x 3" hole in roof with two smaller holes in roof all near roof vent. Peeling paint on lower flange with average mold and mildew growth on sidewalls and roof.

Foundation	Concrete, good condition.
Overflow Pipe	Concrete vault.
Overflow Screen	Not accessible.
Flap Gate	Not accessible.
Splash Pad	Rip-Rap.
Exterior Ladder	Good condition with partial safety cage. Lower ladder platform to 18' above grade.
Safety Climb	Safety cable.
Ladder Gate	Aluminum.
Roof Ladder	N/A
Vent	Aluminum safety vent.
Manway	(2) 24" manways.
Catwalk	N/A
Cables	One coax cable running up ladder cage.
Roof Hatch	30" x 30" with 4" curb
Aviation Light	None.

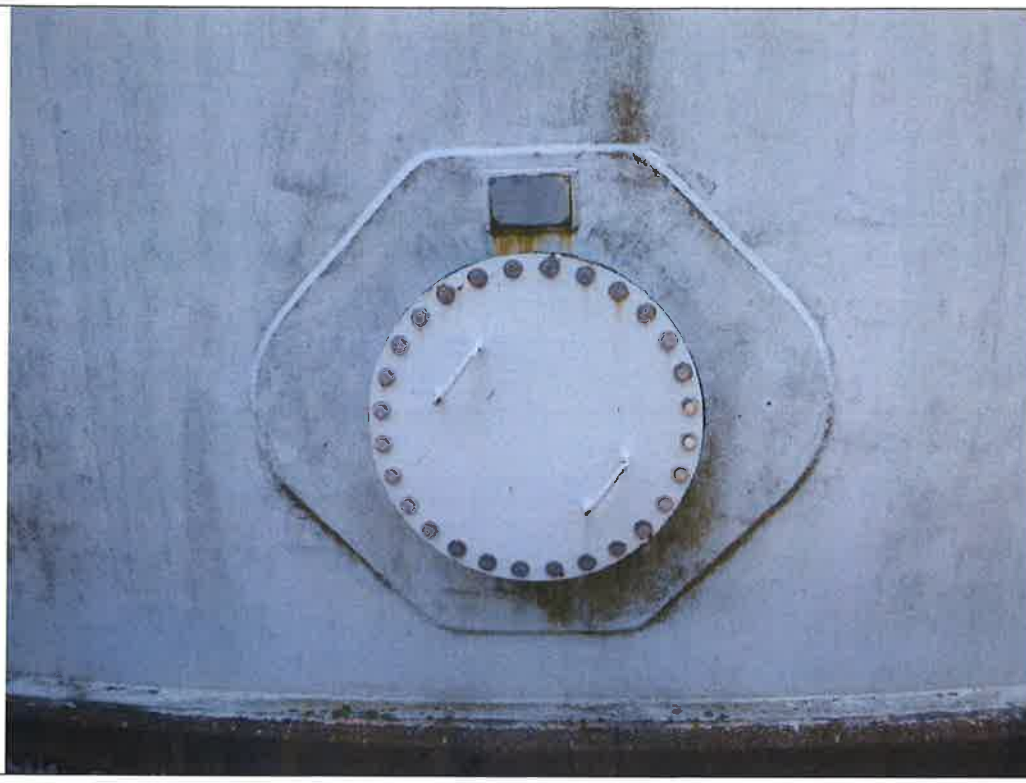
Tank Interior Coatings Condition

Coatings appear to be in good condition with an average of 11.0-12.0 mils DFT. Rust bleed on roof beams and sidewalls due to roof plates contacting roof beams. Minimal spot failures on sidewalls.

Interior Wet Ladder	Good condition.
Safety Climb	Safety cable.
Interior Riser Ladder	N/A
Cathodic Protection	None.
Dry Riser	N/A

Recommendations:

- Pressure wash tank to remove mold and mildew.
- Repair holes in roof near Vent stack.
- Replace ladder guard.




PosiTector 6000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