# Water System Improvements
# Drinking Water State Revolving Fund
# 2025 Project Planning Document

## City of Owosso

Project No.: 240369
May 8, 2024

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**Prepared For:**
**City of Owosso**
**Owosso, Michigan**

**May 8, 2024**
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## List of Abbreviations/Acronyms

| | |
|---|---|
| ADD | Average Day Demand |
| AMP | Asset Management Plan |
| ATS | Automatic Transfer Switch |
| CIP | Capital Improvements Plan |
| CSI | Contaminant Source Inventory |
| City | City of Owosso |
| Corunna | City of Corunna |
| DCLSLR | Disadvantaged Community Lead Service Line Replacement |
| DSMI | Distribution System Materials Inventory |
| DWAM | Drinking Water Asset Management |
| DWI | Drinking Water Infrastructure |
| DWSRF | Drinking Water State Revolving Fund |
| EGLE | Michigan Department of Environment, Great Lakes, and Energy |
| gal | gallon |
| gpd | gallons per day |
| gpm | gallons per minute |
| HSP | High Service Pump |
| HVAC | Heating, Ventilation, and Air Conditioning |
| ITA | Intent to Apply |
| kVA | kilovolt-amphere |
| LSL | Lead Services Line |
| LSLR | Lead Services Line Replacement |
| LW-# | Local Well – (No.) |
| MDD | Maximum Day Demand |
| MG | million gallons |
| mgd | million gallons per day |
| MNFI | Michigan Natural Features Inventory |
| MOR | Monthly Operating Report |
| NPSH | Net Positive Suction Head |
| PFAS | Perfluoroalkyl and Polyfluoroalkyl Substances |
| PHD | Peak Hourly Demand |
| PRV | Pressure Reducing Valve |
| PS-W# | Palmer Street – Well (No.) |
| PVC | polyvinyl chloride |
| REU | Residential Equivalent Units |
| ROW | Right of Way |
| SCADA | Supervisory Control and Data Acquisition |
| SESC | Soil Erosion and Sedimentation Control |
| VFD | Variable Frequency Drive |

| | |
|---|---|
| WHPA | Wellhead Protection Area |
| WHPP | Wellhead Protection Plan |
| WSRS | Water System Reliability Study |
| WTP | Water Treatment Plant |
| WWTP | Wastewater Treatment Plant |

# 1.0 Introduction

In February 2024, the City of Owosso (City) retained Fishbeck to complete a Drinking Water State Revolving Fund (DWSRF) Project Planning Document for improvements to the City's water system. The purpose of this document is to meet the project planning requirements of the Michigan Department of Environment, Great Lakes, and Energy (EGLE).

The City owns and maintains a municipal water distribution system that supplies water to residents and businesses within the City and the City of Corunna (Corunna), as well as portions of Caledonia and Owosso Townships. The Water Treatment Plant (WTP) is a groundwater softening facility with a State of Michigan (State) rated treatment capacity of 3 million gallons per day (mgd). Groundwater is currently supplied to the plant by five active wells. The treatment process consists of aeration, lime softening, solids contact clarification, recarbonation, filtration, chlorination, and fluoridation. Water is conveyed to the distribution system from an underground finished water storage reservoir by high service pumps located in the WTP. The water distribution system, shown in Figure 4, consists of a single pressure district and includes an elevated storage tank, standpipe, and Booster Station. These facilities help maintain and regulate pressure within the distribution system. The distribution system includes over 109 miles of water main, primarily fabricated of cast iron, ductile iron, and polyvinyl chloride (PVC).

The recommended projects included in the DWSRF Project Planning Document are as follows:

### Raw Water Supply

1. Local Well 1 (LW-1) and Palmer Street Well 2 (PS-W2) Wellhouse Building (Wellhouse) and Mechanical Equipment Improvements.
2. Palmer Street Well 1 (PS-W1) Abandonment.

### Water Treatment Plant

1. Electrical Grounding and Equipment Improvements.
2. Storage Reservoir, High Service Pumping, and Transfer Pumping Improvements.
3. Chlorine Feed Improvements.

### Distribution System

1. Transmission Main and River Crossing Replacements (FY 2026)
    a. Allendale Avenue Transmission Main (WTP to Frazer Avenue)
    b. Frazer Avenue Transmission Main (Allendale Avenue to Corunna Avenue)
    c. Garfield Street Transmission Main (Corunna Avenue to Monroe Street)
    d. McMillan Road Transmission Main (Monroe Avenue to South Street)
    e. 12-inch Finished Water River Crossing (S. Gould Street to WTP)
    f. 24-inch Finished Water River Crossing (S. Gould Street to WTP)

2. Transmission Main and River Crossing Replacements (FY 2027)
    a. South Street Transmission Main (McMillan Road to Vandekarr Road)
    b. Cross-Lot Transmission Main (Vandekarr Road to Cook Road)
    c. Cross-Lot Transmission Main (Cook Road to Palmer Street)
    d. Palmer Street Well 2 Transmission Main (PS-W2 to Cross-Lot)
    e. Palmer Street Well 3 Transmission Main (PS-W3 to Cross-Lot)

3. Transmission Main and River Crossing Replacements (FY 2028)
    a. Hintz Road Transmission Main (Hintz Well to Copas Road)
    b. Copas Road Transmission Main (Hintz Road to Hazelton Avenue)

4. Transmission Main and River Crossing Replacements (FY 2029)
    a. Hazelton Road Transmission Main (Oliver Street to M-21)
    b. Rawleigh Avenue Transmission Main (M-21 to Grover Street)
    c. Raw Water River Crossing (Grover Street to WTP)
    d. 12-inch Finished Water River Crossing (Oakood Avenue to S. Gould Street)
    e. 16-inch Finished Water River Crossing (Cass Street to Jermove Avenue)
    f. 12-inch Finished Water River Crossing (M-71 to Jerome Avenue)
5. Water Main Improvements (FY 2025)
    a. Nafus Street Water Main (S. End to Frederick Street)
    b. Gilbert Street Water Main (Mason Street to Oliver Street)
    c. Clinton Street Water Main (Cedar Street to Shiawassee Street)
    d. Olmstead Street Water Main (Ward Street to Chipman Street)
    e. Harding Avenue Water Main (Willow Springs to Hanover Street)
    f. Hanover Street Water Main (Harding Avenue to Riverside Drive)
    g. Stewart Street Water Main (Cedar Street to Shiawassee Street)
    h. Williams Street Water Main (Shiawassee Street to Washington Street)
    i. Dewey Street Water Main (Main Street (M-21) to King Street)
    j. Young Street (Chestnut to Brooks)
    k. Grace Street (Cedar to Shiawassee (M-52))
6. Water Main Improvements (FY 2026)
    a. Genesee Street Water Main (Michigan Avenue to Green Street)
    b. Adams Street Water Main (Oliver Street to King Street)
    c. Adams Street Water Main (Elizabeth Street to N. of Jennett Street)
    d. Brandon Street Water Main (Summit Street to Dingwall Drive)
    e. Dingwall Drive Water Main (Brandon Street to N. End)
    f. Nafus Street Water Main (Stewart Street to N. End)
    g. State Street (S. End to Clyde Street)
    h. State Street (Clyde Street to Stewart Street)
    i. Clyde Street (State Street to Lyon Street)
    j. Lyon Street (Clyde Street to Grace Street)
    k. Woodlawn Avenue Water Main (Farr Street to Auburndale Avenue)
    l. Shady Lane Drive Water Main (Meadow Drive to Chipman Street)
    m. Exchange Street Water Main (Saginaw Street to Dewey Street)
7. Water Main Improvements (FY 2027)
    a. Frazer Avenue Water Main (Corunna Avenue to Allendale Avenue)
    b. Gould Street Water Main (Exchange Street to North Street)
    c. Jennett Street Water Main (Shiawassee Street to Adams Street)
    d. Oak Street Water Main (Main Street (M-21) to Williams Street)
    e. Chipman Street Water Main (Harding Avenue to North Street)
    f. Chipman Street Water Main (Main Street (M-21) to Beehler Street)
    g. Cedar Street Water Main (Hampton Avenue to Main Street (M-21))
    h. Mason Street Water Main (Saginaw Street to Dewey Street)
8. Water Main Improvements (FY 2028)
    a. Elmwood Water Main (Abbott Street to King Street)
    b. Washington Street Water Main (Stratford Drive to North Street)
    c. Williams Street Water Main (Washington Street to Dewey Street)
    d. Wiltshire Drive Water Main (Huntington Drive to Moore Street)

  e. Ball Street Water Main (Exchange Street to Jennett Street)
  f. Monroe Street Water Main (Washington Street to Broadway Avenue)
  g. King Street Water Main (Fifth Street to Ada Street)
  h. Broadway Avenue Water Main (Auburndale Avenue to Franklin Street)

9. Water Main Improvements (FY 2029)
   a. Ada Street Water Main (Oliver Street to Lee Street)
   b. Cass Street Water Main (Shiawassee Street to Green Street)
   c. Curwood Drive Water Main (Oliver Street to Woodhall Court)
   d. Stinson Street Water Main (West Street to Chipman Street)
   e. West Street Water Main (King Street to Stinson Street)
   f. Woodhall Court Water Main (Curwood Drive to Oliver Street)
   g. Fifth Street Water Main (Oliver Street to King Street)
   h. First Street Water Main (Oliver Street to King Street)
   i. Comstock Street Water Main (Park Street to Gould Street)
   j. Elm Street Water Main (Main Street (M-21) to River Street)
   k. Dewey Street Water Main (Comstock Street to Main Street)
   l. Huntington Drive Water Main (Moore Street to Stevens Drive)
   m. Martin Street Water Main (Stewart Street to Milwaukee Street)
   n. Water Street Water Main (Oliver Street to King Street)
   o. Campbell Drive Water Main (Ada Street to Ada Street)
10. Booster Station Improvements
11. Lead Service Line Replacement FY2025
12. Lead Service Line Replacement FY2026
13. Lead Service Line Replacement FY2027
14. Lead Service Line Replacement FY2028
15. Lead Service Line Replacement FY2029

# 2.0 Project Background

## 2.1 Delineation of Study Area

The City is in Shiawassee County, northeast of Lansing and west of Flint. The Study Service Area, as indicated in Figure 1, generally corresponds to the corporation limits of the City, which is bordered by Owosso Charter Township and Caledonia Charter Township. The nearest city to the City of Owosso is Corunna, which is located approximately three miles to the southeast of the City.

The City owns and operates the water system as indicated in Figure 4, including the water supply wells, treatment system, and distribution system that serves a mix of residential, commercial, and industrial users. Water is supplied directly to some residents in Owosso Township and Caledonia Township. Corunna is a wholesale customer of City.

## 2.2 Land Use

Map 1 visually represents the population density within the Study Area. Map 2.1 shows the City's planned land use over the 25-year planning period. Land use for Caledonia Township, Owosso Township and Corunna are included in Maps 2.2-2.4, respectively. The predominant land uses within the study area are residential, institutional, and industrial.

## 2.3 Population Projections

The historical population data was obtained from the US Census Bureau. There is no known data from any regional planning agency providing future population projections. The City's population decreased by 0.4% annually between 2010 and 2020. Table 1 and Chart 1 indicate the historical and projected population served by the City's water system through 2042.

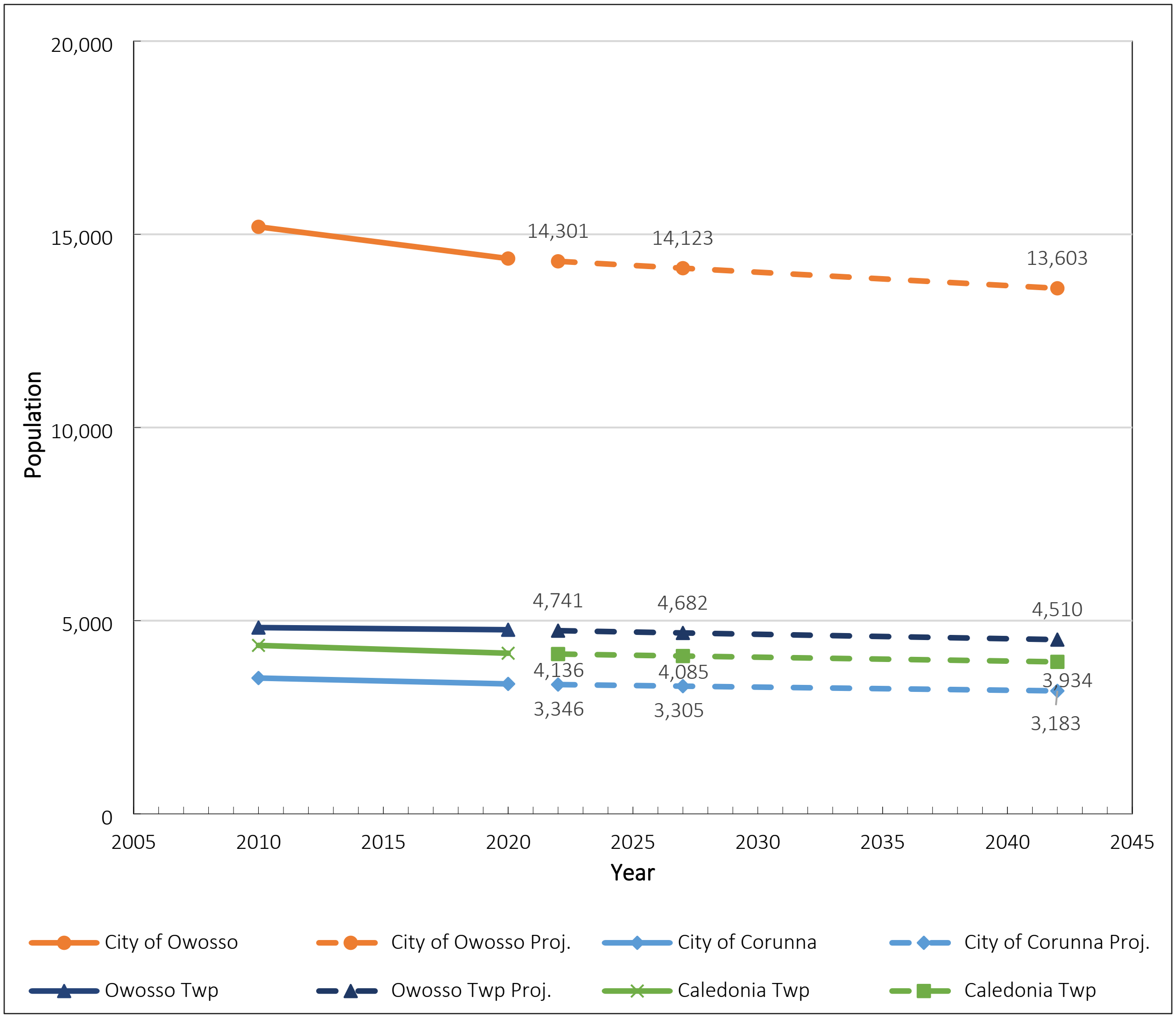
Several assumptions were made about the historical and future population projections for determining the total population served by the City's water system. The historical data documents show a decline in the City's population since 2010. A conservative approach, in relation to past population trends, of 0.25% annual change in population was used to project future population for the City. The same population decline of 0.25% was applied to Corunna and Caledonia and Owosso Townships.

**Table 1 – Population Projections for the City's Water Service Area**

| Year | City of Owosso | City of Corunna | Owosso Twp | Caledonia Twp | Total |
|---|---|---|---|---|---|
| 2010* | 15,194 | 3,515 | 4,821 | 4,360 | 27,890 |
| 2020* | 14,373 | 3,363 | 4,765 | 4,157 | 26,658 |
| 2022 Projection** | 14,301 | 3,346 | 4,741 | 4,136 | 26,525 |
| 2027 Projection** | 14,123 | 3,305 | 4,682 | 4,085 | 26,195 |
| 2042 Projection** | 13,603 | 3,183 | 4,510 | 3,934 | 25,230 |

**US Census Bureau*
***Rate of decline -0.25% annually*

Chart 1 – Population Projections for the City's Water Service Area




*Water System Reliability Study and General Plan Update (Fishbeck, August 2023)*

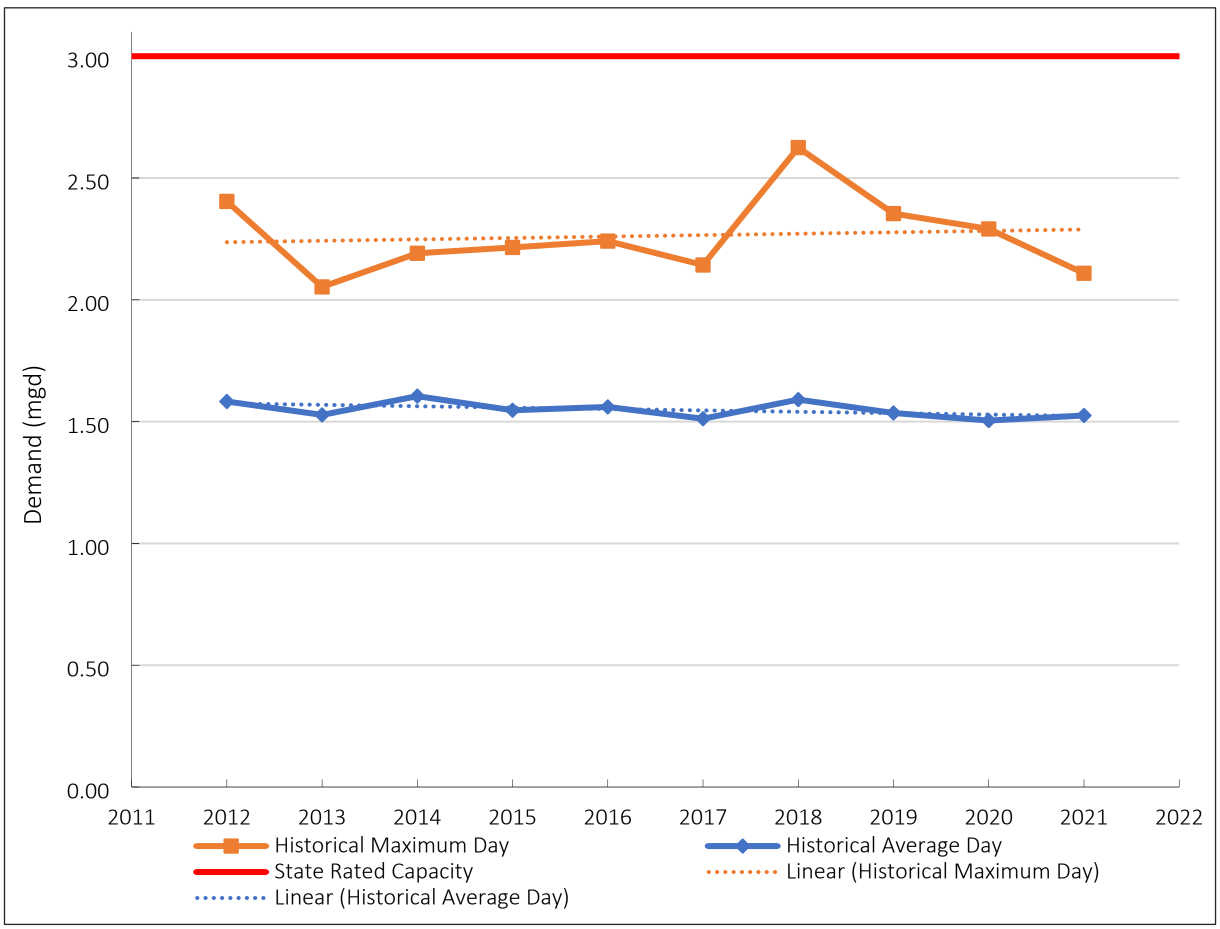
## 2.4 Water Demand

The City's WTP monthly operating reports (MOR) were utilized to analyze historical water usage for the years of 2012 to 2021. The ADD is the average daily volume of water pumped to the system in one year. The MDD is the maximum amount of water pumped to the system in a single day, annually. The ADD, and MDD were determined and calculated for years 2012 to 2021; the historical demands are shown in Table 2 and in Chart 2, where they are compared to the state rated capacity of 3 mgd.

Table 2 – Historical Water Demands (2012--2021)

| Year | ADD (mgd) | MDD (mgd) | MDD:ADD Peaking Factor |
|---|---|---|---|
| 2012 | 1.58 | 2.40 | 1.52 |
| 2013 | 1.53 | 2.05 | 1.34 |
| 2014 | 1.60 | 2.19 | 1.37 |
| 2015 | 1.55 | 2.22 | 1.43 |
| 2016 | 1.56 | 2.24 | 1.44 |
| 2017 | 1.51 | 2.14 | 1.42 |
| 2018 | 1.59 | 2.63 | 1.65 |
| 2019 | 1.54 | 2.35 | 1.53 |
| 2020 | 1.50 | 2.29 | 1.52 |
| 2021 | 1.53 | 2.11 | 1.38 |
| Average | 1.55 | 2.26 | 1.46 |
| Maximum | 1.60 | 2.63 | 1.65 |
| Standard Deviation | 0.03 | 0.17 | 0.10 |
| 95th Percentile | 1.61 | 2.54 | 1.62 |

Chart 2 – Historical Water System Demand



Historical demands have remained consistent over the past decade even though the population has declined by 0.4% annually between 2010 and 2020. Therefore, applying per capita water use and population projections to water demand projections is not recommended, since historical demands do not closely correlate to population changes. To be conservative, a growth rate of 0.25% annually was applied to projected water demands.

To project future water demands, the starting point for the ADD was estimated by using the average ADD from 2012 to 2021 of 1.55 mgd. The MDD was calculated by multiplying the ADD by the 95th percentile peaking factor of 1.62. The peaking factor is the ratio of the MDD demands to the ADD. This value is used to show the variability in demands experienced by the water system. The PHD was calculated by multiplying the MDD by the peak hour factor of 1.5.

Table 3 indicates the projected water demands for the ADD, MDD, and PHD through 2042.

**Table 3 – Projected Water Demands Through 2042**

| Year | ADD (mgd) | MDD (mgd) | PHD (mgd) |
|---|---|---|---|
| 2022 | 1.55 | 2.51 | 3.76 |
| 2027 | 1.57 | 2.54 | 3.81 |
| 2042 | 1.63 | 2.64 | 3.96 |

*MDD:ADD Peaking Factor = 1.62*
*PHD:MDD Peak Hour Factor = 1.5*

## 2.5 Existing Facilities

### *2.5.1 Raw Water Supply*

Since 2012, the City has utilized six different raw water supply wells. Of these six, the City currently has a total of five active supply wells. Three wells, LW-1, Hintz-1, and PS-W2, serve as the primary production wells for the WTP. The water produced by these wells has a lower level of hardness, which makes treatment less expensive. The other two active wells, LW-13 and Osburn, are currently used as emergency backups; however, the City has plans to eventually decommission LW-13. The City currently has each well inspected annually, and rehabilitation and repairs are based on recommendations from the inspection reports. See Figure 4 for location of the wells in the water system.

PS-W1 and PS-W3 are existing wells that are no longer in service. To maintain sufficient raw water supply for the system, the City is currently constructing two new wells with completion expected by the end of 2024: one at Juniper Street and the other at Palmer Street (Palmer Street Well 3A) to replace PS-W3. Table 4 summarizes capacity information for the five current active supply wells.

**Table 4 – Current Supply Well Capacity**

| Well | Year Installed | Last Rehab | Permit Capacity (gpm) | Current Production Capacity (gpm) | Current Production Capacity (mgd) | Specific Capacity (gpm/ft) |
|---|---|---|---|---|---|---|
| LW-1 | Pre 1960 | 2021 | 700 | 403 | 0.58 | 29.1 |
| Hintz-1 | 1968 | 2019 | 730 | 482 | 0.69 | 54.9 |
| PS-W2 | 1963 | 2014 | 757 | 722 | 1.04 | 48.3 |
| LW-13 | 1955 | 2016 | 750 | 482 | 0.69 | 132.5 |
| Osburn | 1968 | 2023 | 722 | 570 | 0.82 | 139.1 |
| | | Total Capacity | 3,659 | 2,659 | 3.83 | |
| | | Firm Capacity | 2,902 | 1,937 | 2.79 | |

Based on the water demand projections, the firm well capacity of 2.79 is sufficient to meet the City's 2042 MDD 2.62 mgd. EGLE generally requires that communities begin planning for an expansion of their supply system when the MDD exceeds 80% of the firm supply capacity of the water system.

### *2.5.2 Water Treatment Plant*

The WTP is a groundwater softening facility with a State rated treatment capacity of 3 mgd. The plant was originally constructed in 1934 but did not become operational until 1941. The last major upgrade was the pretreatment improvements in 2004. Treated water flows by gravity from the WTP to the underground storage tank on the WTP site. Refer to Figure 2 for the current WTP site plan and to Figure 3 for the schematic of the existing treatment process.

#### 2.5.2.1 Treatment Process

The raw water piping from the various wells is manifolded in a pipe gallery at the northwest corner of the existing plant. From there, water is passed through an aeration step, consisting of a single induced draft aerator, to strip off carbon dioxide and reduce the quantity of softening chemicals needed, thereby reducing the volume of residuals produced.

Following aeration, the water flows to two upflow solids contact clarifiers where flocculation, sedimentation, and clarification occur. Lime is dosed in the clarifiers and mixed to raise the pH and to precipitate calcium and manganese hardness. The clarifiers are operated in series with Clarifier No. 1 being the primary and Clarifier No. 2 being the secondary. Each clarifier has a capacity of 3 mgd. If demands rise above 3 mgd, the clarifiers are designed to be able to operate in parallel to provide a clarification capacity of up to 6 mgd; however, the clarifiers are not typically operated in this way. WTP staff have noted that when the clarifiers are run in parallel above demands of 3 mgd, they have no appreciable increase in the amount of water that can be treated, likely due to a hydraulic blockage present downstream of the clarifiers. The City plans to perform inspections into this to determine and remediate the cause of the hydraulic deficiency. Sludge from the two upflow clarifiers is pumped via two centrifugal sludge pumps to one of four sludge lagoons, located on the north side of the WTP site.

Water flows by gravity from the clarifiers to a recarbonation tank. Carbon dioxide is injected into the effluent stream of the clarifiers to lower the pH in the recarbonation tank which stops the precipitation reactions and stabilizes the water.

Water flows from the recarbonation tank to one of four sand/anthracite filters. Improvements to the filters are currently ongoing. Improvements include replacement of the filter media in all four filters, new underdrains, and replacement of the surface wash system with a new air scour system, including two positive displacement blowers. The filters are periodically backwashed to remove the solids, and the backwash wastewater is routed to an onsite backwash pond. Fluoride is added to the filtered water for dental health, and sodium hypochlorite is dosed to the filtered water for disinfection.

The unit processes at the WTP and their capacities are provided in Table 5.

Table 5 – Unit Processes and Capacities

| Unit Process | Capacity |
|---|---|
| Aeration | 6 mgd |
| Clarification | 3 mgd |
| Recarbonation | 6 mgd |
| Filtration | 5.4 mgd |

#### 2.5.2.2 Finished Water Storage

Finished water storage at the WTP site is comprised of an underground storage reservoir and two suction wells for the high service pumps. The south suction well has a capacity of 20,000 gallons and the west suction well has a capacity of 30,000 gallons. The underground storage reservoir was constructed in 1920 and has a capacity of 1.75 MG. The underground reservoir was last rehabilitated in 1990, which included crack injection to repair fractures in the concrete, replacement of manholes and vents, and cleaning and chlorination. The reservoir was last inspected by Liquid Engineering Corporation in 2002. This inspection notes that the injection repairs appeared to be in good condition; however, there was evidence of leaking in both the roof and expansion joints in the floor and sediment buildup. Infiltration issues in the reservoir have continued into the present, as WTP staff note that pH levels drop during heavy rains and periods of elevated river levels. The underground storage reservoir is beyond its useful life, and it cannot be bypassed.

#### 2.5.2.3 High Service Pumping

Four horizontal split case high service pumps (HSP) convey water from the suction wells to the distribution system. HSPs 1 and 2 are supplied from the west suction well. HSP 3 draws water from both suction wells and HSP 4 is supplied from the south suction well. HSP 1 and HSP 2 are currently constant speed pumps, while HSPs 3 and 4 are controlled by VFDs. To meet the ADD, only one pump, HSP 3 or HSP 4, is required. HSPs 1 and 2 are operated once per month to verify reliable operation. The WTP plans to install new pneumatic controls to both HSPs 1 and 2, soon. Overall, the HSPs are in good to fair condition. Table 6 summarizes the high service pumps' capacities.

Table 6 – High Service Pump Capacities

| Pump | Max Capacity (gpm) | Capacity (mgd) |
|---|---|---|
| HSP 1 | 2,200 | 3.17 |
| HSP 2 | 2,200 | 3.17 |
| HSP 3 | 2,200 | 3.17 |
| HSP 4 | 2,200 | 3.17 |
| Total Capacity | 8,800 | 12.68 |
| Firm Capacity | 6,600 | 9.51 |

#### 2.5.2.4 Existing Electrical System

The City WTP receives two medium-voltage (8,320Y/4,800-volt, 3-phase) primary electrical services from the local utility company (Consumers Energy). Primary circuits run to the site overhead, presumably via independent routes from separate utility substations. One service is referred to as the Stewart Circuit and the other is the Oakwood Circuit. There appear to be pole-mounted primary disconnect switches on each overhead service. The switch on the south service may be missing several parts that would allow it to be operated from grade. The switch on the north service appears to be intact. Consumers Energy meters each service via pole-mounted primary metering equipment (current transformers and potential transformers).

There are two banks of pole-mounted transformers that step power down to 480-volts, 3-phase. The City is on a primary rate schedule with Consumers Energy, so they own and are responsible for maintaining the transformer banks and primary switches. Each transformer bank is 500 Kilovolt Amperes (kVA) and consists of three 167 kVA transformers. The transformers appear to be connected in a delta configuration and are pole-mounted to keep them out of the 100-year floodplain.

480-volt, 3-phase, 3-wire power is routed from each transformer bank underground to a double-ended, 800-amp switchboard that includes a main-tie-main circuit breaker configuration. The main and tie circuit breakers are kirk-key interlocked to prevent paralleling. Each main and tie circuit breaker is 3-pole, 600-amps. The WTP typically operates with both main circuit breakers closed and the tie opened.

A 300 Kilowatt (kW) standby diesel generator with sub-base fuel storage tank is provided on the Oakwood circuit ahead of the double-ended switchboard. A 3-pole automatic transfer switch (ATS) is used to switch between utility and generator during power outages.

From the double-ended switchboard, circuits are routed to distribution panels MDP, MDP-R, and MDP-L. Panel MDP is normally on the Stewart Circuit and Panels MDP-R and MDP-L are normally on the Oakwood Circuit. Panels MDP-R and MDP-L are connected as a common panel via feed-through lugs. Panel MDP feeds High Service Pump Nos. 1 and 2 (150 horsepower [HP] each). Significant loads on Panels MDP-R and MDP-L include High Service Pump Nos. 3 and 4 (150 HP each), MCC-1, Backwash Pump Nos. 1 and 2 (40 HP each), Air Compressor Nos. 1 (15 HP), 2 (25 HP), and 3 (25 HP), sump pump, welder, autoclave, Panels DP4 (Well 1) and DP5 (Rapid Mix Room), several step-down transformers/panelboards, and HVAC equipment. Panels MDP, MDP-R, and MDP-L do not include main circuit breakers; they are protected by the 3-pole, 600-amp main circuit breakers in the double-ended switchboard.

MCC-1 includes a 3-pole, 400-amp main circuit breaker. It is fed via a 3-pole, 250-amp feeder circuit breaker in Panel MDP-L. Loads on MCC-1 include the lime silo, carbon dioxide ($CO_2$) storage tank control panel, (2) aerator blowers, four solids contact clarifier drives, two sludge pumps, HVAC equipment, and step-down transformer/panelboard.

### *2.5.3 Distribution System*

Based on the *Water System Reliability Study and General Plan Update* (Fishbeck, 2023), the city currently provides water service to 6,386 service connections including residential, commercial, and industrial users. Refer to Figure 4 for a plan of the water distribution system.

#### 2.5.3.1 <u>Water Mains</u>

The City's Geographic information system and data indicate there are more than 109 miles of water main in its water distribution system. The water distribution is connected to water mains in Corunna, as well as to portions of Caledonia and Owosso Townships. The water main sizes in the water system range from 4 inches to 24 inches. Approximately 45% of the water system is comprised of cast iron pipe, approximately 29% is ductile iron pipe, and approximately 11% is PVC pipe. Approximately 14% of the distribution system pipe material is unknown.

#### 2.5.3.2 <u>Water Storage</u>

The elevated tank and standpipe information is presented in Table 7. The elevated tank located on Delaney Road was constructed in 1997 and has a capacity of 600,000 gallons. The standpipe located on Gute Hill was constructed in 1950 and has a total capacity of 1,192,000 gallons. The usable capacity of the standpipe is 25 feet which corresponds to 556,000 gallons. When the standpipe has 40 feet of water, the normal low-level alarm goes off and the remainder of the storage (636,000 gallons) is unable to be utilized due to suction pressure issues with the Booster Station pump.

Table 7 – Water Storage Summary

| Parameter | Elevated Storage Tank | Standpipe |
|---|---|---|
| Tank Location | Delaney Road | Gute Hill |
| Tank Type | Elevated | Standpipe |
| Installation Year | 1996 | 1953 |
| Capacity (gal) | 600,000 | 1,192,000 |
| Useable Capacity (gal) | 600,000 | 556,000 |
| Range of Operation (ft) | 7.5 | 20 |
| Overflow Elevation | 900 | 875 |
| Upper Level (ft) | 34.5 | 65 |
| Lower Level (ft) | 27 | 40 |

Several improvements were recently completed on the elevated tank. These improvements include replacing mud valves, replacing vents, installing a tank mixer, installing an overflow flap gate, removing cathodic protection system, and installing gaskets on the roof and access tube hatches. No major issues were observed at the elevated tank as part of the condition assessment completed in the *Water Treatment Plant Performance Evaluation* (Fishbeck, 2023). The mechanical and process equipment appeared in good condition, and no major structural issues were observed.

The standpipe has also received several improvements recently. These improvements include installing roof ladders replacing vents with vacuum relief vents, installing an overflow flap gate and a tank mixer, installing conduit routing lugs to exterior, removing existing cathodic protection system, installing a mixing system, controls, and appurtenances, installing roof accessways, gaskets, and screens, and ancillary mechanical, installation of a gravel driveway, and site improvements. The City still has several additional improvements planned for the standpipe. These include installing isolation valves on the distribution system to allow for tank draining without shutting off customers, repairing and replacing altitude valves, updating the signage, updating SCADA (supervisory control and data acquisition), and implementation of inspection and maintenance standard operating procedure.

#### 2.5.3.3 Gute Hill Booster Station

The Gute Hill Booster Station is connected to the standpipe located off Krouse Road between Pearce Street and Walnut Street. The Booster Station has one pump that is manually controlled from the WTP by staff; however, this will soon be automated with ongoing control upgrades at the WTP. The flow capacity of the Booster Station is limited hydraulically by the level in the standpipe. The existing booster pump is rated for 1,000 gpm; however, the pumping capacity decreases significantly as levels in the standpipe drop. Ductile iron and PVC pipe are used in the Booster Station, and lead joints are likely present as well. Refer to Figure 5 for the existing Booster Station layout.

The Booster Station facility was evaluated as part of the condition assessment completed in the *Water Treatment Plant Performance Evaluation* (Fishbeck, 2023). The piping and valving were recently blasted and recoated; heavy pitting was observed on the piping. The altitude valve and associated pilot piping and equipment were found to be worn slightly and are in okay condition. The mechanical equipment was found to be in average to poor condition, and no major structural issues were observed.

## 2.6 Summary of Project Need – Raw Water Supply

### *2.6.1 LW-1 and PS-W2 Wellhouse Building and Mechanical Equipment Improvements*

The Wellhouse Building and mechanical equipment for LW-1 were evaluated in the *Water Treatment Plant Performance Evaluation* (Fishbeck, 2023). Overall, no major structural deficiencies were observed; however, it has been noted that the building is undersized to meet National Electric Code (NEC) requirements for panels and equipment. Additionally, there is insufficient space for performing preventative maintenance on equipment inside the Wellhouse. The metal siding and roof appeared to be in good condition; however, the internal insulation was showing signs of damage and age. Some uncoated wood was present which is susceptible to rot. Plant staff have also noted that the building has been susceptible to rodent and insect infestations. The unit heater and screened air intake for the Wellhouse were found to be in fair condition and functional; however, these items are nearing the end of their service lives and will require replacement. The magnetic flow meter for this well is in a below grade meter pit outside the Wellhouse. This flow meter is beyond its service life and needs replacement.

The Wellhouse building and mechanical equipment for PS-W2 were evaluated in the *Water Treatment Plant Performance Evaluation* (Fishbeck, 2023). Overall, no major structural deficiencies were observed. The exterior metal panels were observed to have minor damage and corrosion. Additionally, the roof panels, metal door, and jambs all have corrosion, and constant roof leaks are present in the Wellhouse. The interior concrete floor of the Wellhouse has noticeable amounts of corrosion. The air intake louver at the Wellhouse does not have any dampers installed and a wooden board is used to cover the louver inside the Wellhouse during cold weather. Additionally, the unit heater and exhaust fan are both in poor condition. The pump discharge piping does not have an isolation valve, which increases the difficulty in testing the pump using the blowoff in the Wellhouse. P lant staff have also noted that this Wellhouse is not secure in its current condition; it is frequently subjected to vandalism and rodent infestations.

### *2.6.2 PS-W1 Abandonment*

The PS-W1 is no longer in service; however, the well, Wellhouse, and raw water main have not yet been decommissioned/abandoned. As per recommendations in Ten States Standards section 3.2.4.14, groundwater sources which are not in use must be sealed to restore the controlling geological conditions which existed prior to construction. Additionally, wells to be abandoned must be sealed to prevent undesirable exchange of water from one aquifer to another and having a negative effect on water quality.

## 2.7 Summary of Project Need – Water Treatment Plant

### *2.7.1 Electrical Grounding and Equipment Deficiencies*

Plant staff are suspect of the reliability and operability of the main and tie breakers and kirk-key interlocks in the double-ended switchboard. This equipment is over 40 years old and has outlived its rated (useful) life. Additionally, there does not appear to be any surge protection on the double-ended switchboard or Panels MDP, MDP-R, or MDP-L.

The configuration of the WTP grounding system is also suspect. Following are several observations from the *Water Treatment Plant Performance Evaluation* (Fishbeck, 2023):

- A grounding connection on the pole with the north transformer bank appears to be broken (disconnected). The connection is supposed to bond the transformers to a driven grounding electrode (rod) at the base of the pole. The connection on the pole with the south transformer bank appears to be intact.
- Because each transformer bank is 3-wire and connected in a delta configuration, there are no neutral (grounded) connections between the transformers and plant power distribution system. There are no return paths for fault currents so overcurrent protective devices (i.e., fuses and circuit breakers) may not trip on faults and short circuits.
- It appears that individual equipment grounding conductors are not provided between the transformers and power distribution equipment. Instead, rigid steel conduits are used as the equipment grounding conductors. This means fault currents likely ‘bleed to ground’ as they try to return to their source (the pole-mounted transformers). Fuses and circuit breakers may not trip on faults and short circuits.
- The grounding of the generator could not be confirmed and there does not appear to be an equipment grounding conductor between the generator and ATS.
- There does not appear to be a grounding electrode connection to the WTP water service as required by the National Electrical Code (NEC).
- Equipment grounding conductors have not been provided in individual feeder and branch circuits as required by the NEC. Instead, cable trays are bonded to a main grounding bus next to the double-ended switchboard. It appears that the cable tray is used as a common equipment grounding conductor. Fuses and circuit breakers may not trip on faults and shorts. Fault currents that pass through the cable trays can impact other equipment whose feeder and branch circuits are routed via the cable tray.
- There appears to be one or more grounding electrodes (rods) outside the WTP building in the vicinity of the generator, near where the underground 480-volt conduits from the pole-mounted transformers enter the building. It is unclear whether the rods are bonded to other items that are required to be bonded together (per the NEC) to form a grounding electrode system.
- The building grounding electrode system is supposed to include connections to the pole-mounted primary switch grounding electrodes, pole-mounted transformer grounding electrodes, building water service, effectively grounded building steel, and power distribution system grounding electrodes. The exact configuration of the grounding electrode system could not be verified.

- Equipment grounding conductor and grounding electrode conductor sizes may be smaller than what is required by the NEC.
- Dry-type, step-down transformers inside the WTP appear to be grounded (bonded) at their disconnects and transformers themselves. Per the NEC, they are supposed to be bonded at only one location.

Improper grounding can have detrimental effects on electrical and electronic equipment. Improvements to the grounding system are necessary to improve the reliability and safety of the WTP.

### *2.7.2 Underground Storage Reservoir*

The existing underground storage reservoir and suction wells are beyond their expected useful life. The underground storage reservoir does not meet several of the recommended Ten States Standards for finished water storage, summarized by the following:

- 7.0.2.a – Location: Base of the structure to be above the 100-year floodplain.
  - The reservoir is below grade.
- 7.0.2.b – Location: Tanks below grade must be waterproofed and underdrains installed above tank roof to capture surface water above tank.
  - The reservoir has no waterproofing, membranes, or underdrains above tank or along walls.
- 7.0.5 – Drains: Allow for draining of reservoir for cleaning or maintenance.
  - There is no gravity drain on the reservoir. The reservoir must be pumped out when taken offline.
- 7.0.7 – Overflow: Requires overflow structure. Overflow pipe discharge to be visible.
  - There is no overflow structure on the reservoir.
- 7.0.10 – Roof and Sidewall: Flat concrete roofs must have waterproof membrane. Roofs with earthen cover must be sloped to facilitate drainage.
  - There is no waterproof membrane installed on the reservoir. The ground surface is relatively flat above the reservoir roof.

The south suction well overflow line leads into the high service pump area inside the WTP, posing a flooding risk to the equipment located there.

### *2.7.3 High Service Pumping*

The high service pumps are not able to start when levels in the underground storage reservoir are below 8-feet. This significantly reduces the operational flexibility of the WTP, reduces the amount of turnover that can be achieved in the underground reservoir, and reduces the overall storage volume available for the system. In addition, the high service pumps are located below grade at the WTP. This poses a risk as the pumps are susceptible to flooding of the basement in the event of a flood or catastrophic piping failure. Ten States Standards recommends that pumping stations be located a minimum of three feet above the 100-year flood elevation, or three feet above the highest recorded flood elevation, whichever is higher.

### *2.7.4 Chlorine Feed*

Bulk sodium hypochlorite, with a 15% concentration, is stored in the chemical room in a single 2,000-gallon bulk storage tank. This tank was reused from the City's Wastewater Treatment Plant (WWTP). It is aging and plant staff have noted leaking from valves and piping on the tank. A 100-gallon day tank and transfer pump are located adjacent to the bulk storage tank. A backup calcium hypochlorite tablet feeder system is present for when the sodium hypochlorite system is offline. Chlorine is fed via three chemical metering pumps located in the chemical room. Chlorine is dosed upstream of the recarbonation tank and downstream of the filters. The 10-year average sodium hypochlorite usage is 31 gpd as solution. At the average usage rate, the bulk storage tank has capacity for up to 65 days of storage.

The existing sodium hypochlorite system poses maintenance concerns for operators, and does not meet the following Ten States Standard:

- Chemical storage systems "shall be located in spaces readily accessible for servicing, repair, and observation."
  - The bulk storage tank is located in a small expansion attached to the chemical room and has very little clearance between the diameter of the tank and the walls of the enclosure. Accessing the enclosure/expansion is difficult due to a half-wall separating the chemical room and enclosure/expansion, required for secondary containment.

In addition to the safety and access concerns regarding the existing sodium hypochlorite system, the City is experiencing increasing capital and delivery costs for bulk sodium hypochlorite. To compound on the issue, the City's WWTP is set to eliminate its need for bulk hypochlorite deliveries due to installation of UV disinfection equipment. This will increase the bulk delivery costs of hypochlorite to the WTP as the City loses its discount for shared deliveries between the WTP and WWTP. Additionally, relying on regular delivery of sodium hypochlorite in bulk poses a reliability concern due to unreliable supply chains for chemical delivery.

## 2.8 Summary of Project Need – Distribution System

### *2.8.1 Transmission Mains and River Crossings*

There are approximately 4.7 miles of raw water ranging from 10 inches to 16 inches in diameter. The installation year for the water mains is unknown, but likely over 75 years ago. The improvements replace the water main from Hintz Well and PS-W1, PS-W2, and PS-W3. The list of raw water transmission mains requiring replacement are listed in Table 8.

Table 8 – Raw Water Transmission Main Improvements

| Project | Size (in) | Length of Main (ft) |
|---|---|---|
| Allendale Avenue Transmission Main (WTP to Frazer Avenue) | 16 | 540 |
| Frazer Avenue Transmission Main (Allendale Avenue to Corunna Avenue) | 16 | 1,180 |
| Garfield Street Transmission Main (Corunna Avenue to Monroe Street) | 16 | 870 |
| McMillan Road Transmission Main (Monroe Avenue to South Street) | 16 | 1,550 |
| South Street Transmission Main (McMillan Road to Vandekarr Road) | 16 | 2,940 |
| Cross-Lot Transmission Main (Vandekarr Road to Cook Road) | 16 | 1,050 |
| Cross-Lot Transmission Main (Cook Road to Palmer Street) | 16 | 2,130 |
| Palmer Street Well 2 Transmission Main (PS-W2 to Cross-Lot) | 12 | 290 |
| Palmer Street Well 3 Transmission Main (PS-W3 to Cross-Lot) | 12 | 490 |
| Hintz Road Transmission Main (Hintz Well to Copas Road) | 16 | 5,420 |
| Copas Road Transmission Main (Hintz Road to Hazelton Avenue) | 16 | 1,030 |
| Hazelton Road Transmission Main (Oliver Street to M-21) | 16 | 1,450 |
| Rawleigh Avenue Transmission Main (M-21 to Grover Street) | 16 | 700 |
| Raw Water River Crossing (Grover Street to WTP) | 16 | 1,310 |

The Shiawassee River runs through Owosso essentially cutting the water system in half which requires the distribution system to cross the river a total of eight times. Three of the river crossings were installed in the early 2000s; however, five of the crossings were installed in 1959 and 1960 and were not buried under the river but laid on the riverbed. The list of river crossings requiring replacement are listed in Table 9.

Table 9 – River Crossing Improvements

| Project | Size (in) | Length of Main (ft) |
|---|---|---|
| 12-inch Finished Water River Crossing (S. Gould Street to WTP) | 12 | 1,140 |
| 24-inch Finished Water River Crossing (S. Gould Street to WTP) | 24 | 880 |
| 12-inch Finished Water River Crossing (Oakwood Avenue to S. Gould Street) | 12 | 750 |
| 16-inch Finished Water River Crossing (Cass Street to Jerome Avenue) | 16 | 300 |
| 12-inch Finished Water River Crossing (M-71 to Jerome Avenue) | 12 | 580 |

### *2.8.2 Water Main*

The proposed distribution system projects recommend action due to aged water main, dead-end lines, or lead service lines (LSL). To avoid redundancy, the concerns of each of these items are described. Refer to Appendix 1 for assignment of project needs to each segment of proposed water main replacement.

#### 2.8.2.1 Aged Water Mains

Aging water mains throughout the system are more likely to fail, lessening the distribution system reliability and increasing operation and maintenance efforts. It is estimated that over 50% of the City's distribution system was constructed before 1960. Additionally, aged water mains generally include lead service lines; it is best practice and most cost effective to replace both the water main and lead service lines concurrently.

#### 2.8.2.2 Undersized

Several water mains proposed for improvements are undersized. This causes issues with water pressure and can promote corrosion or pitting inside of the pipes.

#### 2.8.2.3 Dead End Service Lines

Dead end lines result in a breakdown of chlorine residuals, thereby limiting their disinfection abilities. Chlorine residual also helps to keep lead out of solution, which is important where lead service lines and old water mains exist within the distribution system. The poor water quality may be noticeable to residents and may result in a lack of confidence in the safety of the water. Where feasible, dead-end lines should be gradually removed from the system to eliminate the associated maintenance, operation efforts and water safety concerns.

#### 2.8.2.4 Lead Service Lines (LSL)

Lead water services are a known potential public health hazard. Many LSLs still exist within older portions of the distribution system. These LSLs need to be eliminated within the next 20 years to meet the requirements of the Safe Drinking Water Act.

### *2.8.3 Booster Station*

In addition to the hydraulic deficiency of the existing Booster Station with low standpipe levels, the Booster Station is deficient of several Ten States Standards recommendations for pumping facilities, summarized by the following:

- Pumps: "At least two pumping units shall be provided. With any pump out of service, the remaining pumps shall be capable of providing the maximum pumping demand of the system."
  - The Booster Station only has one pump.
- Standby Power: "A power supply shall be provided from a standby or auxiliary source. If standby power is provided by onsite generators or engines, the fuel storage and fuel line must be designed to protect the water supply from contamination."
  - The Booster Station does not have standby power.

Additional issues within the Booster Station include the following:

- Aging valves and piping date back to the 1950s. These components are heavily pitted and require replacement.
- Lead joints are likely present in the aging piping and should be removed as they are a potential public health hazard.
- There is currently no HVAC equipment for the basement. Additionally, the basement has drainage issues; a sump pump is required.

### *2.8.4 LSL Replacement*

The LSLs associated with any proposed water main improvements project will be addressed. There are potential LSLs in the distribution system that are not associated with any water main improvements. Lead water service lines are a known potential public health hazard.

The lead service line replacement (LSLR) projects need to be completed to meet the requirements of the revised Lead and Copper Rule. Additional funding beyond 2024 is currently required to continue the City's LSLR program.

## 2.9 Compliance with Drinking Water Standards

EGLE issued a Sanitary Survey for the City of Owosso Water System in 2021. The document listed numerous recommendations for the water system. The City addressed those recommendations in their Capital Improvements Projects, and they have been incorporated herein.

## 2.10 Orders or Enforcement Actions

No court or enforcement orders, or written enforcement actions have been issued to the City regarding the water system.

## 2.11 Drinking Water Quality Problems

The aesthetic quality of the water produced by the WTP is generally good; there are no known drinking water problems in the overall distribution system. The water quality report is included in Appendix 2.

## 2.12 Projected Needs for the Next 20 Years

The 2023 Water System Reliability Study (WSRS) and WTP Evaluation Study were completed for the water system. The WSRS included a capital improvements plan (CIP) for both 5-year and 20-year distribution system improvements. The proposed raw water improvements are needed for maintaining compliance and reliability. The proposed WTP projects are based on the recommendations of the study and are needed to improve system reliability and maintain current WTP functionality.

The distribution system improvements include several water mains, transmission mains, and at the Booster Station based on the recommendations of the studies. The improvements will increase the water system reliability.

In addition to the distribution system improvements needed, LSLR is also needed. As mentioned, removal of lead service lines over the next 20 years, is required to meet the lead and copper rule of the Safe Drinking Water Act. The proposed lead service and distribution system improvements will have no impact on system demands nor performance.

# 3.0 Analysis of Alternatives

The alternatives were evaluated using the following project objectives:

- Replace service line materials that are no longer acceptable.
- Replace undersized and aged water mains to ensure system reliability.
- Optimize the existing system where possible to mitigate issues.
- Replace aged equipment to provide reliable water treatment and safe drinking water to system users.
- Utilize existing equipment locations and space available where possible.
- Minimize financial burden to water system users.
- Maintain plant operations during construction.
- Minimize environmental impact during construction.

## 3.1 Raw Water Supply

The alternatives analysis for the Raw Water Supply improvements are presented in this section.

### *3.1.1 LW-1 and PS-W2 Wellhouse Building and Mechanical Equipment Improvements*

#### 3.1.1.1 Alternative 1 – No Action

If no action is taken on the existing LW-1 and PS-W2 Wellhouse, the facilities will continue operating with aging equipment past their expected useful lives and reduce the reliability of the raw water supply system for the City's long-term production wells. Therefore, no further consideration is given to this alternative.

#### 3.1.1.2 Alternative 2 – Optimum Performance of Existing Facilities

In this alternative the existing Wellhouses and mechanical equipment at both LW-1 and PS-W2 will be replaced with the City's standard wellhouse design. The City's standard wellhouse design includes the following building and ancillary components:

- HVAC equipment.
- Interior and exterior lighting.
- Single man door.
- Wall penetration for a blowoff pipe.
- Masonry block walls, insulated, with brick veneer.
- Metal or shingled roof.

Additionally, the existing magnetic flow meter at LW-1 will be replaced and an isolation valve will be added to PS-W2. The remaining existing well pumps and process equipment will remain in service as a part of these improvements. As both LW-1 and PS-W2 are primary production wells for the WTP and are both planned to remain in service long-term, improving the Wellhouses and upgrading the ancillary equipment will improve the reliability of the Wellhouses and the raw water production capability of the system. Additionally, by moving towards the City's standardized wellhouse design, future maintenance will be more efficient due to shared components and features between the various wells. The well pumps, process piping and equipment will remain in service as a part of any Wellhouse improvements. This alternative is evaluated further as a principal alternative.

#### 3.1.1.3 Alternative 3 – Construction Alternative

A construction alternative will require new wells to be drilled and outfitted to replace the existing wells. As LW-1 and PS-W2 are both primary production wells for the City and planned to remain in service long-term, optimization of the current wells is the more cost-effective alternative. Therefore, no further consideration is given to this alternative.

#### 3.1.1.4 Alternative 4 – Regional Alternative

A regional alternative is not applicable for the Wellhouse improvements. The City is already a primary water supplier to surrounding municipalities and there are no other suppliers nearby; therefore, no further consideration is given to this alternative.

### 3.1.2 PS-W1 Abandonment

#### 3.1.2.1 Alternative 1 – No Action

If no action is taken on the existing out of service well and Wellhouse, the facility will continue to remain uncompliant with Ten States Standards recommendations. Therefore, no further consideration will be given to this alternative.

#### 3.1.2.2 Alternative 2 – Optimum Performance of Existing Facilities

In this alternative the existing well will be abandoned according to all State regulatory requirements. Additionally, the raw water main leading to the raw water transmission main will be cut, capped, and filled to prevent cross contamination. Finally, the existing Wellhouse structure and process equipment will be demolished. This alternative will bring the existing decommissioned PS-W1 well in line with Ten States Standards recommendations. This alternative is evaluated further as a principal alternative.

#### 3.1.2.3 Alternative 3 – Construction Alternative

A construction alternative is not applicable for the PS-W1 well abandonment.

#### 3.1.2.4 Alternative 4 – Regional Alternative

A regional alternative is not applicable for the PS-W1 well abandonment.

## 3.2 Water Treatment Plant

The alternatives analysis for the WTP improvements are presented in this section.

### 3.2.1 Electrical Grounding and Equipment Improvements

#### 3.2.1.1 Alternative 1 – No Action

If no action is taken on the existing electrical grounding system at the WTP, the facility will continue to operate outside NEC requirements. Additionally, operating with the existing grounding configuration may pose reliability and safety risks; therefore, no further consideration is given to this alternative.

#### 3.2.1.2 Alternative 2 – Optimum Performance of Existing Facilities

In this alternative, the following improvements would be made to correct the electrical grounding and equipment deficiencies:

- A double-ended switchboard with two 3-pole, 600-amp main circuit breakers; 3-pole, 600-amp tie circuit breaker; and corresponding kirk-key interlocks to replace the existing switchboard is recommended. It is assumed the existing pole-mounted transformer banks would be reused along with the downstream distribution panels. The new switchboard should be service entrance rated, suitable for use on a 3-phase, 4-wire power distribution system, and include integral surge protection on each side.

- Replacing the pole-mounted, gang-operated primary switch on the south service is required to meet NEC requirements related to customer-owned service disconnects.
- Replacing both banks of pole-mounted transformers and the associated conduit and wiring between the transformers and building would provide grounded services to the WTP, ensuring that fuses and circuit breakers trip properly. The new services would include grounded (neutral) and equipment grounding conductors. It is assumed that the existing double-ended switchboard would be replaced separately.
- Modifying the grounding electrode system to include driven electrodes at the pole-mounted primary switches, pole-mounted transformers, and building along with connections to WTP water service and effectively grounded building steel is recommended.
- Modifying feeder and branch circuits (greater than 100-amps) to include appropriately sized equipment grounding conductors is recommended.
- Adding surge protective devices to Panels MDP, MDP-R, and MDP-L is recommended.

These improvements will help bring the electrical equipment at the WTP back in line with NEC requirements and help to improve the operational safety and reliability of the WTP. This alternative is evaluated further as a principal alternative.

#### 3.2.1.3 Alternative 3 – Construction Alternative

A construction alternative is cost prohibitive, requiring building of new facilities. It is more cost efficient to optimize the existing electrical grounding system. Therefore, this alternative is not evaluated further.

#### 3.2.1.4 Alternative 4 – Regional Alternative

A regional alternative is not applicable for the electrical grounding improvements; therefore, no further consideration is given to this alternative.

### *3.2.2 Storage Reservoir, High Service Pumping, and Transfer Pumping Improvements*

#### 3.2.2.1 Alternative 1 – No Action

If no action is taken on the existing underground storage reservoir, the WTP will continue to operate with a failing piece of infrastructure that is critical to the delivery of potable water to the system. This poses a significant risk to the reliability of the WTP; therefore, no further consideration is given to this alternative.

If no action is taken on the existing high service pumps, they will continue to operate outside of Ten States Standards recommendations due to their location beneath the flood elevation. This also poses a reliability risk to the WTP; therefore, no further consideration is given to this alternative.

#### 3.2.2.2 Alternative 2 – Optimum Performance of Existing Facilities

Optimization of the existing underground storage reservoir is not possible as it cannot currently be bypassed for repairs or rehabilitation. Additionally, even if the tank were able to be rehabilitated, it still would not meet several Ten States Standards recommendations due to its location below grade. No further consideration is given to this alternative.

Optimization of the existing HSPs would require them to be moved above potential flooding levels in accordance with Ten States Standards recommendations. The movement of the pumps would reduce the available net positive suction head (NPSH), further exacerbating the existing hydraulic deficiency between the underground storage reservoir and the HSPs. Therefore, any movement of the HSPs must be made in conjunction with the addition of new above-ground finished water storage on the WTP site. Attempting to maintain the existing high service pumps within the existing footprint of the WTP is not feasible; therefore, no further consideration is given to this alternative.

#### 3.2.2.3 Alternative 3 – Construction Alternative

In this alternative, two new 0.75 MG ground storage tanks would be constructed in the northwest portion of the existing WTP site. It is assumed that these tanks would be of the prestressed concrete style. Having two tanks will allow the City to take one-tank out of service and still have storage on-site to utilize. Due to the increase in elevation from the existing underground storage reservoir to the above-ground storage tanks the filters would be unable to fill the new ground storage tanks via gravity flow. Therefore, transfer pumps sized for the maximum flow from the filters, would be required to increase the hydraulic grade to fill the new ground storage tanks.

A new combined high service and transfer pumping station would also be constructed on the WTP site. Water from the filters would flow by gravity to the Pump Station. It is assumed that the transfer pumps would draw suction from either a new below grade clearwell or from concrete encased suction cans. A below grade clearwell option would require special design features to protect the finished water from contamination. The clearwell and concrete encased suction can option should be further evaluated as part of a detailed preliminary design. The transfer pumps would convey water to the new ground storage tanks. The ground storage tanks would then supply the new high service pumps, which would convey water to the distribution system. Locating the high service pumps and finished water storage above grade not only updates the facilities to meet current design standards, but it also removes the existing hydraulic limitation of the existing underground storage reservoir and high service pumping system, increasing the operational flexibility of the WTP and the overall functional storage capacity of the water system. This alternative is evaluated further as a principal alternative.

#### 3.2.2.4 Alternative 4 – Regional Alternative

A regional alternative is not applicable for the storage reservoir, high service pumping, and transfer pumping improvements. The City is already a primary water supplier to surrounding municipalities. There are no other suppliers nearby; therefore, no further consideration is given to this alternative.

### *3.2.3 Chlorine Feed Improvements*

#### 3.2.3.1 Alternative 1 – No Action

If no action is taken, the existing sodium hypochlorite bulk storage system will continue to be used. The issues associated with the rising costs of the chemical, aging bulk tank and leaking valving and piping, unreliable supply chain, and issues with ease of access will continue to exist. Therefore, no further consideration is given to this alternative.

#### 3.2.3.2 Alternative 2 – Optimum Performance of Existing Facilities

Optimization of the existing chlorine feed system would include replacement of components such as the existing bulk tanks, day tanks, and metering pumps in-kind. The life of the equipment may be extended further; however, by remaining within the existing chemical room footprint, the existing issues associated with chemical costs, unreliable supply chain, and access would continue to exist. Therefore, no further consideration is given to this alternative.

#### 3.2.3.3 Alternative 3 – Construction Alternative

A construction alternative includes the installation of a new disinfection technology in a new enclosure on the WTP site. Typical generation systems utilize sodium chloride and softened water to make a salt brine. The brine is electrolyzed to form a low concentration sodium hypochlorite and hydrogen gas. This low-concentration sodium hypochlorite would be fed directly to the process, while the hydrogen gas is vented to the atmosphere.

With an onsite generation system in a new enclosure on the WTP site, the City would not be subjected to the increasing costs of bulk deliveries of hypochlorite; they would produce disinfectant as needed from salt, which is more readily available. Additionally, the lower concentration of hypochlorite produced (approximately 0.8%) by the onsite generation system would be less dangerous for operators compared to the current 15% bulk hypochlorite, if operators are exposed to the chemical.

Two onsite generation systems, one duty and one for redundancy, could be installed to allow the City to perform maintenance on one system while still having capacity to meet chlorine demands. Redundant bulk storage and day tanks would be provided. The new enclosure would include secondary containment for chemical spills and metering pumps for dosing hypochlorite to the treatment process. This alternative is being evaluated further as a principal alternative.

#### 3.2.3.4 Alternative 4 – Regional Alternative

A regional alternative is not applicable for the chlorine feed improvements. The City is already a primary water supplier to surrounding municipalities. There are no other suppliers nearby; therefore, no further consideration is given to this alternative.

## 3.3 Distribution System

The alternatives analysis for the Distribution System improvements are presented in this section.

### *3.3.1 Transmission Main and River Crossings Improvements*

#### 3.3.1.1 Alternative 1 – No Action

If the proposed transmission main is not completed, there will be a risk associated with the failure of aged main, water loss and expensive emergency repairs. The river crossings are also aged; since they are not buried, they are exposed to the elements. There is a risk of failure in these crossings that could result in water loss and expensive emergency repairs.

#### 3.3.1.2 Alternative 2 – Optimum Performance of Existing Facilities

Optimization of the transmission mains and the river crossings is not viable. Repairs are reactionary, expensive, and not a long-term cost-effective solution. Therefore, this alternative will not be considered further.

#### 3.3.1.3 Alternative 3 – Construction Alternative

In this alternative the aged transmission mains will be replaced. The river crossings will be replaced via a construction technology such as horizontal directional drilling. This alternative is evaluated further as a principal alternative. The proposed transmission mains and river crossings for replacements are included in Figures 8-10.

#### 3.3.1.4 Alternative 4 – Regional Alternative

A regional alternative is not applicable for the transmission main improvements. The City is already a primary water supplier to surrounding municipalities; therefore, no further consideration is given to this alternative.

### *3.3.2 Water Main Improvements*

#### 3.3.2.1 Alternative 1 – No Action

If the proposed water main replacements are not completed, the risk of main breaks, lost water, excessive head loss, decreased system pressure, and water quality problems associated with undersized aging water main will remain. Therefore, the no action alternative will not be considered further.

#### 3.3.2.2 Alternative 2 – Optimum Performance of Existing Facilities

Optimization, such as exercising valves, adjusting flows, or other operational measures, is not viable for the 4-inch water mains. Water main repairs are reactionary and not considered a long-term approach to solve problems with pressure and aging pipe. Rehabilitation measures such as pipe lining are not considered cost effective or practical in this case. The mains targeted for replacement are undersized, tuberculated, have deficient pressure, experience frequent breaks, and contribute to water quality problems. Therefore, this alternative is eliminated from further consideration.

#### 3.3.2.3 Alternative 3 – Construction Alternative

In this alternative, the aged cast iron water main would be replaced with new water main. The project would also include replacement of LSLs associated with these water mains (separate from the proposed LSLR only project). This would address the issues associated with undersized, aging water mains, such as: risk of main breaks, lost water, excessive head loss, decreased system pressure, and water quality problems. In addition to addressing the water main issues, associated LSLs will be replaced to comply with the Safe Drinking Water Act. Therefore, this alternative is evaluated further as the principal alternative for water main.

The proposed water mains for replacements are included in Figure 11. The details associated with the water mains included in the proposed improvements is included in the Selected Alternatives section.

#### 3.3.2.4 Alternative 4 – Regional Alternative

The City is a water service provider in the region. Regardless of the system supply, these water mains have reached the end of their expected useful life and will need to be replaced to remain operational, reduce frequency of main breaks, and provide adequate fire protection. Therefore, no further consideration is given to this alternative.

### *3.3.3 Booster Station Improvements*

#### 3.3.3.1 Alternative 1 – No Action

If no action is taken at the existing Booster Station, the functional operational volume of the standpipe will continue to be limited due to the hydraulic deficiencies in the Booster Station. Additionally, the Booster Station would remain operating outside of Ten States Standards recommendations; therefore, no further consideration is given to this alternative.

#### 3.3.3.2 Alternative 2 – Optimum Performance of Existing Facilities

In this alternative, the existing process equipment and piping would be demolished in the existing Booster Station. Two new booster pumps, one duty and one standby, will replace the existing single pump to correct the deficiency from Ten States Standards recommendations. Each booster pump will be driven by a VFD and will be remotely operable from the WTP. The pumps will be sized for one pump to meet the required system demands. In the event of a large fire, it is expected that the second pump could be operated in parallel to increase the flow of stored water back into the distribution system.

Other improvements that would be completed in this alternative include the following:

- Installation of a generator and automatic switchgear to provide standby power to the Booster Station.
- Installation of a separate metered tank fill line and metered pump discharge line.
- Installation of two new pump suction lines directly connected to the standpipe.
- Installation of a new altitude valve with flow throttling capability.
- Replacement of aging mechanical/HVAC equipment.
- Replacement of basement sump pump and plumbing.

These improvements will bring the Booster Station in line with current Ten States Standards recommendations and will increase the functional operational volume of the standpipe, thereby increasing the reliability and operational flexibility of the distribution system. This alternative is evaluated further as a principal alternative.

#### 3.3.3.3 Alternative 3 – Construction Alternative

A construction alternative is not cost efficient, as the necessary improvements can be made within the footprint of the existing Booster Station facility. Therefore, no further consideration is given to this alternative.

#### 3.3.3.4 Alternative 4 – Regional Alternative

A regional alternative is not applicable for the Booster Station improvements. The City is already a primary water supplier to surrounding municipalities; therefore, no further consideration is given to this alternative.

### *3.3.4 Lead Service Line Replacement (LSLR)*

#### 3.3.4.1 Alternative 1 – No Action

This alternative is not considered because LSLs are no longer acceptable and must be replaced to comply with the Safe Drinking Water Act.

#### 3.3.4.2 Alternative 2 – Optimum Performance of Existing Facilities

Lead is no longer an acceptable material for water service lines and no improvements can be made to the existing services to reduce health risks associated with lead and improve performance; therefore, this alternative is not viable.

#### 3.3.4.3 Alternative 3 – Construction Alternative

This alternative will focus on replacements of the LSLs within the City. The replacements will vary and fall into the following categories:

- Full replacements: Water service to be replaced from the water main up to the Owner's meter location.
- Partial replacement: Water service to be replaced from the water main up to the curb stop, or from the curb stop to the Owner's meter location.

This alternative is evaluated further as a principal alternative.

#### 3.3.4.4 Alternative 4 – Regional Alternative

A regional alternative is not applicable for LSLR as the service line replacements are required to comply with the Safe Drinking Water Act.

# 4.0 Principal Alternatives

## 4.1 Monetary Evaluation – Raw Water Supply

### *4.1.1 LW-1 and PS-W2 Wellhouse Building and Mechanical Equipment Improvements*

A monetary analysis was completed for Alternative 2 – Optimum Performance of Existing Facilities. Table 10 indicates the total estimated project budget cost for the LW-1 and PS-W2 Wellhouse Building and Mechanical Equipment Improvements is $770,000.

Table 10 – Estimated Project Cost – LW-1, PS-W2 Wellhouse Building/Mechanical Equipment Improvements

| Item | Initial Capital Cost | Salvage Value |
|---|---|---|
| LW-1 | | |
| Demolition | $20,000 | $0 |
| Magnetic Flow Meter | $11,000 | 0 |
| Wellhouse Building | $125,000 | $80,000 |
| HVAC & Misc. Equipment | $75,000 | $0 |
| PS-W2 | | |
| Demolition | $20,000 | $0 |
| Isolation Valve | $6,500 | $3,000 |
| Wellhouse Building | $125,000 | $80,000 |
| HVAC & Misc. Equipment | $75,000 | $0 |
| **Subtotal: Estimated Bare Construction Cost** | **$457,500** | |
| Contractor General Conditions, Overhead and Profit | $70,000 | |
| Contingency | $100,000 | |
| Engineering, Administration, Legal | $140,000 | |
| **Total: Estimated Project Budget** | **$770,000** | |

### *4.1.2 PS-W1 Abandonment*

A monetary analysis was completed for Alternative 2 – Optimum Performance of Existing Facilities. Table 11 indicates the total estimated project budget cost for the PS-W1 Abandonment is $90,000.

Table 11 – Estimated Project Cost – PS-W1 Abandonment

| Item | Initial Capital Cost | Salvage Value |
|---|---|---|
| Demolition | $25,000 | $0 |
| PS-W1 Well Abandonment | $8,000 | $0 |
| PS-W1 Raw Water Main Abandonment | $8,000 | $0 |
| **Subtotal: Estimated Bare Construction Cost** | **$41,000** | |
| Contractor General Conditions, Overhead and Profit | $10,000 | |
| Contingency | $10,000 | |
| Engineering, Administration, Legal | $20,000 | |
| **Total: Estimated Project Budget** | **$90,000** | |

## 4.2 Monetary Evaluation – Water Treatment Plant

### *4.2.1 Electrical Grounding and Equipment Improvements*

A monetary analysis was completed for Alternative 2 – Optimum Performance of Existing Facilities. Table 12 indicates the total estimated project budget cost for the Electrical Grounding and Equipment Improvements is $1,540,000.

Table 12 – Estimated Project Cost – Electrical Grounding and Equipment Improvements

| Item | Initial Capital Cost | Salvage Value |
|---|---|---|
| Double Ended Switchboard | $150,000 | $50,000 |
| Pole-Mounted Gang-Operated Primary Switch | $100,000 | $40,000 |
| Pole-Mounted Transformers | $400,000 | $140,000 |
| Grounding Electrode System | $100,000 | $40,000 |
| Feeder and Branch Circuits | $100,000 | $40,000 |
| Surge Protective Devices | $80,000 | $30,000 |
| **Subtotal: Estimated Bare Construction Cost** | **$930,000** | |
| Contractor General Conditions, Overhead and Profit | $140,000 | |
| Contingency | $190,000 | |
| Engineering, Administration, Legal | $280,000 | |
| **Total: Estimated Project Budget** | **$1,540,000** | |

### *4.2.2 Storage Reservoir, High Service Pumping, and Transfer Pumping Improvements*

A monetary analysis was completed for Alternative 3 – Construction Alternative. Table 13 indicates the total estimated project budget cost for the Storage Reservoir, High Service Pumping, and Transfer Pumping Improvements is $17,620,000.

Table 13 – Estimated Project Cost – Storage Reservoir, High Service and Transfer Pumping Improvements

| Item | Initial Capital Cost | Salvage Value |
|---|---|---|
| Prestressed Concrete Tanks | | |
| 750,000-gal Ground Storage Tanks | $3,500,000 | $2,100,000 |
| Process Equipment | | |
| 3.0 MGD High Service Pumps (150 HP) | $360,000 | $120,000 |
| 3.0 MGD Transfer Pumps (40 HP) | $270,000 | $90,000 |
| Trolley Hoist | $15,000 | $10,000 |
| Process Pipe Allowance | $1,200,000 | $720,000 |
| Process Valve Allowance | $500,000 | $300,000 |
| Misc. Supports, Sleeve, Penetration Allowance | $50,000 | $30,000 |
| Instrumentation Allowance | $100,000 | $0 |
| Building and Site | | |
| Pump Station Building | $1,260,000 | $1,010,000 |
| Transfer Pump Concrete Encasement | $682,400 | $550,000 |
| Storage Tank Valve Vault | $50,000 | $30,000 |
| Site Work Allowance | $750,000 | $450,000 |
| Electrical and Mechanical | | |
| Electrical Allowance | $1,250,000 | $0 |
| Systems Integration Allowance | $200,000 | $0 |
| Mechanical Allowance | $500,000 | $0 |
| **Subtotal: Estimated Bare Construction Cost** | **$10,687,400** | |
| Contractor General Conditions, Overhead and Profit | $1,610,000 | |
| Contingency | $2,140,000 | |
| Engineering, Administration, Legal | $3,180,000 | |
| **Total: Estimated Project Budget** | **$17,620,000** | |

### *4.2.3 Chlorine Feed Improvements*

A monetary analysis was completed for the Alternative 3 – Construction Alternative. Table 14 indicates the total estimated project budget cost for the Chlorine Feed Improvements is $1,490,000.

Table 14 – Estimated Project Cost – Chlorine Feed Improvements

| Item | Initial Capital Cost | Salvage Value |
|---|---|---|
| Chemical Feed System | | |
| OSG Skids, Brine Storage Tank, Hypochlorite Storage Tank, Accessories | $275,000 | $100,000 |
| Day Tanks | $60,000 | $20,000 |
| Transfer Pumps | $16,000 | $10,000 |
| Metering Pumps | $24,000 | $10,000 |
| Building and Site | | $0 |
| OSG Building | $294,000 | $240,000 |
| Site Work Allowance | $50,000 | $30,000 |
| Site Chemical Piping | $50,000 | $30,000 |
| Electrical and Mechanical | | $0 |
| Electrical Allowance | $110,000 | $0 |
| Mechanical Allowance | $20,000 | $0 |
| **Subtotal: Estimated Bare Construction Cost** | **$899,000** | |
| Contractor General Conditions, Overhead and Profit | $140,000 | |
| Contingency | $180,000 | |
| Engineering, Administration, Legal | $270,000 | |
| **Total: Estimated Project Budget** | **$1,490,000** | |

## 4.3 Monetary Evaluation – Distribution System

### *4.3.1 Transmission Main and River Crossing Improvements*

A monetary analysis was completed for Alternative 3 – Construction Alternative. The costs have been provided by each Fiscal Year, from 2026-2029 in Tables 15-18. The tables indicate that the total estimated project budget cost for the Transmission Main and River Crossing Improvements is $18,390,000.

Table 15 – Estimated Project Cost – Transmission Main and River Crossing Improvements (FY2026)

| Project | Initial Capital Cost | Salvage Value |
|---|---|---|
| Allendale Avenue Transmission Main (WTP to Frazer Avenue) | $220,000 | $140,000 |
| Frazer Avenue Transmission Main (Allendale Avenue to Corunna Avenue) | $448,000 | $270,000 |
| Garfield Street Transmission Main (Corunna Avenue to Monroe Street) | $351,000 | $220,000 |
| McMillan Road Transmission Main (Monroe Avenue to South Street) | $701,000 | $430,000 |
| 12-inch Finished Water River Crossing (S. Gould Street to WTP) | $662,000 | $400,000 |
| 24-inch Finished Water River Crossing (S. Gould Street to WTP) | $1,332,000 | $800,000 |
| **Subtotal: Estimated Bare Construction Cost** | **$3,714,000** | |
| Contractor General Conditions, Overhead and Profit | $560,000 | |
| Contingency | $750,000 | |
| Engineering, Administration, Legal | $1,110,000 | |
| **Total: Estimated Project Budget** | **$6,140,000** | |

Table 16 – Estimated Project Cost – Transmission Main and River Crossing Improvements (FY2027)

| Project | Initial Capital Cost | Salvage Value |
|---|---|---|
| South Street Transmission Main (McMillan Road to Vandecarr Road) | $1,179,000 | $710,000 |
| Cross-Lot Transmission Main (Vandecarr Road to Cook Road) | $365,000 | $220,000 |
| Cross-Lot Transmission Main (Cook Road to Palmer Street) | $627,000 | $380,000 |
| Palmer Street Well 2 Transmission Main (PS-W2 to Cross Lot) | $86,000 | $60,000 |
| Palmer Street Well 3 Transmission Main (PS-W3 to Cross Lot) | $144,000 | $90,000 |
| **Subtotal: Estimated Bare Construction Cost** | **$2,401,000** | |
| Contractor General Conditions, Overhead and Profit | $370,000 | |
| Contingency | $490,000 | |
| Engineering, Administration, Legal | $720,000 | |
| **Total: Estimated Project Budget** | **$3,990,000** | |

Table 17 – Estimated Project Cost – Transmission Main and River Crossing Improvements (FY2028)

| Project | Initial Capital Cost | Salvage Value |
|---|---|---|
| Hintz Road Transmission Main (Hintz Well to Copas Road) | $2,006,000 | $1,210,000 |
| Copas Road Transmission Main (Hintz Road to Hazelton Road) | $367,000 | $230,000 |
| **Subtotal: Estimated Bare Construction Cost** | **$2,373,000** | |
| Contractor General Conditions, Overhead and Profit | $360,000 | |
| Contingency | $480,000 | |
| Engineering, Administration, Legal | $710,000 | |
| **Total: Estimated Project Budget** | **$3,930,000** | |

Table 18 – Estimated Project Cost – Transmission Main and River Crossing Improvements (FY2029)

| Project | Initial Capital Cost | Salvage Value |
|---|---|---|
| Hazelton Road Transmission Main (Oliver Street to M-21) | $419,000 | $260,000 |
| Rawleigh Avenue Transmission Main (M-21 to Grover Street) | $230,000 | $140,000 |
| Raw Water River Crossing (Grover Street to WTP) | $990,000 | $600,000 |
| 12-inch Finished Water River Crossing (Oakwood Avenue to S. Gould Street) | $439,000 | $270,000 |
| 16-inch Finished Water River Crossing (Cass Street to Jerome Avenue) | $188,000 | $120,000 |
| 12-inch Finished Water River Crossing (M-71 to Jerome Avenue) | $346,000 | $210,000 |
| **Subtotal: Estimated Bare Construction Cost** | **$2,612,000** | |
| Contractor General Conditions, Overhead and Profit | $400,000 | |
| Contingency | $530,000 | |
| Engineering, Administration, Legal | $780,000 | |
| **Total: Estimated Project Budget** | **$4,330,000** | |

### *4.3.2 Water Main Improvements*

A monetary analysis was completed for Alternative 3 – Construction Alternative. The water main replacement project budget cost for the construction alternative is presented in tables below. These costs are preliminary estimates and will be further refined during the project design phase. The costs have been provided by each Fiscal Year, from 2025-2029 in Tables 19-23. The tables indicate that the total estimated project cost for the water main improvement projects is $35,880,000. A typical design life of 50 years was used for the salvage value calculation for each water main improvement.

Table 19 – Estimated Project Cost – Water Main Improvements (FY2025)

| Project | Initial Capital Cost | Salvage Value |
|---|---|---|
| Nafus Street Water Main (S. End to Frederick Street) | $119,000 | $80,000 |
| Gilbert Street Water Main (Mason Street to Oliver Street) | $230,000 | $140,000 |
| Clinton Street Water Main (Cedar Street to Shiawassee Street) | $403,000 | $250,000 |
| Olmstead Street Water Main (Ward Street to Chipman Street) | $154,000 | $100,000 |
| Harding Avenue Water Main (Willow Springs to Hanover Street) | $196,000 | $120,000 |
| Hanover Street Water Main (Harding Avenue to Riverside Drive) | $109,000 | $70,000 |
| Stewart Street Water Main (Cedar Street to Shiawassee Street) | $465,000 | $280,000 |
| Williams Street Water Main (Shiawassee Street to Washington Street) | $540,000 | $330,000 |
| Dewey Street Water Main (Main Street (M-21) to King Street) | $2,047,000 | $1,230,000 |
| Young Street Water Main (Chestnut Street to Brooks Street) | $358,000 | $220,000 |
| Grace Street Water Main (Cedar Street to Shiawassee Street) | $424,000 | $260,000 |
| Subtotal: Estimated Bare Construction Cost | $5,045,000 | |
| Contractor General Conditions, Overhead and Profit | $760,000 | |
| Contingency | $1,010,000 | |
| Engineering, Administration, Legal | $1,500,000 | |
| **Total: Estimated Project Budget** | **$8,320,000** | |

Table 20 – Estimated Project Cost – Water Main Improvements (FY2026)

| Project | Initial Capital Cost | Salvage Value |
|---|---|---|
| Genesee Street Water Main (Michigan Avenue to Green Street) | $152,000 | $100,000 |
| Adams Street Water Main (Oliver Street to King Street) | $352,000 | $220,000 |
| Adams Street Water Main (Elizabeth Street to N. of Jennett Street) | $101,000 | $70,000 |
| Brandon Street Water Main (Summit Street to Dingwall Drive) | $117,000 | $80,000 |
| Dingwall Drive Water Main (Brandon Street to N. End) | $302,000 | $190,000 |
| Nafus Street Water Main (Stewart Street to N. End) | $153,000 | $100,000 |
| Woodlawn Avenue Water Main (Farr Street to Auburndale Avenue) | $236,000 | $150,000 |
| Shady Lane Drive Water Main (Meadow Drive to Chipman Street) | $290,000 | $180,000 |
| Exchange Street Water Main (Saginaw Street to Dewey Street) | $496,000 | $300,000 |
| State Street (S. End to Clyde Street) | $115,000 | $70,000 |
| State Street (Clyde Street to Stewart Street) | $347,000 | $210,000 |
| Clyde Street (State Street to Lyon Street) | $115,000 | $70,000 |
| Lyon Street (Clyde Street to Grace Street) | $116,000 | $70,000 |
| Subtotal: Estimated Bare Construction Cost | **$2,892,000** | |
| Contractor General Conditions, Overhead and Profit | $440,000 | |
| Contingency | $580,000 | |
| Engineering, Administration, Legal | $870,000 | |
| **Total: Estimated Project Budget** | **$4,790,000** | |

Table 21 – Estimated Project Cost – Water Main Improvements (FY2027)

| Project | Initial Capital Cost | Salvage Value |
|---|---|---|
| Frazer Avenue Water Main (Corunna Avenue to Allendale Avenue) | $340,000 | $210,000 |
| Gould Street Water Main (Exchange Street to North Street) | $1,706,000 | $1,030,000 |
| Jennett Street Water Main (Shiawassee Street to Adams Street) | $234,000 | $150,000 |
| Oak Street Water Main (Main Street (M-21) to Williams Street) | $382,000 | $230,000 |
| Chipman Street Water Main (Harding Avenue to North Street) | $554,000 | $340,000 |
| Chipman Street Water Main (Main Street (M-21) to Beehler Street) | $676,000 | $410,000 |
| Cedar Street Water Main (Hampton Avenue to Main Street (M-21)) | $1,652,000 | $1,000,000 |
| Mason Street Water Main (Saginaw Street to Dewey Street) | $470,000 | $290,000 |
| **Subtotal: Estimated Bare Construction Cost** | **$6,014,000** | |
| Contractor General Conditions, Overhead and Profit | $910,000 | |
| Contingency | $1,210,000 | |
| Engineering, Administration, Legal | $1,790,000 | |
| **Total: Estimated Project Budget** | **$9,930,000** | |

Table 22 – Estimated Project Cost – Water Main Improvements (FY2028)

| Project | Initial Capital Cost | Salvage Value |
|---|---|---|
| Elmwood Water Main (Abbott Street to King Street) | $152,000 | $100,000 |
| Washington Street Water Main (Stratford Drive to North Street) | $283,000 | $170,000 |
| Williams Street Water Main (Washington Street to Dewey Street) | $496,000 | $300,000 |
| Wiltshire Drive Water Main (Huntington Drive to Moore Street) | $304,000 | $190,000 |
| Ball Street Water Main (Exchange Street to Jennett Street) | $924,000 | $560,000 |
| Monroe Street Water Main (Washington Street to Broadway Avenue) | $481,000 | $290,000 |
| King Street Water Main (Fifth Street to Ada Street) | $430,000 | $260,000 |
| Broadway Avenue Water Main (Auburndale Avenue to Franklin Street) | $234,000 | $150,000 |
| **Subtotal: Estimated Bare Construction Cost** | **$3,304,000** | |
| Contractor General Conditions, Overhead and Profit | $500,000 | |
| Contingency | $670,000 | |
| Engineering, Administration, Legal | $990,000 | |
| **Total: Estimated Project Budget** | **$5,470,000** | |

Table 23 – Estimated Project Cost – Water Main Improvements (FY2029)

| Project | Initial Capital Cost | Salvage Value |
|---|---|---|
| Ada Street Water Main (Oliver Street to Lee Street) | $149,000 | $90,000 |
| Cass Street Water Main (Shiawassee Street to Green Street) | $462,000 | $280,000 |
| Curwood Drive Water Main (Oliver Streetto Woodhall Court) | $54,000 | $40,000 |
| Stinson Street Water Main (West Street to Chipman Street) | $383,000 | $230,000 |
| West Street Water Main (King Street to Stinson Street) | $93,000 | $60,000 |
| Woodhall Court Water Main (Curwood Drive to Oliver Street) | $155,000 | $100,000 |
| Fifth Street Water Main (Oliver Street to King Street) | $235,000 | $150,000 |
| First Street Water Main (Oliver Street to King Street) | $274,000 | $170,000 |
| Comstock Street Water Main (Park Street to Gould Street) | $904,000 | $550,000 |
| Elm Street Water Main (Main Street (M-21) to River Street) | $250,000 | $150,000 |
| Dewey Street Water Main (Comstock Street to Main Street) | $110,000 | $70,000 |
| Huntington Drive Water Main (Moore Street to Stevens Drive) | $347,000 | $210,000 |
| Martin Street Water Main (Stewart Street to Milwaukee Street) | $421,000 | $260,000 |
| Water Street Water Main (Oliver Street to King Street) | $326,000 | $200,000 |
| Campbell Drive Water Main (Ada Street to Ada Street) | $301,000 | $190,000 |
| **Subtotal: Estimated Bare Construction Cost** | **$4,464,000** | |
| Contractor General Conditions, Overhead and Profit | $670,000 | |
| Contingency | $900,000 | |
| Engineering, Administration, Legal | $1,330,000 | |
| **Total: Estimated Project Budget** | **$7,370,000** | |

### *4.3.3 Booster Station Improvements*

A monetary analysis was completed for Alternative 2 – Optimum Performance of Existing Facilities. Table 24 indicates the total estimated project budget cost for the Booster Station Improvements is $1,240,000.

Table 24 – Estimated Project Cost – Booster Station Improvements

| Item | Initial Capital Cost | Salvage Value |
|---|---|---|
| Demolition | $75,000 | $0 |
| Pumps (30 HP) | $110,000 | $40,000 |
| Process Piping Allowance | $150,000 | $90,000 |
| Process Valve Allowance | $50,000 | $20,000 |
| Misc. Supports, Sleeve, Penetration Allowance | $10,000 | $10,000 |
| Instrumentation Allowance | $35,000 | $0 |
| Electrical Allowance | $175,000 | $0 |
| Systems Integration Allowance | $50,000 | $0 |
| Mechanical Allowance | $80,000 | $0 |
| **Subtotal: Estimated Bare Construction Cost** | **$735,000** | |
| Contractor General Conditions, Overhead and Profit | $110,000 | |
| Contingency | $150,000 | |
| Engineering, Administration, Legal | $220,000 | |
| **Total: Estimated Project Budget** | **$1,240,000** | |

### *4.3.4 Lead Service Line Replacement*

A monetary analysis was completed for the Alternative 3 – Construction Alternative. The costs have been provided by each Fiscal Year, from 2025-2029 in Tables 25-29. The tables indicate that the total estimated project cost for the LSLRs is $4,500,000. These costs are preliminary estimates and will be further refined during the project design phase.

Table 25 – Estimated Project Cost – LSLR (FY2025)

| Item | Initial Capital Cost | Salvage Value |
|---|---|---|
| New Service Lines | $630,000 | $402,000 |
| **Subtotal: Estimated Bare Construction Cost** | **$630,000** | |
| Contractor General Conditions, Overhead and Profit | $110,000 | |
| Contingency | $70,000 | |
| Engineering, Administration, Legal | $50,000 | |
| **Total: Estimated Project Budget** | **$900,000** | |

Table 26 – Estimated Project Cost – LSLR (FY2026)

| Item | Initial Capital Cost | Salvage Value |
|---|---|---|
| New Service Lines | $630,000 | $402,000 |
| **Subtotal: Estimated Bare Construction Cost** | **$630,000** | |
| Contractor General Conditions, Overhead and Profit | $110,000 | |
| Contingency | $70,000 | |
| Engineering, Administration, Legal | $50,000 | |
| **Total: Estimated Project Budget** | **$900,000** | |

Table 27 – Estimated Project Cost – LSLR (FY2027)

| Item | Initial Capital Cost | Salvage Value |
|---|---|---|
| New Service Lines | $630,000 | $402,000 |
| **Subtotal: Estimated Bare Construction Cost** | **$630,000** | |
| Contractor General Conditions, Overhead and Profit | $110,000 | |
| Contingency | $70,000 | |
| Engineering, Administration, Legal | $50,000 | |
| **Total: Estimated Project Budget** | **$900,000** | |

Table 28 – Estimated Project Cost – LSLR (FY2028)

| Item | Initial Capital Cost | Salvage Value |
|---|---|---|
| New Service Lines | $630,000 | $402,000 |
| **Subtotal: Estimated Bare Construction Cost** | **$630,000** | |
| Contractor General Conditions, Overhead and Profit | $110,000 | |
| Contingency | $70,000 | |
| Engineering, Administration, Legal | $50,000 | |
| **Total: Estimated Project Budget** | **$900,000** | |

Table 29 – Estimated Project Cost – LSLR (FY2029)

| Item | Initial Capital Cost | Salvage Value |
|---|---|---|
| New Service Lines | $630,000 | $402,000 |
| **Subtotal: Estimated Bare Construction Cost** | **$630,000** | |
| Contractor General Conditions, Overhead and Profit | $110,000 | |
| Contingency | $70,000 | |
| Engineering, Administration, Legal | $50,000 | |
| **Total: Estimated Project Budget** | **$900,000** | |

## 4.4 Present Worth Analysis

A present worth analysis was completed using the 2% discount rate provided by EGLE for the construction and no action alternatives, as summarized in Tables 30-32 below. A present worth analysis details are included in Appendix 3. The No-Action alternative has no associated capital costs. Sunk costs are not included in the analysis.

Table 30 – Present Worth Analysis – Raw Water Supply

| | LW-1 and PS-W2 Wellhouse Building and Mechanical Equipment Improvements | | PS-W1 Abandonment | | No-Action | |
|---|---|---|---|---|---|---|
| | Cost/Value | 20-Year Present Worth | Cost/Value | 20-Year Present Worth | Cost/Value | 20-Year Present Worth |
| Capital Cost | $770,000 | $770,000 | $90,000 | $90,000 | $0 | $0 |
| O&M Cost/Year | $3,500 | $60,000 | $0 | $0 | $3,500 | $60,000 |
| Salvage Value | ($163,000) | ($110,000) | $0 | $0 | $0 | $0 |
| **Total Worth** | | **$720,000** | | **$90,000** | | **$60,000** |

Table 31 – Present Worth Analysis – Water Treatment Plant

| | Electrical Grounding, Equipment Improvements | | Storage Reservoir, High Service Pumping, Transfer Pumping Improvements | | Chlorine Feed Improvements | |
|---|---|---|---|---|---|---|
| | Cost/Value | 20-Year Present Worth | Cost/Value | 20-Year Present Worth | Cost/Value | 20-Year Present Worth |
| Capital Cost | $1,540,000 | $1,540,000 | $17,620,000 | $17,620,000 | $1,490,000 | $1,490,000 |
| O&M Cost/Year | $5,000 | $80,000 | $80,000 | $1,310,000 | $12,500 | $200,000 |
| Salvage Value | ($340,000) | ($230,000) | ($5,410,000) | ($3,650,000) | ($440,000) | ($300,000) |
| **Total Worth** | | **$1,390,000** | | **$15,280,000** | | **$1,390,000** |

| | No-Action | |
|---|---|---|
| | Cost/Value | 20-Year Present Worth |
| Capital Cost | $0 | $0 |
| O&M Cost/Year | $80,000 | $1,310,000 |
| Salvage Value | $0 | $0 |
| **Total Worth** | | **$1,310,000** |

Table 32 – Present Worth Analysis – Distribution System

| | Transmission Main, River Crossing Improvements | | Water Main Improvements | | Booster Station Improvements | |
|---|---|---|---|---|---|---|
| | Cost/Value | 20-Year Present Worth | Cost/Value | 20-Year Present Worth | Cost/Value | 20-Year Present Worth |
| Capital Cost | $18,390,000 | $18,390,000 | $34,600,000 | $34,600,000 | $1,240,000 | $1,240,000 |
| O&M Cost/Year | $46,000 | $750,000 | $88,000 | $1,440,000 | $15,000 | $250,000 |
| Salvage Value | ($6,760,000) | ($4,570,000) | ($12,840,000) | ($8,660,000) | ($160,000) | ($110,000) |
| **Total Worth** | | **$14,570,000** | | **$27,380,000** | | **$1,380,000** |

| | LSLR | | No-Action | |
|---|---|---|---|---|
| | Cost/Value | 20-Year Present Worth | Cost/Value | 20-Year Present Worth |
| Capital Cost | $4,500,000 | $4,500,000 | $0 | $0 |
| O&M Cost/Year | $0 | $0 | $234,000 | $3,820,000 |
| Salvage Value | ($2,034,000) | ($1,380,000) | $0 | $0 |
| **Total Worth** | | **$3,120,000** | | **$3,820,000** |

## 4.5 Environmental Evaluation

### *4.5.1 Cultural Resources*

The raw water supply improvements at LW-1 and PS-W2 Wellhouse are limited to the well site. The PS-W1 abandonment consists of taking the existing well out of service. The WTP and Booster Station projects are limited to the WTP site. The proposed distribution system and LSLR projects will have no direct historical or archeological impacts. If a service line is identified for replacement and located in the vicinity of the historical marker measures will be taken to protect it from damage during construction. The water main and transmission main improvements will occur where there is an existing water main and will be limited to the right-of-way (ROW). The river crossings be limited to the existing crossing locations.

Therefore, no direct impacts on the cultural resources are anticipated from the water system improvement projects.

### *4.5.2 The Natural Environment*

There are no potential long-term impacts on the natural environment because of the proposed projects. A temporary decrease in air quality may occur due to the construction. Additionally, the yards of homeowners receiving LSLRs will be temporarily disturbed but will be restored to the original condition upon completion of the work. The river crossing projects will include methods such as directional drilling underneath the water body to minimize impacts to the natural environment.

## 4.6 Mitigation

The impact on air quality will be controlled to the greatest extent possible by limiting construction to the regular construction season, during normal working hours. Soil erosion and sedimentation measures will be installed to ensure no debris associated with the excavation impact the natural environment.

## 4.7 Implementability and Public Participation

The City owns and operates its water distribution system, including the WTP, and the proposed projects do not require intermunicipal agreements. The public will be provided with opportunities to review the project planning document prior to a public hearing meeting. The City will also present the plan to the public during a regularly scheduled City Council meeting, to provide the community with an opportunity to voice concerns associated with the proposed projects. Refer to Section 8.0 for more information. Public concerns will be considered whenever possible throughout design and construction.

## 4.8 Technical Considerations

The raw water supply system improvements are needed to maintain compliance and system reliability. The WTP and Booster Station projects are needed for water quality and regulatory compliance. The water main, transmission main and river crossing improvements are needed to address aged water mains, water quality and system reliability. Within 20 years, the LSLs must be replaced to meet compliance requirements of the Safe Drinking Water Act. In addition, aging infrastructure components that continue to be operated, increase the likelihood of failures and diminished system reliability.

## 4.9 Residuals

The improvement projects will have no impact on the residuals.

## 4.10 Industrial/Commercial/Institutional

The water system improvement projects will occur in fully developed areas. In most cases it will be limited to the existing site or the ROW. Therefore, no changes are anticipated in industrial, commercial, and institutional areas.

## 4.11 Growth Capacity

The purpose of the proposed projects is to serve existing water system users. The water system improvements are not being installed for future growth of the distribution system.

## 4.12 Contamination

The Part 201 Sites and LUSTs locations is included in Map 3. If the proposed projects are near any listed contaminated site, soil borings taken during preliminary design will be tested. Contaminated soils will be removed and disposed of in accordance with all state and federal regulations.

# 5.0 Selected Alternative

## 5.1 Raw Water Supply

The selected alternatives for the WTP projects are as follows:

- LW-1 and PS-W2 Wellhouse Building and Mechanical Equipment Improvements
  - Alternative 2 – Optimum Performance of Existing Facilities
- PS-W1 Abandonment
  - Alternative 2 – Optimum Performance of Existing Facilities

### *5.1.1 Design Parameters*

#### 5.1.1.1 LW-1 and PS-W2 Wellhouse Building and Mechanical Equipment Improvements

The existing well pumps and process equipment will remain in service long-term, although they may be temporarily inoperable as part of construction activities at the Wellhouse. The Wellhouses will include masonry block walls, insulated with a brick veneer, as well as metal or shingled roofs. The HVAC equipment will include a unit heater and exhaust fan. The new flow meter for LW-1 will be of the magnetic type and an isolation valve will be added to PS-W2.

#### 5.1.1.2 PS-W1 Abandonment

The existing Wellhouse and process equipment will be demolished. The existing well will be abandoned according to regulatory requirements, and the raw water main will be cut, capped, and filled to prevent cross contamination.

### 5.1.2 Raw Water Supply Project Map

The Figure(s) associated with the selected alternatives is in Table 33.

Table 33 – Figure Associated with Raw Water Supply

| Raw Water Supply | Figure Number |
|---|---|
| Water Distribution System | 4 |

### 5.1.3 Schedule for Design and Construction

The Project Schedule for the Raw Water Supply projects, consistent with the quarterly DWSRF funding deadlines, is presented in Table 34.

Table 34 – Raw Water Supply Schedule

| | Estimated Milestone | |
|---|---|---|
| Task | LW-1, PS-W2 Wellhouse Building and Mechanical Equipment Improvements | PS-W1 Abandonment |
| EGLE Fiscal Year and Quarter Planned for Project | FY 2025, Quarter 2 | FY 2025, Quarter 2 |
| Final Design | November 2024 | November 2024 |
| Construction Permit | December 2024 | December 2025 |
| Bidding | December 2024 | December 2024 |
| Loan Closing | March 2025 | March 2025 |
| Notice to Proceed | April 2025 | April 2025 |
| Construction Phase | May 2025 | May 2025 |

### 5.1.4 Cost Estimate

Table 35 presents the estimated costs for Raw Water Supply projects. The proposed costs are in 2024 dollars.

Table 35 – Raw Water Supply Cost Estimates

| Project | Total Estimated Project Cost |
|---|---|
| LW-1, PS-W2 Wellhouse Building and Mechanical Equipment Improvements | $770,000 |
| PS-W1 Abandonment | $90,000 |
| **Total** | **$860,000** |

## 5.2 Water Treatment Plant

The selected alternatives for the WTP projects are as follows:

- Electrical Grounding and Equipment Improvements
  - Alternative 2 – Optimum Performance of Existing Facilities
- Storage Reservoir, High Service Pumping, and Transfer Pumping Improvements
  - Alternative 3 – Construction Alternative
- Chlorine Feed Improvements
  - Alternative 3 – Construction Alternative

### *5.2.1 Design Parameters*

#### 5.2.1.1 Electrical Grounding and Equipment Improvements

The selected alternative for the Electrical Grounding and Equipment Improvements includes the following components:

- A double-ended switchboard with two 3-pole, 600-amp main circuit breakers; 3-pole, 600-amp tie circuit breaker; and corresponding kirk-key interlocks to replace the existing. It is assumed the existing pole-mounted transformer banks will be reused along with the downstream distribution panels. The new switchboard should be service entrance rated, suitable for use on a 3-phase, 4-wire power distribution system, and include integral surge protection on each side.
- Replacing the pole-mounted, gang-operated primary switch on the south service.
- Replacing both banks of pole-mounted transformers and the associated conduit and wiring between the transformers and building. The new services will include grounded (neutral) and equipment grounding conductors. It is assumed that the existing double-ended switchboard will be replaced separately.
- Modifying the grounding electrode system to include driven electrodes at the pole-mounted primary switches, pole-mounted transformers, and building along with connections to WTP water service and effectively grounded building steel.
- Modifying feeder and branch circuits (greater than 100-amps) to include appropriately sized equipment grounding conductors.
- Adding surge protective devices to Panels MDP, MDP-R, and MDP-L.

#### 5.2.1.2 Storage Reservoir, High Service Pumping, and Transfer Pumping Improvements

The selected alternative for the Storage Reservoir, High Service Pumping, and Transfer Pumping Improvements includes the following components:

- Construction of two 0.75 MG prestressed concrete ground storage reservoirs and a valve vault connecting the two.
- Construction of a new combined high service/transfer pumping station on the WTP site, including all necessary process equipment, power distribution equipment, mechanical equipment, and controls and instrumentation. The firm capacity of the transfer and the high service pumps is estimated to be 6.0 mgd. The number and type of pumps will be finalized during design phase.
- Abandonment of the existing underground storage reservoir.

#### 5.2.1.3 Chlorine Feed Improvements

The selected alternative for the Chlorine Feed Improvements includes the following components:

- Construction of a new onsite generation building on the WTP site with necessary electrical and mechanical support systems.
- The onsite generation building will house sodium hypochlorite generation systems, hypochlorite storage and a brine tanks.

### 5.2.2 Water Treatment Plant Improvements Project Map

The Figure(s) associated with the selected alternatives is in Table 36.

Table 36 – Figures Associated with Water Treatment Plant Improvements

| WTP Improvements | Figure Number |
|---|---|
| Proposed WTP Flow Schematic | 6 |
| Proposed Chlorine Feed Flow Schematic | 7 |

### 5.2.3 Schedule for Design and Construction

The project schedule, consistent with the quarterly DWSRF funding deadlines, is presented in Table 37 for the WTP projects.

Table 37 – Water Treatment Plant Project Schedule

| | Estimated Milestone | | |
|---|---|---|---|
| Task | Electrical Grounding, Equipment Improvements | Storage Reservoir, High Service Pumping, Transfer Pumping Improvements | Chlorine Feed Improvements |
| EGLE Fiscal Year and Quarter Planned for Project | FY 2025, Quarter 2 | FY 2028, Quarter 2 | FY 2028, Quarter 2 |
| Final Design and EGLE Submission | November 2024 | November 2027 | November 2027 |
| Construction Permit | December 2024 | December 2027 | December 2027 |
| Bidding | December 2024 | December 2027 | December 2027 |
| Loan Closing | March 2025 | March 2028 | March 2028 |
| Notice to Proceed | April 2025 | April 2028 | April 2028 |
| Construction Phase | May 2025 | May 2028 | May 2028 |

### 5.2.4 Cost Estimate

Table 38 presents the estimated project costs for the WTP projects. The proposed costs are in 2024 dollars.

Table 38 – Water Treatment Plant Cost Estimates

| Project | Total Estimated Project Cost |
|---|---|
| Electrical Grounding and Equipment Improvements | $1,540,000 |
| Storage Reservoir, High Service Pumping, and Transfer Pumping Improvements | $17,620,000 |
| Chlorine Feed Improvements | $1,490,000 |
| **Total** | **$20,650,000** |

## 5.3 Distribution System

The selected alternatives for the Distribution System projects are as follows:

- Transmission Main and River Crossing Improvements
  - Alternative 3 – Construction Alternative
- Water Main Improvements
  - Alternative 3 – Construction Alternative
- Booster Station Improvements
  - Alternative 2 – Optimum Performance of Existing Facilities
- LSLR
  - Alternative 3 – Construction Alternative

### *5.3.1 Design Parameters*

The selected Transmission Main and River Crossing Improvements alternative includes replacing approximately 21,620 lineal feet of mains. Five river crossings will be replaced.

The selected Water Main Improvements alternative includes replacing approximately 63,340 lineal feet of existing aged and undersized mains water mains. The project includes dead end looping and replacement of any associated services.

The selected Booster Station Improvements includes the following components:

- Demolition of existing booster pumps and process piping/equipment.
- Installation of two new VFD controlled booster pumps, one duty and one standby.
- Installation of a generator and automatic switchgear to provide standby power to the Booster Station.
- Installation of a new altitude valve with flow throttling capability.
- New mechanical/HVAC equipment.

The non-compliant lead water service lines will be replaced in its entirety. This alternative will remove lead from the water system and comply with the Safe Drinking Water Act.

### *5.3.2 Project Map*

The list of Figures associated with the selected alternatives is summarized in Table 39.

Table 39 – Summary of Figures Associated with Distribution System

| Distribution System Improvements | Figure Number |
|---|---|
| Transmission Main and River Crossing Improvements | 8, 9 &10 |
| Water Main Improvements | 11 |
| Proposed Booster Station Flow Schematic | 12 |

### *5.3.3 Schedule for Design and Construction*

The project schedule, consistent with the quarterly DWSRF funding deadlines, is presented in Tables 40-45 for the Distribution System projects.

Table 40 – Transmission Main and River Crossing Improvements Schedule

| Task | Estimated Milestone | | | |
|---|---|---|---|---|
| | Transmission Main, River Crossing Improvements (FY2026) | Transmission Main, River Crossing Improvements (FY2027) | Transmission Main, River Crossing Improvements (FY2028) | Transmission Main, River Crossing Improvements (FY2029) |
| EGLE Fiscal Year and Quarter Planned for Project | FY 2026, Quarter 2 | FY 2027, Quarter 2 | FY 2028, Quarter 2 | FY 2029, Quarter 2 |
| Final Design and EGLE Submission | December 2025 | December 2026 | December 2027 | December 2028 |
| Construction Permit | December 2025 | December 2026 | December 2027 | December 2028 |
| Bidding | December 2025 | December 2025 | December 2027 | December 2027 |
| Loan Closing | March 2026 | March 2027 | March 2028 | March 2029 |
| Notice to Proceed | April 2026 | April 2027 | April 2028 | April 2029 |
| Construction Phase | May 2026 | May 2027 | May 2028 | May 2029 |

Table 41 – Water Main Improvements Schedule

| Task | Estimated Milestone | | |
|---|---|---|---|
| | Water Main Improvements (FY2025) | Water Main Improvements (FY2026) | Water Main Improvements (FY2027) |
| EGLE Fiscal Year and Quarter Planned for Project | FY 2025, Quarter 2 | FY 2026, Quarter 2 | FY 2027, Quarter 2 |
| Final Design | November 2024 | November 2025 | November 2026 |
| Construction Permit | December 2024 | December 2025 | December 2026 |
| Bidding | December 2024 | December 2025 | December 2026 |
| Loan Closing | March 2025 | March 2026 | March 2027 |
| Notice to Proceed | April 2025 | April 2026 | April 2027 |
| Construction Phase | May 2025 | May 2026 | May 2027 |

Table 42 – Water Main Improvements Schedule (continued)

| Task | Estimated Milestone | |
|---|---|---|
| | Water Main improvements (FY2028) | Water Main improvements (FY2029) |
| EGLE Fiscal Year and Quarter Planned for Project | FY 2028, Quarter 2 | FY 2029, Quarter 2 |
| Final Design | November 2027 | November 2028 |
| Construction Permit | December 2027 | December 2028 |
| Bidding | December 2027 | December 2028 |
| Loan Closing | March 2028 | March 2029 |
| Notice to Proceed | April 2028 | April 2029 |
| Construction Phase | May 2028 | May 2029 |

Table 43 – Booster Station Improvements Schedule

| Task | Estimated Milestone |
|---|---|
| EGLE Fiscal Year and Quarter Planned for Project | FY 2026, Quarter 2 |
| Final Design | November 2025 |
| Construction Permit | December 2025 |
| Bidding | December 2025 |
| Loan Closing | March 2026 |
| Notice to Proceed | April 2026 |
| Construction Phase | May 2026 |

Table 44 – LSLR Schedule

| Task | Estimated Milestone | | |
|---|---|---|---|
| | LSLR (FY2025) | LSLR (FY2026) | LSLR (FY2027) |
| EGLE Fiscal Year and Quarter Planned for Project | FY 2025 Quarter 2 | FY 2026 Quarter 2 | FY 2027 Quarter 2 |
| Final Design | November 2024 | November 2025 | November 2026 |
| Construction Permit | December 2024 | December 2024 | December 2026 |
| Bidding | December 2024 | December 2024 | December 2026 |
| Loan Closing | March 2025 | March 2026 | March 2027 |
| Notice to Proceed | April 2025 | April 2026 | April 2027 |
| Construction Phase | May 2025 | May 2026 | May 2027 |

Table 45 – LSLR Schedule (Continued)

| Task | Estimated Milestone | |
|---|---|---|
| | LSLR (FY2028) | LSLR (FY2029) |
| EGLE Fiscal Year and Quarter Planned for Project | FY 2028 Quarter 2 | FY 2029 Quarter 2 |
| Final Design | November 2027 | November 2028 |
| Construction Permit | December 2027 | December 2028 |
| Bidding | December 2027 | December 2028 |
| Loan Closing | March 2028 | March 2029 |
| Notice to Proceed | April 2028 | April 2029 |
| Construction Phase | May 2028 | May 2029 |

### *5.3.4 Cost Estimate*

Table 46 presents the estimated project costs for the Distribution System projects. The proposed costs are in 2024 dollars.

Table 46 – Distribution System Cost Estimates

| Project | Total Estimated Project Cost |
|---|---|
| Transmission Main and River Crossing Improvements (FY2026) | $6,140,000 |
| Transmission Main and River Crossing Improvements (FY2027) | $3,990,000 |
| Transmission Main and River Crossing Improvements (FY2028) | $3,930,000 |
| Transmission Main and River Crossing Improvements (FY2029) | $4,330,000 |
| Water Main Improvements (FY2025) | $8,320,000 |
| Water Main Improvements (FY2026) | $4,790,000 |
| Water Main Improvements (FY2027) | $9,930,000 |
| Water Main Improvements (FY2028) | $5,470,000 |
| Water Main Improvements (FY2029) | $7,370,000 |
| Booster Station Improvements | $1,240,000 |
| LSLR (FY2025) | $900,000 |
| LSLR (FY2026) | $900,000 |
| LSLR (FY2027) | $900,000 |
| LSLR (FY2028) | $900,000 |
| LSLR (FY2029) | $900,000 |
| Total | $60,010,000 |

## 5.4 Summary of Project Schedule and Estimated Costs

A summary of the DWSRF projects grouped by fiscal year is provided below. The total estimated costs of the grouped projects for each fiscal year are provided in Table 47.

Table 47 – Summary of DWSRF Projects and Total Estimated Costs by Fiscal Year

| Year | EGLE Fiscal Year and Quarter | Project Description | Total Estimated Project Costs |
|---|---|---|---|
| Year 1 | FY 2025 Quarter2 | • LW-1 and PS-W2 Wellhouse Building and Mechanical Equipment Improvements<br>• PS-W1 Abandonment<br>• Electrical Grounding and Equipment Improvements<br>• Water Main Improvements (FY2025)<br>• LSLR (FY2025) | $11,620,000 |
| Year 2 | FY 2026 Quarter 2 | • Transmission Main and River Crossing Improvements (FY2026)<br>• Water Main Improvements (FY2026)<br>• Booster Station Improvements<br>• LSLR (FY2026) | $13,070,000 |
| Year 3 | FY 2027 Quarter 2 | • Transmission Main and River Crossing Improvements (FY2027)<br>• Water Main Improvements (FY2027)<br>• LSLR (FY2027) | $14,820,000 |
| Year 4 | FY 2028 Quarter 2 | • Storage Reservoir, High Service Pumping, and Transfer Pumping Improvements<br>• Chlorine Feed Improvements<br>• Transmission Main and River Crossing Improvements (FY2028)<br>• Water Main Improvements (FY2028)<br>• LSLR (FY2028) | $29,410,000 |
| Year 5 | FY 2029 Quarter 2 | • Transmission Main and River Crossing Improvements (FY2029)<br>• Water Main Improvements (FY2029)<br>• LSLR (FY2029) | $12,600,000 |
| **Total** | | | **$81,520,000** |

## 5.5 User Costs

The cost of each project in this DWSRF Project Planning Document is allocated to the system users. EGLE guidance requires that eligible loan amounts be presented as an equivalent water system rate increase. Cost saving measures will be explored throughout the design process. The proposed improvements are necessary to continue to provide reliable water service to customers.

Table 48 presents the annual average increase for debt retirement at an interest rate of 3.0 % over 20 years for the proposed projects in fiscal years 2025-2029. The user rate increase is also included in the table below.

Table 48 – Estimated User Rate Increase

| Year | Eligible Amount | Anticipated Annual Debt | User Rate Increase |
|---|---|---|---|
| 2025 | $11,620,000 | $781,047 | $18.28 |
| 2026 | $13,070,000 | $878,509 | $20.44 |
| 2027 | $14,820,000 | $996,137 | $23.16 |
| 2028 | $29,410,000 | $1,976,814 | $42.78 |
| 2029 | $12,600,000 | $846,918 | $17.53 |

## 5.6 Overburdened Community

Communities can be classified as "overburdened" or "significantly overburdened" based on the cost of the projects and the median annual household income (MAHI) of the community. An Overburdened Community Status Determination Worksheet will be submitted to EGLE. Preliminary evaluation indicates that the City meets the Overburdened Community qualifications.

## 5.7 Ability to Implement the Selected Alternatives

The City owns and operates the water supply and distribution system and has direct authority to implement the improvements mentioned in this Project Planning Document. The proposed projects for LSLs and water main replacement will occur within the City limits and require no consent from adjacent municipalities; they are not connected to the City's water system.

# 6.0 Environmental Evaluation

## 6.1 Historical/Archeological/Tribal Resources

Appendix 4 includes a list of all historic sites within Shiawassee County. The proposed water system improvements will have no direct impacts on historical, archeological, or tribal resources. In most cases the projects will occur and be limited to existing sites where there has been previous ground disturbance. Construction sites will be restored to their original condition following all construction activities.

The Michigan State Historical Preservation Office (SHPO) and the Tribal Historic Preservation Officers (THPO) will be contacted, and reviews completed if the proposed improvements are deemed equivalency projects.

## 6.2 Water Quality

The project alternative selected will not have any negative impacts on surface water or groundwater quality in the City. Soil erosion and sedimentation control measures will be utilized to contain soils within construction areas. As discussed, water system improvements projects included in this planning document are for meeting compliance with SDWA, improving water quality and increasing system reliability.

## 6.3 Land/Water Interface

Map 4 depicts the location of wetlands and surface water in the immediate area of the City. The proposed projects will have no negative impacts on these bodies of water, as no construction work is anticipated within the water boundaries. The raw water supply, WTP and distribution system improvement projects will have no effect on natural land and water features as construction will be contained within the existing facilities and road ROWs. The necessary permits and coordination for river crossing project will be obtained. There is no change in ground elevation anticipated in the flood plains. The FEMA flood map is included in Map 5. Soil erosion and sedimentation control measures will be instituted in accordance with Shiawassee County requirements. The soils map is included in Map 6.

## 6.4 Endangered Species

Endangered or threatened species are defined as those species that are or could become endangered or threatened; they are protected under the Endangered Species Act. The objective of the Act is to preserve and restore species threatened with extinction. The U. S. Fish and Wildlife Services (USFWS) Environmental Conservation Online System was used to identify endangered and threatened species by state. A list of endangered and threatened species in Shiawassee County was obtained from the Michigan Natural Features Inventory (MNFI) and provided in Appendix 5. A list of the Threatened and Endangered species for Shiawassee County is provided in Table 49.

**Table 49 – Shiawassee County Federal Endangered/Threatened Species List**

| Scientific Name | Common Name | Status |
|---|---|---|
| Alasmidonta viridis | Slippershell | *Threatened* |
| Baptisia lactea | White or prairie false indigo | *Threatened* |
| Calephelis muticum | Swam metalmark | *Endangered* |
| Clemmys guttata | Spotted turtle | *Threatened* |
| Dennstaedtia punctilobula | Hay-scented fern | *Endangered* |
| Galearis spectabilis | Showy orchis | *Threatened* |
| Juncus vaseyi | Vasey's rush | Threatened |
| Notropis anogenus | Pugnose shiner | Endangered |
| *Plantago cordata* | Heart-leaved plantain | *Endangered* |
| *Sistrurus catenatus* | Eastern massasauga | *Threatened* |
| *Trillium nivale* | Snow trillium | *Threatened* |

The proposed projects will occur in urban areas where no significant wildlife habitat is present. No tree removal is anticipated. Construction or operation activities for the proposed water system projects are not anticipated to have long term negative impacts.

## 6.5 Agricultural Land

There is no agricultural land present within the City. The proposed projects will have no impact on nearby agricultural land.

## 6.6 Social/Economic Impact

The replacement of lead services within the distribution system will result in direct cultural and social benefits. Public health and safety will benefit from the proposed project by meeting the compliance set forth by the Safe Drinking Water Act.

## 6.7 Construction/Operational Impact

There are two types of proposed projects, each with different construction impacts. The water main replacements will likely involve demolition of roadways and rerouting traffic to allow for the work to be completed. The LSLRs will involve work behind the curb or ROW lines. Though streets and properties have trees present, no tree removal is anticipated. All grass parkways will be restored in kind. No adverse impacts on major street traffic patterns are anticipated.

Construction for projects of this type is generally limited to the hours 7 a.m. to 7 p.m., Monday through Saturday. Vehicular and pedestrian access to all properties will be maintained throughout construction.

## 6.8 Indirect Impacts

### *6.8.1 Changes in Development*

The proposed distribution system improvement projects will not facilitate any new areas of development within the City, because they involve replacing existing pipes and infrastructure components and do not result in water service to new areas.

The proposed LSLR project will not facilitate any new areas of development.

### *6.8.2 Changes in Land Use*

The proposed projects will not have an impact on existing or future land use.

### *6.8.3 Changes in Air or Water Quality*

The proposed projects will not impact air or water quality.

### *6.8.4 Changes to Natural Setting or Sensitive Ecosystems*

The proposed projects will not have an impact on the natural setting or the sensitive ecosystems.

### *6.8.5 Changes to Aesthetic Aspects of the Community*

The proposed projects will have an indirect effect of providing a more reliable and safe water system in compliance with the Safe Drinking Water Act.

### *6.8.6 Resource Consumption*

Resource consumption in the form of building materials, new water main, and service line materials will occur for the proposed project.

# 7.0 Mitigation Measures

## 7.1 Mitigation Measures for Short Term Impact

Measures that will be taken to avoid, eliminate, or mitigate potential short-term environmental impacts include the following:

- Traffic: Use of designated traffic routes for construction traffic, as well as flagmen, warning signs, barricades, and cones.
- Air emissions: Use of calcium chloride or water for dust control and proper maintenance on heavy equipment to reduce exhaust emissions.
- Noise control: Use designated daytime work hours, use mufflers on all equipment, and minimize work on weekends and/or holidays.
- Soil erosion and sedimentation control (SESC): Appropriate measures such as use of riprap, hay bales, erosion control fence, silt fence, etc.
- Restoration: Use topsoil, seed, sod, mulch, gravel, and pavement. Vegetation that is removed as a part of the construction will be replaced. All areas will be restored to their existing grade.

## 7.2 Mitigation Measures for Long Term Impact

Every effort will be made to prevent long-term or irreversible impacts because of the project. The selected alternative has been evaluated to determine any potential of long-term impacts.

Measures that will be taken to avoid, eliminate, or mitigate potential long-term environmental impacts include the preparation and implementation of a SESC Plan. The SESC Plan for the construction of the selected alternative will be filed with the local SESC Agency. The plan will also be reviewed by the EGLE Land and Water Management Division. The plan will summarize the quantity of soils that will be excavated, locations where soil will be stored, the destination of soils (onsite or offsite), and measures that will be taken (silt fence, sod, etc.) to minimize erosion.

# 8.0 Public Participation

## 8.1 Public Meeting Advertisement

The formal public meeting regarding the DWSRF Project Planning Document will be advertised on the City's website (http://www.ci.owosso.mi.us) and on the City's social media pages on May 8, 2024. The advertisement will list the public meeting date, include a link to the Project Planning Document for viewing, and briefly describe the proposed projects, impacts, and estimated costs.

The EGLE Project Manager will be provided with a link to the notice. A screenshot of the public meeting advertisement and the EGLE Project Manager's approval will be included with the final Project Planning Document.

## 8.2 Formal Public Meeting

A public meeting will be held at the regularly scheduled City Council meeting on May 20, 2024. Representatives from Fishbeck will be in attendance to explain the projects to the Council members and the public.

The following information will be provided during the public meeting:

- A description of the project needs and problems to be addressed by the proposed projects and the principal alternatives that were considered.
- A description of the selected alternatives, including capital costs.
- A description of project financing and anticipated costs to users, including the proposed method of project financing and the proposed annual charge to the typical residential customer.
- A description of the anticipated social and environmental impacts associated with the selected alternatives and the measures that will be taken to mitigate adverse impacts.

The public meeting minutes and a PDF of the presentation will be included with the final Project Planning Document.

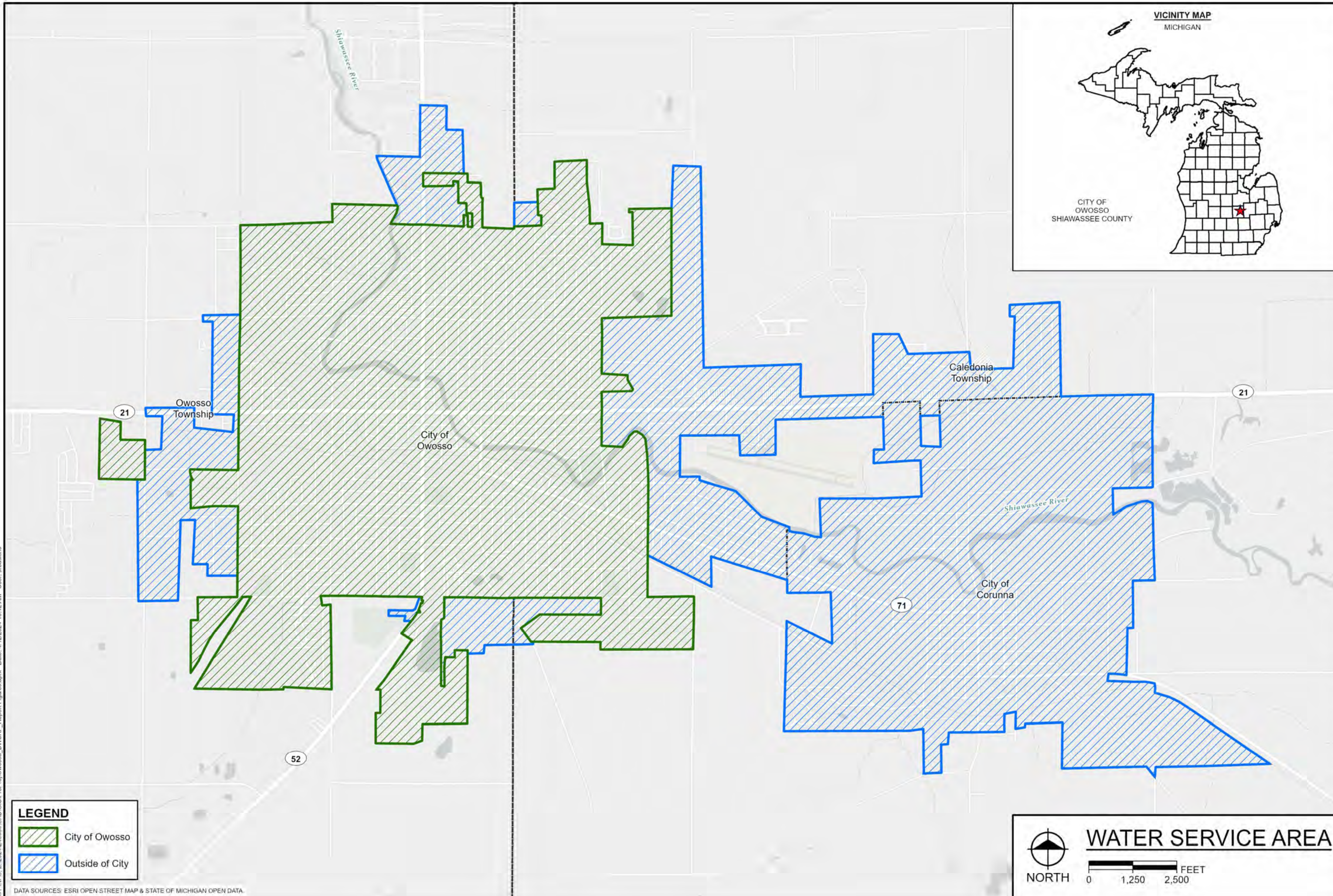
## 8.3 Comments Received and Answered

Comments received during the public comment period and responses provided will be included in final Project Planning Document.

## 8.4 Adoption of the Planning Document

A resolution to formally adopt the plan and implement the selected alternatives will be included in the final Project Planning Document.

# Figures




fishbeck
Engineers | Architects | Scientists | Constructors

Hard copy is intended to be 11"x17" when plotted. Scale(s) indicated and graphic quality may not be accurate for any other size.

**City of Owosso**
Shiawassee County, Michigan
**Drinking Water State Revolving Fund (DWSRF) Project Plan**

PROJECT NO.
240369

FIGURE NO.
1


NORTH

## EXISTING WATER TREATMENT PLANT SITE PLAN

NO SCALE

fishbeck
Engineers | Architects | Scientists | Constructors

**City of Owosso**
Shiawassee County, Michigan

Drinking Water State Revolving Fund (DWSRF) Project Plan

REVISIONS

NOT FOR CONSTRUCTION

| | |
|---|---|
| Drawn By | ZAG |
| Designer | ZAG |
| Reviewer | TDM |
| Manager | BWV |

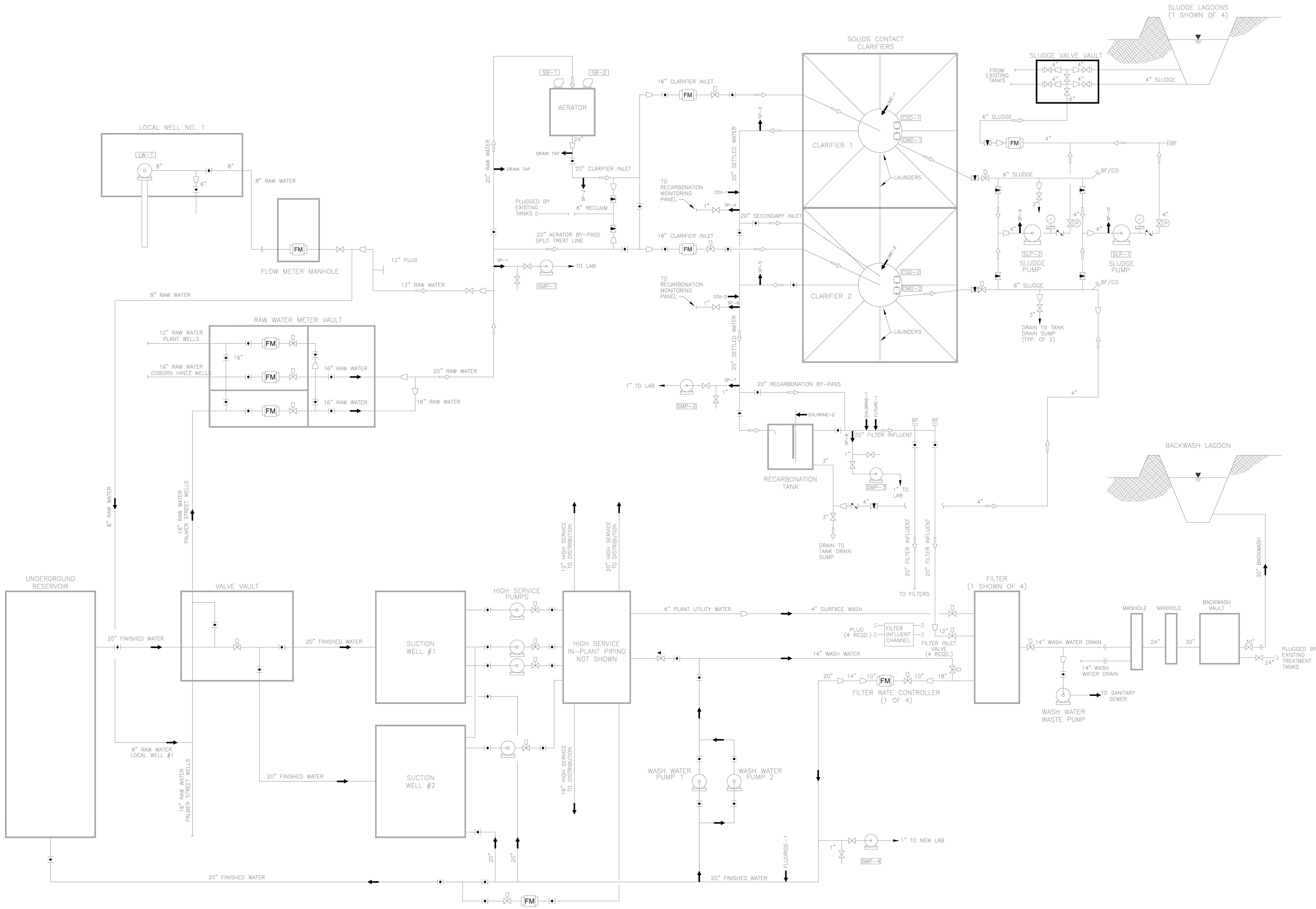
Hard copy is intended to be 24"x36" when plotted. Scale(s) indicated and graphic quality may not be accurate for any other size.

PROJECT NO.
240369

FIGURE NO.
**2**



PLOT INFO: Z:\2024\240369\CAD_FIGURES\SRF REPORT FIGURES.DWG LAYOUT: FIGURE 2 - EXISTING WATER TREATMENT PLANT SITE PLAN DATE: 4/11/2024 TIME: 10:37:26 AM USER: ZGOGULSKI




# EXISTING WATER TREATMENT PLANT FLOW SCHEMATIC

NO SCALE

fishbeck
Engineers | Architects | Scientists | Constructors

**City of Owosso**
Shiawassee County, Michigan
Drinking Water State Revolving Fund (DWSRF) Project Plan

REVISIONS

NOT FOR CONSTRUCTION

| | |
|---|---|
| Drawn By | ZAG |
| Designer | ZAG |
| Reviewer | TDM |
| Manager | BWV |

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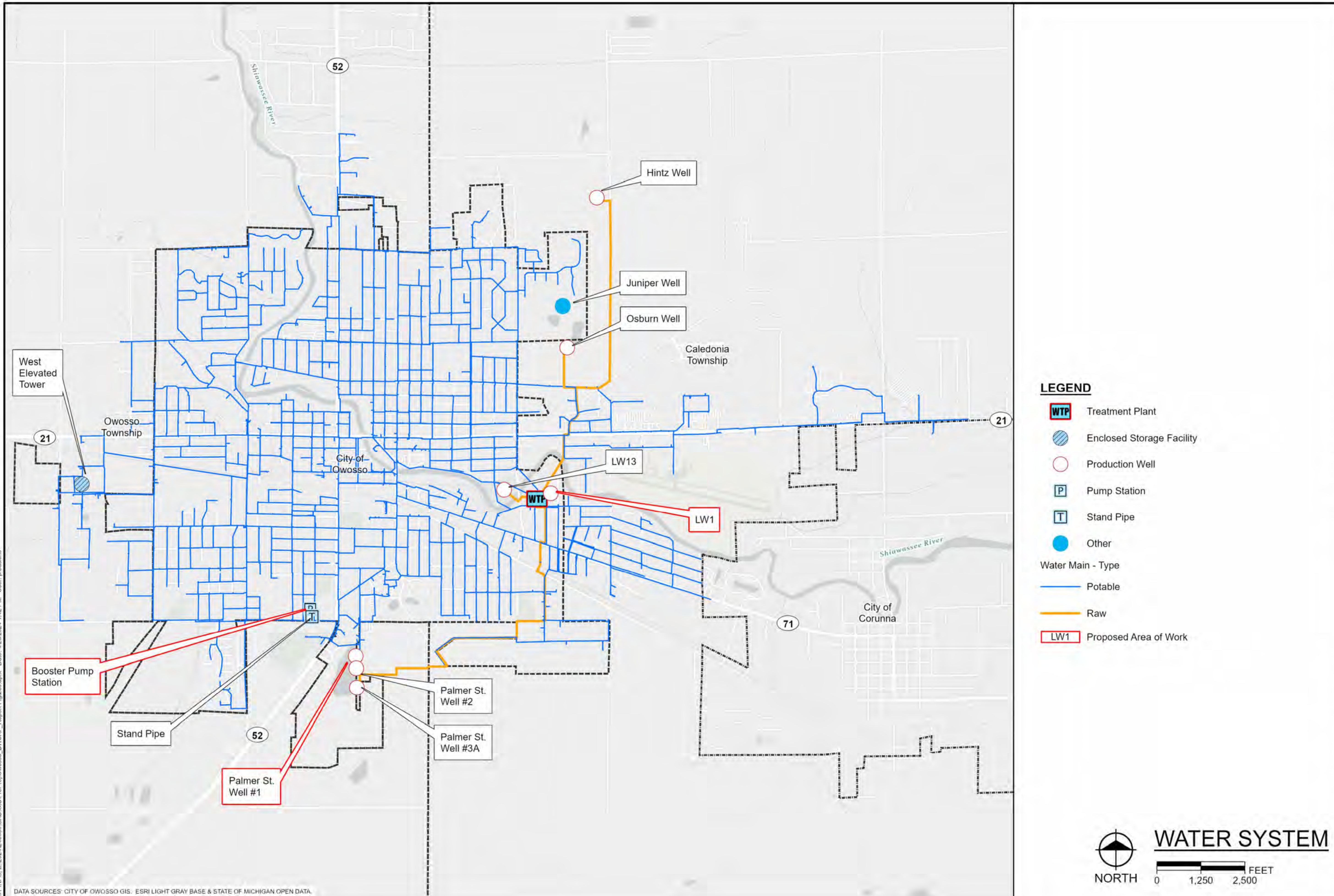
PROJECT NO.
240369

FIGURE NO.
3



PLOT INFO: Z:\2024\240369\CAD_FIGURES\SRF REPORT FIGURES.DWG LAYOUT: FIGURE 3 - EXISTING WATER TREATMENT PLANT FLOW SCHEMATIC DATE: 4/11/2024 TIME: 4:12:48 PM USER: ZGOGULSKI




# WATER SYSTEM

fishbeck
Engineers | Architects | Scientists | Constructors

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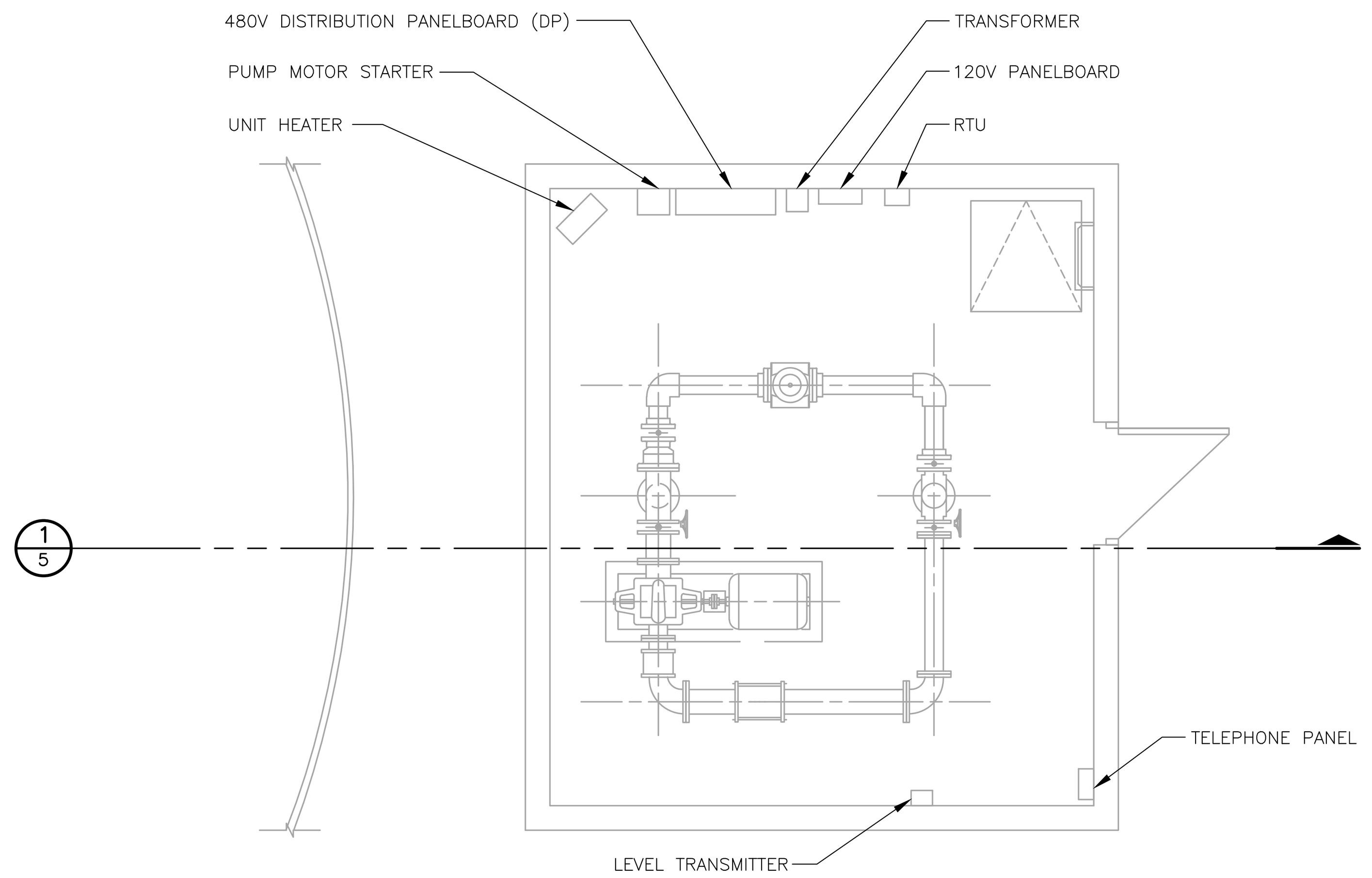
**City of Owosso**
Shiawassee County, Michigan
**Drinking Water State Revolving Fund (DWSRF) Project Plan**

PROJECT NO.
240369

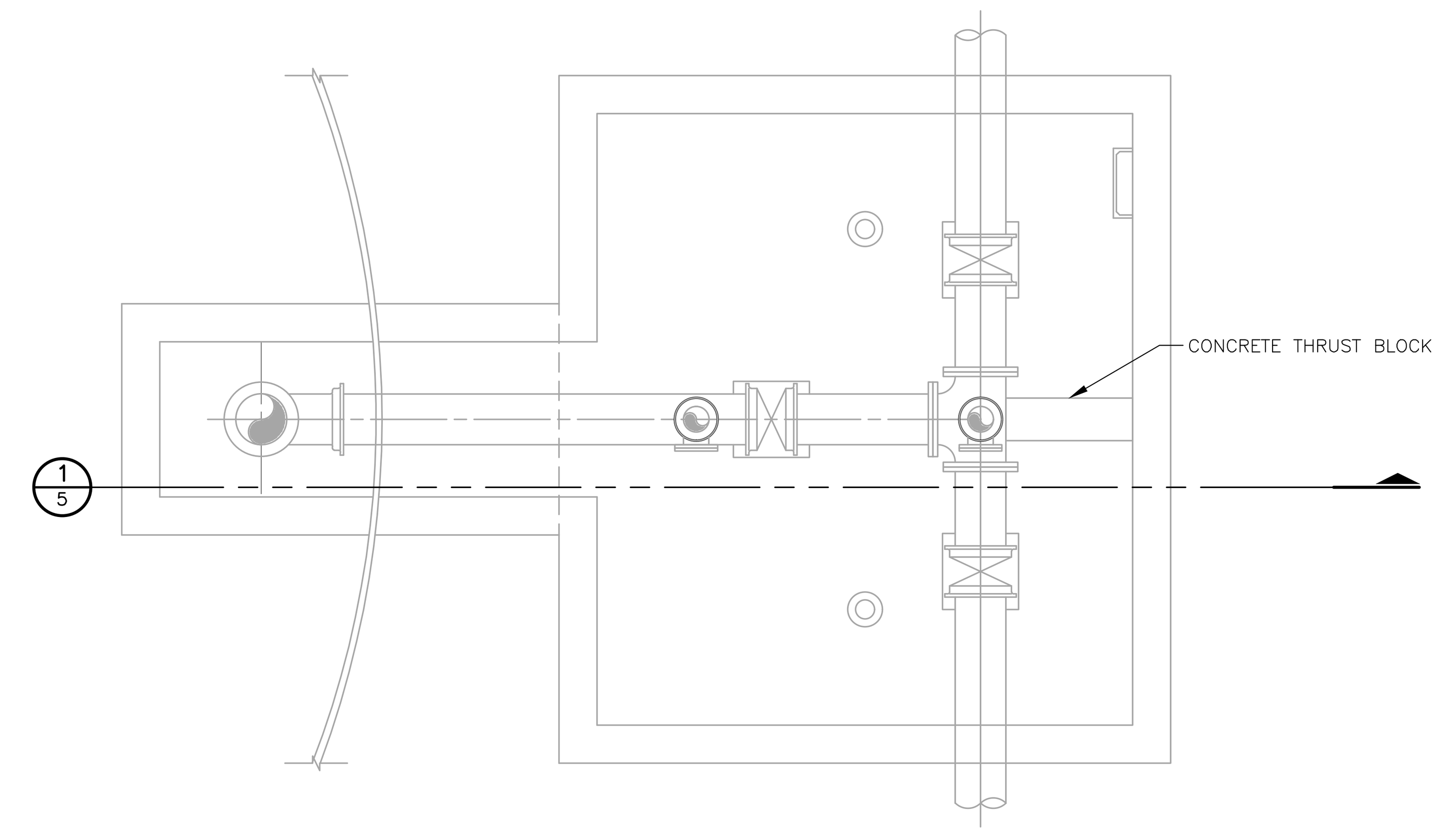
FIGURE NO.
4




NORTH

## UPPER LEVEL PLAN

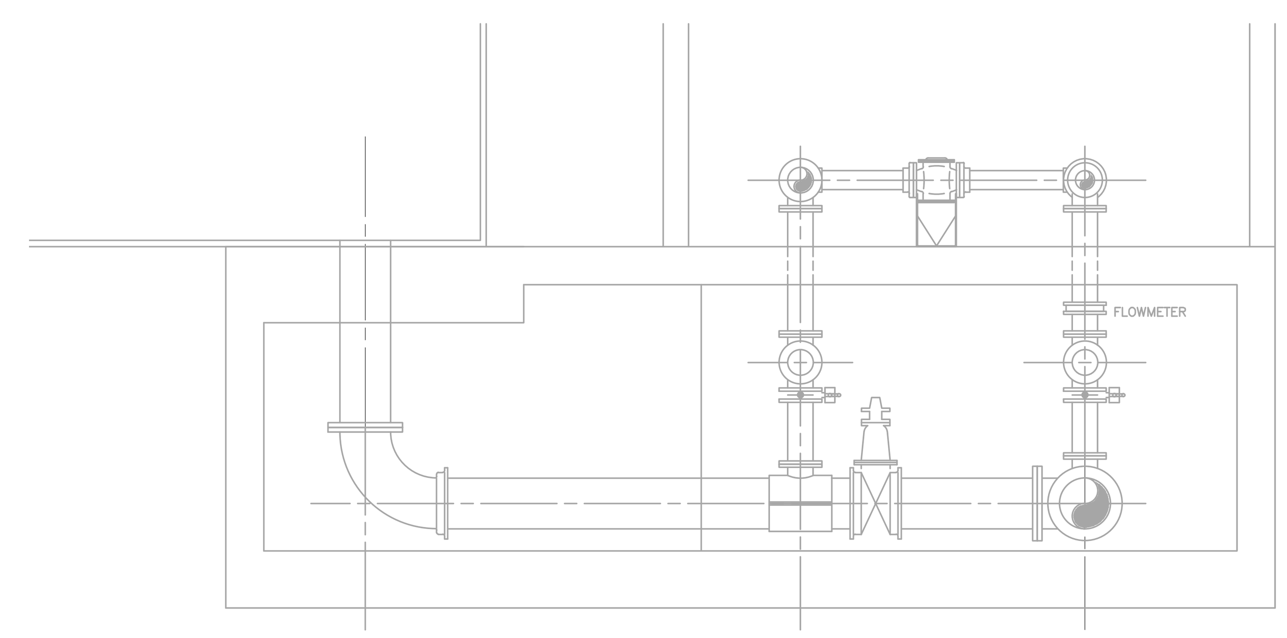
SCALE: 1/4" = 1'-0"




NORTH

## LOWER LEVEL PLAN

SCALE: 1/4" = 1'-0"




1

## SECTION

NO SCALE

# EXISTING BOOSTER STATION LAYOUT

NO SCALE

fishbeck
Engineers | Architects | Scientists | Constructors

**City of Owosso**
Shiawassee County, Michigan

Drinking Water State Revolving Fund (DWSRF) Project Plan

REVISIONS

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| | |
|---|---|
| Drawn By | ZAG |
| Designer | ZAG |
| Reviewer | TDM |
| Manager | BWV |

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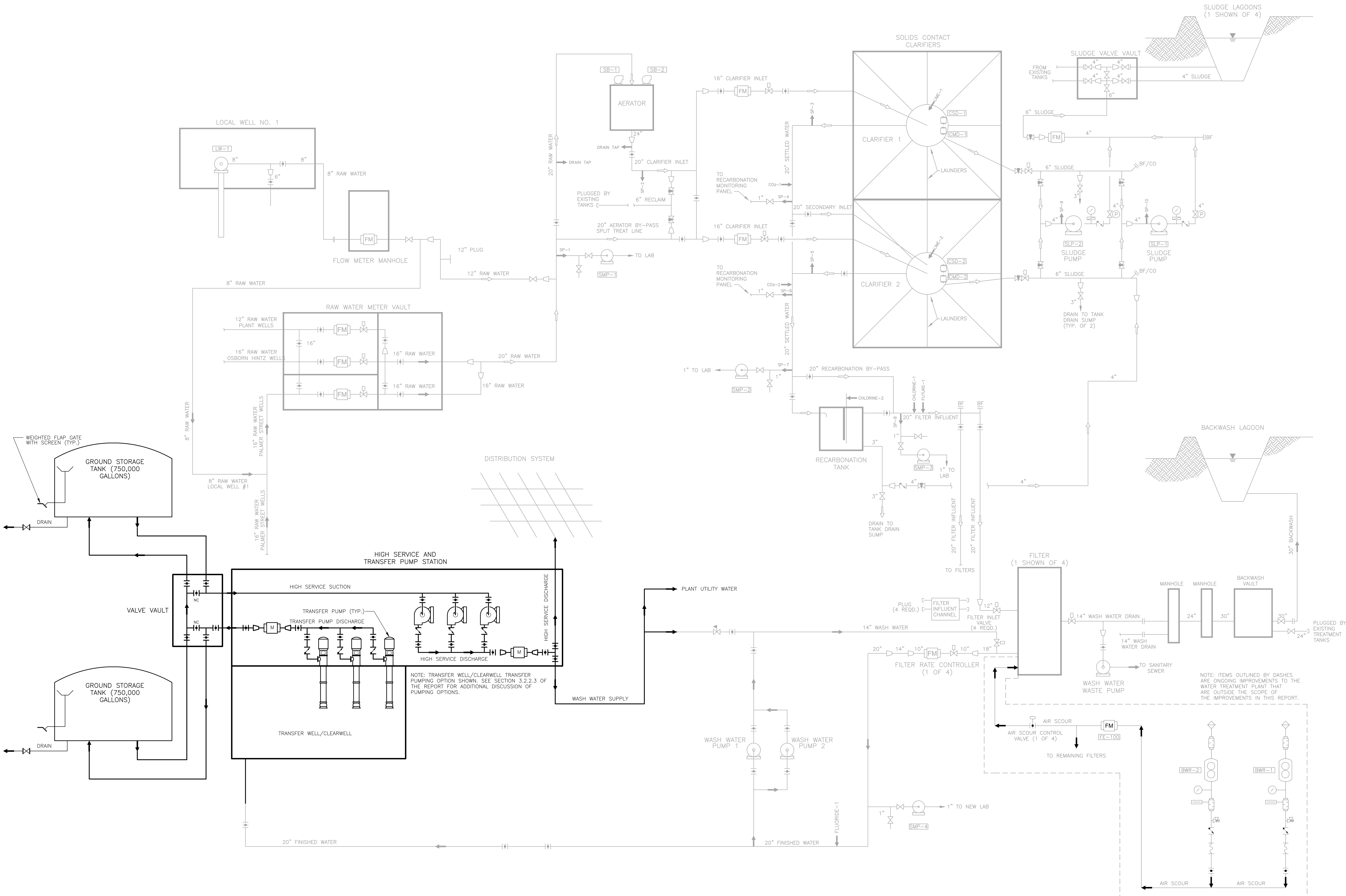
PROJECT NO.
240369

FIGURE NO.
**5**



PLOT INFO: Z:\2024\240369\CAD_FIGURES\SRF REPORT FIGURES.DWG LAYOUT: FIGURE 5 - EXISTING BOOSTER STATION LAYOUT DATE: 4/26/2024 TIME: 9:35:38 AM USER: ZGOGULSKI




# PROPOSED WATER TREATMENT PLANT FLOW SCHEMATIC

NO SCALE

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**City of Owosso**
Shiawassee County, Michigan

Drinking Water State Revolving Fund (DWSRF) Project Plan

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|---|---|
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| Designer | ZAG |
| Reviewer | TDM |
| Manager | BWV |

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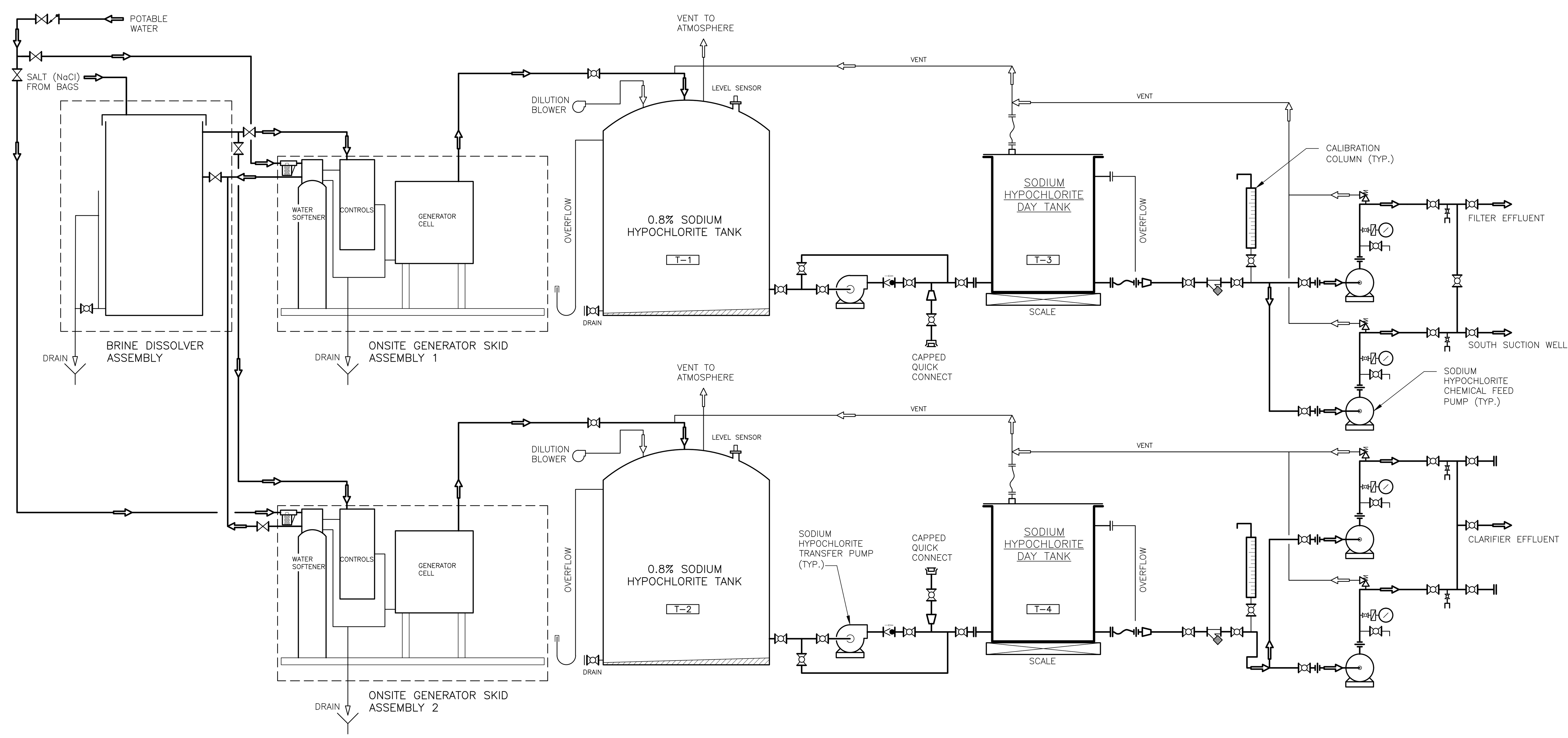
PROJECT NO.
240369

FIGURE NO.
6




## PROPOSED CHLORINE FEED FLOW SCHEMATIC

NO SCALE

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**City of Owosso**

Shiawassee County, Michigan

Drinking Water State Revolving Fund (DWSRF) Project Plan

REVISIONS

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| Designer | ZAG |
| Reviewer | TDM |
| Manager | BWV |

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PROJECT NO.

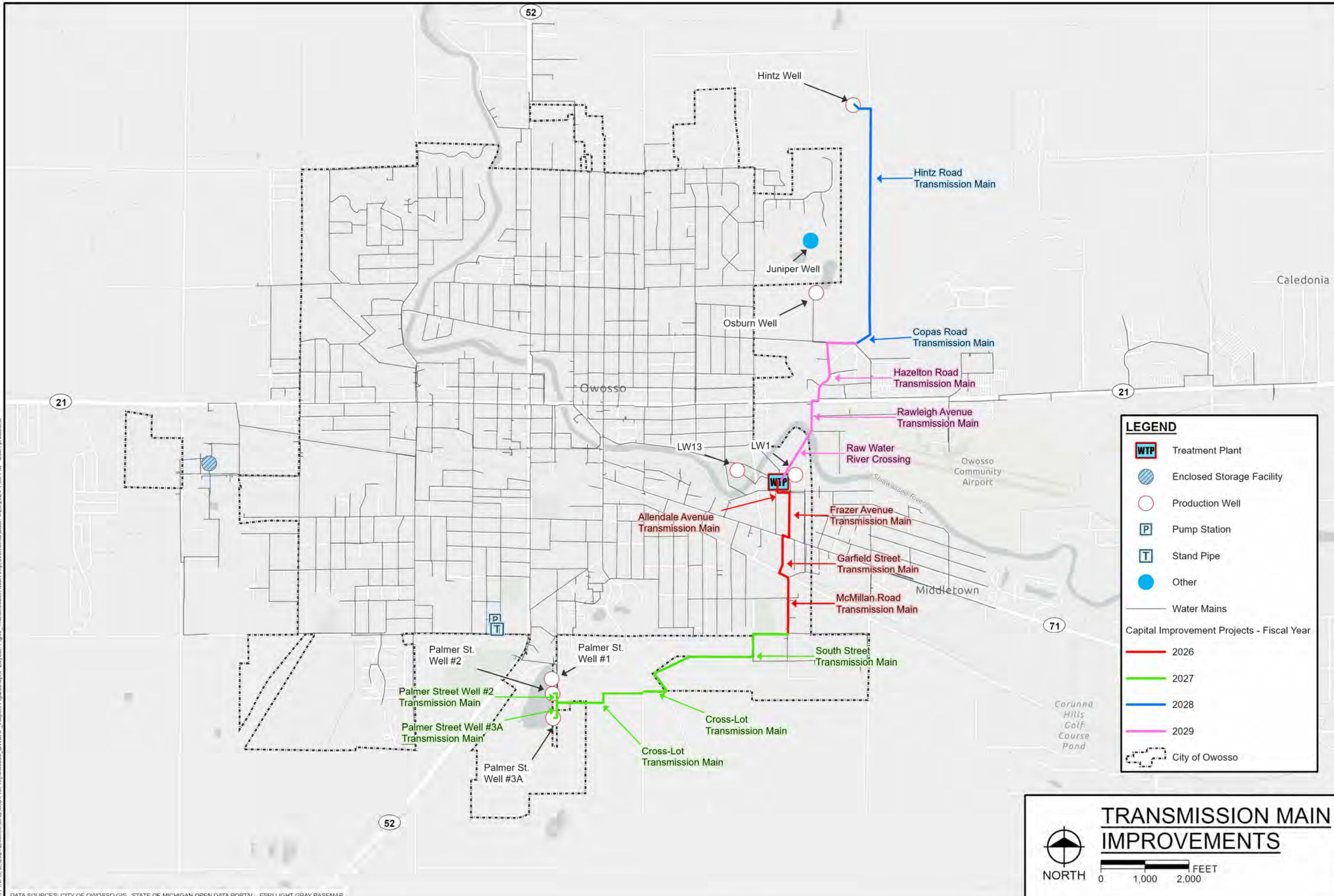
240369

FIGURE NO.

7



PLOT INFO: Z:\2024\240369\CAD_FIGURES\SRF REPORT FIGURES.DWG LAYOUT: FIGURE 7 - PROPOSED CHLORINE FEED FLOW SCHEMATIC DATE: 4/11/2024 TIME: 1:08:29 PM USER: ZGOGULSKI




# TRANSMISSION MAIN IMPROVEMENTS

DATA SOURCES: CITY OF OWOSSO GIS; STATE OF MICHIGAN OPEN DATA PORTAL; ESRI LIGHT GRAY BASEMAP.

fishbeck
Engineers | Architects | Scientists | Constructors

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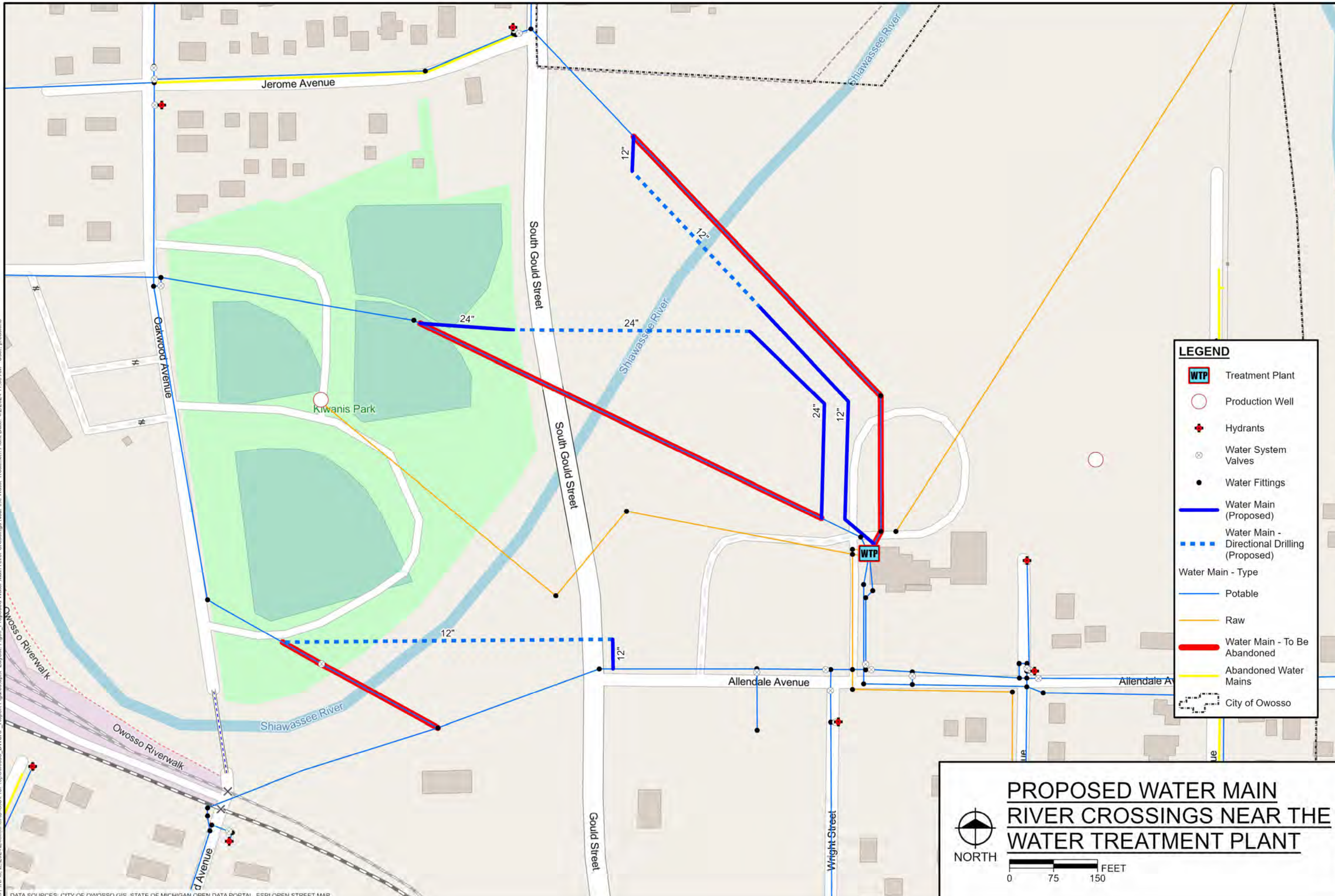
**City of Owosso**
Shiawassee County, Michigan

**Drinking Water State Revolving Fund (DWSRF) Project Plan**

PROJECT NO.
240369

FIGURE NO.
8

PLOT INFO: Z:\2024\240369\CAD\GIS\Pro\Proj\Owosso_DWSRF_Report Figures.aprx Layout: Fig08_Transmission Main Improvements Date: 4/23/2024 1:56 PM User: prhaskins




# PROPOSED WATER MAIN RIVER CROSSINGS NEAR THE WATER TREATMENT PLANT

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Engineers | Architects | Scientists | Constructors

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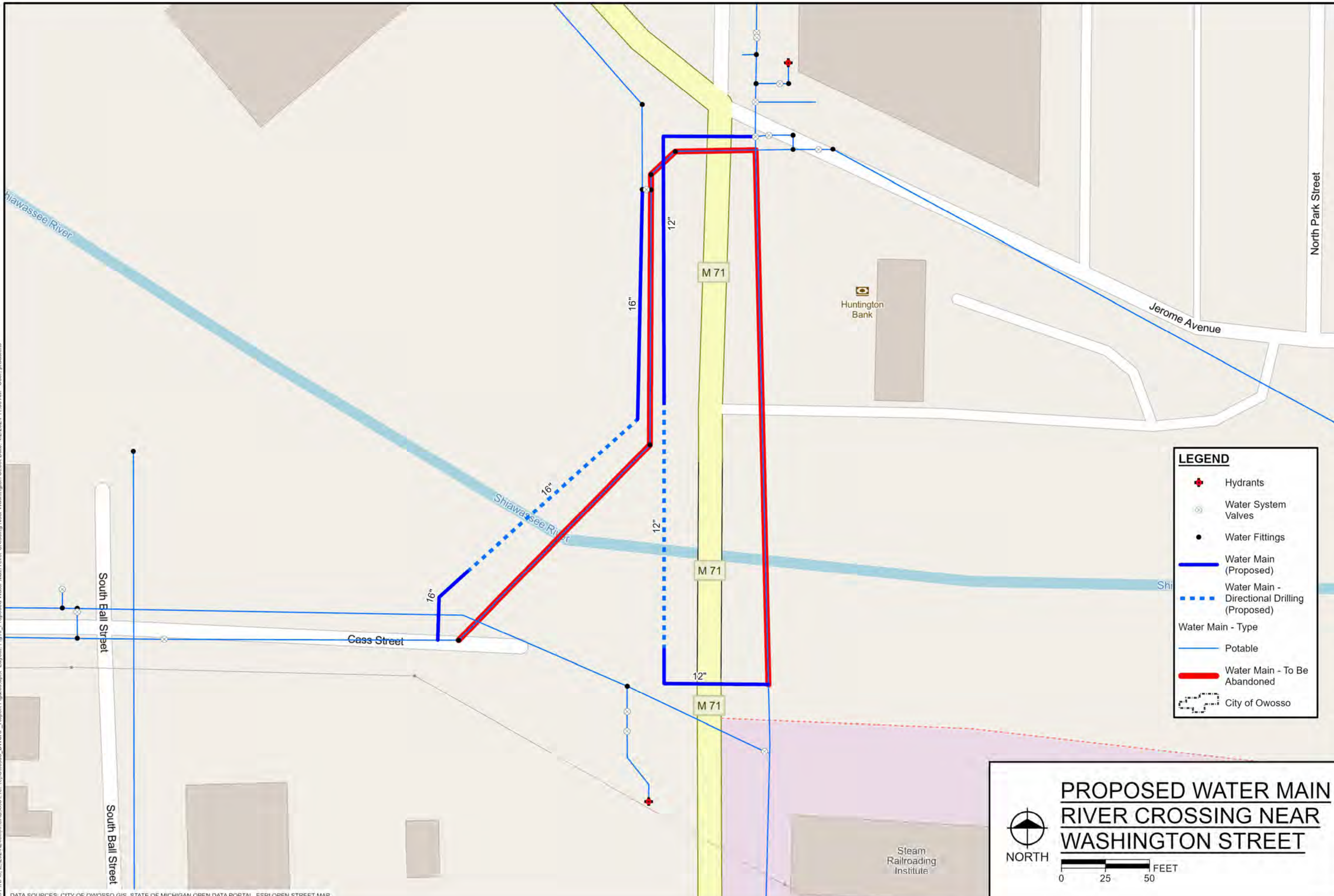
**City of Owosso**
Shiawassee County, Michigan

**Drinking Water State Revolving Fund (DWSRF) Project Plan**

PROJECT NO.
240369

FIGURE NO.
9

PLOT INFO: Z:\2024\240369\CAD\GIS\ProProj\Owosso_DWSRF_Report Figures.aprx Layout: Fig09_Proposed Water Main River Crossings Near the Water Treatment Plant Date: 4/2/2024 11:39 AM User: prbaskins




# PROPOSED WATER MAIN RIVER CROSSING NEAR WASHINGTON STREET

NORTH

FEET 0 25 50

DATA SOURCES: CITY OF OWOSSO GIS, STATE OF MICHIGAN OPEN DATA PORTAL, ESRI OPEN STREET MAP.

fishbeck
Engineers | Architects | Scientists | Constructors

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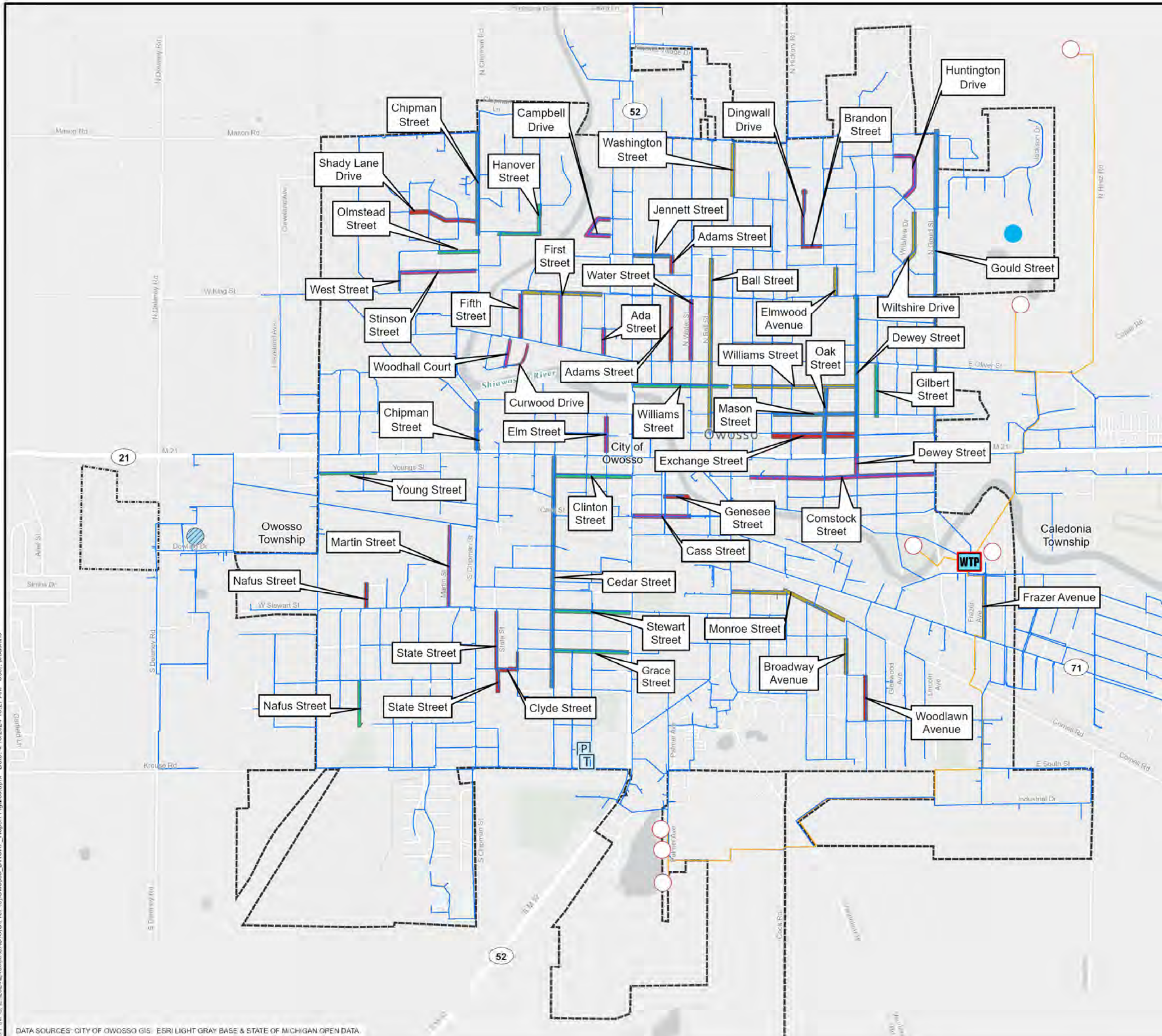
**City of Owosso**
Shiawassee County, Michigan

**Drinking Water State Revolving Fund (DWSRF) Project Plan**

PROJECT NO. 240369

FIGURE NO. 10

PLOT INFO: Z:\2024\240369\CAD\GIS\ProProj\Owosso_DWSRF_Report Figures.aprx Layout: Fig10_Proposed Water Main River Crossing Near Washington Street Date: 4/2/2024 11:39 AM User: prbaskins




DATA SOURCES: CITY OF OWOSSO GIS; ESRI LIGHT GRAY BASE & STATE OF MICHIGAN OPEN DATA.

**LEGEND**

- WTP Treatment Plant
- Enclosed Storage Facility
- Production Well
- P Pump Station
- T Stand Pipe
- Other

Water Main - Type

- Potable
- Raw

Proposed Improvements

- 2025
- 2026
- 2027
- 2028
- 2029

NORTH

FEET 0 850 1,700

# WATER MAIN IMPROVEMENTS

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Engineers | Architects | Scientists | Constructors

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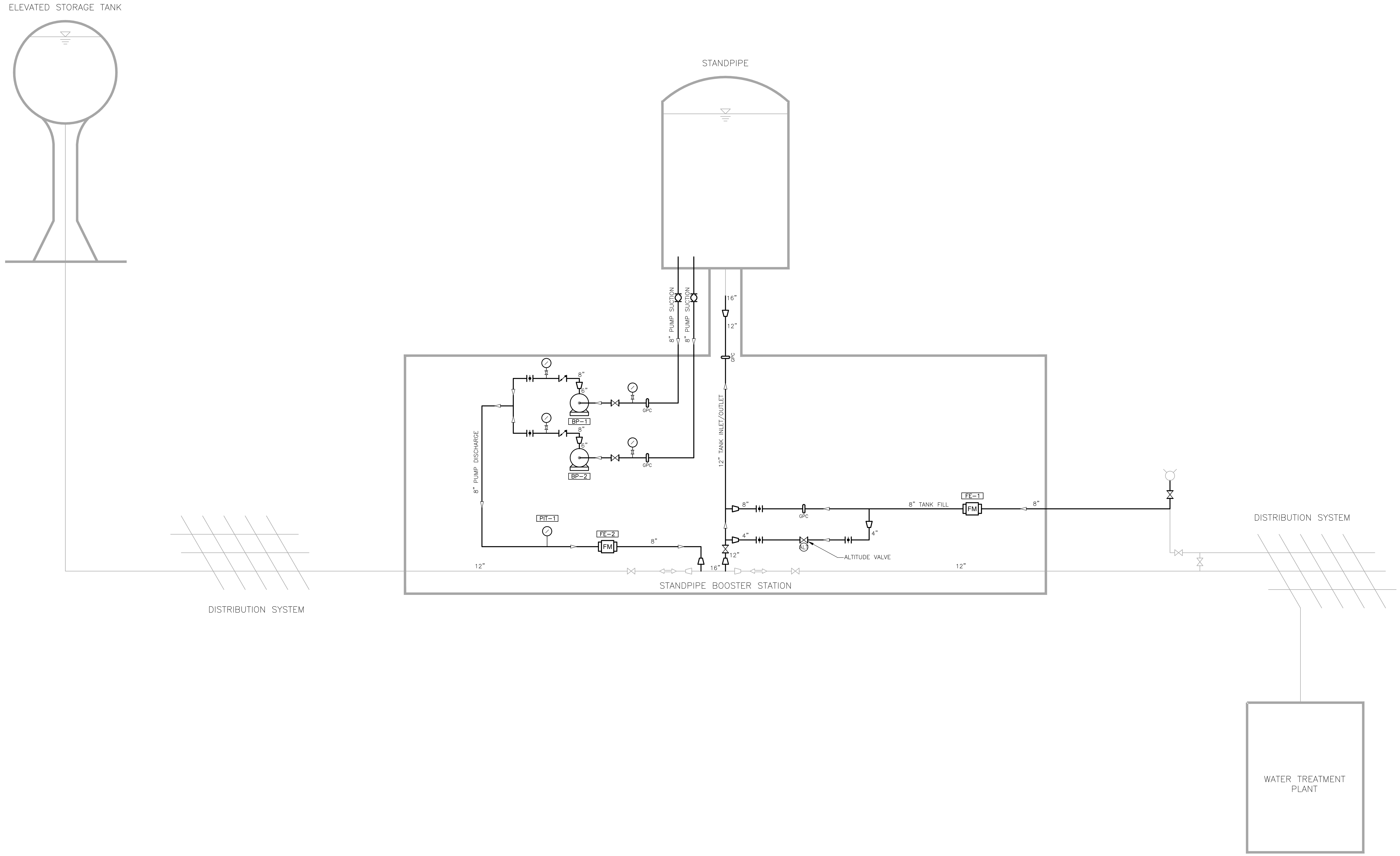
**City of Owosso**
Shiawassee County, Michigan

**Drinking Water State Revolving Fund (DWSRF) Project Plan**

PROJECT NO.
240369

FIGURE NO.
11




## PROPOSED BOOSTER STATION FLOW SCHEMATIC

NO SCALE

fishbeck
Engineers | Architects | Scientists | Constructors

**City of Owosso**
Shiawassee County, Michigan
Drinking Water State Revolving Fund (DWSRF) Project Plan

REVISIONS

NOT FOR CONSTRUCTION

| | |
|---|---|
| Drawn By | ZAG |
| Designer | ZAG |
| Reviewer | TDM |
| Manager | BWV |

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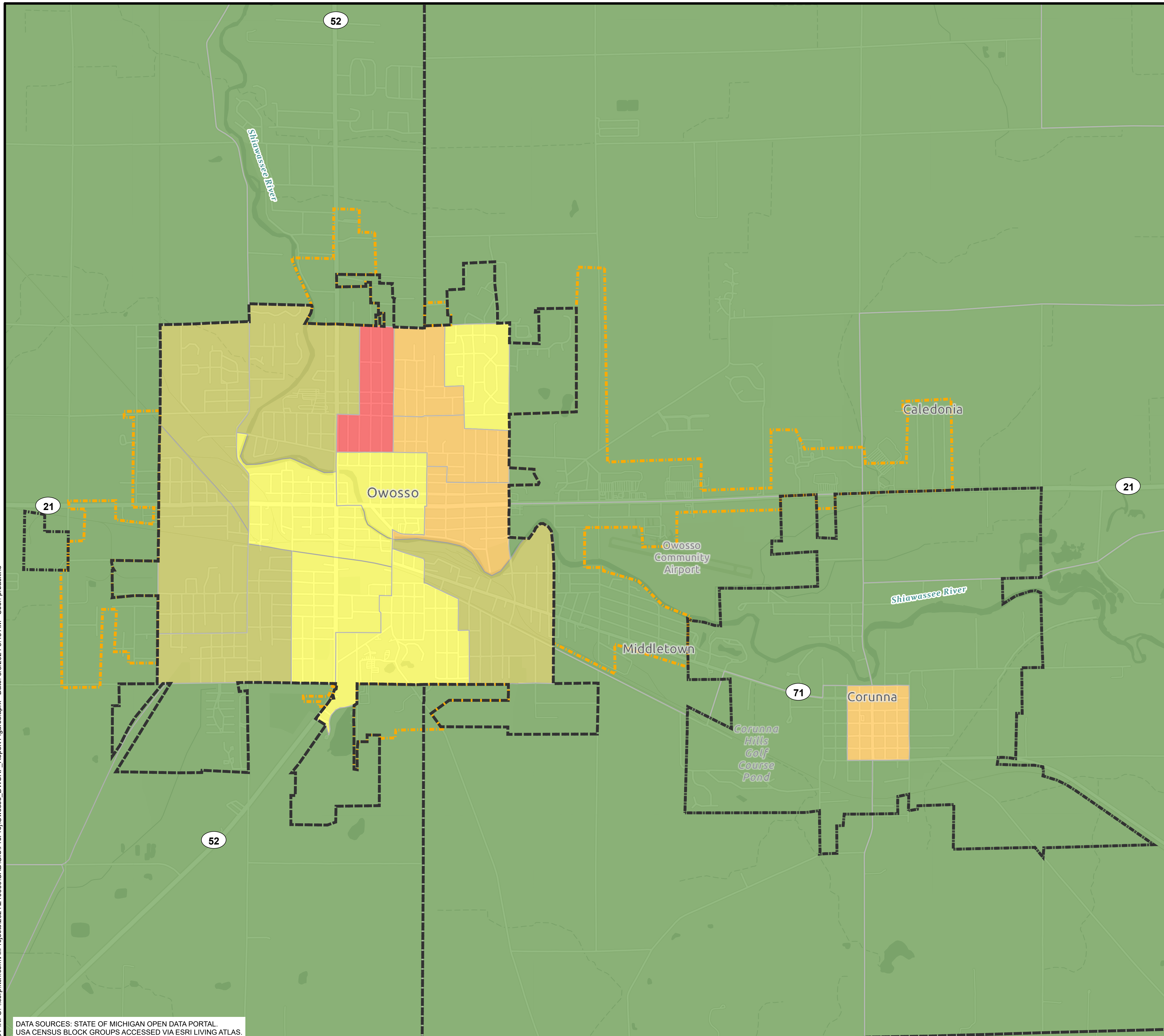
PROJECT NO.
240369

FIGURE NO.
**12**



PLOT INFO: Z:\2024\240369\CAD_FIGURES\SRF REPORT FIGURES.DWG LAYOUT: FIGURE 12 - PROPOSED BOOSTER STATION FLOW SCHEMATIC DATE: 4/3/2024 TIME: 3:49:07 PM USER: ZGOGULSKI

# Maps




**LEGEND**

2022 Population Density (People per Square Mile)

- 0 - 1,000 People per Square Mile
- 1,000 - 2,000 People per Square Mile
- 2,000 - 3,000 People per Square Mile
- 3,000 - 4,000 People per Square Mile
- 4,000 - 5,000 People per Square Mile
- 5,000 - 6,000 People per Square Mile
- Water System Boundary
- Municipal Boundary

NORTH

# POPULATION DENSITY

0 1,500 3,000 FEET

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**City of Owosso**

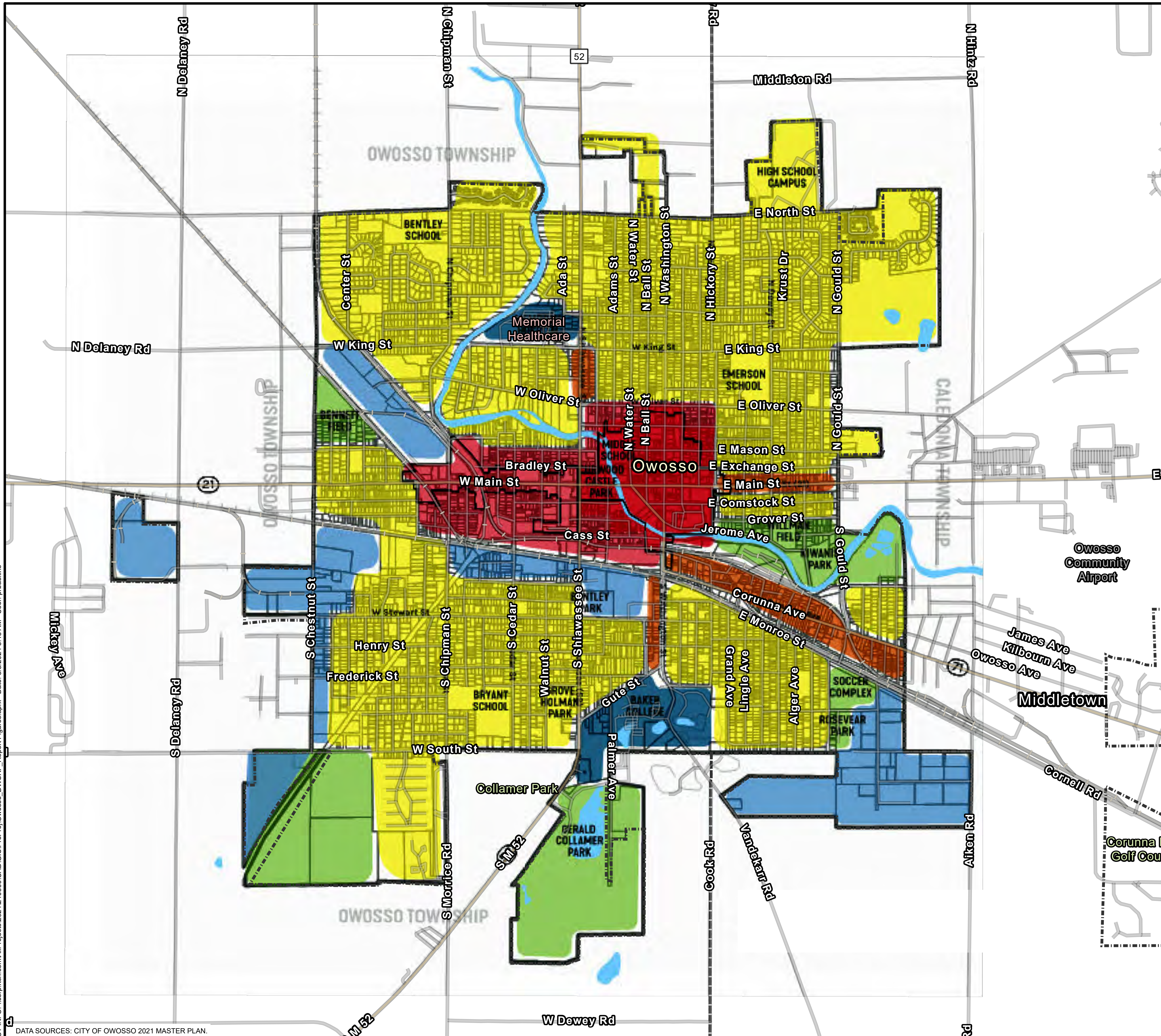
Shiawassee County, Michigan

**Drinking Water State Revolving Fund (DWSRF) Project Plan**

PROJECT NO. 240369

MAP NO. 1

PLOT INFO: \\corp.ftch.com\AllProjects\2024\240369\CAD\GIS\ProProj\Owosso_DWSRF_Report Figures.aprx Date: 3/8/2024 8:48 AM User: prbaskins




LEGEND

- Neighborhoods
- Centers
- Corridors
- Districts
- Open Space

NORTH

0 1,000 2,000 FEET

# EXISTING LAND USE CITY OF OWOSSO

fishbeck
Engineers | Architects | Scientists | Constructors

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**City of Owosso**
Shiawassee County, Michigan

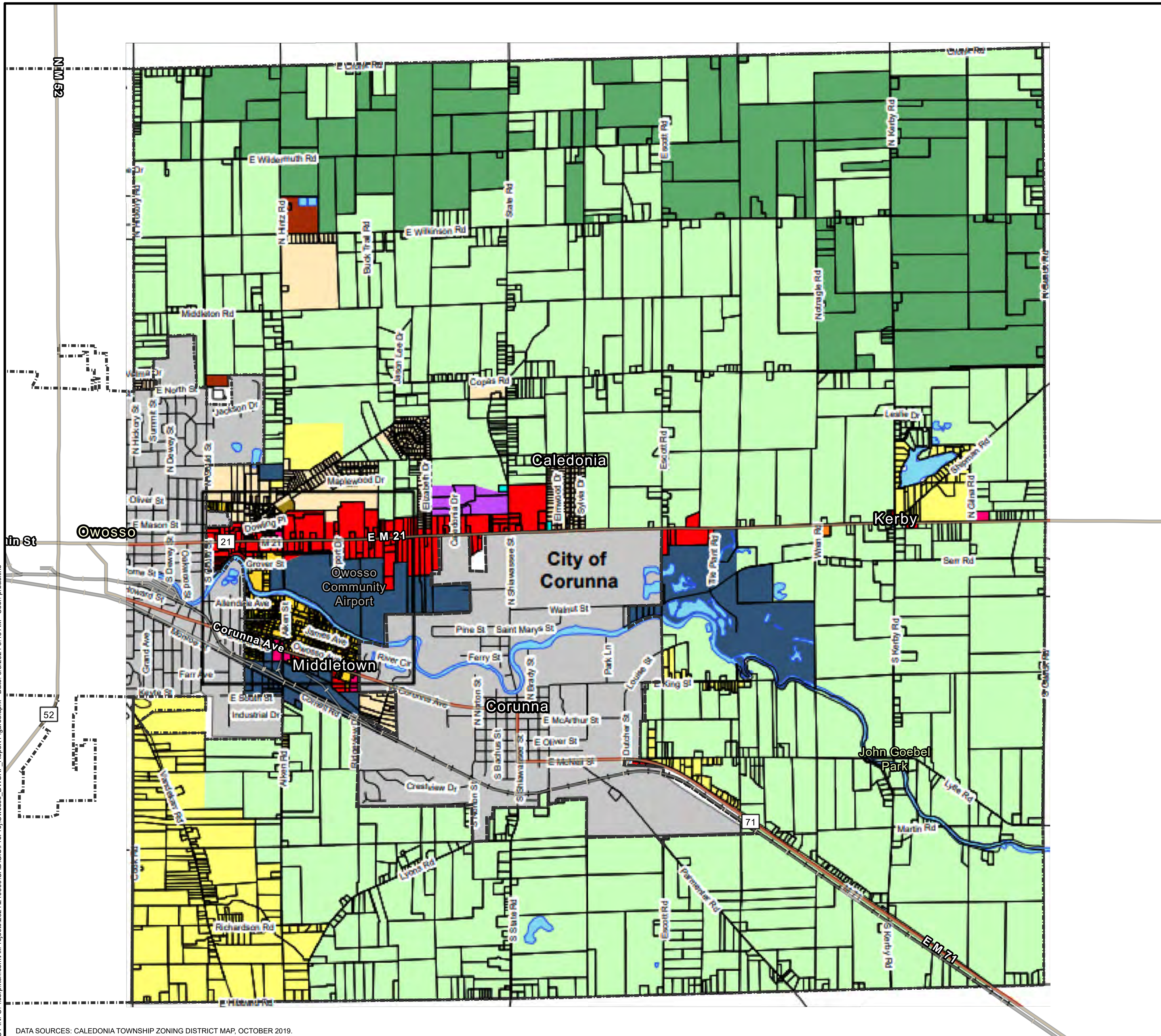
**Drinking Water State Revolving Fund (DWSRF) Project Plan**

PROJECT NO. 240369

MAP NO. 2.1

DATA SOURCES: CITY OF OWOSSO 2021 MASTER PLAN.

PLOT INFO: \\corp.ftch.com\AllProjects\2024\240369\CAD\GIS\ProProj\Owosso_DWSRF_Report Figures.aprx Date: 3/8/2024 8:48 AM User: prbaskins




**LEGEND**

- Agricultural Production (A-1)
- Agricultural Production/Rural Residential (A-2)
- Office (O-1)
- One-Family Residential (R-1A)
- One-Family Low Density Residential (R-1B)
- One-Family Medium Density Residential (R-1C)
- Mobile Home Development (RM-T)
- Multiple Family Residential (RM-1)
- Planned Unit Development (PUD)
- Commercial Business (B-1)
- General Business (B-2)
- Rural Business (B-3)
- Light Manufacturing (M-1)

NORTH

0 1,750 3,500 FEET

# EXISTING LAND USE CALEDONIA TOWNSHIP

DATA SOURCES: CALEDONIA TOWNSHIP ZONING DISTRICT MAP, OCTOBER 2019.

PLOT INFO: \\corp.ftch.com\AllProjects\2024\240369\CAD\GIS\ProProj\Owosso_DWSRF_Report Figures.aprx Date: 3/8/2024 8:48 AM User: prbaskins



fishbeck
Engineers | Architects | Scientists | Constructors

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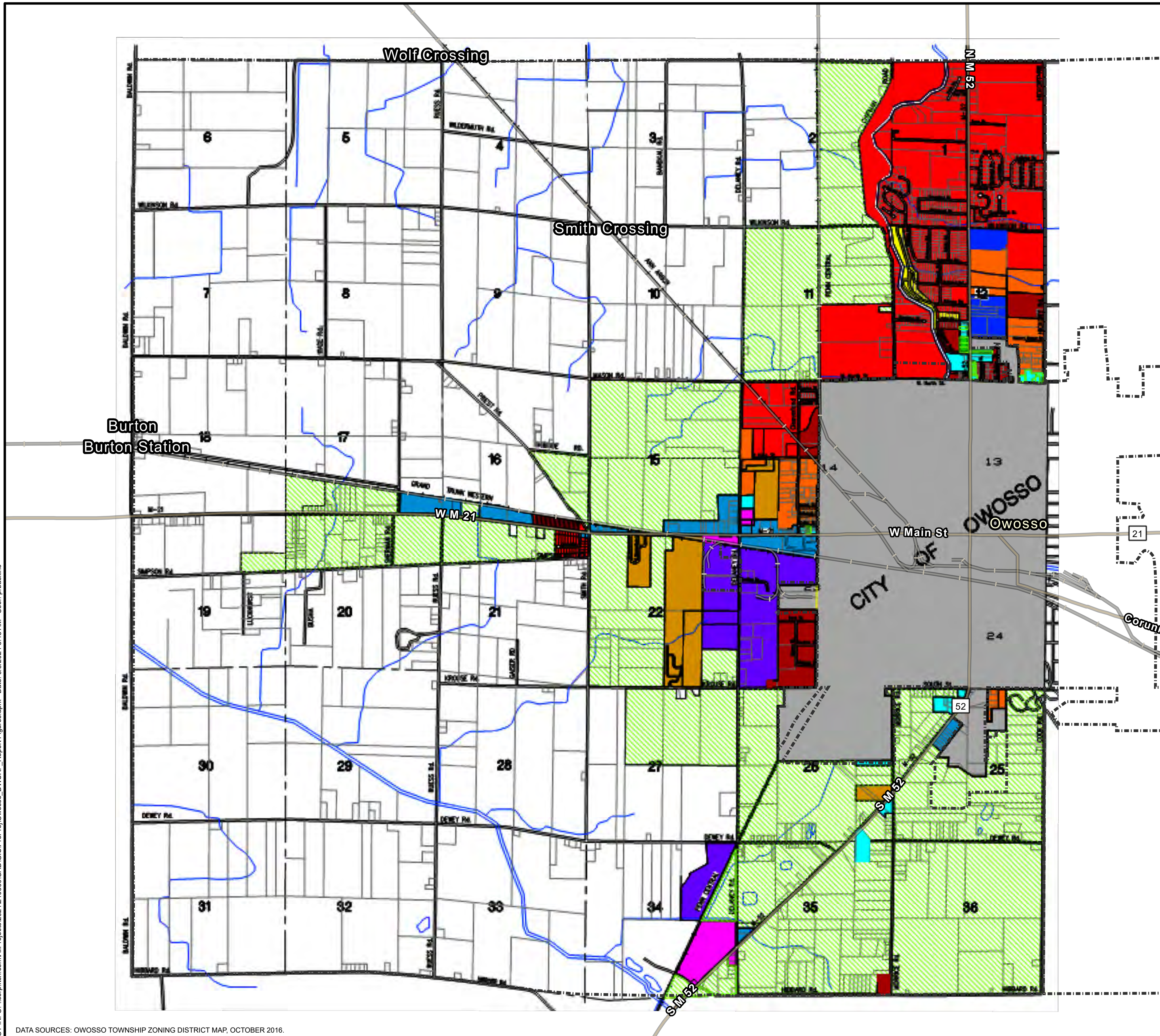
**City of Owosso**
Shiawassee County, Michigan

**Drinking Water State Revolving Fund (DWSRF) Project Plan**

PROJECT NO.
240369

MAP NO.
2.2




LEGEND

| | |
|---|---|
| R-1 RESIDENTIAL/ SINGLE FAM. | |
| R-2 RESIDENTIAL/SINGLE & 2 FAM. | |
| R-3 RESIDENTIAL/ MULTI-FAM | |
| R-4 MOBILE HOME PARK/ PLAT | |
| R-5 RESIDENTIAL-RECREATIONAL | |
| O-1 OFFICE | |
| C-1 LOCAL COMMERCIAL DIST. | |
| C-2 GENERAL COMMERCIAL DIST. | |
| C-3 SHOPPING CENTER DIST. | |
| M-1 LIGHT MANUFACTURING DIST. | |
| M-2 GENERAL MANUFACTURING DIST. | |
| A-1 AGRICULTURE-PRIME DIST. | |
| A-2 AGRICULTURE DIST. | |

# EXISTING LAND USE OWOSSO TOWNSHIP

DATA SOURCES: OWOSSO TOWNSHIP ZONING DISTRICT MAP, OCTOBER 2016.

fishbeck | Engineers | Architects | Scientists | Constructors

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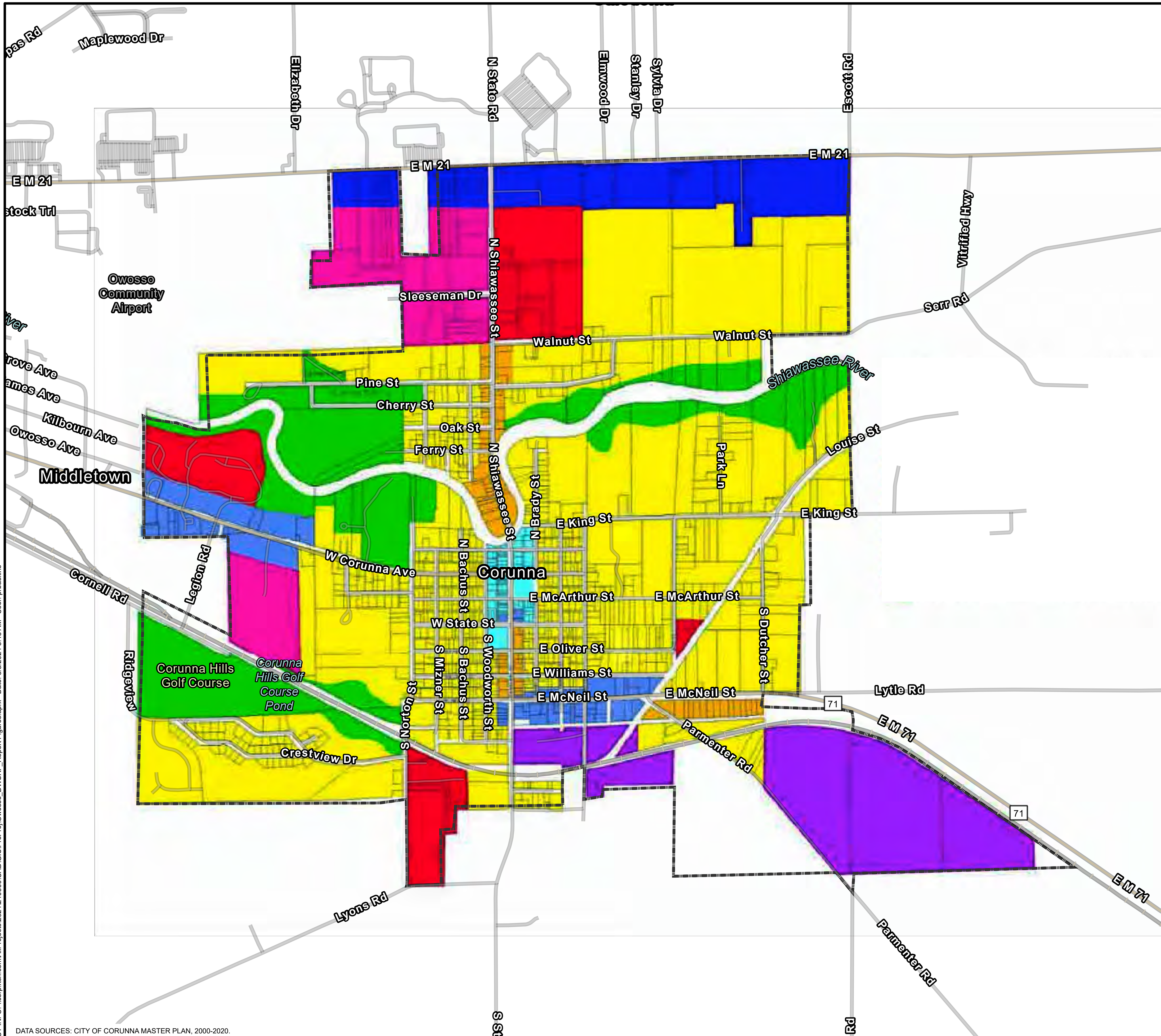
**City of Owosso**
Shiawassee County, Michigan

Drinking Water State Revolving Fund (DWSRF) Project Plan

PROJECT NO. 240369

MAP NO. 2.3

PLOT INFO: \\corp.ftch.com\AllProjects\2024\240369\CAD\GIS\ProProj\Owosso_DWSRF_Report Figures.aprx Date: 3/8/2024 8:48 AM User: prbaskins




**LEGEND**

- Single Family Residential
- Multiple Family Residential
- Residential - Office
- Central Business District
- Business Service District
- General Business District
- Light Industrial
- Heavy Industrial
- Recreation - Conservation

NORTH

0 750 1,500 FEET

# EXISTING LAND USE
# CITY OF CORUNNA

DATA SOURCES: CITY OF CORUNNA MASTER PLAN, 2000-2020.

PLOT INFO: \\corp.ftch.com\AllProjects\2024\240369\CAD\GIS\ProProj\Owosso_DWSRF_Report Figures.aprx Date: 3/8/2024 8:48 AM User: prbaskins



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Engineers | Architects | Scientists | Constructors

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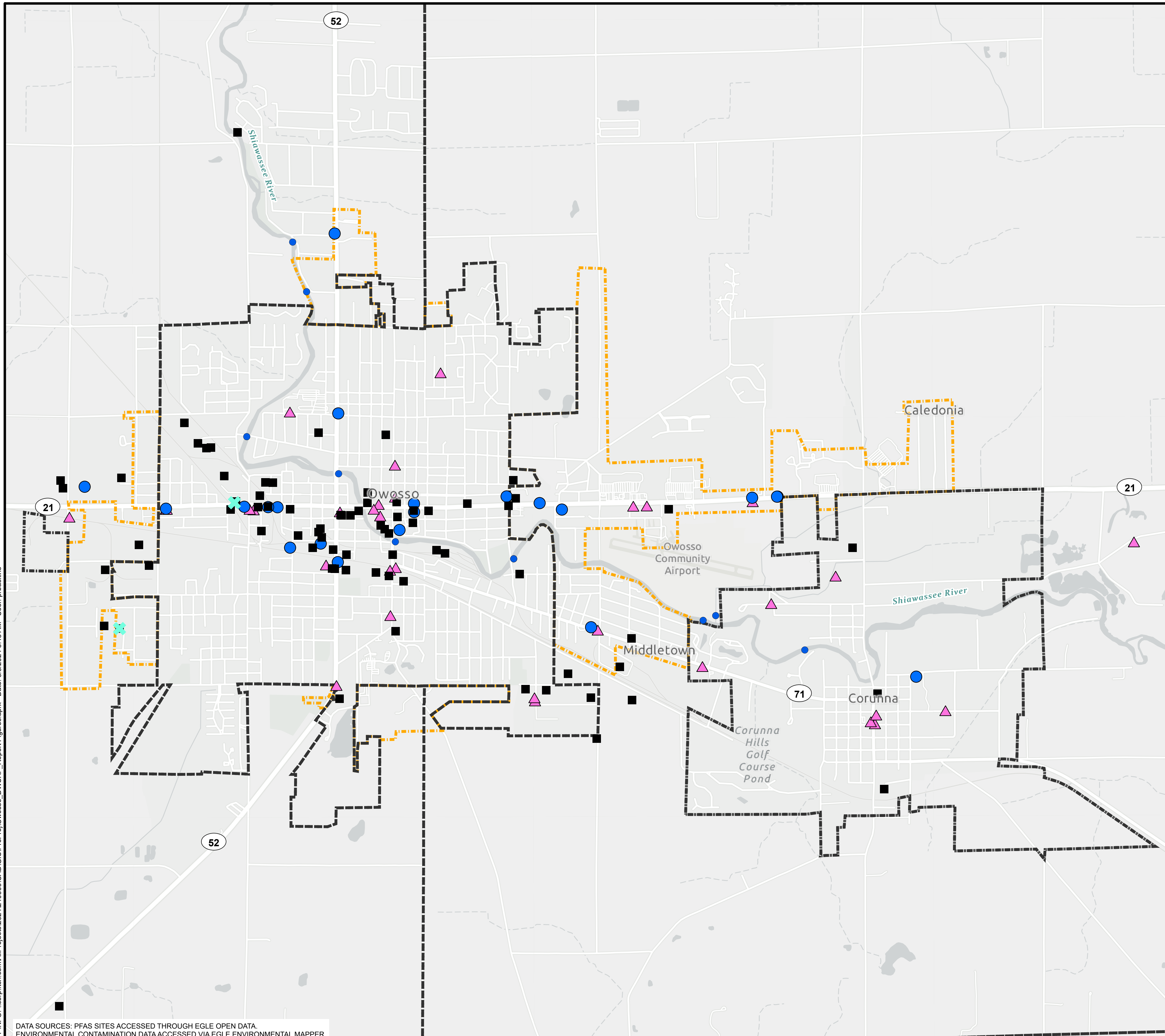
**City of Owosso**
Shiawassee County, Michigan

**Drinking Water State Revolving Fund (DWSRF) Project Plan**

PROJECT NO.
240369

MAP NO.
2.4




# ENVIRONMENTAL CONTAMINATION

fishbeck | Engineers | Architects | Scientists | Constructors

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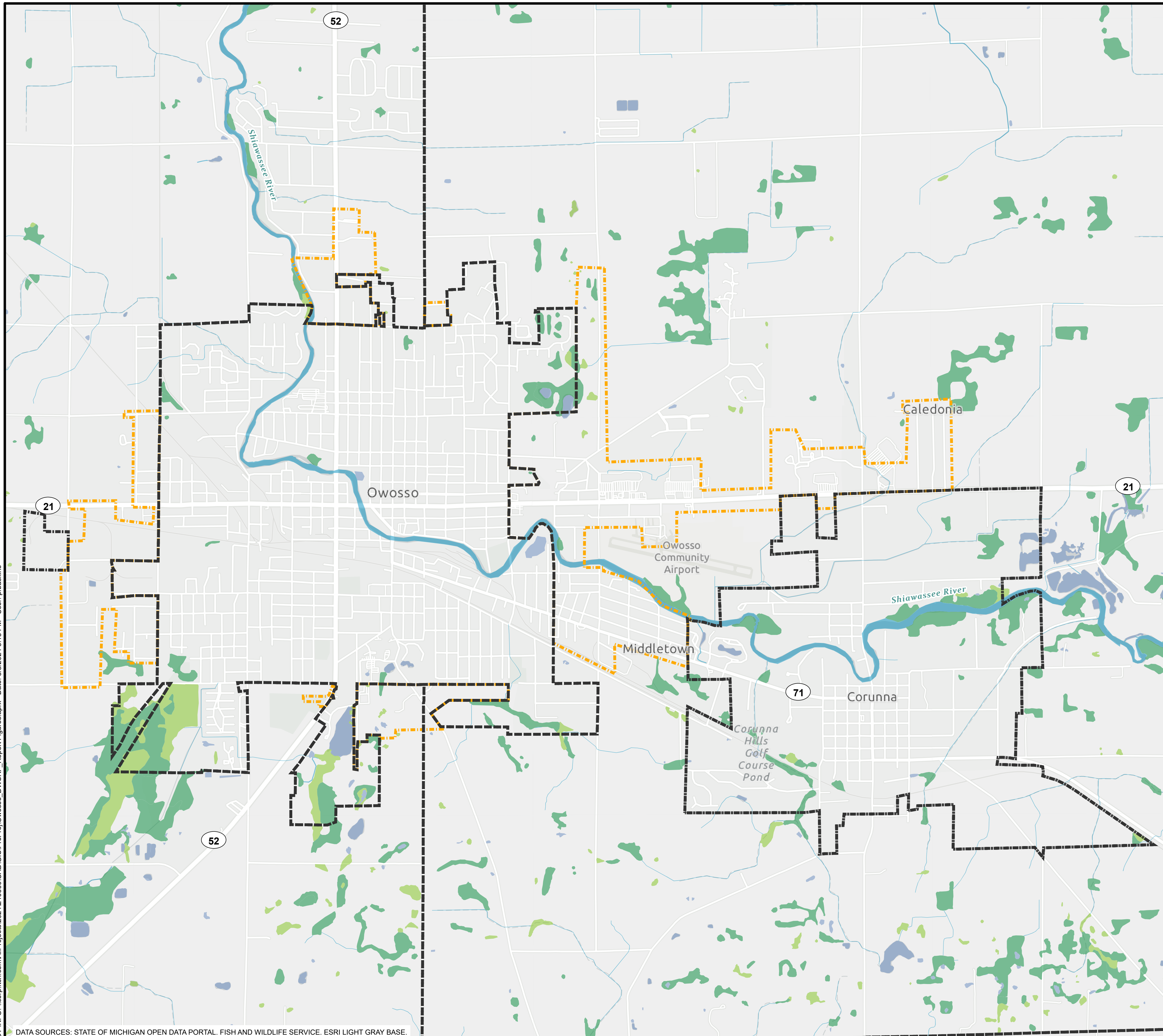
**City of Owosso**
Shiawassee County, Michigan

**Drinking Water State Revolving Fund (DWSRF) Project Plan**

PROJECT NO.
240369

MAP NO.
3

PLOT INFO: \\corp.ftch.com\AllProjects\2024\240369\CAD\GIS\ProProj\Owosso_DWSRF_Report Figures.aprx Date: 3/8/2024 8:48 AM User: prhaskins




**LEGEND**

- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond
- Riverine
- Water System Boundary
- Municipal Boundaries

NORTH

0 1,500 3,000 FEET

# WETLANDS AND MAJOR SURFACE WATERS

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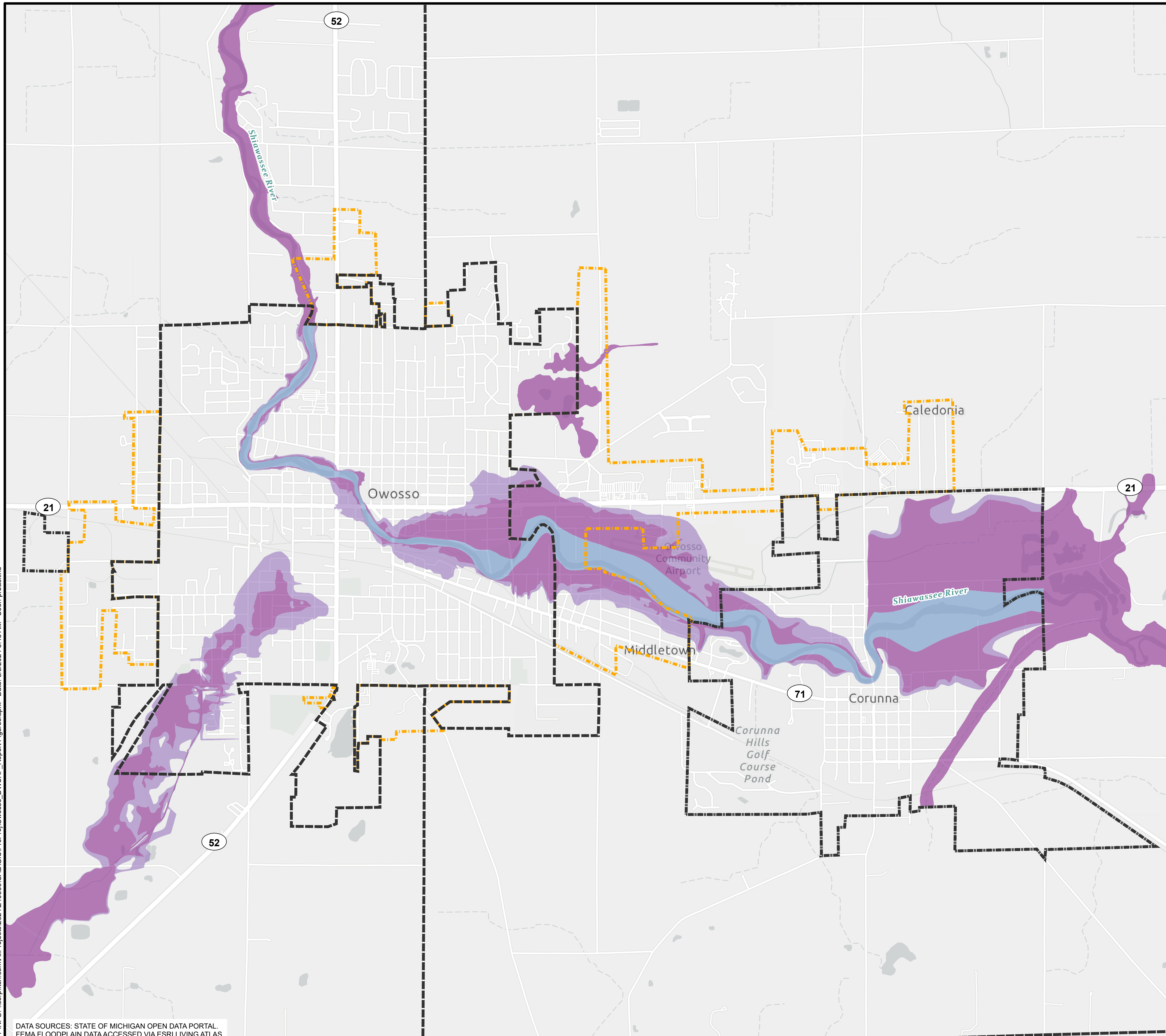
**City of Owosso**
Shiawassee County, Michigan
**Drinking Water State Revolving Fund (DWSRF) Project Plan**

PROJECT NO.
240369

MAP NO.
4

PLOT INFO: \\corp.ftch.com\AllProjects\2024\240369\CAD\GIS\ProProj\Owosso_DWSRF_Report Figures.aprx Date: 3/8/2024 3:15 PM User: prbaskins




# FEMA FLOODPLAIN

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Engineers | Architects | Scientists | Constructors

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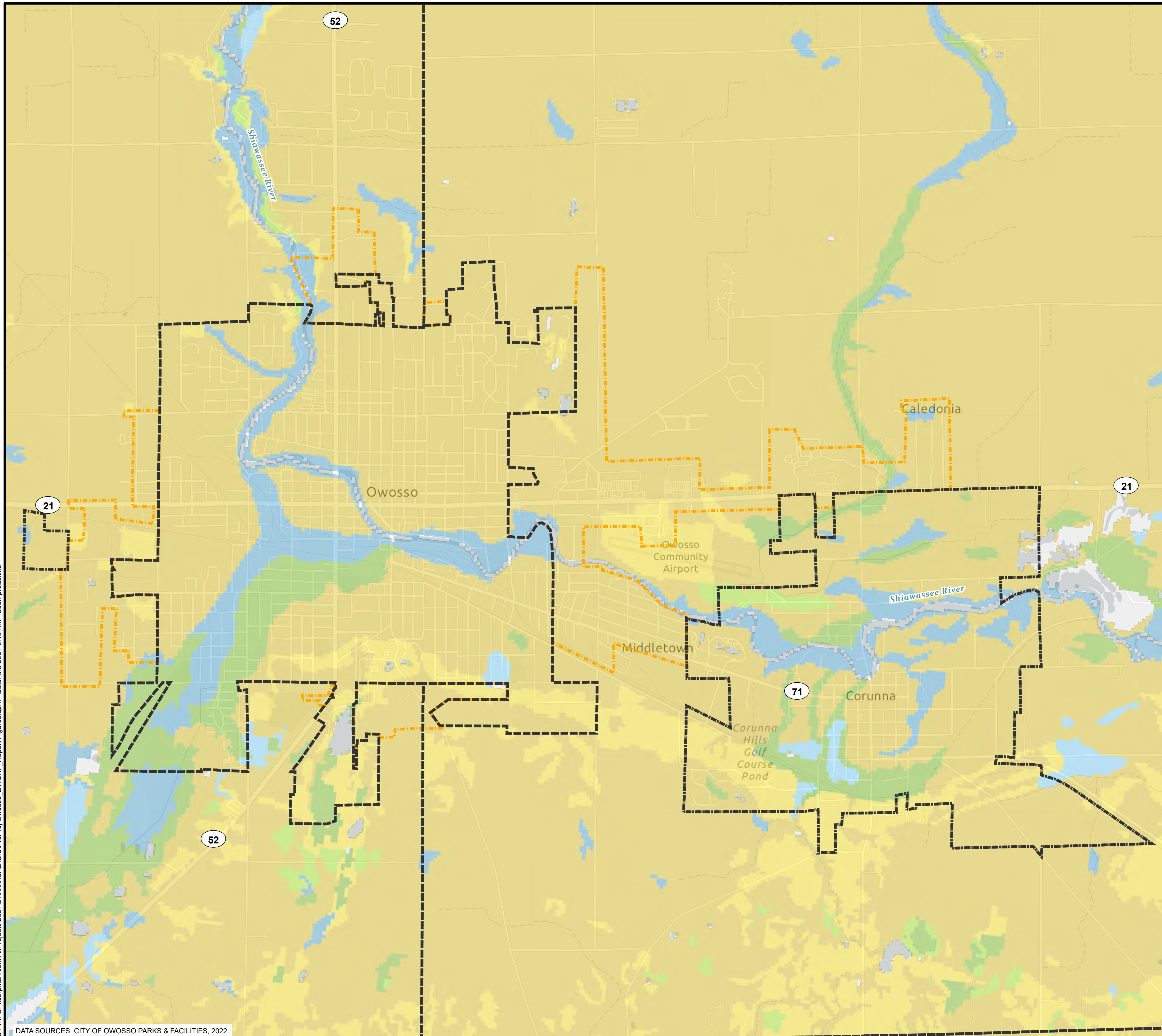
**City of Owosso**
Shiawassee County, Michigan

**Drinking Water State Revolving Fund (DWSRF) Project Plan**

PROJECT NO.
240369

MAP NO.
5

PLOT INFO: \\corp.ftch.com\AllProjects\2024\240369\CAD\GIS\ProProj\Owosso_DWSRF_Report Figures.aprx Date: 3/8/2024 8:48 AM User: prbaskins




**LEGEND**

USA Soils Hydrologic Group

- Group A
- Group B
- Group C
- Group A/D
- Group B/D
- Group C/D
- Water System Boundary
- Municipal Boundaries

NORTH

# SOILS

0 1,500 3,000 FEET

fishbeck

Engineers | Architects | Scientists | Constructors

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## City of Owosso

Shiawassee County, Michigan

**Drinking Water State Revolving Fund (DWSRF) Project Plan**

PROJECT NO.
240369

MAP NO.
6

PLOT INFO: \\corp.ftch.com\AllProjects\2024\240369\CAD\GIS\ProProj\Owosso_DWSRF_Report Figures.aprx Date: 3/8/2024 8:48 AM User: prbaskins

# Appendix 1

**City of Owosso DWSRF**
**Water Main Improvements Project Needs**

| Watermain Improvements Name | Project Limits | Project Need | Size (in) | Length (ft) | Install Year | Pipe Material | Replacement of Service lines |
|---|---|---|---|---|---|---|---|
| Nafus Street | S. End to Frederick Street | Undersized, Break History, Dead End | 2" | 500' | 1958 | Steel | Yes |
| Gilbert Street | Mason Street to Oliver Street | Undersized | 4" | 800' | 1958 | Cast Iron | Yes |
| Clinton Street | Cedar Street to Shiawassee Street | Undersized | 4"/6" | 1220' | 1958 | Cast Iron | Yes |
| Olmstead Street | Ward Street to Chipman Street | Undersized | 6" | 560' | 1959 | Cast Iron | Yes |
| Harding Avenue | Willow Springs to Hanover Street | Break History | 6" | 570' | 1970 | Cast Iron | Yes |
| Hanover Street | Harding Avenue to Riverside Drive | Break History | 6" | 400' | 1970 | Cast Iron | Yes |
| Stewart Street | Cedar Street to Shiawassee Street | Undersized | 6" | 1350' | 1958 | Cast Iron | Yes |
| Williams Street | Shiawassee Street to Washington Street | Break History | 8" | 1670' | 1958 | Cast Iron | Yes |
| Dewey Street (East) | Main Street (M-21) to King Street | Undersized, Break History | 4"/6" | 2540' | 1958/1959 | Cast Iron | Yes |
| Young Street | Chestnut Street to Brooks Street | Undersized, Break History | 4"/6" | 1000' | 1959 | Cast Iron | Yes |
| Grace Street | Cedar Street to Shiawassee Street | Break History | 6" | 1230' | 1960 | Cast Iron | Yes |
| Genesee Street | Michigan Avenue to Green Street | Undersized, Break History, Dead End | 2" | 290' | 1957 | Steel | Yes |
| Adams Street | Oliver Street to King Street | Undersized | 4" | 1110' | 1957 | Cast Iron | Yes |
| Adams Street | Elizabeth Street to N. of Jennett Street | Undersized | 4" | 330' | 1957 | Cast Iron | Yes |
| Brandon Street | Summit Street to Dingwall Drive | Undersized, Break History | 4" | 280' | Unknown | Cast Iron | Yes |
| Dingwall Drive | Brandon Street to N. End | Break History | 4"/6" | 950' | 1959 | Cast Iron | Yes |
| Nafus Street | Stewart Street to N. End | Break History | 6" | 440' | Unknown | Cast Iron | Yes |
| Exchange Street | Saginaw Street to Dewey Street | Undersized | 6" | 1470' | 1957 | Cast Iron | Yes |
| Woodlawn Avenue | Farr Street to Auburndale Avenue | Undersized | 4" | 770' | 1958 | Cast Iron | Yes |
| Shady Lane Drive | Meadow Drive to Chipman Street | Break History | 6" | 870' | Unknown | Cast Iron | Yes |
| State Street | S. End to Clyde Street | Undersized, Break History, Dead End | 4" | 360' | Unknown | Cast Iron | Yes |
| State Street | Clyde Street to Stewart Street | Undersized, Break History | 4" | 1000' | 1958 | Cast Iron | Yes |
| Clyde Street | State Street to Lyon Street | Undersized, Break History, Dead End | 4" | 350' | 1959 | Cast Iron | Yes |
| Lyon Street | Clyde Street to Grace Street | Undersized, Break History | 3" | 290' | 1958 | Transite | Yes |
| Frazer Avenue | Corunna Avenue to Allendale Avenue | Break History | 8" | 1100' | 1960 | Cast Iron | Yes |
| Gould Street | Exchange Street to North Street | Undersized, Break History | 8" | 5060' | 1959/Unknown | Cast Iron | Yes |
| Jennett Street | Shiawassee Street to Adams Street | Undersized, Break History | 4"/6" | 650' | 1957 | Cast Iron | Yes |
| Oak Street | Main Street (M-21) to Williams Street | Undersized | 4" | 1130' | 1926 | Ductile Iron | Yes |
| Chipman Street | Harding Avenue to North Street | Break History | 12" | 1460' | 1970 | Ductile Iron | Yes |
| Chipman Street | Main Street (M-21) to Beehler Street | Undersized | 12" | 980' | 1959/1960/1969 | Cast Iron; Ductile Iron | Yes |
| Cedar Street | Hampton Avenue to Main Street (M-21) | Break History | 6"/12" | 3890' | 1959/1960 | Cast Iron; Ductile Iron; Transite | Yes |
| Mason Street | Saginaw Street to Dewey Street | Undersized | 4" | 1410' | 1958 | Cast Iron | Yes |
| Elmwood | Abbott Street to King Street | Break History | 6" | 540' | Unknown | Cast Iron | Yes |
| Washington Street | Stratford Drive to North Street | Undersized | 4" | 930' | 1958 | Cast Iron | Yes |
| Williams Street | Washington Street to Dewey Street | Undersized, Break History | 4"/6" | 1660' | 1958/Unknown | Cast Iron; Ductile Iron | Yes |
| Wiltshire Drive | Huntington Drive to Moore Street | Break History | 6" | 990' | 1960 | Cast Iron; Ductile Iron | Yes |
| Ball Street | Exchange Street to Jennett Street | Undersized | 4"/6" | 2900' | 1957 | Cast Iron | Yes |
| Monroe Street | Washington Street to Broadway Avenue | Break History | 4"/6" | 2280' | 1960/1961 | Cast Iron | Yes |
| King Street | Fifth Street to Ada Street | Undersized, Break History | 6" | 1030' | 1958 | Cast Iron; Unknown | Yes |
| Broadway Avenue | Auburndale Avenue to Franklin Street | Break History | 6" | 630' | Unknown | Unknown | Yes |

**City of Owosso DWSRF**
**Water Main Improvements Project Needs**

| Watermain Improvements Name | Project Limits | Project Need | Size (in) | Length (ft) | Install Year | Pipe Material | Replacement of Service lines |
|---|---|---|---|---|---|---|---|
| Ada Street | Oliver Street to Lee Street | Undersized | 4" | 440' | 1957 | Unknown | Yes |
| Cass Street | Shiawassee Street to Green Street | Age | 16" | 1270' | 1960 | Cast Iron | Yes |
| Curwood Drive | Oliver Streetto Woodhall Court | Undersized, Break History | 4" | 150' | Unknown | Transite | Yes |
| Stinson Street | West Street to Chipman Street | Break History | 6" | 1330' | Unknown | Cast Iron | Yes |
| West Street | King Street to Stinson Street | Undersized | 4" | 300' | Unknown | Cast Iron | Yes |
| Woodhall Court | Curwood Drive to Oliver Street | Undersized, Dead End | 4" | 340' | Unknown | Transite | Yes |
| Fifth Street | Oliver Street to King Street | Age | 4"/6" | 740' | 1961 | Transite | Yes |
| First Street | Oliver Street to King Street | Break History | 6" | 920' | 1968 | Cast Iron | Yes |
| Comstock Street | Park Street to Gould Street | Undersized, Break History | 4"/6" | 3080' | 1958 | Cast Iron | Yes |
| Elm Street | Main Street (M-21) to River Street | Undersized | 4" | 540' | 1960 | Cast Iron | Yes |
| Dewey Street (West) | Comstock Street to Main Street | Undersized, Break History | 12" | 2990' | 1959/1960 | Cast Iron | Yes |
| Huntington Drive | Moore Street to Stevens Drive | Break History | 6" | 1090' | 1960 | Cast Iron | Yes |
| Martin Street | Stewart Street to Milwaukee Street | Undersized | 4" | 1350' | 1960 | Cast Iron | Yes |
| Water Street | Oliver Street to King Street | Undersized | 4" | 1120' | 1959 | Cast Iron | Yes |
| Campbell Drive | Ada Street to Ada Street | Undersized, Break History | 4" | 920' | Unknown | Transite | Yes |

# Appendix 2


# 2022 Water Quality Report

**Water Supply Serial Number: 05120**

## Municipal tap water is the life source of every community.

Our dependable water supply contributes to public health, keeps citizens safe from waterborne illness, drives economic prosperity, and is vital for everyday life. The Owosso Water Filtration Plant treated over 652 million gallons of water to over 14,301 residents in the City of Owosso during 2022. This report covers the drinking water quality for City of Owosso Water Supply for the 2022 calendar year. This information is a snapshot of the quality of the water that we provided to you in 2022. Included are details about where your water comes from, what it contains, and how it compares to United States Environmental Protection Agency (USEPA) and state standards.

At Owosso’ -
tinuously. Operators also conduct quality assurance and quality control processes to ensure accuracy. Chemists in the water quality laboratory conduct hourly tests from the treatment process. In addition, weekly and monthly, they test samples from water sites throughout the city. Staff work closely with Michigan Department of Environment, Great Lakes, and Energy (EGLE) to ensure water regulatory and safety guidelines are met. Owosso’s team of water quality experts go to great lengths to deliver great-tasting tap water. It’s a 24/7, 365-day-a-year responsibility that they take very seriously.

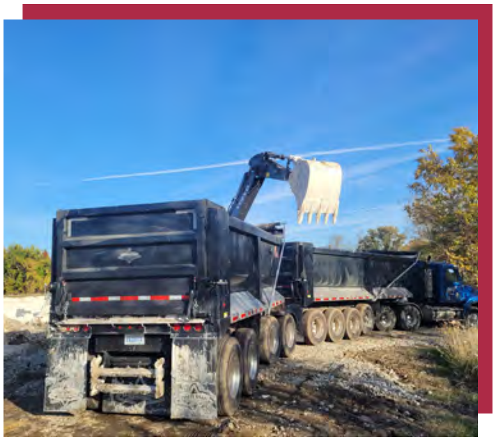
Y
over 80 feet deep. In 2018 EGLE performed an assessment of our source water to determine the susceptibility or the relative potential of contamination. The susceptibility rating is on a seven-tiered scale from “very-low” to “very-high” based on geologic sensitivity, well construction, water chemistry, and contamination sources. The susceptibility of our well source is high to very high.

## Water Treatment Plant and System Maintenance in 2022.

Maintenance at the water plant is a continuous exercise. There are many parts and pieces of equipment that make up the different processes. All of the equipment has an expected useful life which we try to prolong with preventive maintenance. Our Asset Management Plan and Capital Improvement Plan guides us on when to repair/replace more expensive items and how to budget for them. During 2022, as part of a State Drinking Water Revolving Fund (DWRF) loan project, the City completed a rehabilitation of the Standpipe and the West Tower. Both tanks required component upgrades in design due to code changes. Also this work included the installation of mixers. The 24/7 operation of mixers will improve water quality, improve disinfection and prevent damage during winter due to freezing.


The newly painted West Tower!

Ongoing HVAC repairs and replacements in 2022!


Each year used lime sludge is removed for


One of four High Service Pumps that maintain our water pressure and water supply located at the Filtration Plant.


Service and replacing equipment using the DPW tree truck!

## Distribution System

The City of Owosso has over 113 miles of water mains, including raw and potable distribution piping ranging in size from 1.5” to 24”. The majority of water distribution system mains are 50 to 65 years old with some mains 80 to 100 years old. There are over 2,388 water system valves throughout the system and over 799 fire hydrants. Owosso serves over 6,471 residential households and commercial customers with meter sizes ranging from ¾” to 8”. Also, the distribution system includes 2 water storage facilities.

## Projects & Maintenance

The City of Owosso in 2021 started the process of replacing one of our wells near Hopkins Lake and developing another new well site on city property near Osburn Lakes. During 2022 the City obtained permits from EGLE to construct both well sites. The production capacity of both well sites are approved for a capacity of 1,800 gallons per minute. Construction planning and design was completed in 2022 along with plans for obtaining funding in 2023. These two wells will ensure water supply capacity and water quality for future generations in Owosso.

Another major investment in 2022 was the rehabilitation of both water storage tanks. This was a major accomplishment as epoxy and steel supply chain shortages were occurring during this project. Routine inspections of both tanks are included in our future budget to maintain both of these tanks for the next 15 to 20 years like new.

During 2022 roof repairs by a qualified contractor were ongoing and staff along with Public Works replaced other building roof sections. All of our High Service pumps were tested and inspected in 2022 and two were rebuilt to OEM specs. The High Service pumps have a total pumping capacity of 8 million gallons per day! Annual service of the clarifier’s in the plant continued in 2022, worn parts needed to be replaced either by staff or OEM mechanics. Staff completed service on the Lime Silo, replacing failed and aged components.

During 2022 the City was required to complete another Lead and Copper Rule sampling period. We thank everyone involved in collecting samples, filling out paperwork,  and returning everything in a timely manner. Your help made this regulatory requirement easier to accomplish. The LCR (Lead and Copper Rule) results for 2022 were again below the ALE (Action Level Exceedance) and are provided in this report. Again the City is glad to report that at locations where elevated lead and copper test results are obtained, that service line became a priority to ensure all piping going into the residence had compliant materials.

## Contaminants in the Water

Drinking water, including bottled water, may reasonably be expected to contain at least small amounts of some contaminants. The presence of contaminants does not necessarily indicate that water poses a health risk. More information about contaminants and potential health effects can be obtained by calling the USEPA's Safe Drinking Water Hotline (800-426-4791).

## Water Supply

In 2022 we had certified labs test our water for general chemistry, Lead and Copper, Nitrate, PFAS, Synthetic Organic Compounds (SOC's) and Total Trihalomethanes - Haloacetic Acids. Our ground water sources were also tested for general chemistry, Arsenic, Complete Minerals and Metals, and VOC's. We continue to protect our sources by using an updated Wellhead Protection Program (WHPP) to ensure safe drinking water to the public and protect the drinking water from potential sources of contamination by following the WHPP program guidelines set forth by EGLE. Another major investment involves the start of the development of a Water Master Plan, Reliability Plan, WTP Improvement Plan, WTP Performance Evaluation and WTP Engineering Studies by Fishbeck Engineering in 2022. The primary goal of the comprehensive planning study project is to identify needs and costs for Owosso drinking water system in regards to planning, budgeting, and funding. This project will be used to guide future water utility decisions. Such a comprehensive study has not been completed since 1999 and typically is required every 20 years.

During 2022 well development occurred during the coldest months of the year!

## Vulnerability of Sub-Populations

Some people may be more vulnerable to contaminants in drinking water than the general population. Immuno-compromised persons such as persons with cancer undergoing chemotherapy, persons who have undergone organ transplants, people with HIV/AIDS or other immune systems disorders, some elderly, and infants can be particularly at risk from infections. These people should seek advice about drinking water from their health care providers. USEPA/Center for Disease Control guidelines on appropriate means to lessen the risk of infection by Cryptosporidium and other microbial contaminants are available from the Safe Drinking Water Hotline (800-426-4791).

## Sources of Drinking Water

The sources of drinking water (both tap water and bottled water) include rivers, lakes, streams, ponds, reservoirs, springs, and wells. Our water comes from wells. As water travels over the surface of the land or through the ground, it dissolves naturally occurring minerals and, in some cases, radioactive material, and can pick up substances resulting from the presence of animals or from human activity.

## Contaminants that may be in source water:

- Microbial contaminants, such as viruses and bacteria, which may come from sewage treatment plants, septic systems, agricultural livestock operations, and wildlife.
- Inorganic contaminants, such as salts and metals, which can be naturally occurring or result from urban stormwater runoff, industrial or domestic wastewater discharges, oil and gas production, mining, or farming.
- Pesticides and herbicides, which may come from a variety of sources such as agriculture and residential uses.
- Radioactive contaminants, which can be naturally occurring or be the result of oil and gas production and mining activities.
- Organic chemical contaminants, including synthetic and volatile organic chemicals, which are by-products of industrial processes and petroleum production, and can also come from gas stations, urban stormwater runoff, and septic systems.
- To ensure that tap water is safe to drink, the USEPA prescribes regulations that limit the levels of certain contaminants in water provided by public water systems. Federal Food and Drug Administration regulations establish limits for contaminants in bottled water which provide the same protection for public health.

## Visit to Owosso's Water Filtration Plant

Owosso's City Council members joined the EGLE Director Liesl Clark for a tour of Owosso' Tuesday, April 19, 2022. This visit follows EGLE awarding the city a $3 million forgivable loan for lead service line replacement, a $460,021 drinking water asset management grant and a $403,500 grant and $225,960 forgivable loan to replace the City's water main on Center Street and to rehab both the Stand Pipe and Elevated Tower.

City Manager Nathan Henne discussed the impact the $3 million forgivable loan would have on the city's lead service line replacement program. Owosso has 179 known lead service lines and up to 4080 unknown and suspected lead service lines. EGLE requires the city count unknown or suspected lines as lead service lines until they can The city continues to work at identifying all lead service The EGLE funding, paired with funds from the city's water fund, will allow Owosso to replace between 400 and 700 lead service lines.

Former Mayor Eveleth thanked EGLE for the contribution to Owosso's infrastructure projects, acknowledging that Owosso, like most of the country, faces challenges with aging infrastructure. "$4.5 million from EGLE is a really big deal for us and I can't express how appreciative we are and how big of a difference that is going to make," Eveleth stated.

## Information about Lead

If present, elevated levels of lead can cause serious health problems, especially for pregnant women and young children. Lead in drinking water is primarily from materials and components associated with service lines and home plumbing. The City of Owosso Water Supply is responsible for providing high quality drinking water but cannot control the variety of materials used in plumbing components. When your water has been sitting for several hours, you can minimize the potential for lead exposure by flushing your tap for 30 seconds to 2 minutes before using water for drinking or cooking. If you have a lead service line, it is recommended that you run your water for at least 5 minutes to flush water from both your home plumbing and the lead service line. If you are concerned about lead in your water, you may wish to have your water tested. Information on lead in drinking water, testing methods, and steps you can take to minimize exposure is available from the Safe Drinking Water Hotline or at http://www.epa.gov/safewater/lead.

Infants and children who drink water containing lead could experience delays in their physical or mental development. Children could show slight deficits in attention span and learning abilities. Adults who drink this water over many years could develop kidney problems or high blood pressure.

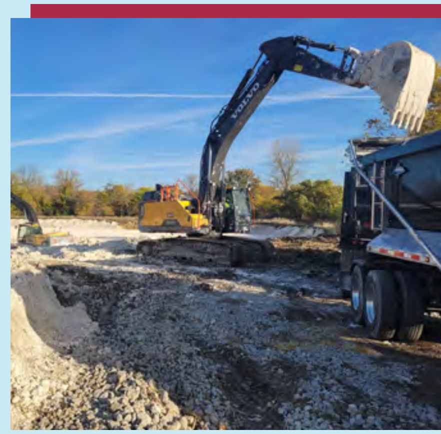
Our water supply has 179 lead service lines and 4080 service lines of unknown material out of a total of 6467 service lines.

Monitoring and Reporting to EGLE Requirements: The State of Michigan and the USEPA require us to test our water on a regular basis to ensure its safety. During the monitoring period from October 1, 2022 to October 31, 2022 we did not take the required number of repeat routine samples for Total Coliform. This violation did not pose a threat to the quality of the drinking water.

During the past year we failed to conduct all of the required assessment(s). On October 13th, 2022, we were required to conduct a Level 1 Assessment. This Level 1 Assessment was completed on November 14th, 2022. In

bacteria that are naturally present in the environment and are used as an indicator that other, potentially harmful, waterborne pathogens may be present or that a potential pathway exists through which contamination may enter the drinking water distribution system. We found coliforms, indicating the need to look for potential problems in water treatment or distribution. When this occurs, we are required to conduct assessment(s) to identify problems and to correct the problems that were found during these assessments.

Due to a Level 1 Assessment being two days overdue, the state considered this a Treatment Technique Violation. Also the number of required samples of well water was short by one sample. This was considered a Groundwater Monitoring Violation. The City of Owosso Water Supply became out of compliance on November 13, 2022, and returned to compliance on November 14, 2022, when the completed L1A form was submitted to EGLE. Additional details and explanation of this event leading up to the Violations were included in an insert in the January 2023 quarterly water bill mailing as required by the state.



Contractors remove lime at an average annual cost over $250,000.00

Regular cleaning and parts replacement each year.

# Water Quality Data

The table below lists all the drinking water contaminants that we detected during the 2022 calendar year. The presence of these contaminants in the water does not necessarily indicate that the water poses a health risk. Unless otherwise noted, the data presented in this table is from testing done January 1 through December 31, 2022. The State allows us to monitor for certain contaminants less than once per year because the concentrations of these contaminants are not . All the data is representative of the water quality, but some are more than one year old.

| Regulated Contaminant | MCL | MCLG | Level Detected | Range | Year Sampled | Violation (Yes/No) | Typical Source of Contaminant |
|---|---|---|---|---|---|---|---|
| Barium (ppm) | 2 | 2 | 0.01 | 0.01 | 08/2018 | No | Discharge from oil drilling wastes and from metal refineries; erosion of natural deposits |
| Fluoride (ppm) | 4 | 4 | 0.64 | 0.37 - 0.64 | 2022 | No | Erosion of natural deposits. Discharge from fertilizer and aluminum factories. *Water additive which promotes strong teeth. |
| HAA5 Haloacetic Acids (ppb) | 60 | N/A | 3 | 1 -3 | 08/2022 | No | Byproduct of drinking water disinfection. |
| TTHM - Total Trihalomethanes(ppb) | 80 | N/A | 43 | 40 - 43 | 08/2022 | No | Byproduct of drinking water disinfection. |
| Chlorine* (ppm) | MRDL 4 | MRDLG 4 | 1.06 | 0.55 - 1.06 | 2022 | No | Water additive used to control microbes. |
| Bromodichloromethane | 0.080 | N/A | 0.014 | 0.012 - 0.014 | 08/2022 | No | Byproduct of drinking water disinfection. |
| Bromoform | 0.080 | N/A | 0.0063 | 0.0054 - 0.0063 | 08/2022 | No | Byproduct of drinking water disinfection. |
| Chlorodibromomethane | 0.080 | N/A | 0.015 | 0.014 - 0.015 | 08/2022 | No | Byproduct of drinking water disinfection. |
| Chloroform | 0.080 | N/A | 0.0083 | 0.0073 - 0.0083 | 08/2022 | No | Byproduct of drinking water disinfection. |

*Chlorine was calculated using the running annual average.

| Microbiological Contaminant | MCL | MCLG | Level Detected | Range | Year Sampled | Violation (Yes/No) | Typical Source of Contaminant |
|---|---|---|---|---|---|---|---|
| Total Coliform (total number or % of positive samples/month) | TT | N/A | N/A | N/A | 2022 | No | Naturally present in the environment |
| E. coli in the distribution system (positive samples) | See E. coli note * | 0 | 0 | N/A | 2022 | No | Human and animal fecal waste |
| Fecal Indicator – E. coli at the source (positive samples) | TT | N/A | 0 | N/A | 2022 | No | Human and animal fecal waste |

* E. coli MCL violation occurs if: (1) routine and repeat samples are total coliform-positive and either is E. coli-positive, or (2) the supply fails to take all required repeat samples following E. coli-positive routine sample, or (3) the supply fails to analyze total coliform-positive repeat sample for E. coli.

| Inorganic Contaminant Subject to ALs | AL | MCLG | Your Water* | Range of Results | Year Sampled | Number of Samples Above AL | Typical Source of Contaminant |
|---|---|---|---|---|---|---|---|
| Lead (ppb) | 15 | 0 | 7 ppb | 0 ppb - 34 ppb | 2022 | 1 | Lead service lines, corrosion of household plumbing including fitting and fixtures; Erosion of natural desposits. |
| Copper (ppm) | 1.3 | 1.3 | 0.0 ppm | 0 ppm - 0.1 ppm | 2022 | 0 | Corrosion of household plumbing systems; Erosion of natural desposits. |

*Ninety (90) percent of the samples collected were at or below the level reported for our water.

We will update this report annually and will keep customers informed of any problems that may occur throughout the year, as required. Copies are available at City Hall. This report will not be sent to you. We invite public participation in decisions that affect drinking water quality. Public comment may be provided at City Hall during regularly scheduled city council meetings, held at 7:30 p.m. on the first and third Mondays of each month. For more information about your water, or the contents of this report, contact the Water Plant Superintendent, David Haut at 989-725-0560, or email: david.haut@ci.owosso.mi.us. Further, the city web site at http://www.ci.owosso.mi.us/Utilities is available for inquiries and comment. Finally the Director of Public Services and Utilities is available for information and inquiries at 989-725-0555 or email at ryan.suchanek@ci.owosso.mi.us. For more information about safe drinking water, visit the U.S. EPA at http://www.epa.gov/safewater/.

## Terms & Abbreviations

**Action Level (AL):** The concentration of a contaminant which, if exceeded, triggers treatment or other requirements that a water system must follow.

**Level 1 Assessment:** A study of the water supply to identify potential problems and determine (if possible) why total coliform bacteria have been found in our water system.

**Maximum Contaminant Level (MCL):** The highest level of a contaminant that is allowed in drinking water. MCLs are set as close to the MCLGs as feasible using the best available treatment technology.

**Maximum Contaminant Level Goal (MCLG):** The level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs allow for a margin of safety.

**Maximum Residual Disinfectant Level (MRDL):** The highest level of a disinfectant allowed in drinking water. There is convincing evidence that addition of a disinfectant is necessary for control of microbial contaminants.

**Maximum Residual Disinfectant Level Goal (MRDLG):** The level of a drinking water disinfectant below which there is no known or expected risk to health. MRDLGs do not reflect the benefits of the use of disinfectants to control microbial contaminants.

**N/A:** Not applicable

**ND:** not detectable at testing limit

**ppb:** parts per billion or micrograms per liter

**ppm:** parts per million or milligrams per liter

**Treatment Technique (TT):** A required process intended to reduce the level of a contaminant in drinking water.

Saving funds by staff replacing a shingle roof.

## Additional Monitoring

Unregulated contaminants are those for which the USEPA has not established drinking water standards. Monitoring helps the USEPA determine where certain contaminants occur and whether regulation of those contaminants is needed.

| Unregulated Contaminant Name | Average Level Detected | Year Sampled | Comments |
|---|---|---|---|
| Sodium (ppm) | 43 | 8/2022 | Typical source is erosion of natural deposits. |
| Chloride (ppm) | 94 | 8/2022 | Naturally occurring or indicative of road salt contamination. |
| Sulfate (ppm) | 124 | 8/2022 | Naturally occurring. |
| Magnesium (ppm) | 15 | 8/2022 | Naturally occurring. |
| Hardness of CaCO3 (ppm) | 169 | 8/2022 | Naturally occurring. |
| Calcium (ppm) | 43 | 8/2022 | Naturally occurring. |
| | Average Level Detected | Year Sampled | Comments See EPA Website: https://www.epa.gov/dwucmr/fourth-unregulated-contaminant-monitoring-rule |
| Germanium (ug/L) | <0.300 | 1/21/2020 | Metal. |
| Manganese (ug/L) | <0.400 | 1/21/2020 | Metal. |
| BHA (ug/L) | <0.0300 | 1/21/2020 | Semi-Volatile Organic Compounds |
| o- Toluidine (ug/L) | <0.0070 | 1/21/2020 | Semi-Volatile Organic Compounds |
| Quinoline (ug/L) | <0.0200 | 1/21/2020 | Semi-Volatile Organic Compounds |
| HAA5 (five regulated haloacetic acids) (ug/L) | 2.00 | 08/2022 | Disinfection Byproducts |
| HAA6Br (six brominated haloacetic acids) (ug/L) | 11.000 | 1/07/2020 | Disinfection Byproducts |
| HAA9 (nine haloacetic acids) (ug/L) | 18.300 | 1/07/2020 | Disinfection Byproducts |
| alpha-BHC (alpha-Hexachlorocyclohexane) (ug/L) | <0.010 | 1/07/2020 | Pesticide |
| Chlorpyrifs (ug/L) | <0.030 | 1/07/2020 | Pesticide |
| Dimethipin (ug/L) | <0.200 | 1/07/2020 | Pesticide |
| Ethoprop (ug/L) | <0.030 | 1/07/2020 | Pesticide |
| Oxyfluorfen (ug/L) | <0.050 | 1/07/2020 | Pesticide |
| Profenofos (ug/L) | <0.300 | 1/07/2020 | Pesticide |
| Tebuconazole (ug/L) | <0.200 | 1/07/2020 | Pesticide |
| Permethrin (ug/L) | <0.040 | 1/07/2020 | Pesticide |
| Tribufos (ug/L) | <0.070 | 1/07/2020 | Pesticide |
| 1-Butanol (ug/L) | <2.000 | 1/07/2020 | Alchohol |
| 2-Methoxyethanol (ug/L) | <0.400 | 1/07/2020 | Alchohol |
| 2-Propen-1-ol (ug/L) | <0.500 | 1/07/2020 | Alchohol |

# Appendix 3

City of Owosso DWSRF Monetary Evaluation
Raw Water Supply - LW-1 and PS-W2 Well House Building and Mechanical Equipment Improvements
Alternative 2 - Optimum Performance of Existing Facilites

| Cost Item | Units | Qty | Unit Cost | Estimated Capital Cost |
|---|---|---|---|---|
| Local Well 1 | | | | |
| Demolition | LS | 1 | $20,000 | $20,000 |
| Magnetic Flow Meter | LS | 1 | $11,000 | $11,000 |
| Well House Building | SF | 250 | $500 | $125,000 |
| HVAC & Misc. Equipment | LS | 1 | $75,000 | $75,000 |
| Palmer Street Well 2 | | | | |
| Demolition | LS | 1 | $20,000 | $20,000 |
| Isolation Valve | LS | 1 | $6,500 | $6,500 |
| Well House Building | SF | 250 | $500 | $125,000 |
| HVAC & Misc. Equipment | LS | 1 | $75,000 | $75,000 |
| Subtotal | | | | $457,500 |
| Contractor General Conditions, Overhead and Profit (15%) | | | | $70,000 |
| Contingency (20%) | | | | $100,000 |
| Engineering/Administration/Legal (22%) | | | | $140,000 |
| Total Estimated Project Cost | | | | $770,000 |

| Cost Item | Estimated Capital Cost | Design Life (yrs) | Replace. Cost | Salvage Value |
|---|---|---|---|---|
| Local Well 1 | | | | |
| Demolition | $20,000 | 0 | $0 | $0 |
| Magnetic Flow Meter | $11,000 | 20 | $0 | $0 |
| Well House Building | $125,000 | 50 | $0 | $80,000 |
| HVAC & Misc. Equipment | $75,000 | 20 | $0 | $0 |
| Palmer Street Well 2 | | | | |
| Demolition | $20,000 | 0 | $0 | $0 |
| Isolation Valve | $6,500 | 30 | $0 | $3,000 |
| Well House Building | $125,000 | 50 | $0 | $80,000 |
| HVAC & Misc. Equipment | $75,000 | 20 | $0 | $0 |
| Subtotal | $457,500 | | | $163,000 |
| Contractor General Conditions, Overhead and Profit (15%) | $70,000 | | | |
| Contingency (20%) | $100,000 | | | |
| Engineering/Administration/Legal (22%) | $140,000 | | | |
| Total Estimated Project Cost | $770,000 | | | |

| 20-Year Present Worth | Actual Cost | 20-Year Present Worth |
|---|---|---|
| Capital Cost | $770,000 | $770,000 |
| Annual O&M Cost | $3,500 | $60,000 |
| Salvage Value | $163,000 | ($110,000) |
| Total Estimate of Present Worth | | $720,000 |

Notes:
Present Worth estimated using discount rate of 2.0% *from EGLE*

City of Owosso DWSRF Monetary Evaluation
Raw Water Supply - PS-W1 Abandonment
Alternative 2 - Optimum Performance of Existing Facilites

| Cost Item | Units | Qty | Unit Cost | Estimated Capital Cost |
|---|---|---|---|---|
| Demolition | LS | 1 | $25,000 | $25,000 |
| PS-W1 Well Abandonment | LS | 1 | $8,000 | $8,000 |
| PS-W1 Raw Water Main Abandonment | LS | 1 | $8,000 | $8,000 |
| Subtotal | | | | $41,000 |
| Contractor General Conditions, Overhead and Profit (15%) | | | | $10,000 |
| Contingency (20%) | | | | $10,000 |
| Engineering/Administration/Legal (22%) | | | | $20,000 |
| Total Estimated Project Cost | | | | $90,000 |

| Cost Item | Estimated Capital Cost | Design Life (yrs) | Replace. Cost | Salvage Value |
|---|---|---|---|---|
| Demolition | $25,000 | 0 | $0 | $0 |
| PS-W1 Well Abandonment | $8,000 | 0 | $0 | $0 |
| PS-W1 Raw Water Main Abandonment | $8,000 | 0 | $0 | $0 |
| Subtotal | $41,000 | | | $0 |
| Contractor General Conditions, Overhead and Profit (15%) | $10,000 | | | |
| Contingency (20%) | $10,000 | | | |
| Engineering/Administration/Legal (22%) | $20,000 | | | |
| Total Estimated Project Cost | $90,000 | | | |

| 20-Year Present Worth | Actual Cost | 20-Year Present Worth |
|---|---|---|
| Capital Cost | $90,000 | $90,000 |
| Annual O&M Cost | $0 | $0 |
| Salvage Value | $0 | $0 |
| Total Estimate of Present Worth | | $90,000 |

Notes:
Present Worth estimated using discount rate of 2.0% *from EGLE*

City of Owosso DWSRF Monetary Evaluation
Water Treatment Plant - Electrical Grounding and Equipment Improvements
Alternative 2 - Optimum Performance of Existing Facilites

| Cost Item | Units | Qty | Unit Cost | Estimated Capital Cost |
|---|---|---|---|---|
| Double Ended Switchboard | LS | 1 | $150,000 | $150,000 |
| Pole-Mounted Gang-Operated Primary Switch | LS | 1 | $100,000 | $100,000 |
| Pole-Mounted Transformers | LS | 1 | $400,000 | $400,000 |
| Grounding Electrode System | LS | 1 | $100,000 | $100,000 |
| Feeder and Branch Circuits | LS | 1 | $100,000 | $100,000 |
| Surge Protective Devices | LS | 1 | $80,000 | $80,000 |
| Subtotal | | | | $930,000 |
| Contractor General Conditions, Overhead and Profit (15%) | | | | $140,000 |
| Contingency (20%) | | | | $190,000 |
| Engineering/Administration/Legal (22%) | | | | $280,000 |
| **Total Estimated Project Cost** | | | | **$1,540,000** |

| Cost Item | Estimated Capital Cost | Design Life (yrs) | Replace. Cost | Salvage Value |
|---|---|---|---|---|
| Double Ended Switchboard | $150,000 | 30 | $0 | $50,000 |
| Pole-Mounted Gang-Operated Primary Switch | $100,000 | 30 | $0 | $40,000 |
| Pole-Mounted Transformers | $400,000 | 30 | $0 | $140,000 |
| Grounding Electrode System | $100,000 | 30 | $0 | $40,000 |
| Feeder and Branch Circuits | $100,000 | 30 | $0 | $40,000 |
| Surge Protective Devices | $80,000 | 30 | $0 | $30,000 |
| Subtotal | $930,000 | | | $340,000 |
| Contractor General Conditions, Overhead and Profit (15%) | $140,000 | | | |
| Contingency (20%) | $190,000 | | | |
| Engineering/Administration/Legal (22%) | $280,000 | | | |
| **Total Estimated Project Cost** | **$1,540,000** | | | |

| 20-Year Present Worth | Actual Cost | 20-Year Present Worth |
|---|---|---|
| Capital Cost | $1,540,000 | $1,540,000 |
| Annual O&M Cost | $5,000 | $80,000 |
| Salvage Value | $340,000 | ($230,000) |
| **Total Estimate of Present Worth** | | **$1,390,000** |

Notes:
Present Worth estimated using discount rate of 2.0% *from EGLE*

City of Owosso DWSRF Monetary Evaluation
Water Treatment Plant - Storage Reservoir, High Service Pumping, and Transfer Pumping Improvements
Alternative 3 - Construction Alternative

| Cost Item | Units | Qty | Unit Cost | Estimated Capital Cost |
|---|---|---|---|---|
| Prestressed Concrete Tanks | | | | |
| 750,000 gal Ground Storage Tank | EA | 2 | $1,750,000 | $3,500,000 |
| Process Equipment | | | | |
| 3.0 MGD High Service Pump (150 HP) | EA | 3 | $120,000 | $360,000 |
| 3.0 MGD Transfer Pumps (40 HP) | EA | 3 | $90,000 | $270,000 |
| Trolley Hoist | EA | 1 | $15,000 | $15,000 |
| Process Pipe Allowance | LS | 1 | $1,200,000 | $1,200,000 |
| Process Valve Allowance | LS | 1 | $500,000 | $500,000 |
| Misc. Supports, Sleeve, Penetration Allowance | LS | 1 | $50,000 | $50,000 |
| Instrumentation Allowance | LS | 1 | $100,000 | $100,000 |
| Building and Site | | 1 | | |
| Pump Station Building | SF | 3600 | $350 | $1,260,000 |
| Transfer Pump Concrete Encasement | TONS | 170.6 | $4,000 | $682,400 |
| Storage Tank Valve Vault | EA | 1 | $50,000 | $50,000 |
| Site Work Allowance | LS | 1 | $750,000 | $750,000 |
| Electrical and Mechanical | | | | |
| Electrical Allowance | LS | 1 | $1,250,000 | $1,250,000 |
| Systems Integration Allowance | LS | 1 | $200,000 | $200,000 |
| Mechanical Allowance | LS | 1 | $500,000 | $500,000 |
| Subtotal | | | | $10,687,400 |
| Contractor General Conditions, Overhead and Profit (15%) | | | | $1,610,000 |
| Contingency (20%) | | | | $2,140,000 |
| Engineering/Administration/Legal (22%) | | | | $3,180,000 |
| Total Estimated Project Cost | | | | $17,620,000 |

| Cost Item | Estimated Capital Cost | Design Life (yrs) | Replace. Cost | Salvage Value |
|---|---|---|---|---|
| <u>Prestressed Concrete Tanks</u> | | | | |
| 750,000 gal Ground Storage Tank | $3,500,000 | 50 | $0 | $2,100,000 |
| <u>Process Equipment</u> | | | | |
| 3.0 MGD High Service Pump (150 HP) | $360,000 | 30 | $0 | $120,000 |
| 3.0 MGD Transfer Pumps (40 HP) | $270,000 | 30 | $0 | $90,000 |
| Trolley Hoist | $15,000 | 30 | $0 | $10,000 |
| Process Pipe Allowance | $1,200,000 | 50 | $0 | $720,000 |
| Process Valve Allowance | $500,000 | 50 | $0 | $300,000 |
| Misc. Supports, Sleeve, Penetration Allowance | $50,000 | 50 | $0 | $30,000 |
| Instrumentation Allowance | $100,000 | 20 | $0 | $0 |
| <u>Building and Site</u> | | | | |
| Pump Station Building | $1,260,000 | 100 | $0 | $1,010,000 |
| Transfer Pump Concrete Encasement | $682,400 | 100 | $0 | $550,000 |
| Storage Tank Valve Vault | $50,000 | 50 | $0 | $30,000 |
| Site Work Allowance | $750,000 | 50 | $0 | $450,000 |
| <u>Electrical and Mechanical</u> | | | | |
| Electrical Allowance | $1,250,000 | 20 | $0 | $0 |
| Systems Integration Allowance | $200,000 | 20 | $0 | $0 |
| Mechanical Allowance | $500,000 | 20 | $0 | $0 |
| Subtotal | $10,687,400 | | | $5,410,000 |
| Contractor General Conditions, Overhead and Profit (1! | $1,610,000 | | | |
| Contingency (20%) | $2,140,000 | | | |
| Engineering/Administration/Legal (22%) | $3,180,000 | | | |
| **Total Estimated Project Cost** | **$17,620,000** | | | |

| 20-Year Present Worth | Actual Cost | 20-Year Present Worth |
|---|---|---|
| Capital Cost | $17,620,000 | $17,620,000 |
| Annual O&M Cost | $80,000 | $1,310,000 |
| Salvage Value | $5,410,000 | ($3,650,000) |
| **Total Estimate of Present Worth** | | **$15,280,000** |

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Notes:

Present Worth estimated using discount rate of 2.0% *from EGLE*

City of Owosso DWSRF Monetary Evaluation
Water Treatment Plant - Chlorine Feed Improvements
Alternative 3 - Construction Alternative

| Cost Item | Units | Qty | Unit Cost | Estimated Capital Cost |
|---|---|---|---|---|
| Chemical Feed System | | | | |
| OSG Skids, Brine Storage Tank, Hypochlorite Storage Tank, Accessories | LS | 1 | $275,000 | $275,000 |
| Day Tanks | EA | 2 | $30,000 | $60,000 |
| Transfer Pumps | EA | 2 | $8,000 | $16,000 |
| Metering Pumps | EA | 4 | $6,000 | $24,000 |
| Building and Site | | | | |
| OSG Building | SF | 840 | $350 | $294,000 |
| Site Work Allowance | LS | 1 | $50,000 | $50,000 |
| Site Chemical Piping | LS | 1 | $50,000 | $50,000 |
| Electrical and Mechanical | | | | |
| Electrical Allowance | LS | 1 | $110,000 | $110,000 |
| Mechanical Allowance | LS | 1 | $20,000 | $20,000 |
| Subtotal | | | | $899,000 |
| Contractor General Conditions, Overhead and Profit (15%) | | | | $140,000 |
| Contingency (20%) | | | | $180,000 |
| Engineering/Administration/Legal (22%) | | | | $270,000 |
| **Total Estimated Project Cost** | | | | **$1,490,000** |

| Cost Item | Estimated Capital Cost | Design Life (yrs) | Replace. Cost | Salvage Value |
|---|---|---|---|---|
| Chemical Feed System | | | | |
| OSG Skids, Brine Storage Tank, Hypochlorite Storage Tank, Accessories | $275,000 | 30 | $0 | $100,000 |
| Day Tanks | $60,000 | 30 | $0 | $20,000 |
| Transfer Pumps | $16,000 | 30 | $0 | $10,000 |
| Metering Pumps | $24,000 | 30 | $0 | $10,000 |
| Building and Site | | | | $0 |
| OSG Building | $294,000 | 100 | $0 | $240,000 |
| Site Work Allowance | $50,000 | 50 | $0 | $30,000 |
| Site Chemical Piping | $50,000 | 50 | $0 | $30,000 |
| Electrical and Mechanical | | | | $0 |
| Electrical Allowance | $110,000 | 20 | $0 | $0 |
| Mechanical Allowance | $20,000 | 20 | $0 | $0 |
| Subtotal | $899,000 | | | $440,000 |
| Contractor General Conditions, Overhead and Profit (15%) | $140,000 | | | |
| Contingency (20%) | $180,000 | | | |
| Engineering/Administration/Legal (22%) | $270,000 | | | |
| **Total Estimated Project Cost** | **$1,490,000** | | | |

| 20-Year Present Worth | Actual Cost | 20-Year Present Worth |
|---|---|---|
| Capital Cost | $1,490,000 | $1,490,000 |
| Annual O&M Cost | $12,500 | $200,000 |
| Salvage Value | $440,000 | ($300,000) |
| Total Estimate of Present Worth | | $1,390,000 |

Notes:

Present Worth estimated using discount rate of 2.0% *from EGLE*

City of Owosso DWSRF Monetary Evaluation
Distribution System - Transmission Main and River Crossing Improvements FY26
Alternative 3 - Constuction Alternative

| Cost Item | Units | Qty | Unit Cost | Estimated Capital Cost |
|---|---|---|---|---|
| Allendale Avenue Transmission Main (WTP to Frazer Avenue) | LS | 1 | $220,000 | $220,000 |
| Frazer Avenue Transmission Main (Allendale Avenue to Corunna Avenue) | LS | 1 | $448,000 | $448,000 |
| Garfield Street Transmission Main (Corunna Avenue to Monroe Street) | LS | 1 | $351,000 | $351,000 |
| McMillan Road Transmission Main (Monroe Avenue to South Street) | LS | 1 | $701,000 | $701,000 |
| 12-inch Finished Water River Crossing (S. Gould Street to WTP) | LS | 1 | $662,000 | $662,000 |
| 24-inch Finished Water River Crossing (S. Gould Street to WTP) | LS | 1 | $1,332,000 | $1,332,000 |
| Subtotal | | | | $3,714,000 |
| Contractor General Conditions, Overhead and Profit (15%) | | | | $560,000 |
| Contingency (20%) | | | | $750,000 |
| Engineering/Administration/Legal (22%) | | | | $1,110,000 |
| **Total Estimated Project Cost** | | | | **$6,140,000** |

| Cost Item | Estimated Capital Cost | Design Life (yrs) | Replace. Cost | Salvage Value |
|---|---|---|---|---|
| Allendale Avenue Transmission Main (WTP to Frazer Avenue) | $220,000 | 50 | $0 | $140,000 |
| Frazer Avenue Transmission Main (Allendale Avenue to Corunna Avenue) | $448,000 | 50 | $0 | $270,000 |
| Garfield Street Transmission Main (Corunna Avenue to Monroe Street) | $351,000 | 50 | $0 | $220,000 |
| McMillan Road Transmission Main (Monroe Avenue to South Street) | $701,000 | 50 | $0 | $430,000 |
| 12-inch Finished Water River Crossing (S. Gould Street to WTP) | $662,000 | 50 | $0 | $400,000 |
| 24-inch Finished Water River Crossing (S. Gould Street to WTP) | $1,332,000 | 50 | $0 | $800,000 |
| Subtotal | $3,714,000 | | | $2,260,000 |
| Contractor General Conditions, Overhead and Profit (15%) | $560,000 | | | |
| Contingency (20%) | $750,000 | | | |
| Engineering/Administration/Legal (22%) | $1,110,000 | | | |
| **Total Estimated Project Cost** | **$6,140,000** | | | |

| 20-Year Present Worth | Actual Cost | 20-Year Present Worth |
|---|---|---|
| Capital Cost | $6,140,000 | $6,140,000 |
| Annual O&M Cost | $15,000 | $250,000 |
| Salvage Value | $2,260,000 | ($1,530,000) |
| **Total Estimate of Present Worth** | | **$4,860,000** |

Notes:
Present Worth estimated using discount rate of 2.0% *from EGLE*

City of Owosso DWSRF Monetary Evaluation
Distribution System - Transmission Main and River Crossing Improvements FY27
Alternative 3 - Constuction Alternative

| Cost Item | Units | Qty | Unit Cost | Estimated Capital Cost |
|---|---|---|---|---|
| South Street Transmission Main (McMillan Road to Vandecarr Road) | LS | 1 | $1,179,000 | $1,179,000 |
| Cross-Lot Transmission Main (Vandecarr Road to Cook Road) | LS | 1 | $365,000 | $365,000 |
| Cross-Lot Transmission Main (Cook Road to Palmer Street) | LS | 1 | $627,000 | $627,000 |
| Palmer Street Well 2 Transmission Main (PS-W2 to Cross Lot) | LS | 1 | $86,000 | $86,000 |
| Palmer Street Well 3 Transmission Main (PS-W3 to Cross Lot) | LS | 1 | $144,000 | $144,000 |
| Subtotal | | | | $2,401,000 |
| Contractor General Conditions, Overhead and Profit (15%) | | | | $370,000 |
| Contingency (20%) | | | | $490,000 |
| Engineering/Administration/Legal (22%) | | | | $720,000 |
| **Total Estimated Project Cost** | | | | **$3,990,000** |

| Cost Item | Estimated Capital Cost | Design Life (yrs) | Replace. Cost | Salvage Value |
|---|---|---|---|---|
| South Street Transmission Main (McMillan Road to Vandecarr Road) | $1,179,000 | 50 | $0 | $710,000 |
| Cross-Lot Transmission Main (Vandecarr Road to Cook Road) | $365,000 | 50 | $0 | $220,000 |
| Cross-Lot Transmission Main (Cook Road to Palmer Street) | $627,000 | 50 | $0 | $380,000 |
| Palmer Street Well 2 Transmission Main (PS-W2 to Cross Lot) | $86,000 | 50 | $0 | $60,000 |
| Palmer Street Well 3 Transmission Main (PS-W3 to Cross Lot) | $144,000 | 50 | $0 | $90,000 |
| Subtotal | $2,401,000 | | | $1,460,000 |
| Contractor General Conditions, Overhead and Profit (15%) | $370,000 | | | |
| Contingency (20%) | $490,000 | | | |
| Engineering/Administration/Legal (22%) | $720,000 | | | |
| **Total Estimated Project Cost** | **$3,990,000** | | | |

| 20-Year Present Worth | Actual Cost | 20-Year Present Worth |
|---|---|---|
| Capital Cost | $3,990,000 | $3,990,000 |
| Annual O&M Cost | $10,000 | $160,000 |
| Salvage Value | $1,460,000 | ($990,000) |
| **Total Estimate of Present Worth** | | **$3,160,000** |

Notes:
Present Worth estimated using discount rate of 2.0% *from EGLE*

City of Owosso DWSRF Monetary Evaluation
Distribution System - Transmission Main and River Crossing Improvements FY28
Alternative 3 - Constuction Alternative

| Cost Item | Units | Qty | Unit Cost | Estimated Capital Cost |
|---|---|---|---|---|
| Hintz Road Transmission Main (Hintz Well to Copas Road) | LS | 1 | $2,006,000 | $2,006,000 |
| Copas Road Transmission Main (Hintz Road to Hazelton Road) | LS | 1 | $367,000 | $367,000 |
| Subtotal | | | | $2,373,000 |
| Contractor General Conditions, Overhead and Profit (15%) | | | | $360,000 |
| Contingency (20%) | | | | $480,000 |
| Engineering/Administration/Legal (22%) | | | | $710,000 |
| **Total Estimated Project Cost** | | | | **$3,930,000** |

| Cost Item | Estimated Capital Cost | Design Life (yrs) | Replace. Cost | Salvage Value |
|---|---|---|---|---|
| Hintz Road Transmission Main (Hintz Well to Copas Road) | $2,006,000 | 50 | $0 | $1,210,000 |
| Copas Road Transmission Main (Hintz Road to Hazelton Road) | $367,000 | 50 | $0 | $230,000 |
| Subtotal | $2,373,000 | | | $1,440,000 |
| Contractor General Conditions, Overhead and Profit (15%) | $360,000 | | | |
| Contingency (20%) | $480,000 | | | |
| Engineering/Administration/Legal (22%) | $710,000 | | | |
| **Total Estimated Project Cost** | **$3,930,000** | | | |

| 20-Year Present Worth | Actual Cost | 20-Year Present Worth |
|---|---|---|
| Capital Cost | $3,930,000 | $3,930,000 |
| Annual O&M Cost | $10,000 | $160,000 |
| Salvage Value | $1,440,000 | ($970,000) |
| **Total Estimate of Present Worth** | | **$3,120,000** |

Notes:
Present Worth estimated using discount rate of 2.0% *from EGLE*

City of Owosso DWSRF Monetary Evaluation
Distribution System - Transmission Main and River Crossing Improvements FY29
Alternative 3 - Constuction Alternative

| Cost Item | Units | Qty | Unit Cost | Estimated Capital Cost |
|---|---|---|---|---|
| Hazelton Road Transmission Main (Oliver Street to M-21) | LS | 1 | $419,000 | $419,000 |
| Rawleigh Avenue Transmission Main (M-21 to Grover Street) | LS | 1 | $230,000 | $230,000 |
| Raw Water River Crossing (Grover Street to WTP) | LS | 1 | $990,000 | $990,000 |
| 12-inch Finished Water River Crossing (Oakwood Avenue to S. Gould Street) | LS | 1 | $439,000 | $439,000 |
| 16-inch Finished Water River Crossing (Cass Street to Jerome Avenue) | LS | 1 | $188,000 | $188,000 |
| 12-inch Finished Water River Crossing (M-71 to Jerome Avenue) | LS | 1 | $346,000 | $346,000 |
| Subtotal | | | | $2,612,000 |
| Contractor General Conditions, Overhead and Profit (15%) | | | | $400,000 |
| Contingency (20%) | | | | $530,000 |
| Engineering/Administration/Legal (22%) | | | | $780,000 |
| **Total Estimated Project Cost** | | | | **$4,330,000** |

| Cost Item | Estimated Capital Cost | Design Life (yrs) | Replace. Cost | Salvage Value |
|---|---|---|---|---|
| Hazelton Road Transmission Main (Oliver Street to M-21) | $419,000 | 50 | $0 | $260,000 |
| Rawleigh Avenue Transmission Main (M-21 to Grover Street) | $230,000 | 50 | $0 | $140,000 |
| Raw Water River Crossing (Grover Street to WTP) | $990,000 | 50 | $0 | $600,000 |
| 12-inch Finished Water River Crossing (Oakwood Avenue to S. Gould Street) | $439,000 | 50 | $0 | $270,000 |
| 16-inch Finished Water River Crossing (Cass Street to Jerome Avenue) | $188,000 | 50 | $0 | $120,000 |
| 12-inch Finished Water River Crossing (M-71 to Jerome Avenue) | $346,000 | 50 | $0 | $210,000 |
| Subtotal | $2,612,000 | | | $1,600,000 |
| Contractor General Conditions, Overhead and Profit (15%) | $400,000 | | | |
| Contingency (20%) | $530,000 | | | |
| Engineering/Administration/Legal (22%) | $780,000 | | | |
| **Total Estimated Project Cost** | **$4,330,000** | | | |

| 20-Year Present Worth | Actual Cost | 20-Year Present Worth |
|---|---|---|
| Capital Cost | $4,330,000 | $4,330,000 |
| Annual O&M Cost | $11,000 | $180,000 |
| Salvage Value | $1,600,000 | ($1,080,000) |
| **Total Estimate of Present Worth** | | **$3,430,000** |

Notes:
Present Worth estimated using discount rate of 2.0% *from EGLE*

City of Owosso DWSRF Monetary Evaluation
Distribution System - Water Main Improvements FY25
Alternative 3 - Constuction Alternative

| Cost Item | Units | Qty | Unit Cost | Estimated Capital Cost |
|---|---|---|---|---|
| Nafus Street Water Main (S. End to Frederick Street) | LS | 1 | $119,000 | $119,000 |
| Gilbert Street Water Main (Mason Street to Oliver Street) | LS | 1 | $230,000 | $230,000 |
| Clinton Street Water Main (Cedar Street to Shiawassee Street) | LS | 1 | $403,000 | $403,000 |
| Olmstead Street Water Main (Ward Street to Chipman Street) | LS | 1 | $154,000 | $154,000 |
| Harding Avenue Water Main (Willow Springs to Hanover Street) | LS | 1 | $196,000 | $196,000 |
| Hanover Street Water Main (Harding Avenue to Riverside Drive) | LS | 1 | $109,000 | $109,000 |
| Stewart Street Water Main (Cedar Street to Shiawassee Street) | LS | 1 | $465,000 | $465,000 |
| Williams Street Water Main (Shiawassee Street to Washington Street) | LS | 1 | $540,000 | $540,000 |
| Dewey Street Water Main (Main Street (M-21) to King Street) | LS | 1 | $2,047,000 | $2,047,000 |
| Young Street Water Main (Chestnut Street to Brooks Street) | LS | 1 | $358,000 | $358,000 |
| Grace Street Water Main (Cedar Stteet to Shiawassee Street) | LS | 1 | $424,000 | $424,000 |
| Subtotal | | | | $5,045,000 |
| Contractor General Conditions, Overhead and Profit (15%) | | | | $760,000 |
| Contingency (20%) | | | | $1,010,000 |
| Engineering/Administration/Legal (22%) | | | | $1,500,000 |
| Total Estimated Project Cost | | | | $8,320,000 |

| Cost Item | Estimated Capital Cost | Design Life (yrs) | Replace. Cost | Salvage Value |
|---|---|---|---|---|
| Nafus Street Water Main (S. End to Frederick Street) | $119,000 | 50 | $0 | $80,000 |
| Gilbert Street Water Main (Mason Street to Oliver Street) | $230,000 | 50 | $0 | $140,000 |
| Clinton Street Water Main (Cedar Street to Shiawassee Street) | $403,000 | 50 | $0 | $250,000 |
| Olmstead Street Water Main (Ward Street to Chipman Street) | $154,000 | 50 | $0 | $100,000 |
| Harding Avenue Water Main (Willow Springs to Hanover Street) | $196,000 | 50 | $0 | $120,000 |
| Hanover Street Water Main (Harding Avenue to Riverside Drive) | $109,000 | 50 | $0 | $70,000 |
| Stewart Street Water Main (Cedar Street to Shiawassee Street) | $465,000 | 50 | $0 | $280,000 |
| Williams Street Water Main (Shiawassee Street to Washington Street) | $540,000 | 50 | $0 | $330,000 |
| Dewey Street Water Main (Main Street (M-21) to King Street) | $2,047,000 | 50 | $0 | $1,230,000 |
| Young Street Water Main (Chestnut Street to Brooks Street) | $358,000 | 50 | $0 | $220,000 |
| Grace Street Water Main (Cedar Stteet to Shiawassee Street) | $424,000 | 50 | $0 | $260,000 |
| Subtotal | $5,045,000 | | | $3,080,000 |
| Contractor General Conditions, Overhead and Profit (15%) | $760,000 | | | |
| Contingency (20%) | $1,010,000 | | | |
| Engineering/Administration/Legal (22%) | $1,500,000 | | | |
| Total Estimated Project Cost | $8,320,000 | | | |

| 20-Year Present Worth | Actual Cost | 20-Year Present Worth |
|---|---|---|
| Capital Cost | $8,320,000 | $8,320,000 |
| Annual O&M Cost | $18,000 | $290,000 |
| Salvage Value | $3,080,000 | ($2,080,000) |
| Total Estimate of Present Worth | | $6,530,000 |

Notes:
Present Worth estimated using discount rate of 2.0% *from EGLE*

City of Owosso DWSRF Monetary Evaluation
Distribution System - Water Main Improvements FY26
Alternative 3 - Constuction Alternative

| Cost Item | Units | Qty | Unit Cost | Estimated Capital Cost |
|---|---|---|---|---|
| Genesee Street Water Main (Michigan Avenue to Green Street) | LS | 1 | $152,000 | $152,000 |
| Adams Street Water Main (Oliver Street to King Street) | LS | 1 | $352,000 | $352,000 |
| Adams Street Water Main (Elizabeth Street to N. of Jennett Street) | LS | 1 | $101,000 | $101,000 |
| Brandon Street Water Main (Summit Street to Dingwall Drive) | LS | 1 | $117,000 | $117,000 |
| Dingwall Drive Water Main (Brandon Street to N. End) | LS | 1 | $302,000 | $302,000 |
| Nafus Street Water Main (Stewart Street to N. End) | LS | 1 | $153,000 | $153,000 |
| Woodlawn Avenue Water Main (Farr Street to Auburndale Avenue) | LS | 1 | $236,000 | $236,000 |
| Shady Lane Drive Water Main (Meadow Drive to Chipman Street) | LS | 1 | $290,000 | $290,000 |
| Exchange Street Water Main (Saginaw Street to Dewey Street) | LS | 1 | $496,000 | $496,000 |
| State Street (S. End to Clyde Street) | LS | 1 | $115,000 | $115,000 |
| State Street (Clyde Street to Stewart Street) | LS | 1 | $347,000 | $347,000 |
| Clyde Street (State Street to Lyon Street) | LS | 1 | $115,000 | $115,000 |
| Lyon Street (Clyde Street to Grace Street) | LS | 1 | $116,000 | $116,000 |
| Subtotal | | | | $2,892,000 |
| Contractor General Conditions, Overhead and Profit (15%) | | | | $440,000 |
| Contingency (20%) | | | | $580,000 |
| Engineering/Administration/Legal (22%) | | | | $870,000 |
| **Total Estimated Project Cost** | | | | **$4,790,000** |

| Cost Item | Estimated Capital Cost | Design Life (yrs) | Replace. Cost | Salvage Value |
|---|---|---|---|---|
| Genesee Street Water Main (Michigan Avenue to Green Street) | $152,000 | 50 | $0 | $100,000 |
| Adams Street Water Main (Oliver Street to King Street) | $352,000 | 50 | $0 | $220,000 |
| Adams Street Water Main (Elizabeth Street to N. of Jennett Street) | $101,000 | 50 | $0 | $70,000 |
| Brandon Street Water Main (Summit Street to Dingwall Drive) | $117,000 | 50 | $0 | $80,000 |
| Dingwall Drive Water Main (Brandon Street to N. End) | $302,000 | 50 | $0 | $190,000 |
| Nafus Street Water Main (Stewart Street to N. End) | $153,000 | 50 | $0 | $100,000 |
| Woodlawn Avenue Water Main (Farr Street to Auburndale Avenue) | $236,000 | 50 | $0 | $150,000 |
| Shady Lane Drive Water Main (Meadow Drive to Chipman Street) | $290,000 | 50 | $0 | $180,000 |
| Exchange Street Water Main (Saginaw Street to Dewey Street) | $496,000 | 50 | $0 | $300,000 |
| State Street (S. End to Clyde Street) | $115,000 | 50 | $0 | $70,000 |
| State Street (Clyde Street to Stewart Street) | $347,000 | 50 | $0 | $210,000 |
| Clyde Street (State Street to Lyon Street) | $115,000 | 50 | $0 | $70,000 |
| Lyon Street (Clyde Street to Grace Street) | $116,000 | 50 | $0 | $70,000 |
| Subtotal | $2,892,000 | | | $1,810,000 |
| Contractor General Conditions, Overhead and Profit (15%) | $440,000 | | | |
| Contingency (20%) | $580,000 | | | |
| Engineering/Administration/Legal (22%) | $870,000 | | | |
| **Total Estimated Project Cost** | **$4,790,000** | | | |

| **20-Year Present Worth** | Actual Cost | 20-Year Present Worth |
|---|---|---|
| Capital Cost | $4,790,000 | $4,790,000 |
| Annual O&M Cost | $12,000 | $200,000 |
| Salvage Value | $1,810,000 | ($1,220,000) |
| **Total Estimate of Present Worth** | | **$3,770,000** |

Notes:
Present Worth estimated using discount rate of 2.0% *from EGLE*

City of Owosso DWSRF Monetary Evaluation
Distribution System - Water Main Improvements FY27
Alternative 3 - Constuction Alternative

| Cost Item | Units | Qty | Unit Cost | Estimated Capital Cost |
|---|---|---|---|---|
| Frazer Avenue Water Main (Corunna Avenue to Allendale Avenue) | LS | 1 | $340,000 | $340,000 |
| Gould Street Water Main (Exchange Street to North Street) | LS | 1 | $1,706,000 | $1,706,000 |
| Jennett Street Water Main (Shiawassee Street to Adams Street) | LS | 1 | $234,000 | $234,000 |
| Oak Street Water Main (Main Street (M-21) to Williams Street) | LS | 1 | $382,000 | $382,000 |
| Chipman Street Water Main (Harding Avenue to North Street) | LS | 1 | $554,000 | $554,000 |
| Chipman Street Water Main (Main Street (M-21) to Beehler Street) | LS | 1 | $676,000 | $676,000 |
| Cedar Street Water Main (Hampton Avenue to Main Street (M-21)) | LS | 1 | $1,652,000 | $1,652,000 |
| Mason Street Water Main (Saginaw Street to Dewey Street) | LS | 1 | $470,000 | $470,000 |
| Subtotal | | | | $6,014,000 |
| Contractor General Conditions, Overhead and Profit (15%) | | | | $910,000 |
| Contingency (20%) | | | | $1,210,000 |
| Engineering/Administration/Legal (22%) | | | | $1,790,000 |
| **Total Estimated Project Cost** | | | | **$9,930,000** |

| Cost Item | Estimated Capital Cost | Design Life (yrs) | Replace. Cost | Salvage Value |
|---|---|---|---|---|
| Frazer Avenue Water Main (Corunna Avenue to Allendale Avenue) | $340,000 | 50 | $0 | $210,000 |
| Gould Street Water Main (Exchange Street to North Street) | $1,706,000 | 50 | $0 | $1,030,000 |
| Jennett Street Water Main (Shiawassee Street to Adams Street) | $234,000 | 50 | $0 | $150,000 |
| Oak Street Water Main (Main Street (M-21) to Williams Street) | $382,000 | 50 | $0 | $230,000 |
| Chipman Street Water Main (Harding Avenue to North Street) | $554,000 | 50 | $0 | $340,000 |
| Chipman Street Water Main (Main Street (M-21) to Beehler Street) | $676,000 | 50 | $0 | $410,000 |
| Cedar Street Water Main (Hampton Avenue to Main Street (M-21)) | $1,652,000 | 50 | $0 | $1,000,000 |
| Mason Street Water Main (Saginaw Street to Dewey Street) | $470,000 | 50 | $0 | $290,000 |
| Subtotal | $6,014,000 | | | $3,660,000 |
| Contractor General Conditions, Overhead and Profit (15%) | $910,000 | | | |
| Contingency (20%) | $1,210,000 | | | |
| Engineering/Administration/Legal (22%) | $1,790,000 | | | |
| **Total Estimated Project Cost** | **$9,930,000** | | | |

| 20-Year Present Worth | Actual Cost | 20-Year Present Worth |
|---|---|---|
| Capital Cost | $9,930,000 | $9,930,000 |
| Annual O&M Cost | $25,000 | $410,000 |
| Salvage Value | $3,660,000 | ($2,470,000) |
| **Total Estimate of Present Worth** | | **$7,870,000** |

Notes:
Present Worth estimated using discount rate of 2.0% *from EGLE*

City of Owosso DWSRF Monetary Evaluation
Distribution System - Water Main Improvements FY28
Alternative 3 - Constuction Alternative

| Cost Item | Units | Qty | Unit Cost | Estimated Capital Cost |
|---|---|---|---|---|
| Elmwood Water Main (Abbott Street to King Street) | LS | 1 | $152,000 | $152,000 |
| Washington Street Water Main (Stratford Drive to North Street) | LS | 1 | $283,000 | $283,000 |
| Williams Street Water Main (Washington Street to Dewey Street) | LS | 1 | $496,000 | $496,000 |
| Wiltshire Drive Water Main (Huntington Drive to Moore Street) | LS | 1 | $304,000 | $304,000 |
| Ball Street Water Main (Exchange Street to Jennett Street) | LS | 1 | $924,000 | $924,000 |
| Monroe Street Water Main (Washington Street to Broadway Avenue) | LS | 1 | $481,000 | $481,000 |
| King Street Water Main (Fifth Street to Ada Street) | LS | 1 | $430,000 | $430,000 |
| Broadway Avenue Water Main (Auburndale Avenue to Franklin Street) | LS | 1 | $234,000 | $234,000 |
| Subtotal | | | | $3,304,000 |
| Contractor General Conditions, Overhead and Profit (15%) | | | | $500,000 |
| Contingency (20%) | | | | $670,000 |
| Engineering/Administration/Legal (22%) | | | | $990,000 |
| Total Estimated Project Cost | | | | $5,470,000 |

| Cost Item | Estimated Capital Cost | Design Life (yrs) | Replace. Cost | Salvage Value |
|---|---|---|---|---|
| Elmwood Water Main (Abbott Street to King Street) | $152,000 | 50 | $0 | $100,000 |
| Washington Street Water Main (Stratford Drive to North Street) | $283,000 | 50 | $0 | $170,000 |
| Williams Street Water Main (Washington Street to Dewey Street) | $496,000 | 50 | $0 | $300,000 |
| Wiltshire Drive Water Main (Huntington Drive to Moore Street) | $304,000 | 50 | $0 | $190,000 |
| Ball Street Water Main (Exchange Street to Jennett Street) | $924,000 | 50 | $0 | $560,000 |
| Monroe Street Water Main (Washington Street to Broadway Avenue) | $481,000 | 50 | $0 | $290,000 |
| King Street Water Main (Fifth Street to Ada Street) | $430,000 | 50 | $0 | $260,000 |
| Broadway Avenue Water Main (Auburndale Avenue to Franklin Street) | $234,000 | 50 | $0 | $150,000 |
| Subtotal | $3,304,000 | | | $2,020,000 |
| Contractor General Conditions, Overhead and Profit (15%) | $500,000 | | | |
| Contingency (20%) | $670,000 | | | |
| Engineering/Administration/Legal (22%) | $990,000 | | | |
| Total Estimated Project Cost | $5,470,000 | | | |

| 20-Year Present Worth | Actual Cost | 20-Year Present Worth |
|---|---|---|
| Capital Cost | $5,470,000 | $5,470,000 |
| Annual O&M Cost | $14,000 | $230,000 |
| Salvage Value | $2,020,000 | ($1,360,000) |
| Total Estimate of Present Worth | | $4,340,000 |

Notes:
Present Worth estimated using discount rate of 2.0% *from EGLE*

City of Owosso DWSRF Monetary Evaluation
Distribution System - Water Main Improvements FY29
Alternative 3 - Constuction Alternative

| Cost Item | Units | Qty | Unit Cost | Estimated Capital Cost |
|---|---|---|---|---|
| Ada Street Water Main (Oliver Street to Lee Street) | LS | 1 | $149,000 | $149,000 |
| Cass Street Water Main (Shiawassee Street to Green Street) | LS | 1 | $462,000 | $462,000 |
| Curwood Drive Water Main (Oliver Streetto Woodhall Court) | LS | 1 | $54,000 | $54,000 |
| Stinson Street Water Main (West Street to Chipman Street) | LS | 1 | $383,000 | $383,000 |
| West Street Water Main (King Street to Stinson Street) | LS | 1 | $93,000 | $93,000 |
| Woodhall Court Water Main (Curwood Drive to Oliver Street) | LS | 1 | $155,000 | $155,000 |
| Fifth Street Water Main (Oliver Street to King Street) | LS | 1 | $235,000 | $235,000 |
| First Street Water Main (Oliver Street to King Street) | LS | 1 | $274,000 | $274,000 |
| Comstock Street Water Main (Park Street to Gould Street) | LS | 1 | $904,000 | $904,000 |
| Elm Street Water Main (Main Street (M-21) to River Street) | LS | 1 | $250,000 | $250,000 |
| Dewey Street Water Main (Comstock Street to Main Street) | LS | 1 | $110,000 | $110,000 |
| Huntington Drive Water Main (Moore Street to Stevens Drive) | LS | 1 | $347,000 | $347,000 |
| Martin Street Water Main (Stewart Street to Milwaukee Street) | LS | 1 | $421,000 | $421,000 |
| Water Street Water Main (Oliver Street to King Street) | LS | 1 | $326,000 | $326,000 |
| Campbell Drive Water Main (Ada Street to Ada Street) | LS | 1 | $301,000 | $301,000 |
| Subtotal | | | | $4,464,000 |
| Contractor General Conditions, Overhead and Profit (15%) | | | | $670,000 |
| Contingency (20%) | | | | $900,000 |
| Engineering/Administration/Legal (22%) | | | | $1,330,000 |
| Total Estimated Project Cost | | | | $7,370,000 |

| Cost Item | Estimated Capital Cost | Design Life (yrs) | Replace. Cost | Salvage Value |
|---|---|---|---|---|
| Ada Street Water Main (Oliver Street to Lee Street) | $149,000 | 50 | $0 | $90,000 |
| Cass Street Water Main (Shiawassee Street to Green Street) | $462,000 | 50 | $0 | $280,000 |
| Curwood Drive Water Main (Oliver Streetto Woodhall Court) | $54,000 | 50 | $0 | $40,000 |
| Stinson Street Water Main (West Street to Chipman Street) | $383,000 | 50 | $0 | $230,000 |
| West Street Water Main (King Street to Stinson Street) | $93,000 | 50 | $0 | $60,000 |
| Woodhall Court Water Main (Curwood Drive to Oliver Street) | $155,000 | 50 | $0 | $100,000 |
| Fifth Street Water Main (Oliver Street to King Street) | $235,000 | 50 | $0 | $150,000 |
| First Street Water Main (Oliver Street to King Street) | $274,000 | 50 | $0 | $170,000 |
| Comstock Street Water Main (Park Street to Gould Street) | $904,000 | 50 | $0 | $550,000 |
| Elm Street Water Main (Main Street (M-21) to River Street) | $250,000 | 50 | $0 | $150,000 |
| Dewey Street Water Main (Comstock Street to Main Street) | $110,000 | 50 | $0 | $70,000 |
| Huntington Drive Water Main (Moore Street to Stevens Drive) | $347,000 | 50 | $0 | $210,000 |
| Martin Street Water Main (Stewart Street to Milwaukee Street) | $421,000 | 50 | $0 | $260,000 |
| Water Street Water Main (Oliver Street to King Street) | $326,000 | 50 | $0 | $200,000 |
| Campbell Drive Water Main (Ada Street to Ada Street) | $301,000 | 50 | $0 | $190,000 |
| Subtotal | $4,464,000 | | | $2,750,000 |
| Contractor General Conditions, Overhead and Profit (15%) | $670,000 | | | |
| Contingency (20%) | $900,000 | | | |
| Engineering/Administration/Legal (22%) | $1,330,000 | | | |
| Total Estimated Project Cost | $7,370,000 | | | |

| 20-Year Present Worth | Actual Cost | 20-Year Present Worth |
|---|---|---|
| Capital Cost | $7,370,000 | $7,370,000 |
| Annual O&M Cost | $19,000 | $310,000 |
| Salvage Value | $2,750,000 | ($1,860,000) |
| **Total Estimate of Present Worth** | | **$5,820,000** |

Notes:

Present Worth estimated using discount rate of 2.0% *from EGLE*

City of Owosso DWSRF Monetary Evaluation
Distribution System - Booster Station Improvements
Alternative 2 - Optimum Performance of Existing Facilites

| Cost Item | Units | Qty | Unit Cost | Estimated Capital Cost |
|---|---|---|---|---|
| Demolition | LS | 1 | $75,000 | $75,000 |
| Pumps (30 HP) | EA | 2 | $55,000 | $110,000 |
| Process Piping Allowance | LS | 1 | $150,000 | $150,000 |
| Process Valve Allowance | LS | 1 | $50,000 | $50,000 |
| Misc. Supports, Sleeve, Penetration Allowance | LS | 1 | $10,000 | $10,000 |
| Instrumentation Allowance | LS | 1 | $35,000 | $35,000 |
| Electrical Allowance | LS | 1 | $175,000 | $175,000 |
| Systems Integration Allowance | LS | 1 | $50,000 | $50,000 |
| Mechanical Allowance | LS | 1 | $80,000 | $80,000 |
| Subtotal | | | | $735,000 |
| Contractor General Conditions, Overhead and Profit (15%) | | | | $120,000 |
| Contingency (20%) | | | | $150,000 |
| Engineering/Administration/Legal (22%) | | | | $230,000 |
| Total Estimated Project Cost | | | | $1,240,000 |

| Cost Item | Estimated Capital Cost | Design Life (yrs) | Replace. Cost | Salvage Value |
|---|---|---|---|---|
| Demolition | $75,000 | 0 | $0 | $0 |
| Pumps (30 HP) | $110,000 | 30 | $0 | $40,000 |
| Process Piping Allowance | $150,000 | 50 | $0 | $90,000 |
| Process Valve Allowance | $50,000 | 30 | $0 | $20,000 |
| Misc. Supports, Sleeve, Penetration Allowance | $10,000 | 30 | $0 | $10,000 |
| Instrumentation Allowance | $35,000 | 20 | $0 | $0 |
| Electrical Allowance | $175,000 | 20 | $0 | $0 |
| Systems Integration Allowance | $50,000 | 20 | $0 | $0 |
| Mechanical Allowance | $80,000 | 20 | $0 | $0 |
| Subtotal | $735,000 | | | $160,000 |
| Contractor General Conditions, Overhead and Profit (15%) | $120,000 | | | |
| Contingency (20%) | $150,000 | | | |
| Engineering/Administration/Legal (22%) | $230,000 | | | |
| Total Estimated Project Cost | $1,240,000 | | | |

| 20-Year Present Worth | Actual Cost | 20-Year Present Worth |
|---|---|---|
| Capital Cost | $1,240,000 | $1,240,000 |
| Annual O&M Cost | $15,000 | $250,000 |
| Salvage Value | $160,000 | ($110,000) |
| Total Estimate of Present Worth | | $1,380,000 |

Notes:
Present Worth estimated using discount rate of 2.0% *from EGLE*

City of Owosso DWSRF Monetary Evaluation
Distribution System - Lead Service Line Replacement FY25
Alternative 3 - Constuction Alternative

| Cost Item | Units | Qty | Unit Cost | Estimated Capital Cost |
|---|---|---|---|---|
| New Service Lines | LS | 1 | $670,000 | $670,000 |
| Subtotal | | | | $670,000 |
| Contractor General Conditions, Overhead, and Profit (15%) | | | | $110,000 |
| Contingency (10%) | | | | $70,000 |
| Engineering/Administration/Legal (5%) | | | | $50,000 |
| Total Estimated Project Cost | | | | $900,000 |

| Cost Item | Estimated Capital Cost | Design Life (yrs) | Replace. Cost | Salvage Value |
|---|---|---|---|---|
| New Service Lines | $670,000 | 50 | $0 | $402,000 |
| Subtotal | $670,000 | | | $402,000 |
| Contractor General Conditions, Overhead, and Profit (15%) | $110,000 | | | |
| Contingency (10%) | $70,000 | | | |
| Engineering/Administration/Legal (22%) | $50,000 | | | |
| Total Estimated Project Cost | $900,000 | | | |

| 20-Year Present Worth | Actual Cost | 20-Year Present Worth |
|---|---|---|
| Capital Cost | $900,000 | $900,000 |
| Annual O&M Cost | $0 | $0 |
| Salvage Value | $402,000 | ($280,000) |
| Total Estimate of Present Worth | | $620,000 |

Notes:
Present Worth estimated using discount rate of 2.0% *from EGLE*

City of Owosso DWSRF Monetary Evaluation
Distribution System - Lead Service Line Replacement FY26
Alternative 3 - Constuction Alternative

| Cost Item | Units | Qty | Unit Cost | Estimated Capital Cost |
|---|---|---|---|---|
| New Service Lines | LS | 1 | $670,000 | $670,000 |
| Subtotal | | | | $670,000 |
| Contractor General Conditions, Overhead, and Profit (15%) | | | | $110,000 |
| Contingency (10%) | | | | $70,000 |
| Engineering/Administration/Legal (5%) | | | | $50,000 |
| **Total Estimated Project Cost** | | | | **$900,000** |

| Cost Item | Estimated Capital Cost | Design Life (yrs) | Replace. Cost | Salvage Value |
|---|---|---|---|---|
| New Service Lines | $670,000 | 50 | $0 | $402,000 |
| Subtotal | $670,000 | | | $402,000 |
| Contractor General Conditions, Overhead, and Profit (15%) | $110,000 | | | |
| Contingency (10%) | $70,000 | | | |
| Engineering/Administration/Legal (22%) | $50,000 | | | |
| **Total Estimated Project Cost** | **$900,000** | | | |

| 20-Year Present Worth | Actual Cost | 20-Year Present Worth |
|---|---|---|
| Capital Cost | $900,000 | $900,000 |
| Annual O&M Cost | $0 | $0 |
| Salvage Value | $402,000 | ($280,000) |
| **Total Estimate of Present Worth** | | **$620,000** |

Notes:
Present Worth estimated using discount rate of 2.0% *from EGLE*

City of Owosso DWSRF Monetary Evaluation
Distribution System - Lead Service Line Replacement FY27
Alternative 3 - Constuction Alternative

| Cost Item | Units | Qty | Unit Cost | Estimated Capital Cost |
|---|---|---|---|---|
| New Service Lines | LS | 1 | $670,000 | $670,000 |
| Subtotal | | | | $670,000 |
| Contractor General Conditions, Overhead, and Profit (15%) | | | | $110,000 |
| Contingency (10%) | | | | $70,000 |
| Engineering/Administration/Legal (5%) | | | | $50,000 |
| Total Estimated Project Cost | | | | $900,000 |

| Cost Item | Estimated Capital Cost | Design Life (yrs) | Replace. Cost | Salvage Value |
|---|---|---|---|---|
| New Service Lines | $670,000 | 50 | $0 | $402,000 |
| Subtotal | $670,000 | | | $402,000 |
| Contractor General Conditions, Overhead, and Profit (15%) | $110,000 | | | |
| Contingency (10%) | $70,000 | | | |
| Engineering/Administration/Legal (22%) | $50,000 | | | |
| Total Estimated Project Cost | $900,000 | | | |

| 20-Year Present Worth | Actual Cost | 20-Year Present Worth |
|---|---|---|
| Capital Cost | $900,000 | $900,000 |
| Annual O&M Cost | $0 | $0 |
| Salvage Value | $402,000 | ($280,000) |
| Total Estimate of Present Worth | | $620,000 |

Notes:
Present Worth estimated using discount rate of 2.0% *from EGLE*

City of Owosso DWSRF Monetary Evaluation
Distribution System - Lead Service Line Replacement FY28
Alternative 3 - Constuction Alternative

| Cost Item | Units | Qty | Unit Cost | Estimated Capital Cost |
|---|---|---|---|---|
| New Service Lines | LS | 1 | $670,000 | $670,000 |
| Subtotal | | | | $670,000 |
| Contractor General Conditions, Overhead, and Profit (15%) | | | | $110,000 |
| Contingency (10%) | | | | $70,000 |
| Engineering/Administration/Legal (5%) | | | | $50,000 |
| Total Estimated Project Cost | | | | $900,000 |

| Cost Item | Estimated Capital Cost | Design Life (yrs) | Replace. Cost | Salvage Value |
|---|---|---|---|---|
| New Service Lines | $670,000 | 50 | $0 | $402,000 |
| Subtotal | $670,000 | | | $402,000 |
| Contractor General Conditions, Overhead, and Profit (15%) | $110,000 | | | |
| Contingency (10%) | $70,000 | | | |
| Engineering/Administration/Legal (22%) | $50,000 | | | |
| Total Estimated Project Cost | $900,000 | | | |

| 20-Year Present Worth | Actual Cost | 20-Year Present Worth |
|---|---|---|
| Capital Cost | $900,000 | $900,000 |
| Annual O&M Cost | $0 | $0 |
| Salvage Value | $402,000 | ($280,000) |
| Total Estimate of Present Worth | | $620,000 |

Notes:
Present Worth estimated using discount rate of 2.0% *from EGLE*

City of Owosso DWSRF Monetary Evaluation
Distribution System - Lead Service Line Replacement FY29
Alternative 3 - Constuction Alternative

| Cost Item | Units | Qty | Unit Cost | Estimated Capital Cost |
|---|---|---|---|---|
| New Service Lines | LS | 1 | $670,000 | $670,000 |
| Subtotal | | | | $670,000 |
| Contractor General Conditions, Overhead, and Profit (15%) | | | | $110,000 |
| Contingency (10%) | | | | $70,000 |
| Engineering/Administration/Legal (5%) | | | | $50,000 |
| **Total Estimated Project Cost** | | | | **$900,000** |

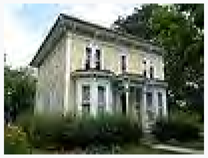
| Cost Item | Estimated Capital Cost | Design Life (yrs) | Replace. Cost | Salvage Value |
|---|---|---|---|---|
| New Service Lines | $670,000 | 50 | $0 | $402,000 |
| Subtotal | $670,000 | | | $402,000 |
| Contractor General Conditions, Overhead, and Profit (15%) | $110,000 | | | |
| Contingency (10%) | $70,000 | | | |
| Engineering/Administration/Legal (22%) | $50,000 | | | |
| **Total Estimated Project Cost** | **$900,000** | | | |

| 20-Year Present Worth | Actual Cost | 20-Year Present Worth |
|---|---|---|
| Capital Cost | $900,000 | $900,000 |
| Annual O&M Cost | $0 | $0 |
| Salvage Value | $402,000 | ($280,000) |
| **Total Estimate of Present Worth** | | **$620,000** |

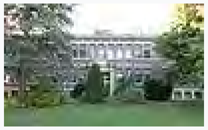
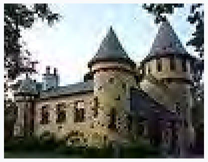
Notes:
Present Worth estimated using discount rate of 2.0% *from EGLE*

# Appendix 4

# National Register of Historic Places Listings in Shiawassee County, Michigan

| [2] | Name on the Register[3] | Image | Date listed[4] | Location | City or town | Description |
|---|---|---|---|---|---|---|
| 1 | Nathan Ayres House |  | November 4, 1980 (#80001891) | 604 N. Water St. 43°00′11″N 84°10′23″W | Owosso | |
| 2 | Byron Historic Commercial District |  | September 13, 1984 (#84001848) | Roughly Saginaw St. from Maple to Water Sts. 42°49′20″N 83°56′39″W | Byron | |
| 3 | Charles H. Calkins House |  | March 29, 1978 (#78001511) | 127 E. 1st St. 42°49′27″N 84°13′05″W | Perry | |
| 4 | Leigh Christian House |  | November 4, 1980 (#80001892) | 622 N. Ball St. 43°00′13″N 84°10′19″W | Owosso | |
| 5 | Christian-Ellis House |  | November 4, 1980 (#80001893) | 600 N. Water St. 43°00′10″N 84°10′23″W | Owosso | |

# National Register of Historic Places Listings in Shiawassee County, Michigan

| [2] | Name on the Register[3] | Image | Date listed[4] | Location | City or town | Description |
|---|---|---|---|---|---|---|
| 6 | Hezekiah W. and Sarah E. Fishell Cobb House |  | April 11, 1997 (#97000281) | 115 W. 2nd St. 42°49′29″N 84°13′12″W | Perry | |
| 7 | Elias Comstock Cabin |  | November 4, 1980 (#80001894) | Curwood Castle Dr., and John St. 42°59′57″N 84°10′32″W | Owosso | |
| 8 | Corunna High School |  | March 13, 2017 (#100000748) | 106 S. Shiawassee St. 42°58′46″N 84°07′07″W | Corunna | |
| 9 | Curwood Castle |  | September 3, 1971 (#71000420) | 224 John St. 42°59′58″N 84°10′31″W | Owosso | |

National Register of Historic Places Listings in Shiawassee County, Michigan

| [2] | Name on the Register[3] | Image | Date listed[4] | Location | City or town | Description |
|---|---|---|---|---|---|---|
| 10 | Duff Building |  | January 31, 1985 (#85000168) | 118 W. Exchange St 42°59′56″N 84°10′18″W | Owosso | |
| 11 | Durand High School |  | March 17, 2009 (#09000130) | 100 West Sycamore Street 42°54′55″N 83°59′11″W | Durand | |
| 12 | Frederick Frieseke Birthplace and Boyhood Home |  | November 4, 1980 (#80001895) | 654 N. Water St. 43°00′15″N 84°10′23″W | Owosso | |
| 13 | Julius Frieseke House |  | April 5, 1990 (#90000574) | 529 Corunna Ave. 42°59′30″N 84°09′51″W | Owosso | |

National Register of Historic Places Listings in Shiawassee County, Michigan

| [2] | Name on the Register[3] | Image | Date listed[4] | Location | City or town | Description |
|---|---|---|---|---|---|---|
| 14 | Amos Gould House |  | November 4, 1980 (#80001896) | 115 W. King St. 43°00′16″N 84°10′18″W | Owosso | |
| 15 | Daniel Gould House |  | November 4, 1980 (#80001897) | 509 E. Main St. 42°59′52″N 84°09′51″W | Owosso | Building no longer exists. |
| 16 | Ebenezer Gould House |  | November 4, 1980 (#80001898) | orig. 603 W. Main St. now: 42°59′01″N 84°07′38″W | Owosso | Building relocated to historic/museum village in nearby Corunna. |
| 17 | Grand Trunk Railway Station |  | May 6, 1971 (#71000419) | 200 Railroad St. 42°54′33″N 83°58′57″W | Durand | |

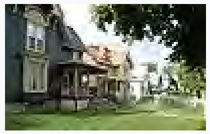
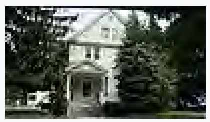
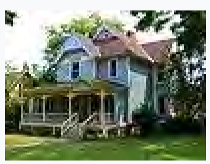
# National Register of Historic Places Listings in Shiawassee County, Michigan

| [2] | Name on the Register[3] | Image | Date listed[4] | Location | City or town | Description |
|---|---|---|---|---|---|---|
| 18 | Grow Block |  | January 31, 1985 (#85000169) | 120-122 W. Exchange St. 42°59′56″N 84°10′18″W | Owosso | |
| 19 | William Horton Farmhouse |  | April 10, 1986 (#86000711) | 1647 W. Miller Rd. 42°51′49″N 84°11′52″W | Morrice | |
| 20 | House at 314 W. King St. |  | November 4, 1980 (#80001899) | 314 W. King St. 43°00′18″N 84°10′26″W | Owosso | Replaced by a newer house at the same address. |
| 21 | John N. Ingersoll House |  | May 9, 1980 (#80001890) | 570 W. Corunna Ave. 42°58′57″N 84°07′35″W | Corunna | |
| 22 | Eugene Jacobs House |  | November 4, 1980 (#80004553) | 220 W. King St. 43°00′18″N 84°10′23″W | Owosso | |

# National Register of Historic Places Listings in Shiawassee County, Michigan

| [2] | Name on the Register[3] | Image | Date listed[4] | Location | City or town | Description |
|---|---|---|---|---|---|---|
| 23 | Lincoln School |  | August 8, 2016 (#16000510) | 120 Michigan Ave. 42°59′50″N 84°10′29″W | Owosso | |
| 24 | Martin Road Bridge |  | July 12, 1991 (#91000876) | Martin Rd. across the Shiawassee River, Caledonia Township 42°58′08″N 84°03′21″W | Corunna | In 2016, the bridge was disassembled and removed by Bach Steel. Renovation is underway, and it will be re-assembled at the Auburn Heights Preserve in Yorklyn, Delaware.[5] |
| 25 | Mason Street Historic Residential District |  | November 4, 1980 (#80001900) | Roughly bounded by Laverock Alley, Dewey, Hickory and Exchange Sts. 42°59′57″N 84°09′54″W | Owosso | |
| 26 | Colin McCormick House |  | November 4, 1980 (#80001901) | 222 E. Exchange St. 42°59′53″N 84°10′06″W | Owosso | |

National Register of Historic Places Listings in Shiawassee County, Michigan

| [2] | Name on the Register[3] | Image | Date listed[4] | Location | City or town | Description |
|---|---|---|---|---|---|---|
| 27 | Michigan Avenue-Genesee Street Historic Residential District |  | November 4, 1980 (#80001902) | Roughly bounded by Michigan Ave.; Shiawassee, Cass and Clinton Sts. 42°59′43″N 84°10′32″W | Owosso | |
| 28 | Selden Miner House |  | November 4, 1980 (#80001903) | 418 W. King St. 43°00′18″N 84°10′32″W | Owosso | |
| 29 | Old Miller Hospital |  | November 4, 1980 (#80001904) | 121 Michigan Ave. 42°59′48″N 84°10′29″W | Owosso | |
| 30 | Oliver Street Historic District |  More images | November 4, 1980 (#80001905) | Oliver St. between 3rd and Oak Sts., Williams and Goodhue Sts. 43°00′06″N 84°10′24″W | Owosso | |

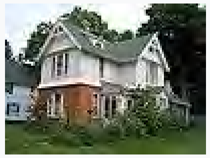
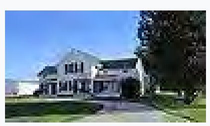
# National Register of Historic Places Listings in Shiawassee County, Michigan

| [2] | Name on the Register[3] | Image | Date listed[4] | Location | City or town | Description |
|---|---|---|---|---|---|---|
| 31 | Sylvester Opdyke House |  | November 4, 1980 (#80001906) | 655 N. Pine St. 43°00′16″N 84°10′33″W | Owosso | |
| 32 | Owosso Downtown Historic District |  | April 7, 2014 (#14000126) | Roughly bounded by Shiawassee R., Comstock, Water, Park and Mason Sts. 42°59′53″N 84°10′14″W | Owosso | |
| 33 | Albert Palmer House |  | November 4, 1980 (#80001907) | 528-530 River St. 42°59′58″N 84°10′43″W | Owosso | |

National Register of Historic Places Listings in Shiawassee County, Michigan

| [2] | Name on the Register[3] | Image | Date listed[4] | Location | City or town | Description |
|---|---|---|---|---|---|---|
| 34 | George Pardee House |  | November 4, 1980 (#80001908) | 603 N. Ball St. 43°00′10″N 84°10′20″W | Owosso | |
| 35 | Pere Marquette Railway Steam Locomotive No. 1225 |  | July 31, 1994 (#94000744) | 600 S. Oakwood St. 42°59′35″N 84°09′53″W | Owosso | |
| 36 | George Perrigo House |  | November 4, 1980 (#80001909) | 213 N. Cedar St. 42°59′56″N 84°10′55″W | Owosso | |
| 37 | Shiawassee County Courthouse |  | November 12, 1982 (#82000546) | Shiawassee St. 42°58′53″N 84°07′02″W | Corunna | see Claire Allen for more info |

# National Register of Historic Places Listings in Shiawassee County, Michigan

| [2] | Name on the Register[3] | Image | Date listed[4] | Location | City or town | Description |
|---|---|---|---|---|---|---|
| 38 | Edwin Todd House |  | November 4, 1980 (#80001910) | 520 N. Adams St. 43°00′10″N 84°10′28″W | Owosso | |
| 39 | West Town Historic Commercial and Industrial District |  | November 4, 1980 (#80001911) | Main St. 42°59′55″N 84°11′02″W | Owosso | |
| 40 | Alfred Williams House |  | November 4, 1980 (#80001912) | 611 N. Ball St. 43°00′12″N 84°10′20″W | Owosso | |
| 41 | Benjamin Williams House |  | November 4, 1980 (#80001913) | 628 N. Ball St. 43°00′14″N 84°10′19″W | Owosso | |
| 42 | Williams-Cole House |  | December 4, 1986 (#86003418) | 6810 Newburg Rd. 42°54′35″N 84°01′49″W | Durand | |

# National Register of Historic Places Listings in Shiawassee County, Michigan

| [2] | Name on the Register[3] | Image | Date listed[4] | Location | City or town | Description |
|---|---|---|---|---|---|---|
| 43 | Lee Woodard and Sons Building |  | November 4, 1980 (#80001914) | 306 S. Elm St. 42°59′42″N 84°10′42″W | Owosso | |
| 44 | Lyman Woodard Company Workers' Housing |  | November 4, 1980 (#80001916) | 601 Clinton St. 42°59′47″N 84°10′43″W | Owosso | |
| 45 | Lyman Woodard Furniture and Casket Company Building |  | November 4, 1980 (#80001915) | 216-222 Elm St. 42°59′44″N 84°10′43″W | Owosso | |

# Appendix 5

Michigan Natural Features Inventory
MSU Extension

# County Element Data

The lists include all elements (species and natural communities) for which locations have been recorded in MNFI's database for each county. Information from the database cannot provide a definitive statement on the presence, absence, or condition of the natural features in any given locality, since much of the state has not been specifically or thoroughly surveyed for their occurrence and the conditions at previously surveyed sites are constantly changing. The County Elements Lists should be used as a reference of which natural features currently or historically were recorded in the county and should be considered when developing land use plans.

Choose a county Shiawassee

## Shiawassee County

Code Definitions

### Species

| Scientific Name | Common Name | Federal Status | State Status | Global Rank | State Rank | Occurrences in County | Last Observed in County |
|---|---|---|---|---|---|---|---|
| *Alasmidonta marginata* | Elktoe | | SC | G4 | S3? | 5 | 2001 |
| *Alasmidonta viridis* | Slippershell | | T | G4G5 | S2S3 | 4 | 2001 |
| *Angelica venenosa* | Hairy angelica | | SC | G5 | S3 | 2 | 1948 |
| *Baptisia lactea* | White or prairie false indigo | | T | G4Q | S3 | 1 | 1928 |

| Scientific Name | Common Name | Federal Status | State Status | Global Rank | State Rank | Occurrences in County | Last Observed in County |
|---|---|---|---|---|---|---|---|
| *Bombus auricomus* | Black and gold bumble bee | | SC | G5 | S2 | 1 | 1948 |
| *Calephelis muticum* | Swamp metalmark | | E | G3 | S1 | 1 | 1981 |
| *Cambarunio iris* | Rainbow | | SC | GNR | S3 | 6 | 2001 |
| *Clemmys guttata* | Spotted turtle | | T | G5 | S2 | 1 | 1980 |
| *Dennstaedtia punctilobula* | Hay-scented fern | | E | G5 | S1 | 1 | 1889 |
| *Emydoidea blandingii* | Blanding's turtle | | SC | G4 | S2S3 | 8 | 2021 |
| *Faxonius immunis* | Calico crayfish | | SC | G5 | S4 | 3 | 2015 |
| *Galearis spectabilis* | Showy orchis | | T | G5 | S2 | 1 | 1890 |
| *Haliaeetus leucocephalus* | Bald eagle | | SC | G5 | S4 | 5 | 2021 |
| *Jeffersonia diphylla* | Twinleaf | | SC | G5 | S3 | 1 | 2022 |
| *Juncus vaseyi* | Vasey's rush | | T | G5 | S1S2 | 1 | 1990 |
| *Lasmigona compressa* | Creek heelsplitter | | SC | G5 | S3 | 3 | 1934 |
| *Lasmigona costata* | Flutedshell | | SC | G5 | SNR | 1 | 1926 |
| *Mesomphix cupreus* | Copper button | | SC | G5 | S1 | 1 | 1947 |
| *Microtus pinetorum* | Woodland vole | | SC | G5 | S3S4 | 1 | 1929 |
| *Moxostoma duquesnei* | Black redhorse | | SC | G5 | S2 | 1 | 1941 |
| *Notropis anogenus* | Pugnose shiner | | E | G3 | S1S2 | 1 | 1987 |

| Scientific Name | Common Name | Federal Status | State Status | Global Rank | State Rank | Occurrences in County | Last Observed in County |
|---|---|---|---|---|---|---|---|
| *Plantago cordata* | Heart-leaved plantain | | E | G4 | S1 | 1 | 1889 |
| *Pleurobema sintoxia* | Round pigtoe | | SC | G4G5 | S3 | 4 | 2001 |
| *Ptychobranchus fasciolaris* | Kidney shell | | SC | G4G5 | S2 | 2 | 1937 |
| *Pupilla muscorum* | Widespread column | | SC | G5 | S2 | 1 | 1947 |
| *Schoenoplectus torreyi* | Torrey's bulrush | | SC | G5? | S2S3 | 1 | 1893 |
| *Sistrurus catenatus* | Eastern massasauga | LT | T | G3 | S3 | 1 | 1928 |
| *Speyeria idalia* | Regal fritillary | | X | G3? | SH | 2 | 1975 |
| *Thamnophis butleri* | Butler's garter snake | | SC | G4 | S4 | 2 | 1969 |
| *Trichophorum clintonii* | Clinton's bulrush | | SC | G4 | S3 | 1 | 1990 |
| *Trillium nivale* | Snow trillium | | T | G4 | S2 | 1 | 1994 |
| *Venustaconcha ellipsiformis* | Ellipse | | SC | G4 | S3 | 6 | 2001 |

## Natural Communities

| Community Name | Global Rank | State Rank | Occurrences in County | Last Observed in County |
|---|---|---|---|---|
| No natural communities found for this county | | | | |