

**Grand Ledge
Drinking Water State Revolving Fund
Project Plan**

**Project No. 220505
April 1, 2022**

DRAFT PROJECT PLAN

City of Grand Ledge Drinking Water State Revolving Fund Project Plan

**Prepared For:
City of Grand Ledge, Michigan**

**April 1, 2022
Project No. 220505**

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List of Abbreviations/Acronyms

ADD	Average Day Demand
AHU	Air Handling Unit
ARI	Adverse Resource Impacts
bgs	below ground surface
City	City of Grand Ledge
CMU	Concrete Masonry Unit
DWEHD	Drinking Water and Environmental Health Division
DWSRF	Drinking Water State Revolving Fund
EGLE	Michigan Department of Environment, Great Lakes, and Energy
fc	foot-candles
gpm	gallons per minute
HMO	Hydrous Manganese Oxide
HP	Horsepower
HPF	Horizontal Pressure Filter
I/O	Input/Output
LBWL	Lansing Board of Water and Light
MDD	Maximum Day Demand
MG	million gallon(s)
mgd	million gallon(s) per day
NEC	National Electrical Code
O&M	Operation and Maintenance
OA	Outside air
PLC	Programmable Logic Controller
PWSPR	Public Water Supply Pre-Screening Review
REU	Residential Equivalent Unit
SHPO	State Historic Preservation Office
VFD	Variable Frequency Drive
WRD	Water Resources Division
WTP	Water Treatment Plant

1.0 Introduction

In March 2021, the City of Grand Ledge (City) retained Fishbeck to complete a Drinking Water State Revolving Fund (DWSRF) Project Plan for improvements to the City's water system. This Project Plan was prepared to meet the project planning requirements of the Michigan Department of Environment, Great Lakes, and Energy (EGLE). The improvements proposed in this Project Plan include:

- The construction of a new Water Treatment Plant (WTP) to replace the existing WTP, which is beyond its useful life.
- A water main improvement along Green Street between West South Street and Seminary Street.
- The construction of Well Nos. 9 and 10, inclusive of a hydrogeological study evaluating the impacts of Well No. 9 on an adjacent stream.

The City owns and operates a municipal water system that supplies water to the City and portions of Oneida Charter Township. The City water system consists of four groundwater supply wells, a WTP, two elevated tanks, and a ground storage tank with a booster pump station. The WTP treats water from three of the groundwater supply wells (Well Nos. 6, 7, and 8); the fourth well (Well No. 2) can supply water directly to the water distribution system. The existing WTP utilizes an Aeralater Type II-Q by General Filter, which is a type of Package Iron Removal Treatment System (PIRTS) to remove iron from the water.

Fishbeck was retained by the City in 2020 to review a number of water supply and treatment options to replace the existing, aging WTP. The results of those studies led the City to retain Fishbeck to design a new WTP with iron removal only in 2021. That design is underway. In addition to this DWSRF project plan, a Preliminary Engineering Report was created in pursuit of Rural Development funding for the WTP.

A map of the water service area for the City's water system is included in Figure 1. A map of the City's water distribution system, including the pressure districts, storage tanks, water mains, and the existing WTP is provided in Figure 2.

The new WTP is intended to replace the existing plant, which is aging and at risk of failure. The estimated project cost for the new WTP is \$14,957,000.

The Green Street water main replacement project will provide redundancy and improve reliability to the surrounding area of the City water system. The estimated project cost for the water main replacement portion of the project is \$198,000.

The construction of Well Nos. 9 and 10 and the related hydrogeological study have a preliminary estimated project cost of \$4,802,000. While the construction of Well No. 9 is planned within fiscal year 2023, there are issues around permitting through EGLE that will need to be resolved.

2.0 Project Background

2.1 Delineation of Study Area

The City is located in both Eaton and Clinton Counties in central Michigan and is roughly 3.91 square miles in size. It is west-northwest of Lansing, Michigan and is adjacent to Oneida and Eagle Townships.

The City owns and operates a municipal water system that supplies water to the City and portions of Oneida Charter Township as shown in Figure 1. The current water distribution system is displayed in Figure 2. The existing WTP is located at 320 West Saginaw Highway, Grand Ledge, Michigan. This same location will be the site of construction of the new WTP. A site plan of this parcel showing the proposed WTP project is shown in Figure 3. The proposed water main improvements will involve the replacement of 980 feet of water main along Green

Street between West South Street and Seminary Street as shown in Figure 4. The Well Nos. 9 and 10 sites are shown in Figure 5. Map 1 shows the Quaternary Geology of the region.

2.2 Land Use

Per the 2018 City of Grand Ledge Master Plan, which is included as Appendix 1 of this report, the existing land use within the City includes residential, commercial, industrial, recreational, and vacant land. The largest land use in the City is residential, encompassing 41.9% of the land area. The commercial and office land use represents 5% of the City. The Industrial land use represents 2.1% of the City. The Institutional Facilities land use represents 28% of the City. Vacant land represents 23% of the City. The existing land use in Map 2 is represented using the current zoning map layers published by the Esri ArcOnline map services. Map 3 presents the planned land use.

Map 4 visually represents the population density within the study area. The Grand River bisects the City, running from the north to the southeast. As indicated, the City is predominantly residential. The northeast quadrant has a significant amount of industrial, mainly the National Guard Armory, in the area. The northwest quadrant has a large portion devoted to Fitzgerald Park. The southeast quadrant includes a large portion of commercial developments. The southwest quadrant has a large portion of the area devoted to the high school and middle school.

2.3 Population Projections

A population review was conducted for the City and the townships that are served by the sanitary system, with the resulting data provided in Table 2-1. Census data was obtained for the City as well as Oneida and Eagle Townships for 2000 and 2010. According to the City’s 2018 Master Plan, “the Tri-County Regional Planning Commission project[ed] a 7.8% population increase between 2010 and 2020.” However, according to U.S. Census Bureau data, only a 1.4% increase was seen from 2010 to 2019 (i.e., 0.16% annual growth) for the City. With a lack of data available at this time, populations for Oneida and Eagle Townships were estimated for 2019 and 2022 based on the actual 0.16% annual growth seen for the City. The previous Tri-County Regional Planning Commission projected 7.8% rate of growth per 10 years was then applied for future projections for 2032 and 2042.

Table 2-1 – Regional Municipal Population Trends

Year	City of Grand Ledge	Oneida Township	Eagle Township	Total
2000	7,813*	3,703*	2,332*	13,848
2010	7,786*	3,861**	2,548**	14,195
2020	7,896*	3,914*	2,713*	14,253
2022 projection	7,921	3,928	2,722	14,571
2027 projection	8,230	4,081	2,828	15,139
2032 projection	8,551	4,240	2,934	15,725
2042 projection	9,217	4,571	3,162	16,950

*U.S. Census Bureau

**Tri-County Regional Planning Commission

The total municipal populations do not represent the projected planning area or the existing service area, as some areas of the population are served by other sanitary means. In general, population trends and projections are valuable indicators of overall regional growth. The current population served by the existing WTP is estimated to be 8,855. The 20-year projected population served by the proposed project is estimated to be 10,305. The current population densities are shown in Map 4.

2.4 Water Demand

2.4.1 Statistical Water Demand Projections

To help establish a Basis of Design (BOD), the last ten years of water demand data for the City system and recent raw water quality data were analyzed statistically. Trends in the water demands were evaluated and used to create a statistical analysis of water demands 20 years into the future.

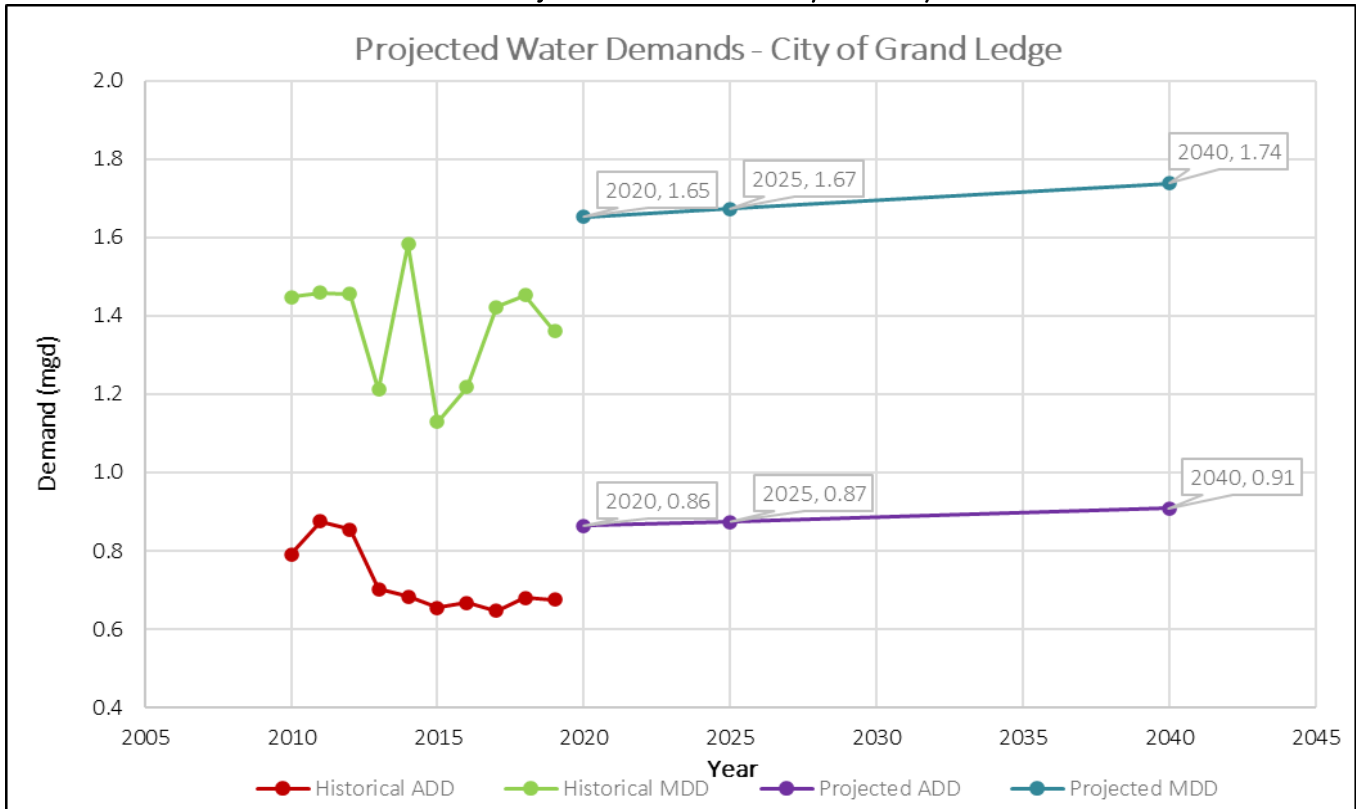
To project future water demands using a statistical analysis, the starting point for both the average day demand (ADD) and maximum day demand (MDD) projections were estimated. The starting point for the ADD was estimated by finding the standard deviation of the historical data and adding 1.65 times the standard deviation to the historical average of the ADD. Statistically, this value is predicted to be greater than 95% of the probable future values of the ADD based on the dataset. To find the starting point for the MDD, the average MDD:ADD peaking factor of the dataset was multiplied by the determined starting point of the ADD.

The starting point for the ADD projections is 0.86 million gallons per day (mgd), which as discussed above is the average of the dataset plus 1.65 times the standard deviation of that same dataset. The starting point for the MDD projections is 1.64 mgd, which is the starting point of the ADD, 0.86 mgd, multiplied by the average MDD:ADD Peaking Factor of 1.91.

The ADD and MDD water demands for the City system, starting at the points described above, were projected out for the next 20 years. An annual demand growth of 0.25% was assumed for the demand projections. Chart 2-1 shows the historical dataset and the demand projections for both the ADD and MDD and shows the current, 5-year and 20-year projected demands. A 2040 projected average daily demand of 0.91 mgd and a 2040 projected MDD of 1.74 mgd were estimated.

Chart 2-1 shows the historic demands and the projected demands based on the statistical analysis of the historic demands and on the population projections.

Chart 2-1 – Projected Demands for City Water System



2.4.2 Current and Planned Development

The City has provided guidance and input on planned growth and development in and around the City to be served by the City water system. These areas reflect available land such as undeveloped parcels in the industrial park and recent interest in residential, commercial, and industrial development. The City has partnered with Oneida Township to supply some areas outside the City limits with water and sewer infrastructure. Development has been occurring and there is continuing interest for further development in areas in and around the City that will require water and sewer infrastructure. Analysis of the developable areas currently under agreement for the City indicates a full buildout capacity of 4.0 mgd is likely for the City water system.

2.5 Existing Facilities

2.5.1 Existing Facilities Description

The total capacity of the existing raw water system is 3.46 mgd. The firm capacity of the raw water supply system is 1.87 mgd, with Well No. 6 (the largest well) out-of-service. However, Well No. 2, with a capacity of 0.58 mgd, pumps directly to the distribution system and cannot provide raw water directly to the iron removal plant. Thus, the total raw water capacity supplied to the iron removal plant is 2,000 gallons per minute (gpm) and the firm raw water capacity supplied to the iron removal plant is 2.88 mgd. This raw water capacity will need to be expanded to meet firm capacity of the new WTP.

The existing WTP uses a PIRTS with a total design treatment capacity of 2.3 mgd. With a single filter cell out-of-service, the iron removal treatment capacity drops to 1.73 mgd. The PIRTS at the existing WTP combines aeration, detention, and filtration in a single treatment unit to remove iron from the raw water. Raw water is pumped by the wells to the top of the unit and flows by gravity through a distribution tray. The iron in the water is oxidized by air drawn upward through the top of the unit using an induced draft blower. A detention tank is just

below the aeration portion of the unit and allows time for the formation of filterable iron precipitate particles. The water then passes through the dual-media (anthracite and sand) filters at the bottom of the unit, which filter the iron precipitate out of the water. The filtered water exits through a common outlet connection, is chlorinated for disinfection, and flows to the 100,000-gallon clearwell.

Three high service pumps convey water from the clearwell to the distribution system. High Service Pumps 1, 2, and 3 have capacities of 0.72 mgd, 1.44 mgd, and 2.16 mgd, respectively. The total high service pump capacity is 4.32 mgd and the firm capacity is 2.16 mgd.

The City's water distribution system contains nearly 49 miles of water main. It has two elevated tanks: a 0.5-million-gallon (MG) tank at the WTP site constructed in 1971, and a 0.1 MG tank near the river crossing at Bridge Street constructed in 1909. The City has a 0.75 MG ground storage tank and booster station in the north part of the system to provide fire flow to the National Guard Armory. The booster station has a total capacity of 2,100 gpm and a firm capacity of 1,400 gpm when supplying the distribution system.

2.5.2 Condition of Existing Facilities

2.5.2.1 Groundwater Supply Wells

The supply wells are generally in good condition and are well maintained by City staff, but the raw water supply capacity is limited in relation to the existing treatment plant and system demand. Wells are periodically serviced through contracts with well contractors in the local area.

Well No. 2, installed in 1941, is the oldest well in the system. This well is considered a standby or emergency source that can be pumped directly into the distribution system as needed. Chlorine is fed at the wellhouse for disinfection of raw water.

Well No. 6, installed in 1971, is in good condition. In 2016, it was rebuilt to allow it to pump directly to the distribution system and was equipped with a variable frequency drive (VFD). Well No. 6 is the largest supply well with a permit capacity of 1,100 gpm.

Well No. 7, installed in 1988, was rehabilitated in 2011 to restore its capacity. This well is in good condition. Well No. 7 has a capacity of 500 gpm. It should be noted that the quality of water produced by this well is higher in iron and manganese than the other wells.

Well No. 8, installed in 1995, is well is in good condition. EGLE has limited the operation of this well to eight hours per day to avoid drawing down the aquifer. Well No. 8 has a capacity of 400 gpm.

2.5.2.2 Water Treatment Plant

The existing WTP was constructed in 1988 and has been in service for approximately 34 years, which is about the expected equipment life of the treatment unit according to the manufacturer. Significant repair to the PIRTS would be required for continued long-term use. Fishbeck completed a small study in 2019 to determine if the PIRTS could be repaired. The repair was estimated to be costly and disruptive to the existing treatment system. In addition, it was unknown how long the unit would remain operational if repaired, due to its significant age and condition. Replacement of the PIRTS was recommended.

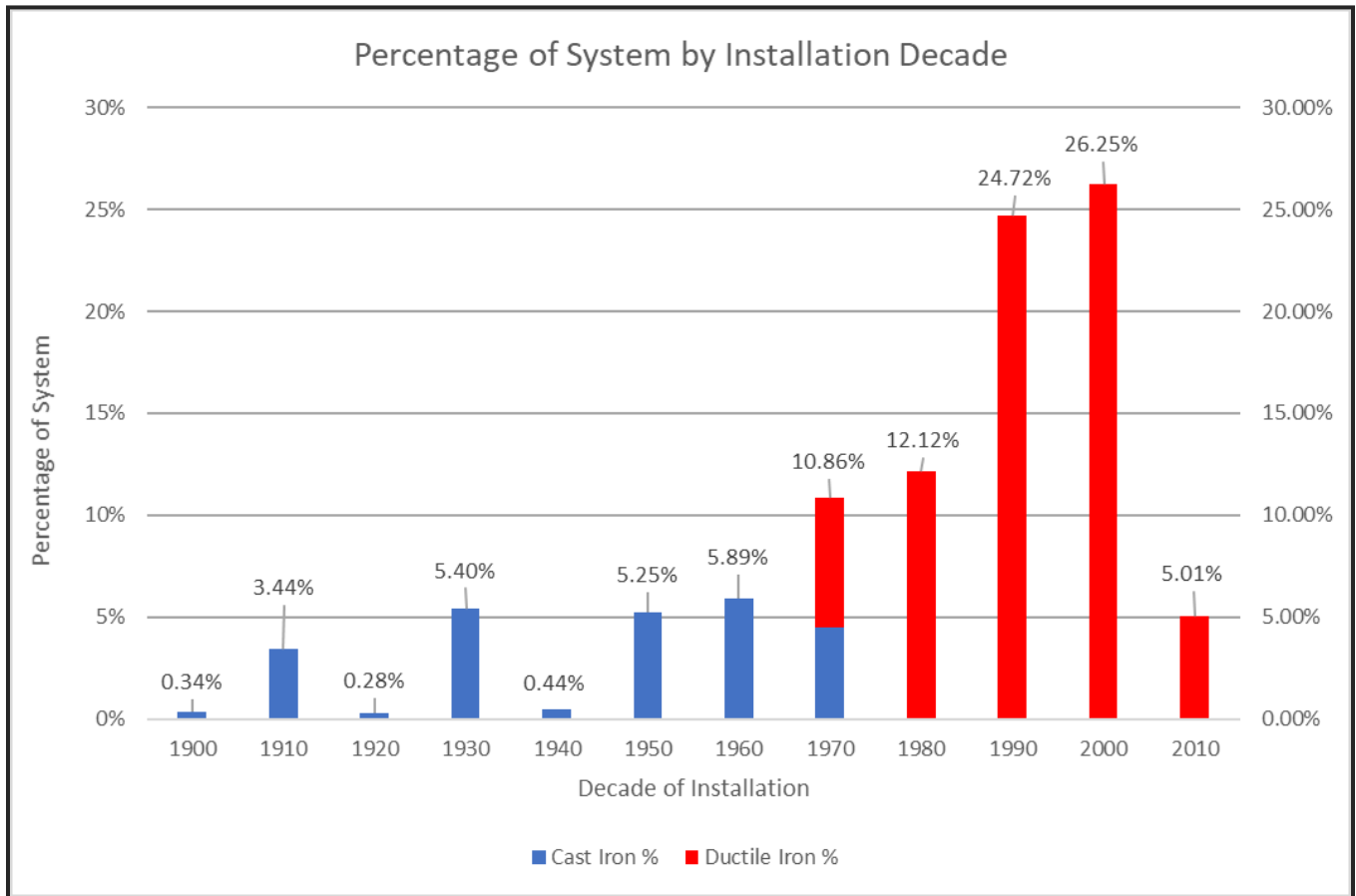
The three high service pumps that convey water from the clearwell to the distribution system are generally in good condition. These pumps have been rehabilitated several times since being initially installed.

2.5.2.3 Distribution System and Sites

The City's water distribution system is generally in good condition due to the City's proactive replacement of water mains. However, the system still contains some older water mains that should be replaced. Chart 2-2

presents a breakdown of the percentage of water mains in the system by the decade in which the mains were installed. It also includes information on the proportion of water mains installed by material.

Chart 2-2 – Percentage of System by Installation Decade



As can be seen in Chart 2-2 over 21% of the system consists of cast iron water main constructed before 1970. The City will continue to be proactive in water main replacement, particularly in the replacement of 4-inch cast iron water main which makes up more than 11% of the distribution system. This work will be funded directly from system revenues.

The 0.5 MG elevated tank was constructed in 1971 and is still in good condition. The 0.1 MG elevated tank is over 110 years old but is well-maintained and in good condition. In addition, the elevated tank is seen as a historical site by many of the citizens of Grand Ledge.

The pump station and ground storage tank, that are primarily used to supply the National Guard Armory with fire flow, were constructed in 2006 and are generally in good condition.

2.6 Summary of Project Needs

2.6.1 Water Treatment Plant Improvements

The City’s PIRTS, installed in 1988, is approaching or beyond the end of its useful life and showing significant signs of deterioration. Significant repair to the package system would be required for continued long-term use. Fishbeck completed a small study in 2019 to determine if the package system could be repaired. The repair was estimated to be costly and disruptive to the existing treatment system. In addition, it was unknown how long the

unit would remain operational if repaired, due to its age and condition. Replacement of the existing PIRTS was recommended.

Three studies were completed considering different options for the replacement of the existing PIRTS. The first study reviewed alternatives for a new iron removal treatment system to replace the existing PIRTS. The second study reviewed alternatives for softening systems. The third study looked at connecting to the City of Lansing water system as a wholesale user. From the results of those studies, a new WTP on the existing WTP site was the selected alternative. These studies will be provided to EGLE as supplemental documents to this project plan.

The design treatment capacity of the WTP to be used as the basis of the study was determined through the demand projections, equipment sizing and needs, and discussion with City staff. The chosen capacity was used to evaluate the WTP alternatives and to develop equipment sizing and associated costs. There were several considerations that went into sizing the WTP capacity.

EGLE typically requires a minimum of 20% extra capacity in relation to the MDD before suggesting an expansion of a WTP. Using the 20-year demand projection, that would equate to a minimum capacity of 2.175 mgd.

The WTP capacity is partly a function of the size and configuration of pressure filters available. The design includes three filters supplied initially, which result in the initial firm treatment capacity of 2.85 mgd with one cell offline. With only two filters, the firm treatment capacity is 2.28 mgd, which is just above EGLE capacity expansion guideline as noted above.

Table 2-2 – Filter Capacity Design Characteristics

Parameter	Initial Design	Ultimate Design
Number of Filters	3	4
Capacity per Filter (mgd)	1.14	1.14
Number of Cells per Filter	2	2
Capacity per Cell (mgd)	0.57	0.57
Firm Capacity with one Filter out (mgd)	2.28	3.42
Firm Capacity with one Cell out (MGD)	2.85	4.00

An initial design capacity of 2.85 mgd (installation of 3 filters) with an ultimate capacity of 4.0 mgd (room for a fourth filter) was chosen for the WTP. The sizing of the WTP considered future demand projections, some allotment for growth, and a treatment capacity safety factor in case of an emergency. The excess capacity will also allow the WTP to be run at a lower filtration rate, which will reduce the number of backwash cycles needed for the filters over a period. To accommodate the selected capacity, a new WTP would need to be constructed.

2.6.2 Water Main Replacements

The 6-inch water main that runs along Green Street is almost 50 years old and is one of the recommended improvements from the 2015 *Water System Reliability Study*. Replacement of this water main with an 8-inch ductile iron water main will improve the reliability of the system in the area, reduce operation and maintenance costs due to main breaks, and improve pressures in the City water system. The Project Plan proposes to replace 980 feet of 6-inch water main along Green Street between West South Street and Seminary Street.

2.6.3 Expansion of the Raw Water Supply System

The total peak capacity of the existing raw water system is 2,400 gpm. The firm capacity of the raw water supply system is 1,300 gpm, with Well No. 6 (the largest well) out-of-service. However, Well No. 2, with a capacity of 400 gpm, pumps directly to the distribution system and cannot provide raw water directly to the WTP. Thus, the total raw water capacity supplied to the WTP is 2.88 mgd and the firm raw water capacity supplied to the WTP is 1.30 mgd. This raw water capacity will need to be expanded to meet the design firm capacity needs of the WTP, a value of 2.85 mgd.

2.6.4 Orders of Enforcement Actions

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

2.6.5 Drinking Water Quality Problems

The aesthetic quality of the water produced by the City's iron removal plant is generally good; there are no known drinking water problems in the distribution system.

2.6.6 Projected Needs for the Next 20 Years

The 2017 *Water System Reliability Study* included 5-year and 20-year Capital Improvements Plans for the water distribution system and WTP. The recommended improvements from this study and the City's current Capital Improvements Plan are provided in Appendix 2. This Project Plan includes water main replacement at Green Street to improve reliability and pressures in the system.

The recommended construction of a new WTP is based on the 2020 *Iron Removal Treatment Plant Study*. The new WTP proposed in this Project Plan will address the concerns around the existing, aging WTP.

The expansion of the existing raw water supply system is needed to meet future projected demands for the City.

3.0 Analysis of Alternatives

3.1 Water Treatment Plant Replacement

The existing WTP is quickly deteriorating and is in need of replacement. Three construction alternatives were considered for replacement of the existing WTP. Other alternatives were considered as part of a series of studies completed for the City in 2020. These will be provided as a supplement to this document.

3.1.1 No Action

The City's existing WTP utilizes a PIRTS for iron removal. The PIRTS is approaching the end of its useful life, showing significant signs of deterioration. The No Action alternative is not considered a feasible alternative due to the deteriorating condition of the existing WTP and the desire of the City and its customers to have a water supply that has been treated for iron removal.

3.1.2 Optimum Performance of Existing Facilities

Fishbeck completed a small study in 2019 to determine if the PIRTS could be repaired. The repair was estimated to be costly and disruptive to the existing treatment system. In addition, it was unknown how long the unit would remain operational if repaired, due to its age and condition. This alternative was also not considered to be feasible.

3.1.3 Construction Alternatives

Three construction alternatives were considered; based on the analysis of each alternative, the third alternative was selected.

3.1.3.1 Alternative 1 – Installation of a New PIRTS

The first alternative considered was to install a new PIRTS to replace the existing unit. There were several issues identified early on with installing a new PIRTS in the existing treatment plant building, which are described below:

- The WTP capacity designated for the new treatment process is greater than the capacity of the existing treatment unit. It is unlikely that a new larger capacity PIRTS would fit in the same space as the existing, as it would have to treat almost twice the water of the existing unit.

- To install the new PIRTS, the existing PIRTS would need to be demolished and removed from the building. Then the new PIRTS would need to be installed and commissioned before the water plant could be put back online. During this time, water would have to be supplied to the City's customers directly from the supply wells with no iron removal or other treatment beyond chlorine disinfection.
- The existing WTP building has a vaulted ceiling supported by Glulam beams. Construction within the existing building would require a portion of the roof to be removed and replaced which would be expensive. Construction of a simple, economical building is preferable to the City.
- With the new PIRTS, the existing clearwell and high service pumps would need to be reused and likely expanded or upgraded. These assets are old. The extent to which these assets can be relied upon long-term is not known, and they could require replacement soon after the plant is put into service.

Thus, the installation of a new PIRTS alternative was not deemed a viable alternative but was included to show that it was considered.

3.1.3.2 Alternative 2 – Horizontal Pressure Filters in Existing Building

The second alternative considered was to install horizontal pressure filters (HPFs) in the existing WTP. There were several issues identified early on with installing HPFs in the existing WTP building, which are described below:

- To install the new horizontal pressure filters, the existing PIRTS would need to be demolished and removed from the building. Then the HPFs would need to be installed and commissioned before the WTP could be put back online. During this time, water would have to be supplied to the City's customers directly from the supply wells, with no iron removal or other treatment beyond chlorine disinfection. The City is concerned about having to supply untreated groundwater to the system for an extended period.
- The existing WTP building has a vaulted ceiling supported by Glulam beams. Construction within the existing building would require a portion of the roof to be removed and would be expensive to replace. Construction of a simple, economical building is preferable to the City.
- The ultimate design capacity of 4.0 mgd cannot be met without a significant expansion of the existing WTP building, which is not well situated on the site for an expansion. An addition for a hydrous manganese oxide (HMO) chemical feed and storage room would also be needed.

Due to these issues, the installation of HPFs in the existing WTP building was not deemed a viable alternative but was included to show it was considered.

3.1.3.3 Alternative 3 – Horizontal Pressure Filters and New Building

The third alternative, and the one selected for the replacement of the existing WTP, was the installation of HPFs at a new WTP building. A new below-grade cast-in-place concrete basin will be constructed onsite to hold the filter backwash wastewater. A control valve in an adjacent vault will regulate the rate of gravity flow of the backwash water to the City's existing sanitary sewer. This alternative would avoid the major construction phasing concerns of the other alternatives and provide the City with a new building and treatment process optimized for the City's needs. The alternative is described in more detail later in this report.

3.1.4 *Regional Alternative*

Three regional supply alternatives connecting the City to the Lansing Board of Water and Light (LBWL) were evaluated as part of a separate study. These alternatives were considered but were ultimately not selected by the City for a couple of reasons. The Present Worth Analysis showed the WTP as the least cost option of the alternatives considered. This study has been provided as a supplement to this report.

3.2 Green Street Water Main Replacement

3.2.1 No Action

The no-action alternative would result in continuing the operation of the system as before. This would likely result in further breaks along the Green Street water main and would leave the reliability and pressure issues in the area unresolved. The no-action alternative would not eliminate these problems and therefore is not considered further.

3.2.2 Optimum Performance of Existing Facilities

Water system performance in the project area is optimized. The deficiencies targeted for improvements are a function of pipe age, issues related to maintaining the water main, and redundancy, which would all require capital improvements for correction. This alternative is eliminated from further consideration.

3.2.3 Construction Alternative – Water Main Replacements

In this alternative, approximately 980 linear feet of 6-inch water main along Green Street would be replaced by a new 8-inch water main. This would address the water main break issues while providing reliability for the area. Therefore, this alternative is evaluated further as the principal alternative for water main.

3.2.4 Regional Alternative

This main is not near the boundary of the water system. To supply it via another water system would not be feasible.

3.3 Expansion of Raw Water Supply Capacity

3.3.1 No Action

The no-action alternative would result in the City's raw water capacity being unable to meet projected demands. This capacity will be needed to continue to supply water to the City's customers. The no-action alternative was not considered feasible.

3.3.2 Optimum Performance of Existing Facilities

The City is planning to add permanent standby power along with the new WTP, which would also power Well Nos. 6 and 7 in case of an emergency. Well No. 8 has a connection for a portable generator that the City can use to operate it in the event of an emergency. While these measures help provide reliability to the raw water system, it does not solve the capacity issues. This alternative was not considered feasible.

3.3.3 Construction Alternatives

Two principal construction alternatives were evaluated for the expansion of the raw water supply system for the City. Each are described generally in this Section. Further detail on costs, considerations, feasibility, etc. will be provided later in the report.

3.3.3.1 Alternative 1 – Construction of Well Nos. 9 and 10

The City has already drilled Well No. 9 and has a site secured for Well No. 10. The outfitting and construction of Well Nos. 9 and 10 will provide additional capacity to the raw water system, increasing the reliability and availability of raw water to the existing and new WTP. In 1998, the City drilled Well No. 9 with an expected capacity of 1.44 mgd; however, it was not outfitted. EGGLE has indicated the variance granted for the well at that time is no longer valid. The City continues to correspond with EGGLE to try to reach a compromise.

As part of the effort to reach a compromise with EGGLE, a hydrogeological study will be done to investigate whether Well No. 9 will have an Adverse Resource Impact (ARI) on an adjacent stream. This study would

potentially remove concerns regarding impact on the stream, based on well monitoring, aquifer performance testing, and investigation of potential impacts to the stream.

3.3.3.2 Alternative 2 – Identification and Construction of Well Field

The second alternative evaluated for expansion of the existing raw water supply for the City was the identification and construction of a well field potentially three miles or more from the WTP site. The construction of three new groundwater supply wells at a new well field would provide the City with sufficient raw water capacity to meet projected demands of the water system. As part of the effort to construct new groundwater supply wells, a hydrogeological study will need to be completed to identify potential sites. It should be noted that a large quantity withdrawal permit would be needed to construct wells with a capacity over 2.0 mgd. This has not yet been obtained.

3.3.4 *Regional Alternative*

Three regional supply alternatives connecting the City to the LBWL was considered as part of a separate study. These alternatives were considered but were ultimately not selected by the City for a couple of reasons. The Present Worth Analysis showed the WTP as the least cost option of the alternatives considered. For further information, this study has been provided as a supplement to this report.

4.0 Principal Alternatives

For the Water Treatment Plant Replacement, the construction of a new WTP building was selected as the only principal alternative. The replacement of 980 linear feet of 6-inch water main along Green Street was selected as the only principal alternative for the Water Main Replacement. For the Expansion of Raw Water Capacity, two principal alternatives were evaluated: the construction of Well Nos. 9 and 10; and the identification and construction of a new well field three miles or more from the WTP site.

4.1 Water Treatment Plant Replacement

4.1.1 *Monetary Evaluation*

A monetary analysis was completed for the construction alternative. The project cost summary for the construction alternative is presented in Table 4-1.

Table 4-1 – Water Treatment Plant Replacement Construction Cost Estimate

Cost Category	Estimated Cost	Salvage Value
<i>Water Treatment Plant Costs</i>		
Building Construction	\$2,235,000	\$1,274,000
Process Equipment	\$2,230,000	\$613,000
Process Piping and Valving	\$689,000	\$350,000
Chemical Storage and Feed Equipment	\$490,000	\$134,000
Mechanical Equipment (HVAC)	\$330,000	\$80,000
Plant Electrical	\$778,000	\$148,000
Plant Control System	\$716,000	\$145,000
<i>Sitework Costs</i>		
Site Utilities	\$1,302,000	\$588,000
General Sitework	\$255,000	\$68,000
Backwash Equalization Basin	\$552,000	\$299,000
<i>Work at Remote Sites Costs</i>		
Outfit Wells to Pump to Distribution	\$261,000	\$104,000
Controls Upgrades at Remote Sites	\$36,000	\$7,000
Subtotal	\$9,874,000	\$3,810,000
Design, Estimating, and Escalation Contingency (7%)	\$693,000	
Building Permits Allowance (1%)	\$99,000	
General Contractor/Construction Manager Fee (5%)	\$495,000	
General Contractor Overhead and General Conditions (8%)	\$790,000	
Subtotal	\$11,951,000	
Construction Contingency (10%)	\$1,196,000	
Construction Cost Opinion	\$13,147,000	

A present worth analysis was completed for the construction alternative, as summarized in Table 4-2. The present worth analysis for the new treatment plant alternative is included in Appendix 3. Sunk costs are not included in the analysis.

Table 4-2 – 20-Year Present Worth Analysis – Water Treatment Plant

Cost Category	WTP Replacement	
	Cost/Value	20-Year Present Worth
Capital Cost	\$13,147,000	\$13,147,000
O&M* Cost/Year	\$1,516,989	\$31,317,000
Replacement Cost	\$63,000	\$63,000
Salvage Value	\$3,810,000	(\$4,046,000)
Total Present Worth		\$40,481,000

* Operation and Maintenance (O&M)

4.1.2 Environmental Evaluation

4.1.2.1 Cultural Resources

The proposed projects will have no direct expected historical or archeological impacts. A State Historic Preservation Office (SHPO) review has already been completed and is included in Appendix 4.

4.1.2.2 Natural Environment

No long-term impacts to the natural environment are anticipated due to the proposed improvement projects. Where applicable, construction will occur during the typical construction season for underground work.

4.1.3 *Mitigation*

The impact on air quality will be controlled to the greatest extent possible by limiting construction to regular working hours during the week and ensuring proper maintenance on heavy equipment to reduce exhaust emissions. Dust will be controlled by appropriate measures, such as the use of calcium chloride or water.

4.1.4 *Implementability and Public Participation*

The public will be provided with opportunities to comment on the project at the Public Hearing. Public concerns will be considered whenever possible throughout design and construction.

The City owns and operates its water distribution system, including the WTP, and the projects do not require intermunicipal agreements.

4.1.5 *Technical Considerations*

The following design information and assumptions were used to evaluate treatment and construction alternatives considered in this alternative analysis.

- The new WTP would have an initial firm capacity of 2.85 mgd with an ultimate firm capacity of 4.0 mgd.
- The WTP processes would be designed to reduce the iron, manganese, and radium present in the raw water to meet acceptable drinking water standards.
- The design should consider minimizing disruption to the City's current treatment.
- The City would like to use chlorine gas for iron oxidation and disinfection.
- Expansion of the existing WTP would be very challenging and expensive due to the existing layout and surrounding uses.
- Some means to control the flow of the backwash waste to the sanitary sewer should be considered. To accomplish this, the construction of a backwash equalization basin will be needed. It should be sized assuming half of the filters are backwashed in the same day.
- The City would like to have the WTP continue unmanned operation, so it can operate 24 hours a day without additional staff.
- HMO should be used for radium removal.

4.1.6 *Residuals*

The City has provided input on planned growth and development. These areas reflect available land, such as undeveloped parcels in the industrial park and recent interest in residential, commercial, and industrial development. The City has partnered with Oneida Township to supply some areas outside the City limits with water and sewer infrastructure. The City has seen development and growing interest for further development on sites in and around the City that will require water and sewer infrastructure.

4.1.7 *Potential Industrial/Commercial/Institutional*

The City currently serves industrial customers and expects to serve additional industrial users in the next 5 years. This is expected as part of the Lansing Economic Area Partnership, which is a regional economic development organization including Clinton, Eaton, and Ingham counties.

4.1.8 *Growth Capacity*

The sizing of the WTP accounts for projected demands, ease of operation, and potential future growth.

4.1.9 Contamination

Map 5 shows the location of the contaminated sites within the service area. No adverse site conditions are anticipated for the proposed water system and WTP improvement projects.

4.2 Green Street Water Main Replacement

4.2.1 Monetary Evaluation

A monetary analysis was completed for the construction alternative. The project cost summary for the construction alternative is presented in Table 4-3. The cost estimates include the installation of the water main itself and the restoration required near the water main.

Table 4-3 – Green Street Water Main Replacement Construction Cost Estimate

Item	Initial Capital Cost	Salvage Value
New 8-Inch Water Main and Restoration	\$156,000	\$125,000
Subtotal	\$156,000	
Contractor’s General Conditions and Profit and Contingency	\$23,000	
Construction Cost Opinion	\$179,000	

A present worth analysis was completed for the construction alternative, as summarized in Table 4-4. The present worth analysis for the water main alternative is included in Appendix 5. Sunk costs are not included in the analysis.

Table 4-4 – 20-Year Present Worth Analysis – Green Street

Cost Category	Green Street Water Main	
	Cost/Value	20-Year Present Worth
Capital Cost	\$179,000	\$179,000
O&M Cost/Year	\$9,900	\$277,000
Replacement Cost	\$0	\$0
Salvage Value	\$125,000	(\$229,866)
Total Present Worth		\$156,134

The capital costs for the water main include only the water main and the restoration above the main. The O&M costs were assumed to be 5% of the cost of the water main. The salvage value was calculated assuming the water main had a useful life of 100 years.

4.2.2 Environmental Evaluation

4.2.2.1 Cultural Resources

The proposed projects will have no direct expected historical or archeological impacts.

4.2.2.2 Natural Environment

No long-term impacts to the natural environment are anticipated due to the proposed improvement projects. Where applicable, construction will occur during the typical construction season for underground work.

4.2.3 Mitigation

The impact on air quality will be controlled to the greatest extent possible by limiting construction to regular working hours during the week and ensuring proper maintenance on heavy equipment to reduce exhaust emissions. Dust will be controlled by appropriate measures such as the use of calcium chloride or water.

4.2.4 *Implementability and Public Participation*

The public will be provided with opportunities to comment on the project at the Public Hearing. Public concerns will be considered whenever possible throughout design and construction.

The City owns and operates its water distribution system, and the projects do not require intermunicipal agreements.

4.2.5 *Technical Considerations*

The replacement of the 6-inch water main with the 8-inch water main will improve reliability and pressures in the surrounding area of the water system.

4.2.6 *Residuals*

The City has provided input on planned growth and development. These areas reflect available land such as undeveloped parcels in the industrial park and recent interest in residential, commercial, and industrial development. The City has partnered with Oneida Township to supply some areas outside the City limits with water and sewer infrastructure. The City has seen development and growing interest for further development on sites in and around the City that will require water and sewer infrastructure.

4.2.7 *Potential Industrial/Commercial/Institutional*

The City currently serves industrial customers and expects to serve additional industrial users in the next 5 years. This is expected as part of the Lansing Economic Area Partnership, which is a regional economic development organization including Clinton, Eaton, and Ingham counties.

4.2.8 *Growth Capacity*

The sizing of the water main accounts for projected demands, ease of operation, and potential future growth.

4.2.9 *Contamination*

Map 5 shows the location of the contaminated sites within the service area. No adverse site conditions are anticipated for the water main area.

4.3 *Expansion of Raw Water Supply System*

Two principal alternatives were evaluated for the expansion of the raw water supply system: the construction of Wells No. 9 and 10; and the identification and construction of a new well field.

4.3.1 *Construction of Well Nos. 9 and 10*

The construction of Well Nos. 9 and 10 would help improve raw water supply capacity to meet the growing needs of the City water system. These wells will increase the reliability and availability of raw water to the existing and new WTP. A hydrogeological study is also proposed to help provide additional justification for the approval of Well No. 9 as a supply well.

4.3.1.1 *Monetary Evaluation*

A monetary analysis was completed for the construction alternative. The project cost summary for the construction alternative is presented in Table 4-5. The cost estimates include a hydrogeological study and construction of Well Nos 9 and 10. It should be noted that there are little to no transmission main costs due to the raw water main already being run to these sites.

Table 4-5 – Construction of Well Nos. 9 and 10 Estimated Costs

Item	Initial Capital Cost	Salvage Value
Well Drilling and Testing (cost reduced with Well No. 9 already drilled)	\$180,000	-
Wellhouse and Pump	\$2,500,000	\$1,500,000
Standby Power	\$200,000	\$67,000
Power Feed/Transformers	\$180,000	\$60,000
Telemetry	\$180,000	-
Site Work Allowance	\$80,000	-
Subtotal	\$3,320,000	\$1,627,000
Design, Estimating, and Escalation Contingency (9%)	\$297,000	
Building Permits Allowance (1%)	\$33,000	
General Contractor/Construction Manager Fee (5%)	\$165,000	
General Contractor Overhead and General Conditions (8%)	\$265,000	
Subtotal	\$4,080,000	
Construction Contingency (10%)	\$407,000	
Total Construction Cost Opinion (Well Construction)	\$4,487,000	

A present worth analysis was completed for the construction alternative, as summarized in Table 4-6. The present worth analysis for the construction of Well Nos. 9 and 10 and the associated hydrogeological study alternative are included in Appendix 6. Sunk costs are not included in the analysis.

Table 4-6 – 20-Year Present Worth Analysis

Cost Category	Expansion of Raw Water System	
	Cost/Value	20-Year Present Worth
Capital Cost	\$4,487,000	\$4,487,000
O&M Cost/Year	\$55,000	\$1,539,000
Replacement Cost	\$0	\$0
Salvage Value	\$1,627,000	(\$2,992,000)
Total Present Worth		\$3,034,000

The capital costs are for the hydrogeological study and the construction of Well Nos. 9 and 10. The O&M costs for the wells were calculated based on electrical use and regular maintenance. The salvage value was calculated assuming the wells had a useful life of 50 years and the other equipment had typical useful lives.

4.3.1.2 Environmental Evaluation

4.3.1.2.1 Cultural Resources

The proposed projects have no direct expected historical or archeological impacts.

4.3.1.2.2 Natural Environment

No long-term impacts to the natural environment are anticipated due to the proposed improvement projects. This is being confirmed through the hydrogeological study, which will verify no ARI will affect the adjacent stream. Where applicable, construction will occur during the typical construction season for underground work.

4.3.1.3 Mitigation

The impact on air quality will be controlled to the greatest extent possible by limiting construction to regular working hours during the week and ensuring proper maintenance on heavy equipment to reduce exhaust emissions. Dust will be controlled by appropriate measures such as the use of calcium chloride or water.

Noise from construction will be mitigated by only working during daylight hours and mitigating the noise of construction where possible.

4.3.1.4 Implementability and Public Participation

The public will be provided with opportunities to comment on the project at the Public Hearing. Public concerns will be considered whenever possible throughout design and construction.

The City owns and operates its water distribution system, and the projects do not require intermunicipal agreements.

4.3.1.5 Technical Considerations

4.3.1.5.1 Construction of Well Nos. 9 and 10

Well No. 9 was drilled back in 1998. Well No. 10 still needs to be drilled but would be constructed similarly to Well No. 9. Each well will be outfitted with a vertical turbine style well pump and will be housed in a well house. The pump discharges will be connected to the existing 8-inch raw water main on the site. Typical operation will be to pump to the water plant.

4.3.1.5.2 Hydrogeological Study for Well No. 9

In January 2019, representatives from Fishbeck, the City, and the Drinking Water and Environmental Health Division (DWEHD) of EGLE met to discuss the required steps to get an approval to use Well No. 9. Based on discussions, the DWEHD requested the Water Resources Division (WRD) complete a Public Water Supply Pre-Screening Review (PWSPR). The WRD has asserted that the proposed withdrawal failed the PWSPR, and additional data are necessary to demonstrate that Well No. 9 will not cause an ARI. A hydrogeological study will be completed to demonstrate that Well No. 9 will not cause an ARI to the adjacent stream.

4.3.1.6 Residuals

The City has provided input on planned growth and development. These areas reflect available land such as undeveloped parcels in the industrial park and recent interest in residential, commercial, and industrial development. The City has partnered with Oneida Township to supply some areas outside the City limits with water and sewer infrastructure. The City has seen development and growing interest for further development on sites in and around the City that will require water and sewer infrastructure.

4.3.1.7 Potential Industrial/Commercial/Institutional

The City currently serves industrial customers and expects to serve additional industrial users in the next 5 years. This is expected as part of the Lansing Economic Area Partnership, which is a regional economic development organization including Clinton, Eaton, and Ingham counties.

4.3.1.8 Growth Capacity

The groundwater supply wells added will account for projected demands, ease of operation, and potential future growth.

4.3.1.9 Contamination

Map 5 shows the location of the contaminated sites within the service area. No adverse site conditions are anticipated for the water main area.

4.3.2 Identification and Construction of New Well Field

The construction of three new groundwater supply wells at a new well field would provide the City with sufficient raw water capacity to meet projected demands of the water system. As part of the effort to construct new groundwater supply wells, a hydrogeological study will need to be completed to identify potential sites.

4.3.2.1 Monetary Evaluation

A monetary analysis was completed for the construction alternative. The project cost summary for the construction alternative is presented in Table 4-7. The cost estimates include a hydrogeological study and construction of three new groundwater supply wells with an estimated length of three miles of redundant 16-inch raw water transmission mains. It should be noted that the hydrogeological study is planned for completion in fiscal year 2023, while the construction of the wells is planned for fiscal year 2024. The hydrogeological study cost is inclusive of observation well drilling and testing, together with new source water quality testing costs, at up to 8 sites. The acquisition cost of property for new well fields is highly variable in the area the City is looking. One potential property was priced at \$10,000,000.

Table 4-7 – Identification and Construction of New Wellfield Estimated Costs

Item	Initial Capital Cost	Salvage Value
<i>Project for Completion in Fiscal Year 2023</i>		
Hydrogeological Study	\$360,000	-
Total Project Cost Opinion (FY 2023)	\$360,000	-
<i>Project for Completion in Fiscal Year 2024</i>		
16-inch Raw Water Transmission Main (31,680 feet)	\$13,512,000	\$8,108,000
Property Acquisition	\$1,000,000	\$1,000,000
Three Wellhouses and Pumps	\$2,550,000	\$1,530,000
Subtotal	\$17,062,000	\$10,638,000
Design, Estimating, and Escalation Contingency (7%)	\$1,195,000	
Building Permits Allowance (1%)	\$171,000	
General Contractor/Construction Manager Fee (5%)	\$854,000	
General Contractor Overhead and General Conditions (8%)	\$1,365,000	
Subtotal	\$20,647,000	
Construction Contingency (10%)	\$2,065,000	
Total Project Cost Opinion (FY 2024)	\$22,712,000	

A present worth analysis was completed for the construction alternative, as summarized in Table 4-8. The present worth analysis for the expansion of the raw water system alternative is included in Appendix 6. Sunk costs are not included in the analysis.

Table 4-8 – 20-Year Present Worth Analysis

Cost Category	Expansion of Raw Water System	
	Cost/Value	20-Year Present Worth
Capital Cost	\$23,072,000	\$23,072,000
O&M Cost/Year	\$275,000	\$7,691,000
Replacement Cost	\$0	\$0
Salvage Value	\$10,638,000	(\$19,563,000)
Total Present Worth		\$11,200,000

The capital costs are for a hydrogeological study, the construction of three groundwater supply wells within three miles of the WTP, and the installation of redundant raw water transmission mains to the plant. The O&M costs for the wells were calculated based on electrical use and regular maintenance with an added O&M cost for the transmission main. The salvage value was calculated assuming the wells had a useful life of 50 years and the other equipment had typical useful lives.

4.3.2.2 Environmental Evaluation

4.3.2.2.1 Cultural Resources

The proposed projects have no direct expected historical or archeological impacts.

4.3.2.2.2 Natural Environment

No long-term impacts to the natural environment are anticipated due to the proposed improvement projects. Where applicable, construction will occur during the typical construction season for underground work.

4.3.2.3 Mitigation

The impact on air quality will be controlled to the greatest extent possible by limiting construction to regular working hours during the week and ensuring proper maintenance on heavy equipment to reduce exhaust emissions. Dust will be controlled by appropriate measures such as the use of calcium chloride or water.

Noise from drilling activities on the potential well sites will be mitigated by only drilling during daylight hours and mitigating the noise of construction where possible.

4.3.2.4 Implementability and Public Participation

The public will be provided with opportunities to comment on the project at the Public Hearing. Public concerns will be considered whenever possible throughout design and construction.

The City owns and operates its water distribution system, and the projects do not require intermunicipal agreements.

4.3.2.5 Technical Considerations

4.3.2.5.1 Hydrogeological Study

The following scope of services is based on tasks required to assess the viability of groundwater resources at potential well field development locations:

A review and evaluation of local hydrogeological and water quality conditions will be completed using a combination of existing and readily available information (i.e., government databases, publications, and well records). The study will encompass the area where parcels are likely to be procured by the City. State and local databases will also be reviewed to determine known sites of environmental contamination that may be of concern or have impacted groundwater in the area. Information from this review will be used to evaluate potential groundwater sources, including information regarding physical aquifer characteristics, estimated yields, and potential water quality concerns. This initial evaluation will also include assessing issues regarding isolation from potential contamination sources as required by the Michigan Safe Drinking Water Act (Act 399). The EGLE Water Withdrawal Screening Tool will also be utilized to determine if the groundwater withdrawal from new water supply wells at a selected site could potentially create an ARI. A technical memo will be prepared that summarizes its findings and will include recommendations for additional field activities at sites that exhibit favorable conditions for a potential water supply well.

The hydrogeological study would include initial field activities to determine groundwater quality and provide preliminary yield information at sites that warrant additional evaluation to determine the suitability for a well field. Initial field activities will include an exploratory boring that will be drilled to the base of the Saginaw Bedrock

Formation, which is estimated to be 300 to 400 feet below ground surface. A 5 to 6-inch diameter casing will be installed and grouted into the upper portion of the sandstone bedrock at each boring location. Following the installation of the surface casing, the sandstone bedrock will then be drilled through the casing to the base of the sandstone formation creating an open hole bedrock observation well. The observation wells will be used to confirm the preliminary evaluation of hydrogeological conditions and determine groundwater quality and to further evaluate the suitability of selected sites for future City water supply well development.

The following is a summary of initial field activities:

1. Site selection in consultation with City staff
2. Drilling specifications and oversight
3. Access, utility clearances, electrical power supply, and permitting
4. Observation well installation, to consist of:
 - a. Mobilization
 - b. Mud rotary drill and casing installation to bedrock, anticipated at 70 feet +/- below ground surface (bgs)
 - c. Seat and grout casing in place at top of bedrock
 - d. Air rotary drilling through bedrock to total depth, estimated at 350 feet +/- bgs
 - e. Well development
 - f. Installation of temporary pump to complete short-term test pumping
 - g. Conduct a short-term pumping test to complete a preliminary evaluation of aquifer yield and collect representative groundwater samples
 - h. Install removable locking casing cap
 - i. Demobilization
5. Water quality sampling

Water quality samples will be collected from each observation well at the end of the yield test. The water samples will be submitted for laboratory analyses of parameters required by the Michigan Safe Drinking Water Act for Type I public water supply wells. The analytical results will determine if the groundwater quality is suitable for new Type I water supply wells.

Following the selection of suitable well field sites, the water supply well installation and testing phase of the project will begin. Design and technical specifications for Type I water supply well installation and testing will be prepared. This would include installation of a second observation well at a different radius and azimuth from the proposed production well at one or more sites of interest. At that time, the City will contract directly with a licensed drilling firm for the drilling, construction, performance testing, equipping, and commission of the new groundwater observation and production wells.

4.3.2.5.2 Construction of New Supply Wells

In fiscal year 2024, three groundwater supply wells are assumed to be constructed. As noted before, the construction of these supply wells has many inherent assumptions since sites are not yet identified. When well sites are identified, the details and cost estimates of this construction will be refined.

Each new well assumes the following design conditions:

- A well house building will be constructed to house the well and new well pump. It is assumed to be constructed with a single story, split-face masonry block wall construction and an asphalt-shingled roof.
- The pump will be a vertical turbine style well pump and will be designed to pump water directly through the new WTP and into the City water distribution system. The well pump will be supplied with a VFD for operational flexibility and to provide slow start and stop of the motor to mitigate hydraulic transients.

- The well house will be designed with provisions for a temporary chemical feed of sodium hypochlorite and orthophosphate during an emergency, when water has to be pumped directly to the water distribution system.
- A flow meter will be provided in the well house for flow monitoring and totalization. An entry alarm (monitored via the station control system) will also be included. Station monitoring and control equipment will be connected to the City's control system for remote monitoring and control from the water plant.
- A water service from the City water supply will be provided to the building and include a backflow preventer. It is assumed a gravity-fed, refillable eyewash station will be provided.
- The mechanical systems will include an electric unit heater, exhaust fan, and intake louver. The electrical system will include a 480 volt, 3-phase, 60 hertz service from the local electric utility company. A stationary diesel generator with a subbase fuel storage tank and automatic transfer switch will be provided for distributing standby power.

The assumption for the raw water transmission mains is that dual 16-inch mains will be run three miles from a new well field to the new treatment plant. Dual mains are assumed for redundancy for the raw water supply from the well field. It was assumed that the raw water main would have to be run along some major roads which drove the cost estimate.

4.3.2.6 Residuals

The City has provided input on planned growth and development. These areas reflect available land such as undeveloped parcels in the industrial park and recent interest in residential, commercial, and industrial development. The City has partnered with Oneida Township to supply some areas outside the City limits with water and sewer infrastructure. The City has seen development and growing interest for further development on sites in and around the City that will require water and sewer infrastructure.

4.3.2.7 Potential Industrial/Commercial/Institutional

The City currently serves industrial customers and expects to serve additional industrial users in the next 5 years. This is expected as part of the Lansing Economic Area Partnership, which is a regional economic development organization including Clinton, Eaton, and Ingham counties.

4.3.2.8 Growth Capacity

The groundwater supply wells added will account for projected demands, ease of operation, and potential future growth.

4.3.2.9 Contamination

Map 5 shows the location of the contaminated sites within the service area. No adverse site conditions are anticipated for the water main area.

5.0 Selected Alternatives

5.1 Water Treatment Plant Replacement

5.1.1 *Description*

The selected alternative was the construction of a new WTP on the existing plant site. This alternative allows for the ultimate capacity identified within the existing and potential expanded service area to be met and addresses the project needs and concerns associated with construction sequencing and plant operations.

5.1.2 Preliminary Project Design

5.1.2.1 General Process Stream

The raw water will be pumped to the plant from Well Nos. 6, 7, and 8 directly through the new WTP to the distribution system; no secondary pumping will be needed. Chlorine gas and HMO will be added to the raw water to chemically oxidize the iron and to adsorb the radium, respectively. Water will then flow through the HPFs, in which oxidized iron, manganese oxide particles with adsorbed radium, will be filtered by a media bed of anthracite, sand, and garnet sand. Filtered water will flow directly to the distribution system with chlorine gas added for disinfection, fluoride added for dental health, and a blended phosphate, with a majority of orthophosphate, added for corrosion control. The HPFs will require periodic backwashing to remove accumulated solids from the filter media. The backwash water will be provided by the filtered water passing through the other filter cells in service and supplemented, if necessary, by flow from the distribution system. The filter backwash wastewater will flow by gravity to a new below-grade, cast-in-place concrete basin constructed onsite. A control valve in a vault adjacent to the equalization tank will regulate the rate of gravity flow of the backwash wastewater to the City's existing sanitary sewer system.

The BOD for the improved treatment system is included in Appendix 7. The site layout, flow schematic, and process floor plan are shown on Figures 3, 6 and 7, respectively.

5.1.2.2 Siting of New Water Treatment Plant

The new WTP will be sited south of the existing treatment plant and garage. An access road for the new plant will be extended south to Wellhouse No. 6, wrapping around the east end of the plant to allow for chemical deliveries to the southern entrance of the plant. Existing raw and finished water mains will be utilized as much as possible. Dual raw water and finished water mains will be used for redundancy and operational flexibility at the new WTP. A new backwash equalization tank will be constructed onsite north of the new WTP. Backwash and drain water will flow by gravity to the tank and then to the sanitary sewer through a control valve located in a vault to the west of the new equalization tank. Figure 3 following the body of this report includes a site layout plan to illustrate the proposed site construction, raw and finished water main, and the existing WTP facility.

5.1.2.3 Building Description

The proposed building construction is described in this section. The details of the construction continue to be refined as part of the design process. The proposed floor plan for the new iron removal plant and building is included within Figure 7.

5.1.2.3.1 Project Architectural Description

Exterior masonry walls will be cavity construction consisting of an interior load bearing concrete masonry unit (CMU) wythe and an exterior split face decorative block veneer. The decorative block will be produced with integral color and water repellant admixtures for low maintenance. Rigid insulation will be installed in the cavity to meet energy code requirements. Interior masonry walls will be painted CMU.

Roofing will be prefinished standing seam metal roof panels applied over sheathing, metal roof deck, and cold formed steel roof trusses. Gypsum board will be applied to the underside of the roof trusses. A vapor barrier will be installed on the underside of the trusses and R-49 blown-in fiberglass insulation will be installed between the trusses to meet energy code requirements.

Exterior doors and frames will be painted, hollow-metal construction. The doors will be insulated and galvanized. Interior doors and frames will be painted, hollow-metal construction. Doors at chemical storage rooms will be fire rated fiber reinforced plastic construction for chemical resistance with panic hardware. Door hardware will be keyed to match the Owner's existing system.

Interior ceilings in process, chemical storage, and mechanical equipment spaces will be painted gypsum board. Suspended acoustical ceilings will be provided in administrative spaces, corridors, and restrooms. Ceilings above H-3 and H-4 classified chemical storage rooms will be fire-rated horizontal shaftwall construction.

Floors will be sealed concrete in process, chemical storage, and mechanical equipment spaces. Vinyl composition tile will be provided in administrative spaces and restrooms with a resilient base applied to the perimeter walls.

Stainless steel toilet accessories will be provided in restrooms, including grab bars at water closets, to meet handicapped accessibility requirements.

5.1.2.3.2 Project Structural Description

The overall building structure concept is generally metal roof decking over cold-formed steel trusses bearing on concrete masonry walls. Cold-formed steel trusses may often be spaced 4-feet on center, rather than 24-inches, as is common with wood trusses, but a sub-framing system should then be considered for ceiling support. The masonry walls will be reinforced with vertical bar reinforcing at a regular spacing, wire reinforcing in joints, and added reinforcing around openings. The mezzanine structure will be precast concrete plank with a cast-in-place concrete topping bearing on concrete masonry walls.

Building slab on grade will be concrete on compacted granular soil, with welded wire reinforcing. A pipe trench will be constructed of reinforced concrete with reinforcing amounts and water stopped joints intended to minimize cracking and leakage. The grating over the trench is presumed to be heavy duty galvanized steel, capable of carrying a heavy wheel load. Supplementary steel members supporting the grating and other steel necessary in the building will be galvanized structural steel shapes. Slabs in chemical storage rooms will be constructed of reinforced concrete and designed to be fluid containing.

Foundations will be constructed using shallow strip and spread footings constructed of reinforced concrete.

The backwash equalization tank concept consists of reinforced concrete bottom slab with trench/sump, walls, and an open top tank. The tank walls will come up approximately 2 feet above grade and will be topped with guardrail. A ladder will be installed for access and maintenance for the tank. An adjacent vault will be provided with control valves. An aluminum access hatch will be located at the ground surface for access into the vault. Tank joints will be water stopped.

5.1.2.4 Process Systems

The proposed process systems are described in this section. The details of these systems will continue to be refined as part of the design process.

5.1.2.4.1 Modification of Existing Well Pumps

The current process design concept calls for the existing wells to pump through the HPFs and directly to the distribution system, forgoing the need for additional pumps in the WTP. Well Nos. 6 and 7 are equipped with VFDs and have sufficient flow pumping capacity to allow them to pump to the existing WTP or to the distribution system. However, the additional head loss caused by the HPFs will require additional pump capacity for Well Nos. 6 and 7. This can be achieved by pulling the pumps for these wells and installing additional bowls or by replacing impellers in the existing bowls, which would result in an increase the head that each pump can provide. Based on preliminary analysis, Well Pump No. 7 will not need to have its motor changed, as the existing motor has sufficient horsepower (HP) to handle the increased load, while Well Pump No. 6 will require a new motor. Well No. 8 is currently designed to only pump to the existing WTP. It will need to be outfitted with a VFD, as well as have additional bowls added to increase the amount of head the pump can provide. The motor for Well No. 8 will need to be upsized to meet the new pump design requirements.

5.1.2.4.2 Horizontal Pressure Filters

Three HPFs in an end-piped configuration with two independent filter cells each will be provided for the filtration of the water. Space will be provided in the plant for the addition of a fourth filter in the future, if required. Each filter cell will have a capacity of 0.57 mgd, based on a loading rate of 3.0 gpm/ft², providing the WTP with a firm filtration capacity of 2.85 mgd with one cell out-of-service. When the fourth filter is added in the future, the firm filtration capacity will increase to 4.0 mgd. The filters will contain a media bed of sand, anthracite, and garnet sand to filter out the oxidized iron and adsorbed radium from the raw water. Flow through the filters will be controlled by electrically actuated valves.

A pilot study for this project was completed in May of 2021. As part of that study, the concept for use of chemical oxidation, HMO, and pressure filtration was confirmed to provide for removal of iron, manganese, and radium to below their respective regulatory limits. In addition, low filter runtimes were observed at loading rates of 4 gpm/ft². A layer of garnet sand was added to provide a tighter media matrix to prevent colloidal iron from breaking through as quickly (this was the assumed cause of low runtimes). This, along with a decreased loading rate, significantly improved runtimes in the pilot study. Given the observations from the pilot study, an anthracite, sand, and garnet sand media was chosen to run at a loading rate of 3.0 gpm/ft² for the full-scale plant design.

5.1.2.4.3 Backwash and Residuals Handling

The HPFs will need to be periodically backwashed to remove accumulated solids from the filter media. The backwash process for the filters will consist of an initial combined air and water backwash process to agitate the filter media and dislodge residual solids for waste discharge, and a second backwash at a higher rate of flow with water only to re-stratify the filter media. The backwashed pressure filter cell will then run filter-to-waste to allow any remaining debris and turbidity stirred up by the backwash process to pass from the filter before it provides water to the system.

The air for the backwash process will be provided by one of two blowers. The backwash water will be provided from the pressurized filtered water passing through the other cells ahead of the chemicals fed to the finished water and controlled by an electrically actuated valve. The backwash wastewater and the filter-to-wastewater will flow by gravity into a sump (with an air gap). The combined wastewater will then flow by gravity to a newly constructed below-grade, cast-in-place concrete equalization basin north of the WTP. The combined wastewater will then discharge by gravity to the City's existing sanitary sewer system, controlled by an electrically actuated valve in a vault adjacent to the equalization basin.

5.1.2.5 Chemical Storage and Feed Systems

5.1.2.5.1 Chlorine Gas

The chlorine gas system will include two separate rooms: a chlorine gas storage room and a chlorine gas feed room. The storage room will be sized to ultimately hold twelve, 150-pound cylinders. Vacuum regulators will be fitted to two pressure manifolds with five cylinders hooked up to each, which will sit on scales that measure how much of the chlorine gas has been utilized. The cylinders will be kept in place by chain restraints bolted to the wall.

Gas piping from the cylinders will be run to four chlorinators installed in an adjacent room to control the feed rate of chlorine gas through an injector into a carrier water line fed by the plant service water. The chlorine gas feed rate will be metered based on the flow rate from the filters.

A chlorine gas scrubber is assumed to be required to protect the surrounding residential areas in the event of a gas leak. Alternatively, chlorine gas containment could be used. Gas leak detectors will be provided to alarm to supervisory control and data acquisition in the event of a gas leak and activate the scrubber system that is installed.

5.1.2.5.2 Sodium Permanganate

Sodium permanganate (NaMnO_4) will be used for onsite batching of HMO. The 19.5% solution will be delivered in 275-gallon totes and be periodically transferred to batch tanks for onsite batching of a 10% HMO solution. The liquid level in the tote will be continuously monitored by an electronic scale.

5.1.2.5.3 Manganese Sulfate

Manganese sulfate (MnSO_4) will be used for onsite batching of HMO. The 29.4% solution will be delivered in 275-gallon totes and periodically transferred to batch tanks for onsite batching of a 10% HMO solution. The liquid level in the tote will be continuously monitored by an electronic scale.

5.1.2.5.4 Hydrous Manganese Oxide

Hydrous Manganese Oxide (HMO) will be batched onsite from a combination of sodium permanganate, manganese sulfate, and WTP service water. The HMO chemical is initially made at a 10% (as MnO_4) concentrated solution before being diluted to a 1% (as Mn) solution that is fed to the water treatment process. The HMO is a slurry that must be continuously mixed to maintain the proper, uniform concentration. The chemical tanks for the HMO system must be continuously mixed to prevent the HMO from settling out of solution.

Two batch tanks will be installed to batch the HMO onsite. Sodium permanganate, manganese sulfate, and WTP service water will be combined in the batch tanks to create a 10% concentrated HMO solution. The sodium permanganate and manganese sulfate will be fed to the batch tanks using chemical metering pumps. The WTP service water will be fed using the pressure inherent to the service water system and controlled by solenoid valves. The 10% solution and WTP service water will be fed to the day tanks adjacent to the batch tanks using chemical transfer pumps and solenoid valves, respectively, to dilute to a 1% HMO solution. The 1% HMO solution will be fed from the day tanks to the raw water feed using chemical metering pumps for the adsorption of radium.

5.1.2.5.5 Phosphate

A blended phosphate, of which the majority is orthophosphate, will be fed to the finished water for protection of the piping system service leads and residential plumbing against corrosion. The blended phosphate will be received and stored in 55-gallon drums. Chemical metering pumps will be used to feed the phosphate to the finished water lines from a day tank. The weight of liquid in the drum in use will be continuously measured using a chemical scale.

5.1.2.5.6 Fluoride

Liquid fluoride solution will be fed into the distribution system to enhance dental protection for the City's customers. Hydrofluosilicic acid (23%) will be received and stored in 55-gallon drums. Chemical metering pumps will be used to feed the fluoride to the finished water lines from a day tank. The weight of liquid in the drum in use will be continuously measured using a chemical scale.

5.1.2.6 Mechanical Systems

Ventilation/makeup air for the WTP will be provided primarily by an air handling unit (AHU) and blower coil. Outside air (OA) will be provided to meet code requirements to make up air being exhausted from the building. The OA quantity from the AHU will be fixed and will positively pressurize the process area. Return air from these areas will be continuously re-circulated. A central system boiler will provide hot water to hot water coils in the building Mezzanine AHU and unit heaters. Two boilers have been sized for 100% redundancy. A heating only AHU serves the process area and is located on the mezzanine. Unit heaters and the mezzanine AHU will be used in tandem to heat the process area. Unit heaters are sized to prevent pipes from freezing in the event the AHU fails. The AHU is sized to heat outside air and to provide additional heating capacity for the building.

Unit heaters will provide backup/supplemental heat to the chemical rooms. Chemical rooms will be exhausted as required by code. Most chemical rooms will be exhausted at a minimum of 1 air change per hour when unoccupied, and 6 air changes per hour when occupied. Occupation is determined by light switch position. Each chemical room will be exhausted by an individual exhaust fan. Chemical rooms located in the interior of the building will be exhausted by fans located in the mezzanine and discharge out of the south wall. Chemical rooms located on perimeter spaces will utilize inline fans and discharge out of the east exterior wall. Transfer grilles will be installed on the common wall with the process area for each chemical room to provide makeup air for the negatively pressurized chemical rooms. The Hydrous Manganese room has both an internal grille and exterior wall louver/damper to allow OA directly into the space, due to higher space exhaust requirements. The Blower Room and Mechanical Room are provided with exhaust fans for temperature control. Toilet room will be provided with an exhaust fan for general exhaust.

The chlorine storage/chlorine feed rooms will be ventilated by a system isolated from the rest of the building. The rooms will have exhaust fans capable of 60 air changes per hour and will be energized via a wall switch on the exterior of the building, per code. A scrubber will be provided on the exterior of the building. If a chlorine gas leak is detected, a fan on the scrubber unit will activate, bringing the chlorine gas through the unit where it will be neutralized. The scrubber will operate until manually shut down by an operator. Equipment and ductwork will be corrosion resistant, where applicable. A heat pump system serves the Lab and Office. The indoor blower section is located in the Mechanical Room and the condensing unit located on the exterior of the building on the west wall. Variable Area Volume diffusers will be located in the lab area to modulate supply air to the space. Direct Expansion portable dehumidifiers will provide dehumidification for the process area.

A complete plumbing system will be provided in accordance with the 2015 Michigan Plumbing Code and applicable ordinances. Systems will include sanitary waste and vent, domestic hot and cold water with recirculating hot water return, and natural gas. Domestic hot water will be provided by a water heater. Chemical rooms will have emergency shower/eyewash combination units as required by code. The entire building, except the chlorine gas storage room, will have a complete wet pipe fire protection system. The chlorine gas storage room will have a dry chemical fire protection system.

5.1.2.7 Electrical Systems

A new 480Y/277-volt, 3-phase (secondary) electrical service will be obtained from the local utility company for the new WTP. It is assumed that a pad-mounted transformer will be provided. The exact loading calculations will be developed as the design progresses. A diesel generator will be provided to supply standby power in case of a utility power outage. The generator will be sized so that the WTP and local wells can meet ADDs. Provisions (i.e., generator docking station) will be included for connecting a portable generator and load bank so the generator can be serviced and maintained with minimal interruptions in accordance with the requirements of Article 700.3 of the National Electrical Code (NEC). The generator will be located outside in a weather-protected, sound-attenuated enclosure. A subbase fuel storage tank sized to allow the generator to operate at full load for a minimum of 24 hours will be provided with the generator.

Power will be distributed via two motor control centers, automatic transfer switch, power distribution panelboards, 208Y/120-volt step-down transformers, and lighting panelboards. Motor starters and VFDs will be provided as required for controlling motor loads. Wells 6 and 7 will be powered via the new electrical service that supplies power to the WTP. Standby power will be provided via the new generator that serves the WTP. Normal (utility) and standby (generator) power will also be provided to the existing WTP building, elevated storage tank, and utility building (garage) from the new power distribution system. A new (larger HP) motor will be provided at Well No. 6 along with a new VFD. The existing pump, motor, and VFD will remain and be reused at Well No. 7. A new (larger HP) motor and VFD will also be provided at Well No. 8. Utility service requirements for the WTP and power distribution system improvements at Well No. 8 will be coordinated with the local utility company.

Rigid metal conduit will be utilized above grade in locations that are not corrosive areas. PVC-coated rigid metal conduit will be utilized in corrosive areas. Below grade conduit will be Schedule 40 PVC where it is not concrete encased. Duct banks outside buildings will utilize Type EB (Schedule 20 PVC) conduit and be concrete encased and steel reinforced. The minimum conduit size will be 3/4-inch. Wiring will be specified to be 600-volt, Type THHN/THWN-2. Minimum conductor sizes will be #12 for power wiring, #14 for control wiring, and #16 twisted shielded pair for analog signal wiring. All electrical work will be specified to be in accordance with the NEC and locally adopted codes.

LED lighting will be provided throughout the plant to deliver an average of 30 foot-candles (fc) of illumination. Higher lighting levels (i.e., 50 fc average) will be provided in the control room, laboratory, chemical feed rooms, and offices. Emergency lighting will be provided via fixtures with integral battery back-up or by circuiting fixtures to a separate emergency power distribution system powered via the generator. Lights will be controlled via local switches and occupancy sensors. Wall-mounted exterior LED lighting will be provided above personnel doors for egress purposes. Pole-mounted LED lights will be provided to illuminate the access drive and parking areas. Exterior lighting will be controlled via a lighting contactor and photocell.

Chemical feed rooms will be considered High Hazard (H-3 or H-4) occupancies depending on chemical characteristics and quantities (volumes). A fire alarm system will be provided throughout the WTP to include initiating devices (e.g., smoke detectors, manual pull stations, and tamper and flow switches) and indicating appliances (e.g., audio/visual alarms) as required by NFPA 72 (Fire Alarm Code). Access control, security, network, and camera system requirements will be determined as the design progresses. We will coordinate with the City's preferred security system supplier during final design.

5.1.2.8 Control System

Treatment equipment, chemical feed systems, and instrumentation and controls will be monitored and controlled by a programmable logic controller (PLC) based control system. Control panels with distributed PLCs and input/output (I/O) racks will be strategically located throughout the plant. Signals from level, flow, pressure, temperature, and analytical instruments will be wired to local control panels. Each control panel will include an uninterruptible power supply to allow equipment to ride through momentary power interruptions. A network of computer servers and client workstations will interface with the PLCs and be programmed to provide operator interface visualization, alarming, reporting, trending, data collection, storage, and archiving features. Industrial workstations with touchscreen capabilities will be provided in certain control panels as necessary. Control system equipment will be connected on an Ethernet network. Category 6 (copper) cabling will be used for network connections shorter than 300 feet. Multi-mode fiber optic cabling will be used for longer runs and between buildings. Remote access to the control system will be provided via an Internet connection and virtual private network. Managed Ethernet switches will be utilized to provide network security. Access via cell phones, tablets, and hand-held devices will also be incorporated.

PLCs and remote communications with well houses and other sites (e.g., elevated tanks, etc.) will be upgraded as part of constructing the new WTP. A new control panel with local PLC, I/O rack, and cellular modem will be provided at each site. Existing instruments and motor controls will be reused.

5.1.3 *Project Map*

The selected project area within the City for the new WTP is shown in Figure 2. The topography of the area is shown in Map 6.

5.1.4 *Schedule for Design and Construction*

The project schedule, shown in Table 5-1, is consistent with the quarterly DWSRF deadlines. The project is currently being aligned for the Quarter 1.5 of Fiscal Year 2023. The project is planned to commence beginning in

December of 2022 based upon the EGLE order of approval. The project is anticipated to be completed by Winter of 2024.

Table 5-1 – Schedule of Design and Construction – Water Treatment Plant

Task	Completion Date
Print and submit 100% set for Owner Review	6/15/2022
Submittal of Draft Plans and Specifications to EGLE	7/6/2022
Submittal of Final Plans and Specifications to EGLE	9/8/2022
Issuance of Construction Permit	10/18/2022
Obtain EGLE Permit Approval	10/25/2022
Project Out to Bid	10/26/2022
Pre-bid Meeting	11/4/2022
Bids Due	11/29/2022
Complete bid evaluation, interviews	12/8/2022
City Council Approval	12/21/2022
EGLE Order of Approval	12/27/2022
Preconstruction Meeting	1/3/2023
Commence Construction	1/4/2023
Substantial Completion	7/4/2024
Final Completion	8/5/2024
Deliver Construction Record Drawings to City	9/4/2024

5.1.5 Project Cost Estimate

The estimated costs for the proposed project are provided in Table 5-2. The costs provided are in 2022 dollars.

Table 5-2 – Water Treatment Plant Replacement Project Cost Estimate

Cost Category	Estimated Cost
Construction Cost Opinion	\$13,147,000
Architectural/Engineering Fee and Expenses	\$1,540,000
Special Inspections/Testing Allowance	\$25,000
Pilot Study	\$50,000
Corrosion Control Study	\$180,000
Geotechnical Investigations	\$15,000
Total Project Cost Opinion	\$14,957,000

5.2 Green Street Water Main Replacement

5.2.1 Description

The selected water main alternative is the replacement of the existing 6-inch water main along Green Street with a new 8-inch water main. This alternative addresses the three concerns described in the summary of need: water main age, reliability in the area, and water main breaks.

5.2.2 Design Parameters

Replacement of approximately 980 linear feet of 6-inch water main with 8-inch water main.

5.2.3 Maps

A map of the selected area for the proposed water main replacement is included in Figure 2. The topography of the area is shown in Map 6.

5.2.4 Schedule for Design and Construction

The project schedule is consistent with the quarterly DWSRF funding deadlines and is provided in Table 5-3. The project is scheduled for DWSRF Funding Quarter 1.5 in Fiscal Year 2023.

Table 5-3 – Schedule of Design and Construction – Green Street Water Main

Task	Completion Date
Submittal of Draft Plans and Specifications to EGLE	7/6/2022
Submittal of Final Plans and Specifications to EGLE	9/8/2022
Issuance of Construction Permit	10/18/2022
Obtain EGLE Permit Approval	10/25/2022
Project Out to Bid	10/26/2022
Bids Due	11/29/2022
City Council Approval	12/21/2022
EGLE Order of Approval	12/27/2022

5.2.5 Project Cost Estimate

The estimated project cost for the selected alternative is included in Table 5-4. The costs are provided in 2022 dollars.

Table 5-4 – Green Street Water Main Replacement Project Cost Estimate

Cost Category	Estimated Cost
Construction Cost Opinion	\$179,000
Architectural/Engineering Fee and Expenses	\$19,000
Total Project Cost Opinion	\$198,000

5.3 Expansion of Raw Water Supply System

5.3.1 Construction of Well Nos. 9 and 10

5.3.1.1 Description

The selected raw water supply expansion alternative was the construction of Well Nos. 9 and 10. These well sites have raw water transmission main run to them, and Well No. 9 is already drilled. In addition, Well Nos. 9 and 10 are in relatively close proximity to the WTP, which makes operation and maintenance of these wells easier. Finally, the cost of this alternative was significantly less than the identification and construction of a new well field at a further distance from the WTP.

A hydrogeological study will be completed to assess the impact of Well No. 9 on the adjacent Sandstone Creek.

5.3.1.2 Design Parameters

5.3.1.2.1 Well Nos. 9 and 10

Each well will be outfitted with a vertical turbine style well pump and will be housed in a well house. The pump discharges will be connected to the existing 8-inch raw water main on the site. Typical operation will be to pump to the WTP. VFDs will be provided for operational flexibility and to provide slow start and stop functionality to reduce pipeline surge. The well houses will be designed with provisions for a temporary chemical feed of sodium hypochlorite and orthophosphate at the wells in the event of pumping directly to the distribution system.

A flow meter will be provided in each well house for flow monitoring and totalization. Entry alarms (monitored via the station control system) will also be included. Station monitoring and control equipment will be connected to the City’s control system for remote monitoring and control from the WTP. Hardware and software will be

compatible with equipment used at the WTP and other remote sites associated with the water system. The control system network will be expanded to include Well Nos. 9 and 10. A local operator interface will be provided for Well Nos. 9 and 10, and include graphics, alarms, reports, and trends to match other wells.

The well house buildings will be single story, split-face masonry block wall construction with an asphalt-shingled roof. The sites will include a paved driveway and PVC-coated chain link fence. Shrubs will be planted along the sides facing neighboring properties.

The mechanical systems will include an electric unit heater, exhaust fan, and intake louver.

The electrical systems will include a 480 volt, 3-phase, 60 hertz service from the local electric utility company. Stationary diesel generators with a sub-base fuel storage tank and automatic transfer switch will be provided for distributing standby power.

5.3.1.2.2 Hydrogeological Study

Four new monitoring wells will be installed. The monitoring wells will be installed in suspected areas of sand and gravel deposits. These wells will be monitored during an aquifer performance test to help evaluate whether the bedrock aquifer is hydraulically connected to the watershed.

Following installation of the shallow monitoring wells, an aquifer performance test will be completed, utilizing Well No. 9. The four new shallow monitoring wells and four existing bedrock monitoring wells will be used for observing groundwater elevations during the aquifer performance test. The aquifer performance test will be conducted by pumping the test well at a constant flow rate of a minimum of 1,000 gpm. The aquifer performance test will include collecting water level data from the existing test well and the eight observation wells for a period of up to 72 hours. A drilling contractor will provide the equipment and support necessary to complete the aquifer performance test. Fishbeck will install a data logger in each observation well to record water level data prior to, during, and after the pumping portion of the aquifer performance test. A geologist from Fishbeck will be onsite to check monitoring equipment during the test start-up and ensure that data is being collected.

Following completion of the aquifer performance test, a step-drawdown capacity test will be conducted at Well No. 9 to determine its current specific capacity.

Groundwater samples will be collected towards the end of the aquifer performance test and will be submitted for laboratory analyses of parameters required for a Type I water supply well.

Following the aquifer performance test, Fishbeck will download and analyze the data to determine aquifer characteristics, boundary effects, and evaluate the potential effect that the pumping of Well No. 9 installed in the bedrock aquifer has on the wells installed within the glacial sands and gravels and Sandstone Creek.

The stream investigation will be used in conjunction with the aquifer performance test to evaluate the potential effect the pumping from Well No. 9 installed in the bedrock aquifer might have on Sandstone Creek. The proposed stream depletion evaluation will be used to characterize the streamflow and head gradients within Sandstone Creek in the area adjacent to the Well No. 9.

A reconnaissance of the stream area will be completed to evaluate stream morphology/hydrology conditions prior to completion of streamflow monitoring and aquifer performance testing. Streamflow monitoring will be conducted to accurately determine the quantity of surface water flow within the channel of Sandstone Creek during specific monitoring events. The combined results at upstream, adjacent, and downstream locations will be used to evaluate potential relative changes in the stream flow that might be related to interactions with the unconsolidated aquifer, the bedrock aquifer, or weather conditions.

Five streamflow monitoring locations will be established. The specific locations will be selected after conducting a stream reconnaissance inspection. Streamflow will be measured using wading rods and an electronic flow meter.

Each location will be staked and located so that future measurements can be made at the exact same location to provide directly comparable data.

Streambed piezometers will be installed at five locations into the streambed sediments. Piezometer monitoring will be conducted to accurately determine the head (pressure) differences between the surface water of Sandstone Creek and the underlying sediment/aquifer. Data loggers will be installed in the piezometers to record water level measurements.

The information collected during the aquifer performance testing and stream depletion evaluation will be used to locate and size the potential stream flow augmentation system to account for potential stream flow losses. Additional data will be collected to ensure that stream flow augmentation water that is withdrawn from the bedrock aquifer will protect and support aquatic life in Sandstone Creek. The bedrock aquifer is expected to contain water that is under-saturated with respect to dissolved oxygen. When used for stream augmentation, the bedrock source water will need to contain the required oxygen concentration to support the fish species that use the creek. To ensure that the final discharge of augmentation water to the creek will contain the required dissolved oxygen concentration, a series of aeration tests will be conducted during the extended aquifer test phase. During each test, the influent and effluent dissolved oxygen concentration of the water will be measured.

EGLE indicated there are sites of known or potential contamination in the area that could be pulled toward the well field. EGLE’s response to the City’s work plan included a list of nine sites of potential contamination. Of these nine sites, three are listed as “active,” two are listed as “closed with restrictions,” and four are listed as “closed without restrictions.” To evaluate the potential impact of these sites to Well No. 9, EGLE files will be reviewed.

After the file review, groundwater flow and transport modeling will be completed to evaluate whether contaminants are likely to be pulled into the well field. The modeling effort and results will be documented in a brief report. It is possible that a simple analytical natural attenuation transport model may be adequate to evaluate potential concerns. Otherwise, a more complex, three-dimensional model may be necessary. If a more complex model is needed, an existing groundwater flow model developed by the U.S. Geological Survey for Clinton, Eaton, and Ingham Counties could be used with minimal modification.

EGLE has indicated that isolation distances for Well 9 would need to be reviewed and if potential sources of contamination are located within the 200-foot isolation area, an evaluation and explanation of why these potential sources of contamination do not pose an exposure risk need to be completed in order to receive a waiver from EGLE.

5.3.1.3 Maps

A map indicating the Well Nos. 9 and 10 site locations is included in Figure 5. The topography of the area is shown in Map 6.

5.3.1.4 Schedule for Design and Construction

The construction of Well Nos. 9 and 10 and the associated hydrogeological study are proposed to be completed in Quarter 4 of fiscal year 2023.

Table 5-5 – Schedule of Design and Construction – Construction of Well Nos. 9 and 10

Task	Completion Date
Submittal of Draft Plans and Specifications to EGLE	2/1/2023
Submittal of Final Plans and Specifications to EGLE	4/6/2023
Issuance of Construction Permit	5/16/2023
Obtain EGLE Permit Approval	5/23/2023
Project Out to Bid	5/24/2023
Bids Due	6/27/2023

Table 5-5 – Schedule of Design and Construction – Construction of Well Nos. 9 and 10

Task	Completion Date
City Council Approval	7/10/2023
EGLE Order of Approval	8/7/2023

5.3.1.5 Project Cost Estimate

The estimated project cost for the selected alternative is included in Table 5-6. The costs are provided in 2022 dollars.

Table 5-6 – Construction of Well Nos. 9 and 10

Cost Category	Estimated Cost
Construction Cost Opinion	\$4,487,000
Hydrogeological Study	\$200,000
Architectural/Engineering Fee and Expenses	\$115,000
Total Project Cost Opinion	\$4,802,000

5.4 User Costs

The annual debt service payment for the capital cost of \$19.957 million funding at 2.125% for 30 years is estimated to be \$906,467. This debt payment creates a total increase of \$17.54 per Residential Equivalent Unit (REU) per month. This would be paid for through an increase in the rates for the water system of \$7.50 per REU per month, done in fiscal year 2022 and will be raised by the same amount again in fiscal year 2023.

An additional \$75,000 of O&M expenses is expected as part of these projects, which is expected to raise the cost for the system an additional \$1.46 per REU per month.

5.5 Disadvantaged Community

The disadvantaged community qualification is determined for each loan that is applied for by the community. A Disadvantaged Community Status Determination Worksheet was submitted to EGLE along with the Intent To Apply. EGLE has determined that the City does not meet the disadvantaged community qualifications.

5.6 Ability to Implement the Selected Alternative

The City has the ability to implement the selected alternatives. The City owns and operates the water supply, WTP, and distribution systems. The proposed improvement projects will occur within the City. No amendments to any water service agreements will be necessary. All financial and loan-related work will be handled by the City’s Financial Department.

6.0 Environmental Evaluation

6.1 Historical/Archeological/Tribal Resources

To identify sites of historical and cultural significance, the City’s 2018 Master Plan historic resources and the National Register of Historic Places by county were reviewed. Two historical sites in the City that were identified from the National Register are included in Appendix 8. The City Master Plan, which is included in Appendix 1, has some discussion about the identification and management of existing historical properties. No direct historical or archeological impacts are expected.

The Michigan SHPO and the Tribal Historic Preservation Officers were not contacted since the proposed projects have been deemed non-equivalency projects.

6.2 Water Quality

The proposed projects will meet compliance requirements of the Safe Drinking Water Act. The proposed projects are not expected to affect surface water or groundwater quality or quantity. A map of the major surface waters and wetlands is depicted in Map 7.

6.3 Land/Water Interface

Map 7 depicts the locations of wetlands. No construction work is anticipated within wetland areas. The soils map is included in Map 8. The proposed projects will not have any negative impacts on the wetlands.

The extent of the 500-year flood boundary as defined by the National Flood Insurance Program consists primarily of the areas immediately adjacent to the Grand River. Map 9 presents both the 100-year and 500-year floodplains. No negative impacts on the flood boundaries are expected as a result of the proposed water system improvements projects.

6.4 Endangered Species

The federally listed endangered and threatened species for Eaton and Clinton County (2018) were reviewed and are detailed in Table 6-1. Endangered or threatened species are defined as those species that are or could become endangered or threatened and, therefore, are protected under the Endangered Species Act. The objective of the act is to preserve and restore species threatened with extinction. The Michigan Natural Features Inventory by county was also reviewed. It has additional listings of fauna and flora with a state status of endangered, threatened, or special concern which are listed in Table 6-2.

Table 6-1 – Federally Threatened and Endangered Species

Name	Status
Eastern prairie fringed orchid	Threatened
Northern Long-Eared Bat	Threatened

Table 6-2 – State Threatened, Endangered, Rare, and Special Concern Species

Name	Status
Elktoe	Special Concern
Slippershell	Threatened
Henslow’s sparrow	Endangered
Grasshopper sparrow	Special Concern
Sort-eared owl	Endangered
Northern amber bumble bee	Special Concern
Three-seed sedge	Special Concern
Blanding’s turtle	Special Concern
Common loon	Threatened
Wood turtle	Special Concern
Bald eagle	Special Concern
Vasey’s rush	Threatened
Migrant loggerhead shrike	Endangered
Creek heelsplitter	Special Concern
Flutedshell	Special Concern
Black sandshell	Endangered

Table 6-2 – State Threatened, Endangered, Rare, and Special Concern Species

Name	Status
Pickerel frog	Special Concern
Little brown bat	Special Concern
Bigmouth shiner	Special Concern
Osprey	Special Concern
Round pigtoe	Special Concern
Eastern massasauga	Special Concern
Dickcissel	Special Concern
Butler’s garter snake	Special Concern

The probability of threatened, endangered, or special concern species can be seen on Map 10. The proposed projects will occur in urban areas where no suitable wildlife habitat is present and construction work will be limited to existing water service lines that are connected to the system. No tree removal is anticipated that could have potential impacts to these species.

6.5 Agricultural Land

Prime farmland locations are depicted in Map 11. The proposed projects activities will not negatively impact existing land use.

6.6 Social/Economic Impact

The proposed water system improvements will result in direct economic and social benefits. Public health and safety will benefit from meeting the compliance set forth by the Safe Drinking Water Act, increased water system quality, and greater system reliability.

The construction of the projects will create jobs and contribute favorably to local contractors and the economy.

6.7 Construction/Operational Impact

The water main improvements will likely involve roadway demolition and rerouting traffic to allow for the work to be completed. Routine construction for a typical water main replacement is anticipated. No tree removal is anticipated. Construction hours for projects of this type are generally limited to 7:00 a.m. to 7:00 p.m. Monday through Friday. Access to all properties will be maintained throughout construction.

The construction of the new WTP will occur at the existing WTP site. The construction activity will have minimal disruption to the surrounding areas. The property has adequate space for staging activities and no significant modifications to the environment are anticipated. Construction hours for projects of this type are generally limited to 7:00 a.m. to 7:00 p.m. Monday through Friday.

6.8 Indirect Impacts

6.8.1 Changes in Development

No significant changes in development are anticipated due to the proposed improvements. However, the proposed projects will enhance the existing water distribution and treatment system.

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 surface 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 sensitive ecosystems.

6.8.5 Changes to Aesthetic Aspects of the Community

The proposed projects will not have long-term aesthetic changes because the work is belowground, and the land will be restored post-construction.

6.8.6 Resource Consumption

Resource consumption in the form of materials, labor, and equipment will be required to construct the proposed projects.

7.0 Mitigation Measures

The proposed projects were evaluated for long-term adverse impacts. There are no long-term negative impacts associated with the construction activities. However, suitable mitigation measures will be considered to safeguard from any irreversible adverse impacts on the environment.

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 of heavy equipment to reduce exhaust emissions.
- Noise control: Use of designated daytime work hours, use of mufflers on all equipment, and minimizing work on weekends and/or holidays.
- Restoration: Areas of grass, curb, sidewalk, and pavement that are disturbed as a result of the proposed project will be restored as closely as possible to their original appearance.

Long-term environmental impacts are not anticipated for the proposed project. There is no anticipated tree removal or adverse impact on the sensitive environmental features anticipated. However, measures will be taken to avoid, eliminate, or mitigate potential long-term environmental impacts. Using vacuum boring excavation, hand digging, conventional machine excavation, or a combination thereof will be used such that disturbance is minimal.

The proposed project is not anticipated to create additional indirect environmental impacts.

8.0 Public Participation

8.1 Public Hearing Advertisement

On March 26, 2022, a Notice of Public Hearing for the DWSRF Project Plan for the proposed projects will appear in the Grand Ledge Independent. The advertisement will briefly describe the proposed projects and estimated costs, mentioning the availability of the report for viewing, and inviting written comments from the public. The Project Plan will be made available on the City's website for public review and comment starting April 1, 2022. Written comments were requested to be received no later than 5:00 p.m. on May 1, 2022, to be a part of the public record.

The public notice affidavit of publication will be included in the final project plan.

8.2 Presentation of the Project Plan

A formal public hearing along with a presentation of the project plan will be held at City Hall on May 9, 2022, at 7:30 p.m. The following items will be discussed during the public hearing:

1. A description of the drinking water quality needs and problems to be addressed by the proposed projects and the principal alternatives that were considered.
2. A description of the selected alternatives, including their capital costs and a cost breakdown by project components.
3. A discussion of project financing and costs to users, including the proposed method of project financing and estimated monthly debt retirement; the proposed annual, quarterly, or monthly charge to the typical residential customer; and any special fees that will be assessed.
4. A description of the anticipated social and environmental impacts associated with the recommended alternatives and the measures that will be taken to mitigate adverse impacts.

A certified stenographer will be retained by the City to transcribe the presentation, questions, and comments at the public hearing. The transcript will be provided within the final project plan.

8.3 Public Hearing

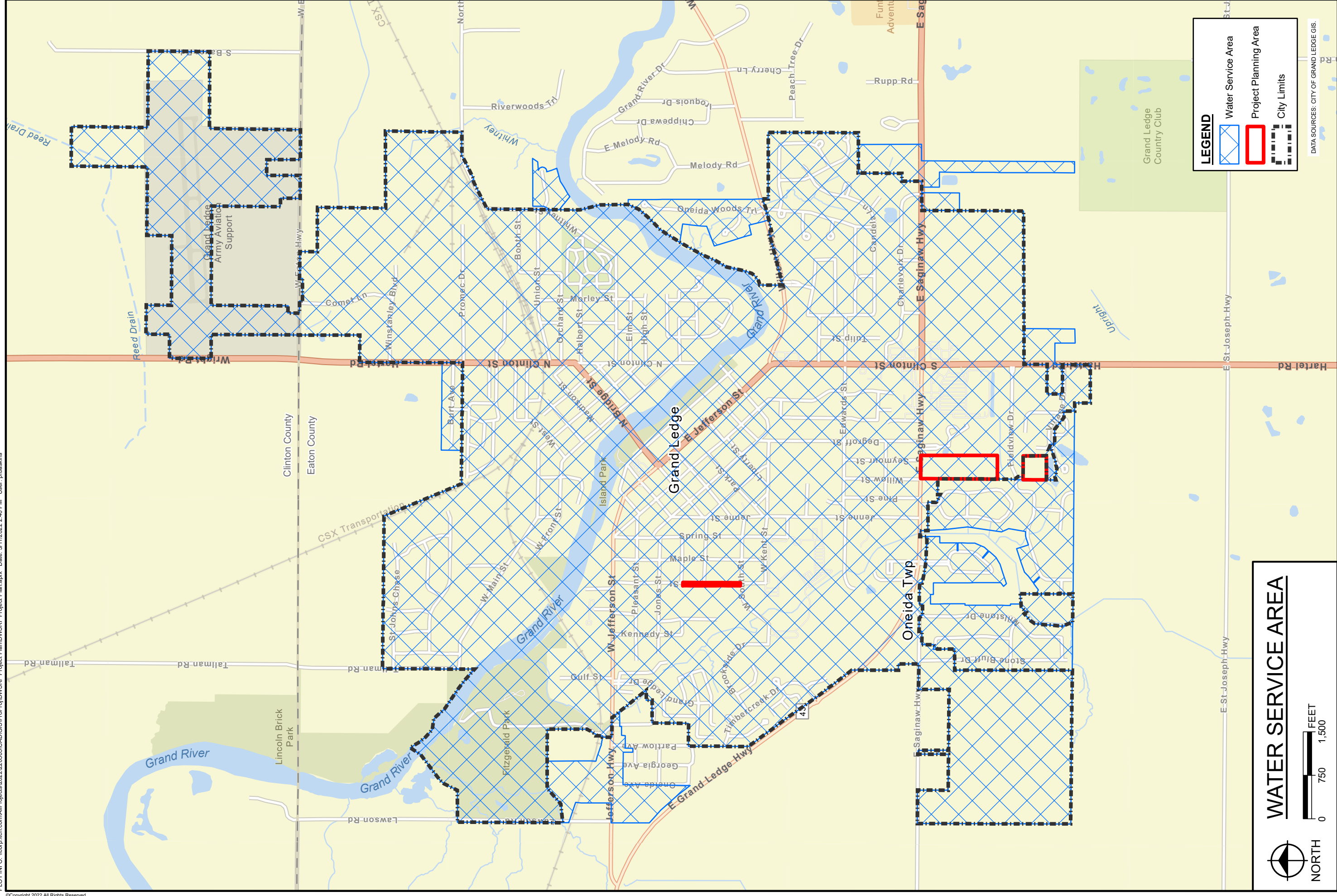
The public hearing comments received will be included within the final project plan.

8.4 Adoption of the Project Plan

A resolution to formally adopt the Project Plan and implement the selected alternatives is scheduled at the City Council session on May 9, 2022. The resolution will be included within the final project plan.

Figures




PLOT INFO: \\corp.itc.com\AllProjects\2022\20505\CAD\GIS\Proj\GWSRF Project Plan\GWSRF Project Plan.aprx Date: 3/11/2022 2:40 PM User: pbbaskins



WATER SERVICE AREA



LEGEND

-  Water Service Area
-  Project Planning Area
-  City Limits

DATA SOURCES: CITY OF GRAND LEDGE GIS.

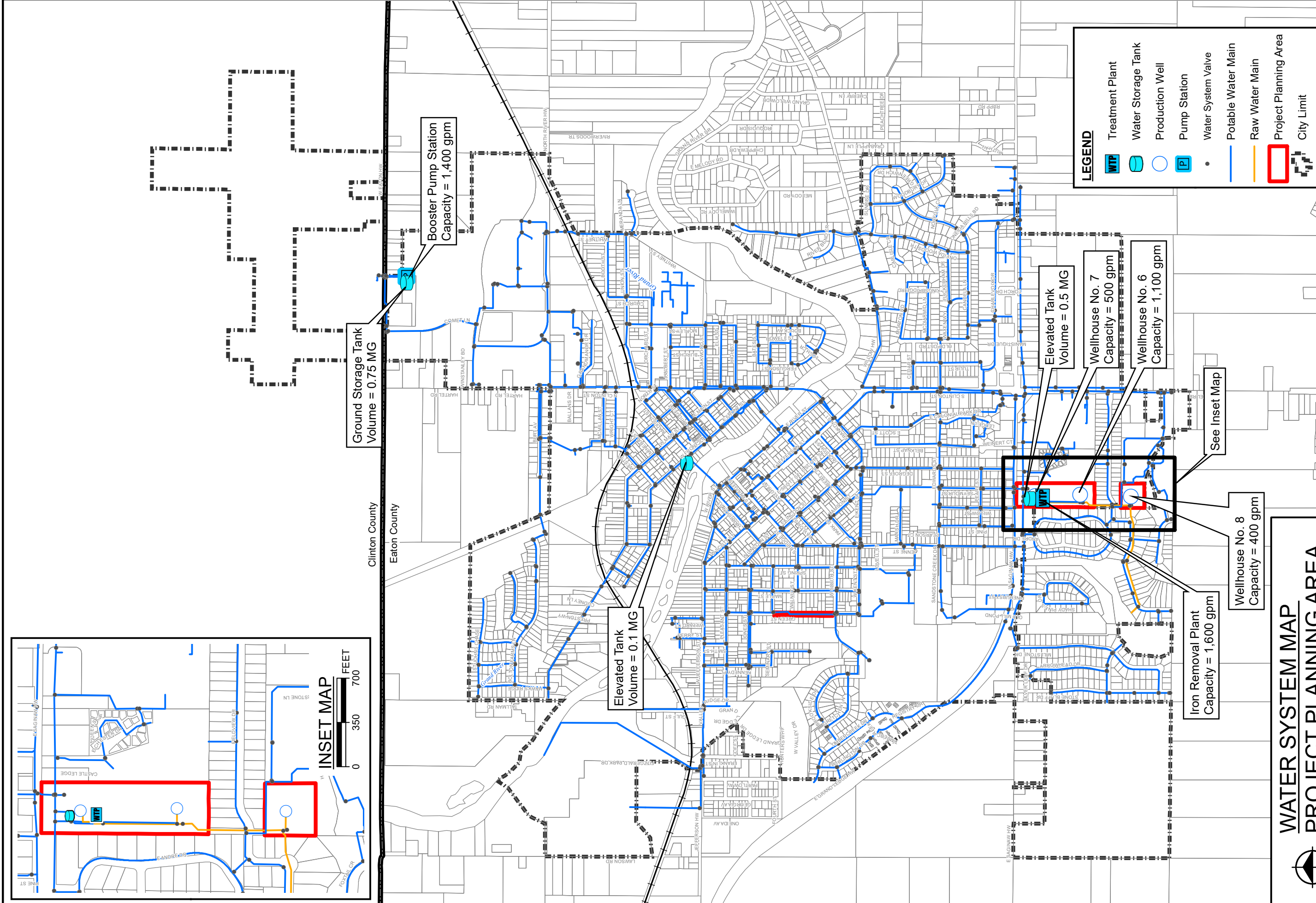
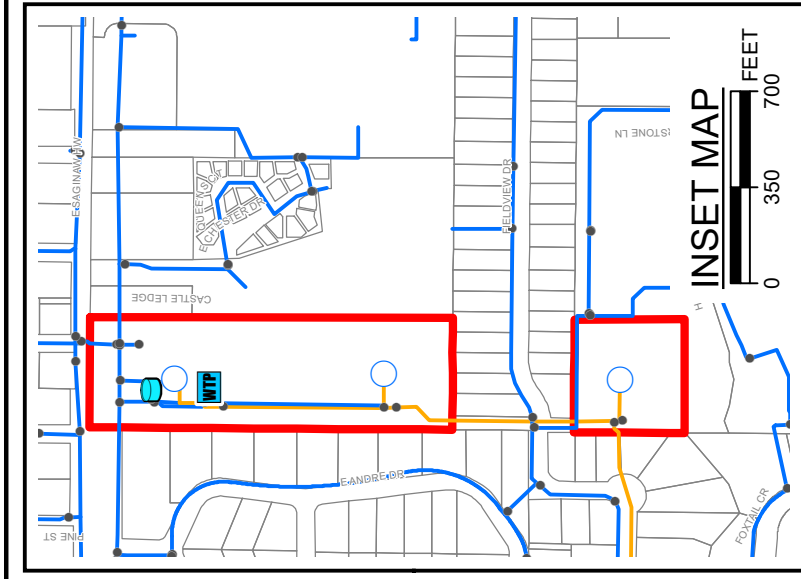
City of Grand Ledge
 Clinton County and Eaton County, Michigan
Drinking Water State Revolving Fund (DWSRF) Project Plan

PROJECT NO.
220505

FIGURE NO.
1



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



WATER SYSTEM MAP
PROJECT PLANNING AREA



PROJECT NO.
220505

FIGURE NO.
2

City of Grand Ledge
Eaton County, Michigan

Drinking Water State Revolving Fund (DWSRF) Project Plan

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DATA SOURCES: CITY OF GRAND LEDGE, MICHIGAN GIS. PARCELS ACQUIRED FROM EATON COUNTY, MICHIGAN.

BENCH MARKS

- BENCH MARK A ELEVATION: 843.36
FOUND RAILROAD SPIKE IN NORTHWEST FACE OF POWER POLE, 120 FEET SOUTH OF M-43 AND 13 FEET WEST OF WATER TREATMENT PLANT DRIVEWAY
- BENCH MARK B ELEVATION: 853.31
CHISELED X ON WESTERLY FLANGE BOLT ON HYDRANT LOCATED 137'± WEST-SOUTHWEST OF SOUTHWEST CORNER OF BUILDING NEAR CENTER OF MIDDLE SITE
- BENCH MARK C ELEVATION: 857.71
DIMPEL ON SOUTHERLY SIDE OF WATER MANHOLE RIM, LOCATED EAST OF DRIVE AND 162'± WEST OF NORTHWEST CORNER OF BUILDING NEAR CENTER OF SOUTH SITE
- BENCH MARK D ELEVATION: 856.27
CHISELED X ON TOP OF EAST SIDE OF 12" CMP CULVERT, EAST OF DRIVE ON WEST SIDE OF SOUTH SITE, NEAR NORTHWEST CORNER OF SURVEY AREA

SYMBOL LEGEND

- 8" SAN. SANITARY SEWER & MANHOLE
- WYE & LEAD
- RISER & LEAD
- STANDARD SEWER CLEANOUT
- 12" STORM STORM SEWER & MANHOLE
- CATCH BASIN
- UNDERDRAIN
- 8" WATER WATER MAIN
- VALVE & BOX
- VALVE & CHAMBER
- METER
- PLUG
- STANDARD FIRE HYDRANT ASSEMBLY
- CURB STOP & BOX
- GAS MAIN
- ELECTRIC
- TELEPHONE/FIBER OPTIC

NOTES

1. EXISTING UTILITIES LOCATIONS SHOWN ARE APPROXIMATE.
2. VERIFY THE HORIZONTAL AND VERTICAL LOCATION OF EXISTING UTILITIES PRIOR TO EXCAVATION WHERE NECESSARY.
3. PROTECT AND MAINTAIN SERVICE OF OTHER UTILITIES AT CROSSINGS.
4. DO NOT CONNECT ROOF DRAINS, FOUNDATION DRAINS, AND OTHER CLEAN WATER SERVICES TO THE SANITARY SEWER.
5. END SECTIONS ARE INCLUDED IN PIPE LENGTHS SHOWN.
6. PROVIDE RIPRAP AT ALL END SECTIONS UNLESS OTHERWISE NOTED.
7. PROVIDE AND MAINTAIN INLET FILTERS AT ALL CATCH BASIN INLETS, DURING CONSTRUCTION.
8. WATER MAIN TO HAVE A MINIMUM OF 5.5 FEET OF COVER.
9. FIRE HYDRANTS LOCATED IN CURB ISLAND OR GREEN SPACE SHALL BE LOCATED 5' FROM BACK OF CURB OR EDGE OF PAVEMENT (TYP.).
10. PROVIDE A MINIMUM OF EIGHTEEN (18) INCHES OF VERTICAL SEPARATION AND TEN (10) FEET OF HORIZONTAL SEPARATION BETWEEN THE WATER MAIN AND ALL SANITARY AND STORM SEWERS.
11. FACE NOZZLES OF SITE FIRE HYDRANTS TOWARD BUILDING.
12. ADJUST ALL CASTINGS TO FINISH GRADES.
13. PIPE LENGTHS ARE TO CENTER OF STRUCTURES UNLESS NOTED OTHERWISE. ALL PIPE LENGTHS ARE FOR THE CONVENIENCE OF THE CONTRACTOR.

REVISIONS

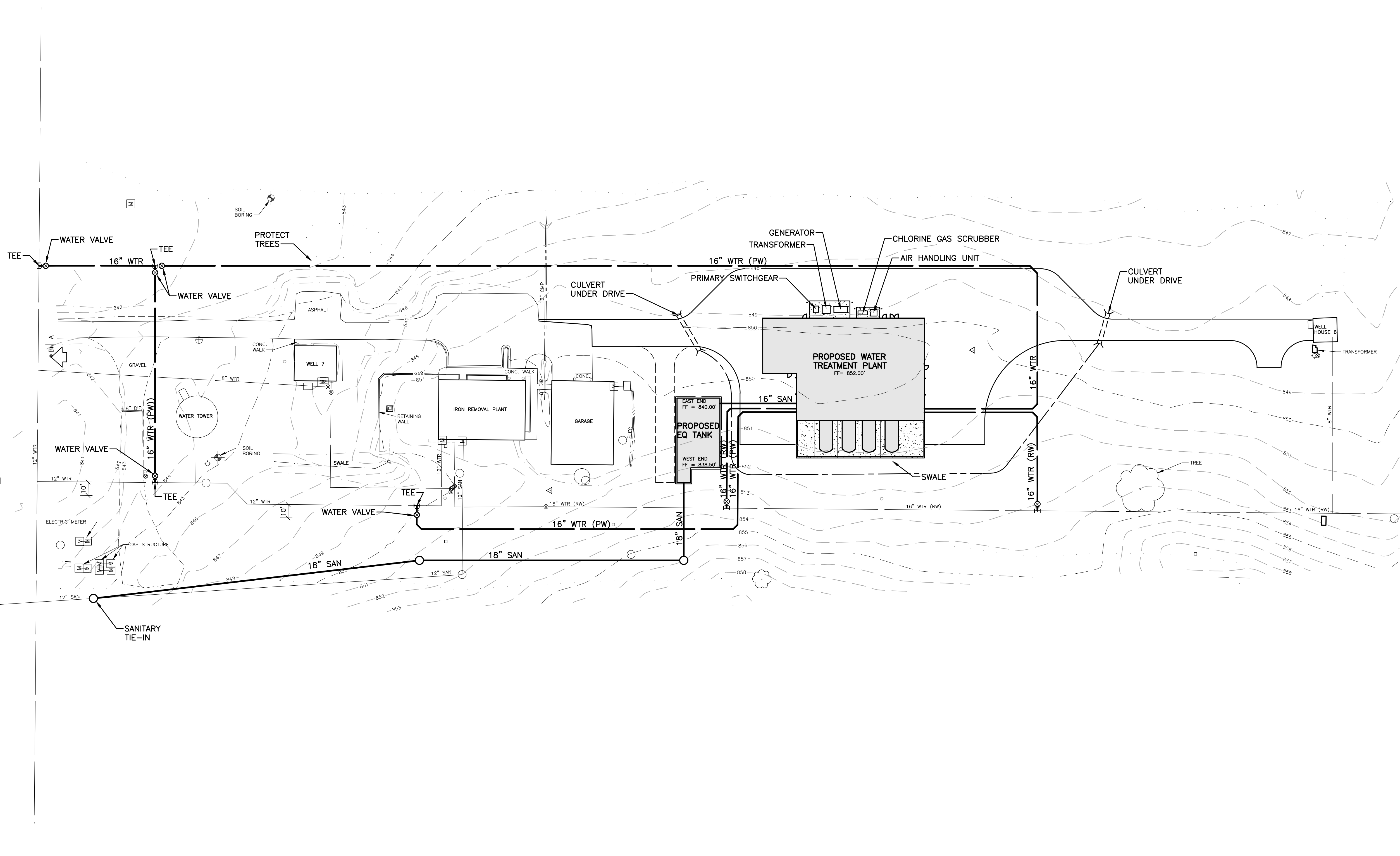
NOT FOR CONSTRUCTION

10/13/2021/30% OWNER REVIEW	
Drawn By	BEV
Designer	NRT
Reviewer	
Manager	DJB

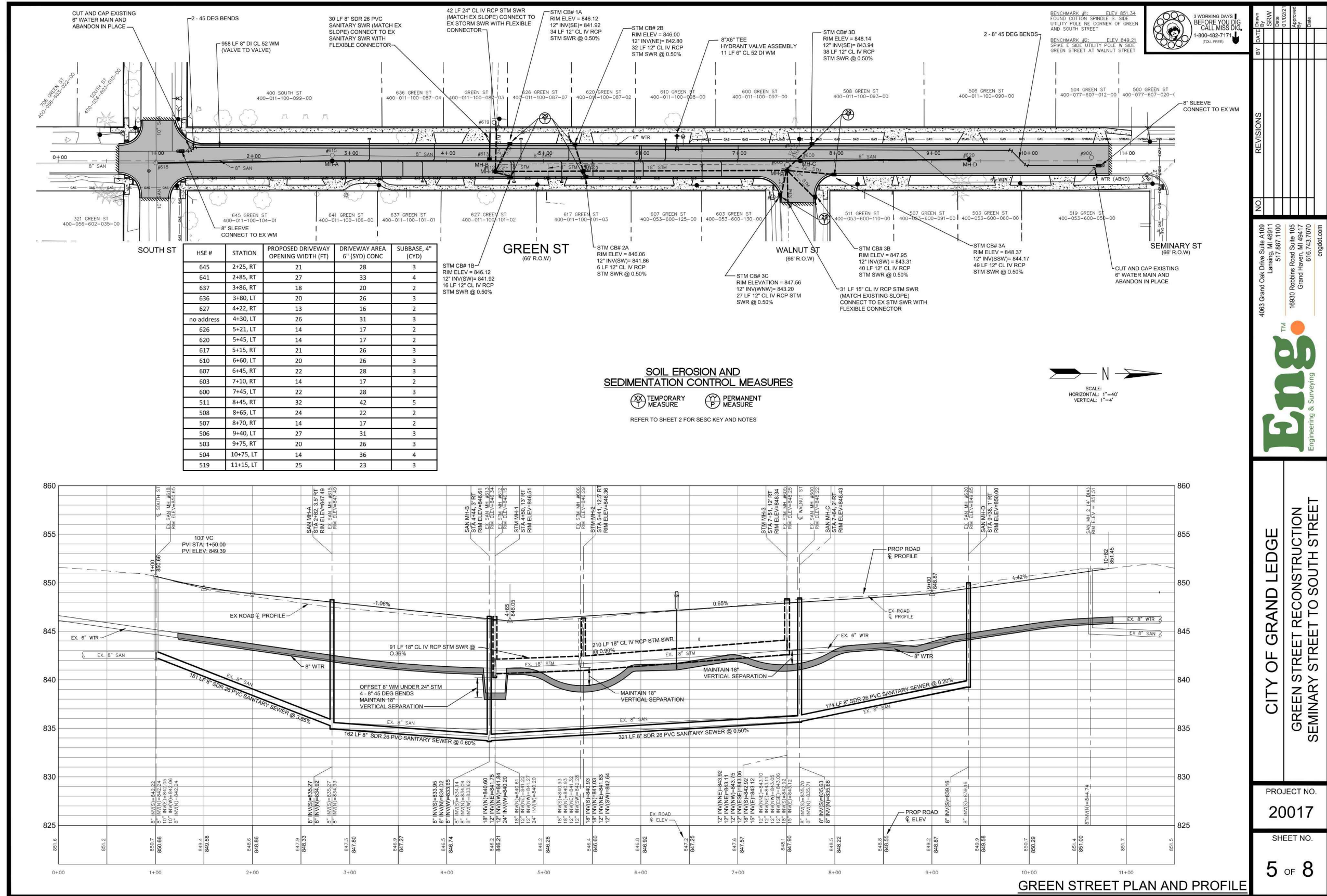
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PROJECT NO.
220505

SHEET NO.
3



SITE LAYOUT PLAN
SCALE: 1" = 40'
0 20 40 80



4063 Grand Oak Drive Suite A109
Lansing, MI 48911
517.867.7100
16930 Robbins Road Suite 105
Grand Haven, MI 49417
616.743.7070
engdot.com

NO	REVISIONS	BY	DATE

CITY OF GRAND LEDGE
GREEN STREET RECONSTRUCTION
SEMINARY STREET TO SOUTH STREET

PROJECT NO.
20017

SHEET NO.
5 OF 8

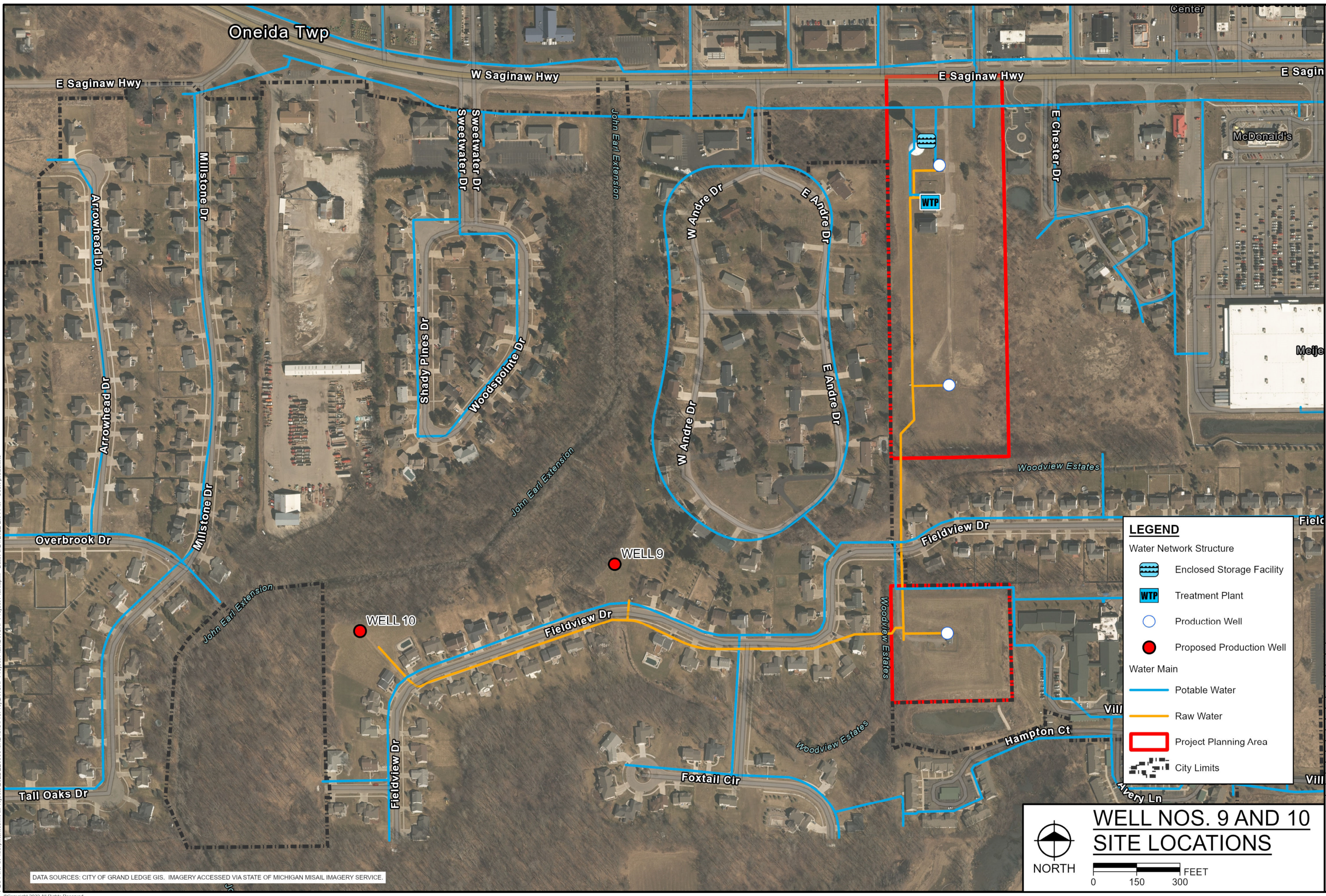
City of Grand Ledge
Eaton County, Michigan
DWSRF Project Plan

PROJECT NO.
220505
FIGURE NO.



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LEGEND

Water Network Structure

- Enclosed Storage Facility
- WTP Treatment Plant
- Production Well
- Proposed Production Well

Water Main

- Potable Water
- Raw Water
- Project Planning Area
- City Limits

**WELL NOS. 9 AND 10
SITE LOCATIONS**

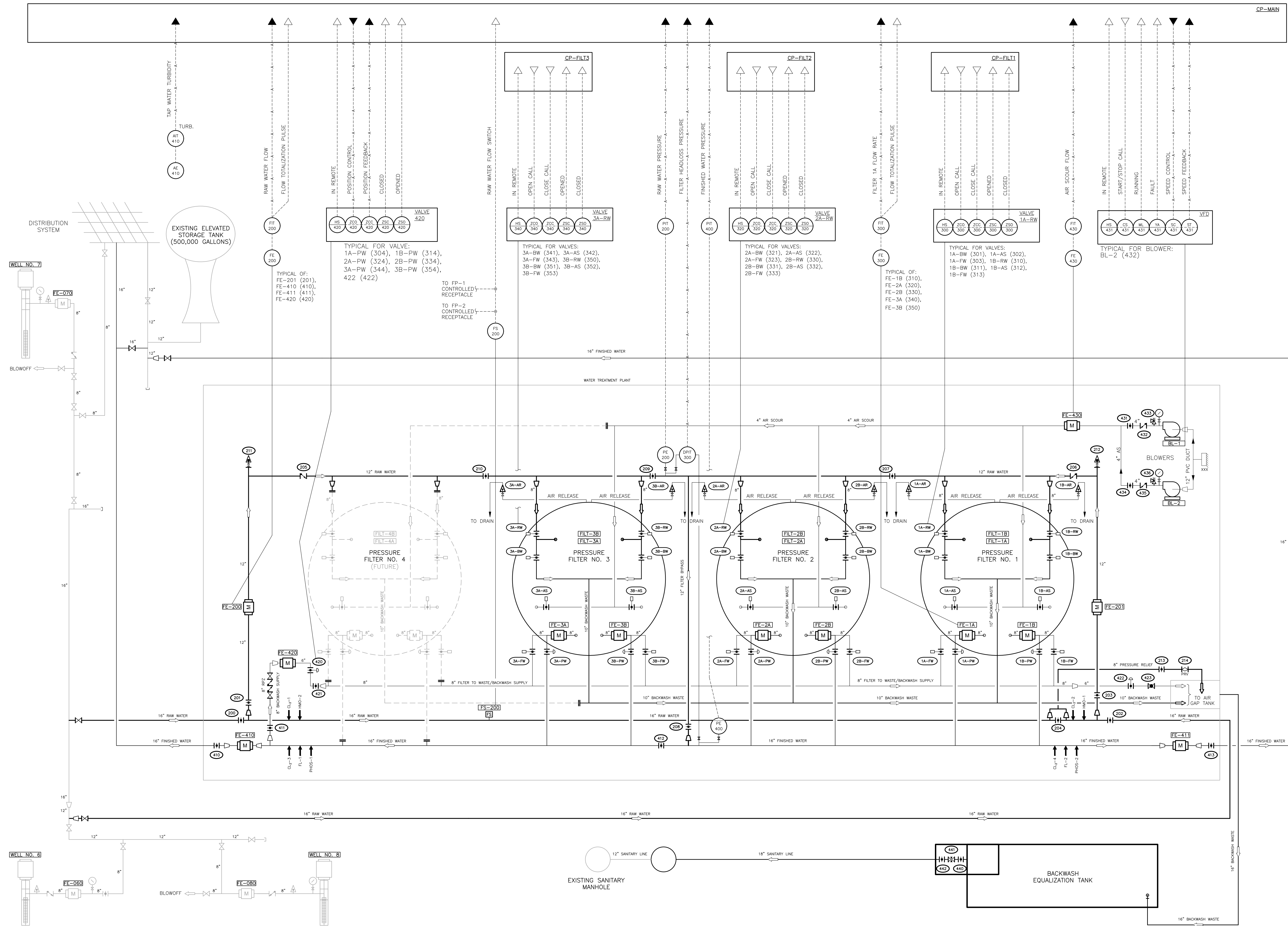
NORTH

0 150 300 FEET

DATA SOURCES: CITY OF GRAND LEDGE GIS. IMAGERY ACCESSED VIA STATE OF MICHIGAN MISAIL IMAGERY SERVICE.

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

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FLOW SCHEMATIC AND P&ID
NO SCALE

REVISIONS

NOT FOR CONSTRUCTION

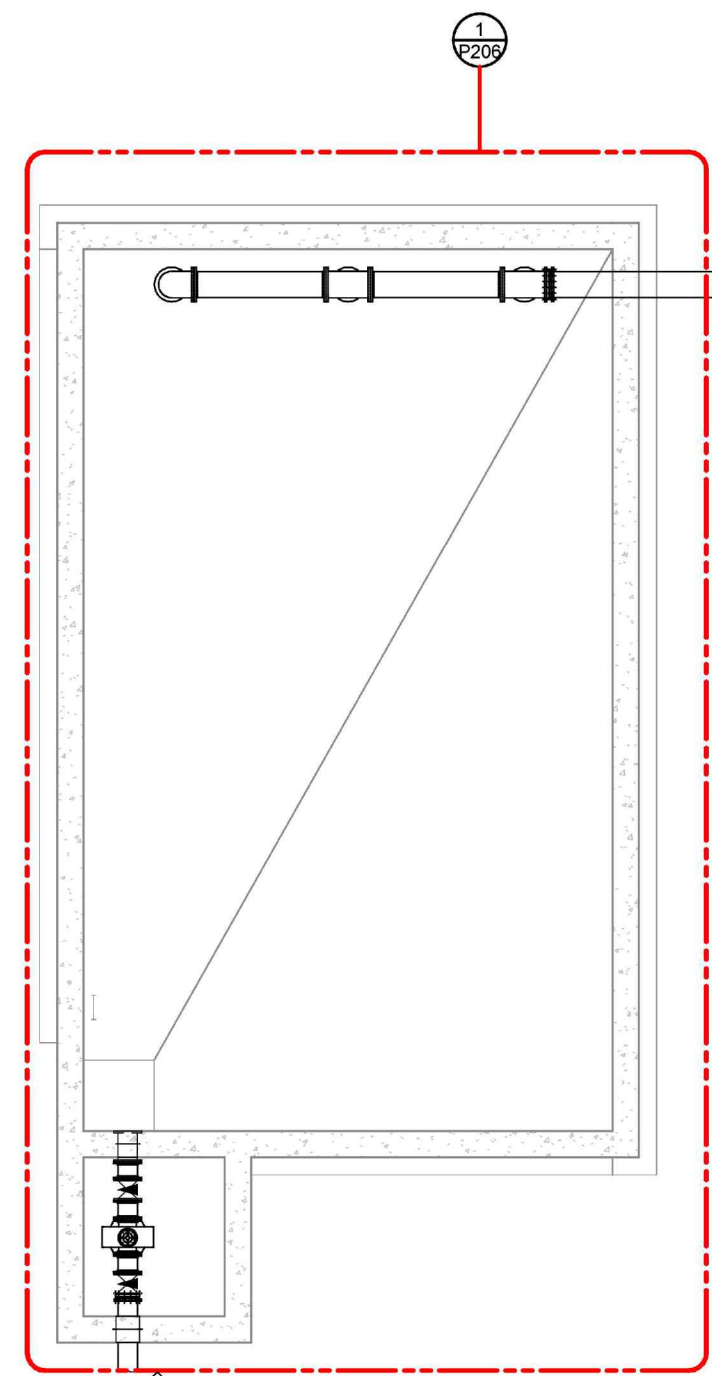
3/2/2022	60% OWNER REVIEW
10/13/2021	30% OWNER REVIEW
Drawn By	RS2
Designer	CGM
Reviewer	
Manager	DJB
PROJECT NO.	220505
SHEET NO.	



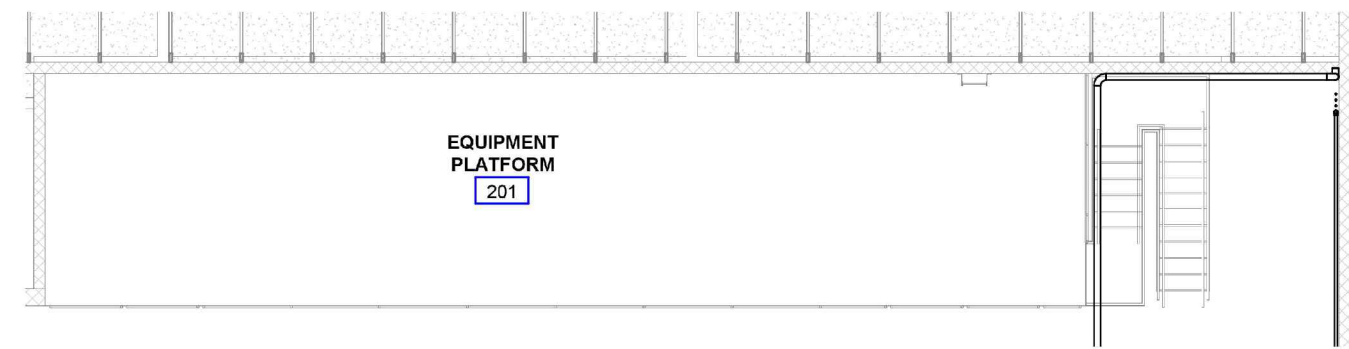
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BACKWASH EQUALIZATION TANK PLAN



EQUIPMENT PLATFORM PLAN



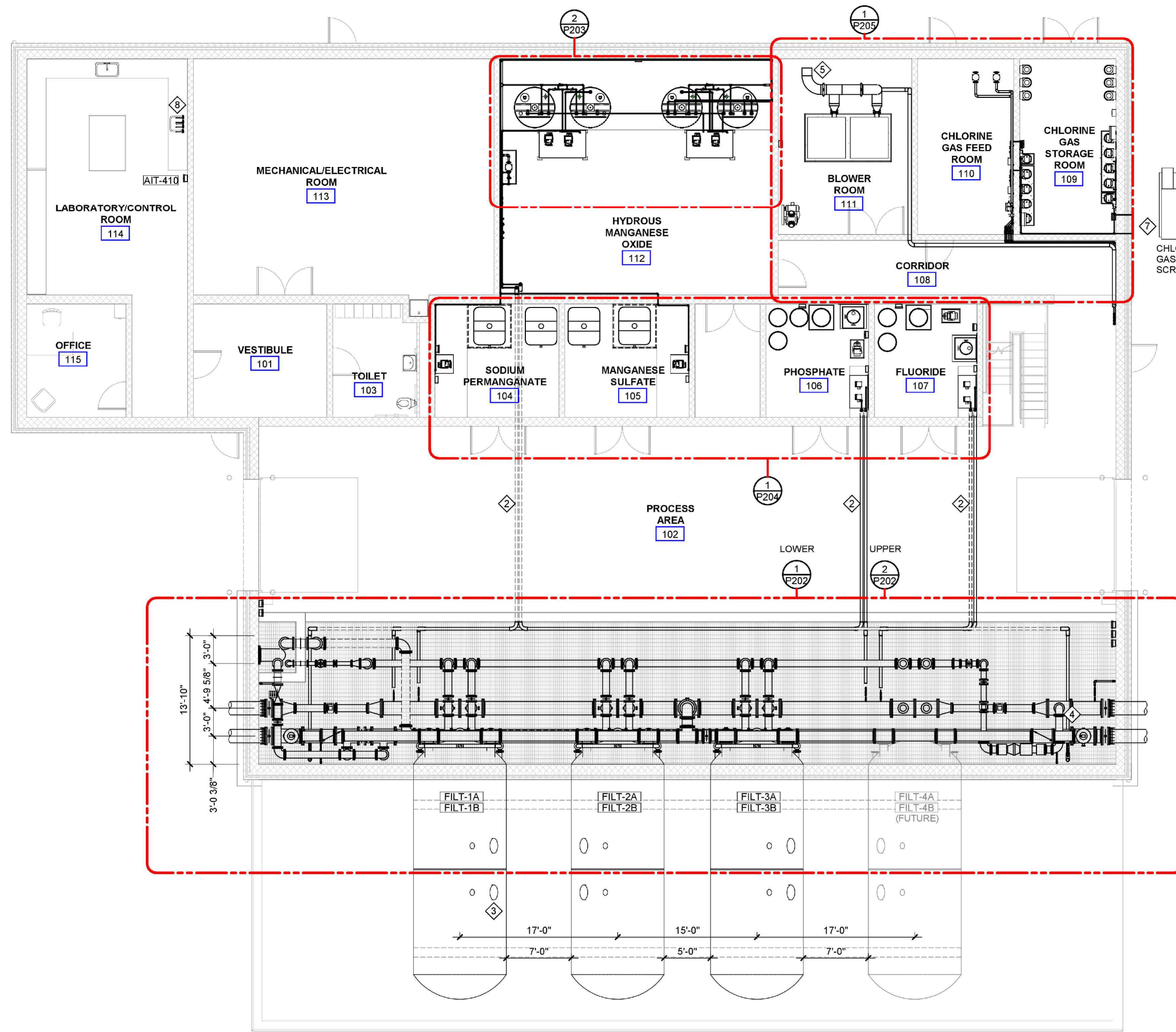
NOTES

KEY NOTES

- 1 SEE CIVIL FOR PIPING TO AND GRADING AROUND BACKWASH WASH/EQUALIZATION TANK
- 2 CHEMICAL FEED TUBING WITHIN 3 INCH PVC CARRIER PIPE, TYP OF 2
- 3 FILTER ACCESS HATCH, TYP.
- 4 FIRE PROTECTION CONNECTION. COORDINATE CONTINUATION WITH MECHANICAL.
- 5 CONNECT TO INTAKE LOUVER. COORDINATE WITH MECHANICAL.
- 6 CHLORINE GAS SCRUBBER MOUNTED ON CONCRETE PAD. SEE STRUCTURAL FOR PAD DETAILS. SEE CIVIL FOR SITE DETAILS.
- 7 SEE MECHANICAL FOR DUCTWORK AND CONNECTION TO SCRUBBER.
- 8 SAMPLE SINK.



OVERALL FIRST FLOOR PLAN



City of Grand Ledge
Eaton County, Michigan
Iron Removal Plant

REVISIONS

NOT FOR CONSTRUCTION

3/2/2022	60% OWNER REVIEW
10/13/2021	30% OWNER REVIEW

Drawn By: RSZ
Designer: CGM
Reviewer:
Manager: DJB

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PROJECT NO.
210262

SHEET NO.
P201

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PROCESS LAYOUT PLAN

SCALE: NO SCALE

City of Grand Ledge
Eaton County, Michigan
Iron Removal Plant

REVISIONS

NOT FOR CONSTRUCTION

3/2/2022	60% OWNER REVIEW
10/13/2021	30% OWNER REVIEW

Drawn By: RSZ
Designer: CGM
Reviewer:
Manager: DJB

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.
210262

SHEET NO.

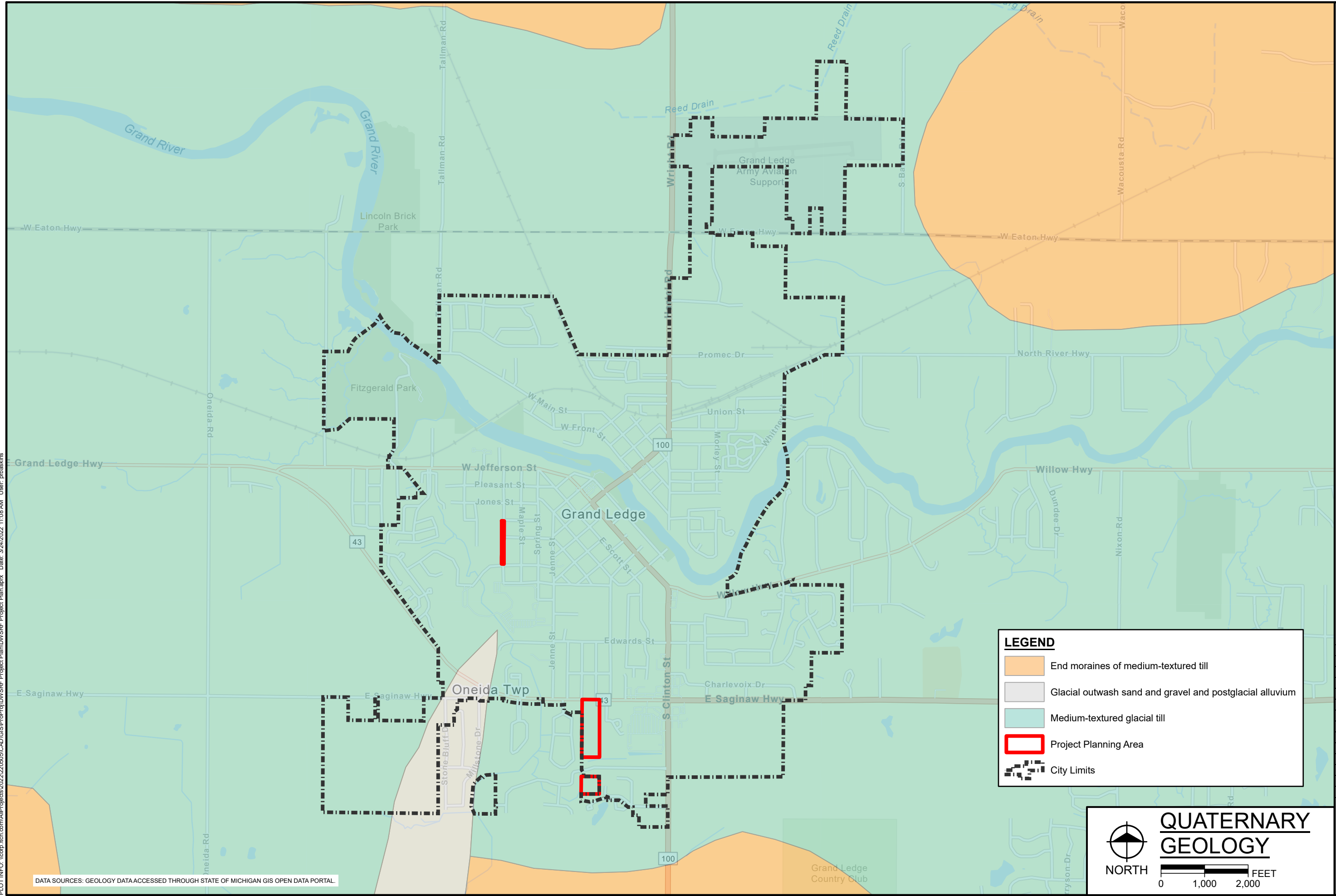
7

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Maps

PLOT INFO: \\corp.ftch.com\AI\Projects\2022\20505\CAD\GIS\Proj\QMSRF Project Plan\QMSRF Project Plan.aprx Date: 3/24/2022 11:08 AM User: pfbaskins

DATA SOURCES: GEOLOGY DATA ACCESSED THROUGH STATE OF MICHIGAN GIS OPEN DATA PORTAL.



LEGEND

- End moraines of medium-textured till
- Glacial outwash sand and gravel and postglacial alluvium
- Medium-textured glacial till
- Project Planning Area
- City Limits

**QUATERNARY
GEOLOGY**

NORTH

0 1,000 2,000 FEET

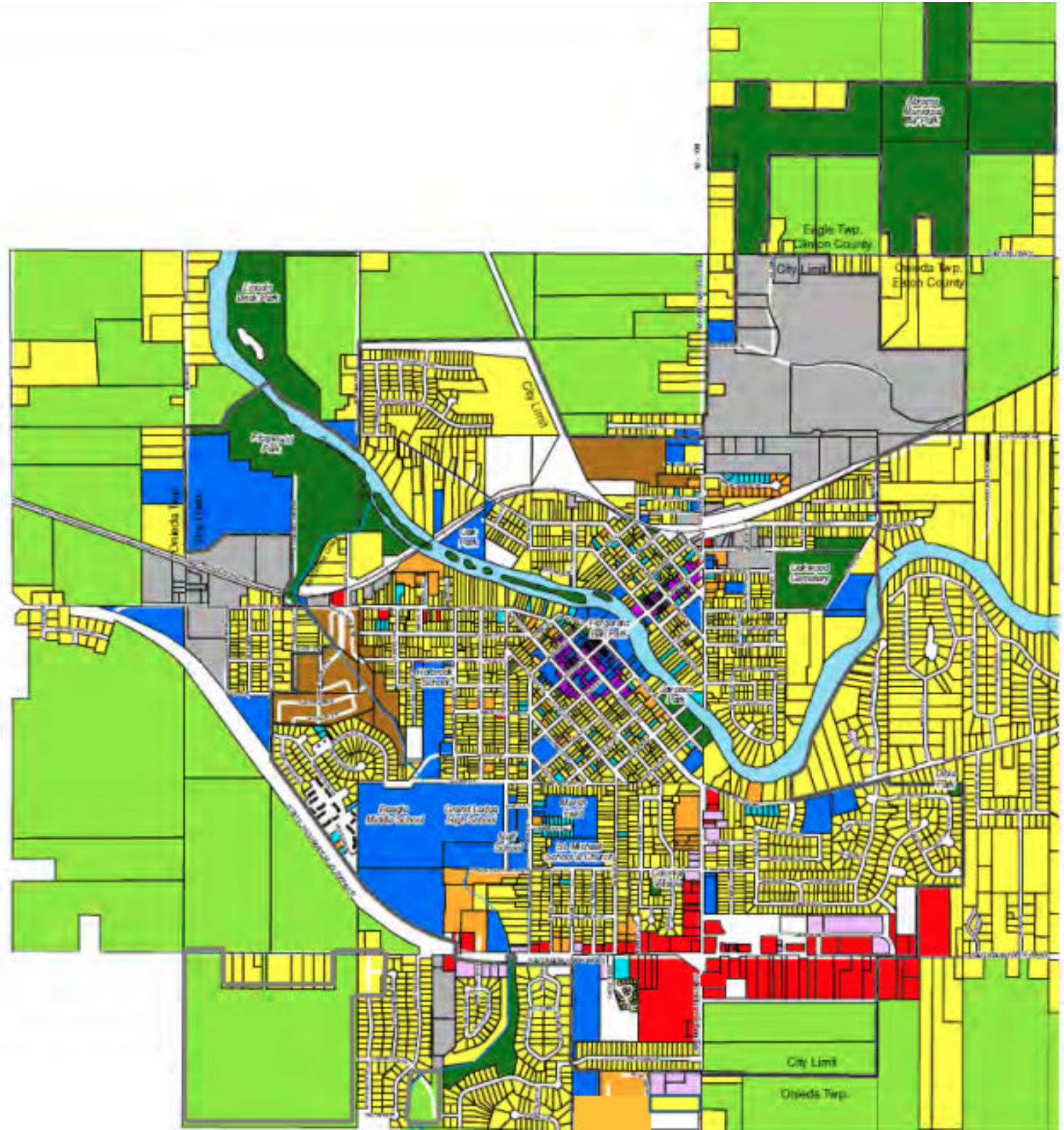


Hard copy is intended to be 11"x17" when plotted. Scale(s) indicated and graphic quality may not be accurate for any other size.

City of Grand Ledge
Clinton County and Eaton County, Michigan
Drinking Water State Revolving Fund (DWSRF) Project Plan

PROJECT NO.
220505

MAP NO.
1



- Legend**
- Single Family Residential
 - 2-Family Residential
 - Multiple Family Residential 3+ Units
 - Mobile Home Community
 - Central Business District
 - Commercial/Highway Services
 - Office
 - Industrial
 - Churches, Schools, Public Facilities
 - City and County Parks, Public Open Space/Airport, Cemeteries
 - Agricultural
 - Vacant



EXISTING LAND USE
JANUARY, 2018

PROJECT NO.
220505

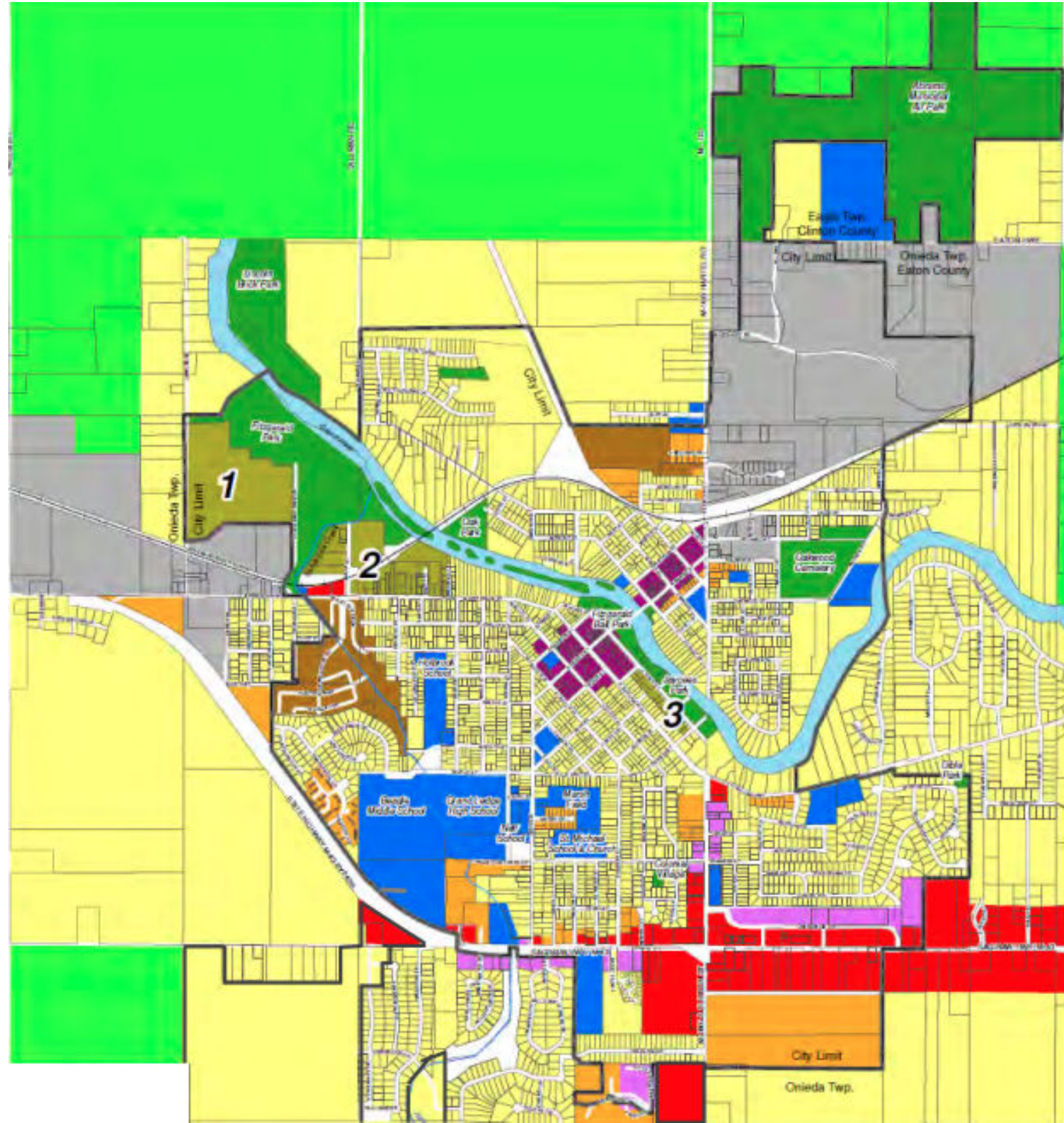
MAP NO.
2

City of Grand Ledge
Clinton County and Eaton County, Michigan
Drinking Water State Revolving Fund (DWSRF) Project Plan



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

DATA SOURCES: PLANNED LAND USE MAP ACQUIRED FROM 2018 CITY OF GRAND LEDGE MASTER PLAN. BASE MAP AND PARCELS, EATON COUNTY 2006.



Legend

- Single Family Residential
- Planned Unit Development**
- Multiple Family Residential 2+ Units
- Mobile Home Community
- Central Business District
- Commercial/Highway Services
- Office
- Industrial
- Institutional: Churches, Schools, Public Facilities
- Public Open Space/Airport, City & County Parks, Cemeteries
- Agricultural



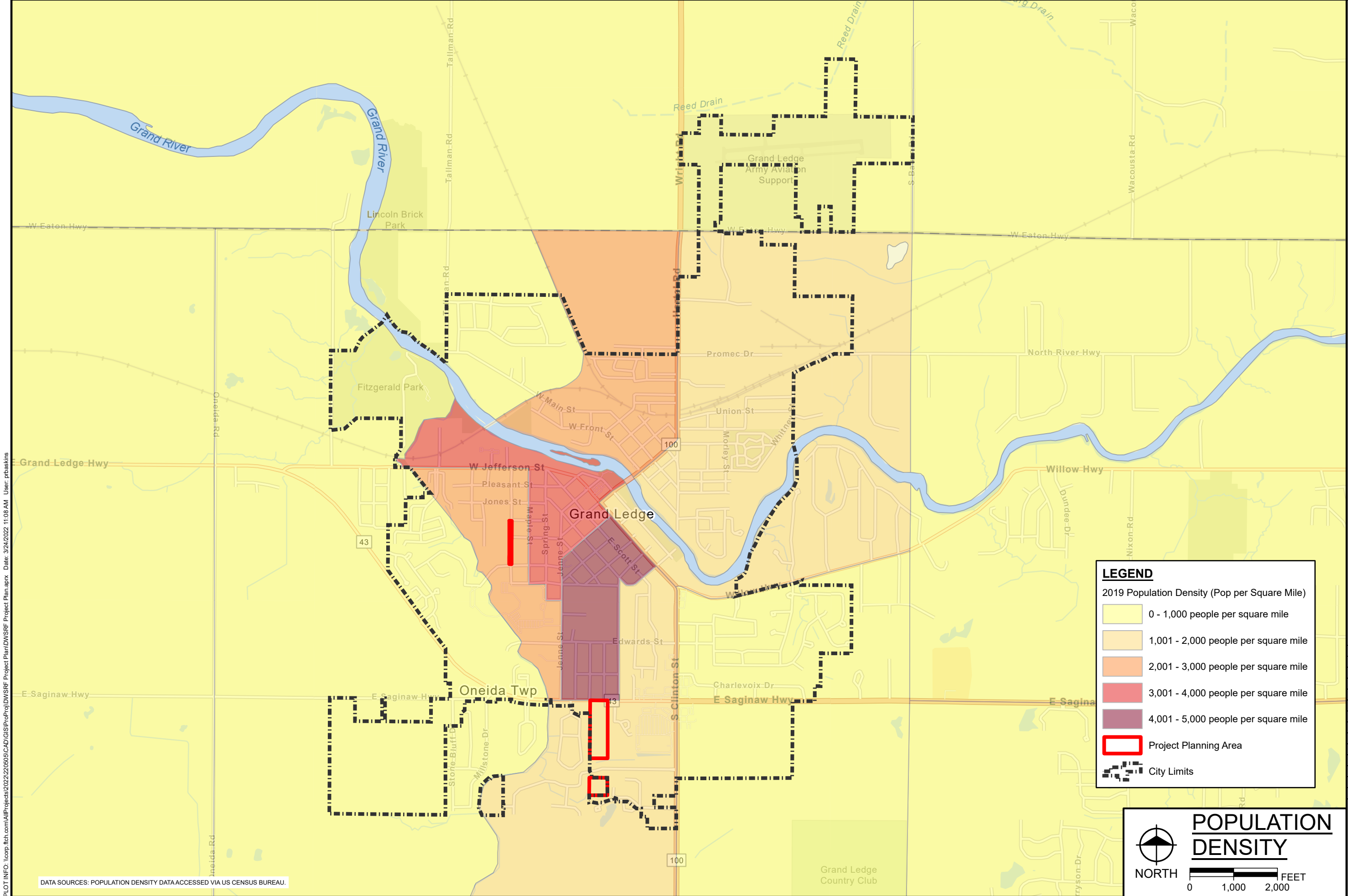
PLANNED LAND USE
JANUARY, 2018

PROJECT NO.
220505

MAP NO.
3

City of Grand Ledge
 Clinton County and Eaton County, Michigan
Drinking Water State Revolving Fund (DWSRF) Project Plan

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LEGEND

2019 Population Density (Pop per Square Mile)

- 0 - 1,000 people per square mile
- 1,001 - 2,000 people per square mile
- 2,001 - 3,000 people per square mile
- 3,001 - 4,000 people per square mile
- 4,001 - 5,000 people per square mile
- Project Planning Area
- City Limits

POPULATION DENSITY

NORTH

0 1,000 2,000 FEET

DATA SOURCES: POPULATION DENSITY DATA ACCESSED VIA US CENSUS BUREAU.

PLOT INFO: \\corp.itch.com\AI\Projects\2022\0505\CAD\GIS\Proj\UWSRF Project Plan\UWSRF Project Plan.aprx Date: 3/24/2022 11:08 AM User: pfbaskins

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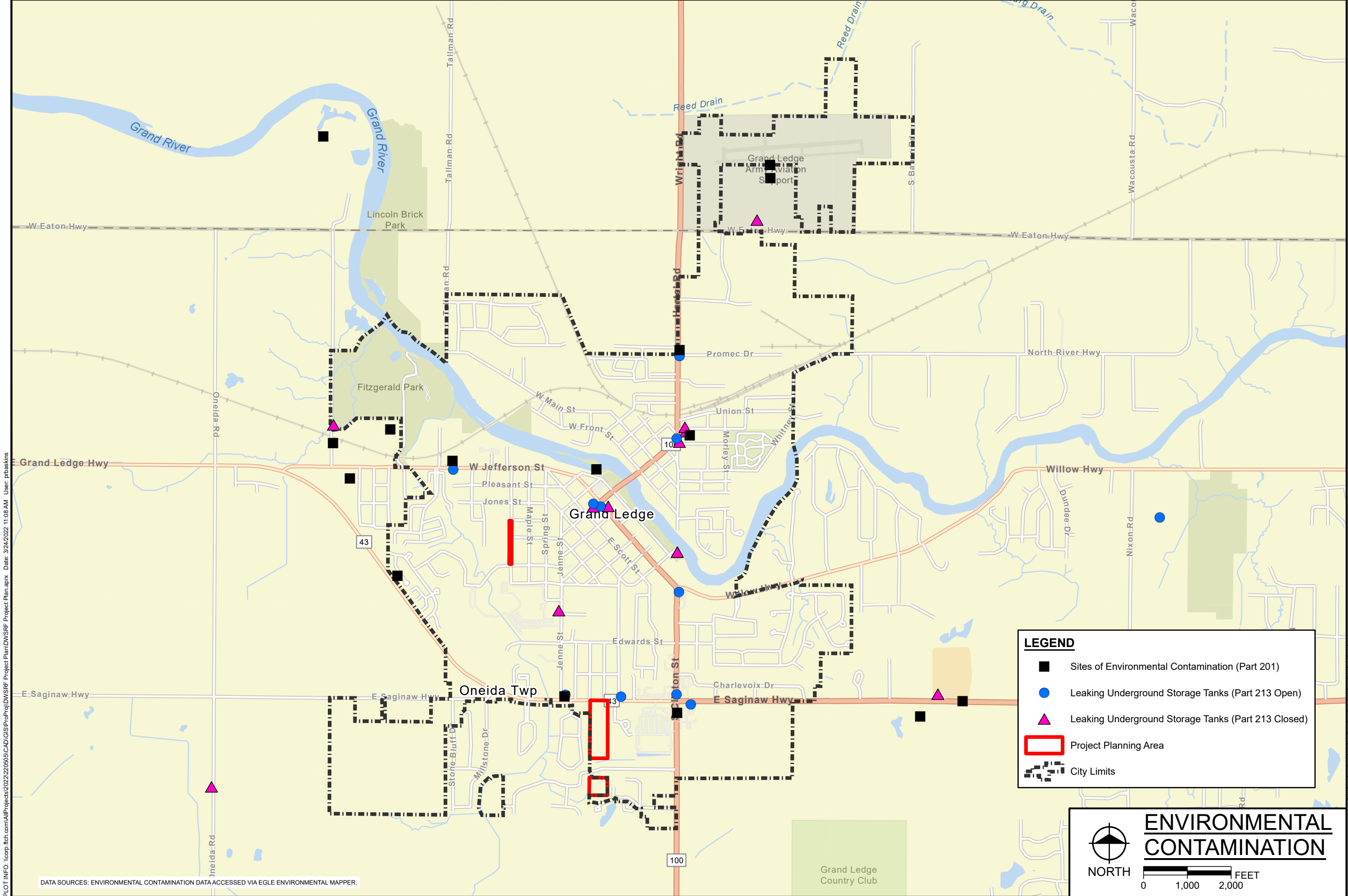


Hard copy is intended to be 11"x17" when plotted. Scale(s) indicated and graphic quality may not be accurate for any other size.

City of Grand Ledge
 Clinton County and Eaton County, Michigan
Drinking Water State Revolving Fund (DWSRF) Project Plan

PROJECT NO.
220505

MAP NO.
4



PLOT INFO: \\corp.fish.com\AI\Projects\2022\20505\CAD\GIS\Proj\DWG\SRF Project Plan.dwg Date: 3/24/2022 11:08 AM User: pfbaskins

DATA SOURCES: ENVIRONMENTAL CONTAMINATION DATA ACCESSED VIA EGLE ENVIRONMENTAL MAPPER.

LEGEND

- Sites of Environmental Contamination (Part 201)
- Leaking Underground Storage Tanks (Part 213 Open)
- ▲ Leaking Underground Storage Tanks (Part 213 Closed)
- ▭ Project Planning Area
- - - City Limits

ENVIRONMENTAL CONTAMINATION

NORTH

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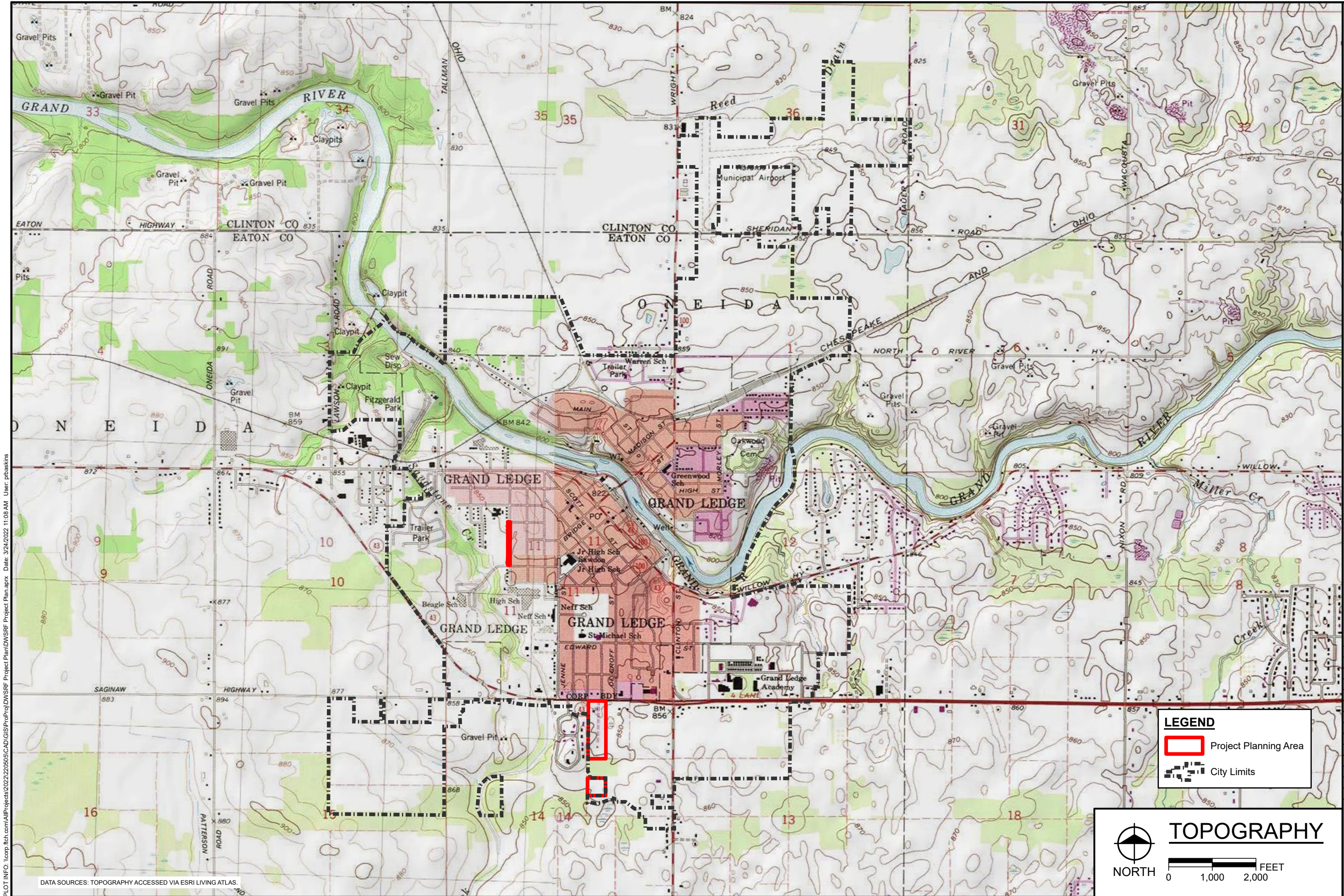


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City of Grand Ledge
Clinton County and Eaton County, Michigan
Drinking Water State Revolving Fund (DWSRF) Project Plan

PROJECT NO.
220505


MAP NO.
5



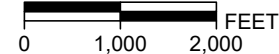
LEGEND

-  Project Planning Area
-  City Limits

TOPOGRAPHY

NORTH 

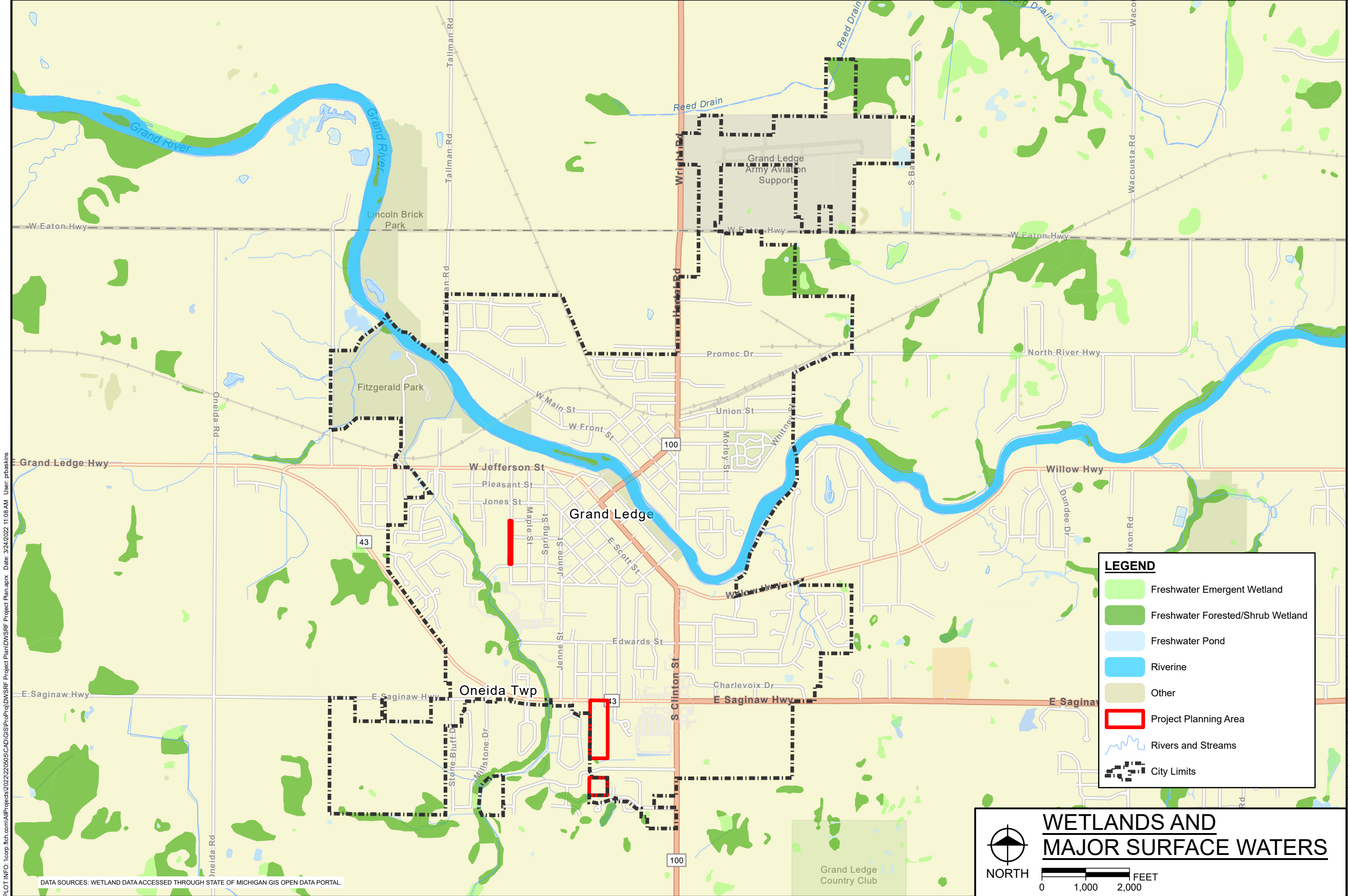
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DATA SOURCES: TOPOGRAPHY ACCESSED VIA ESRI LIVING ATLAS.

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LEGEND

- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond
- Riverine
- Other
- Project Planning Area
- Rivers and Streams
- City Limits

**WETLANDS AND
MAJOR SURFACE WATERS**

NORTH

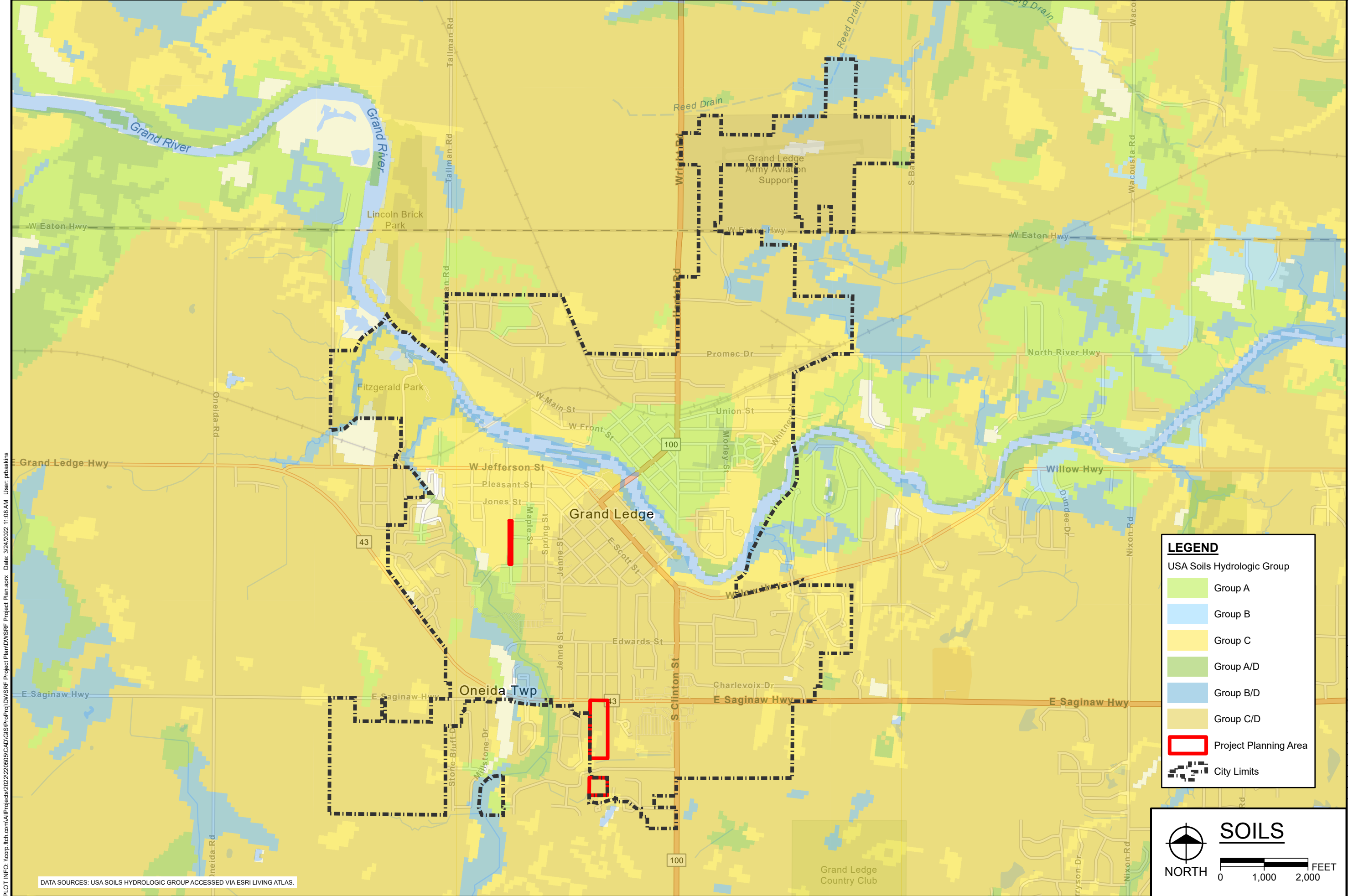
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DATA SOURCES: WETLAND DATA ACCESSED THROUGH STATE OF MICHIGAN GIS OPEN DATA PORTAL

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PLOT INFO: \\corp.itc.com\AI\Projects\2022\0505\CAD\GIS\Proj\DWG\SRF Project Plan.aprx Date: 3/24/2022 11:08 AM User: pfbaskins

DATA SOURCES: USA SOILS HYDROLOGIC GROUP ACCESSED VIA ESRI LIVING ATLAS.

LEGEND

USA Soils Hydrologic Group

- Group A
- Group B
- Group C
- Group A/D
- Group B/D
- Group C/D
- Project Planning Area
- City Limits

SOILS

NORTH

FEET

Engineers | Architects | Scientists | Constructors

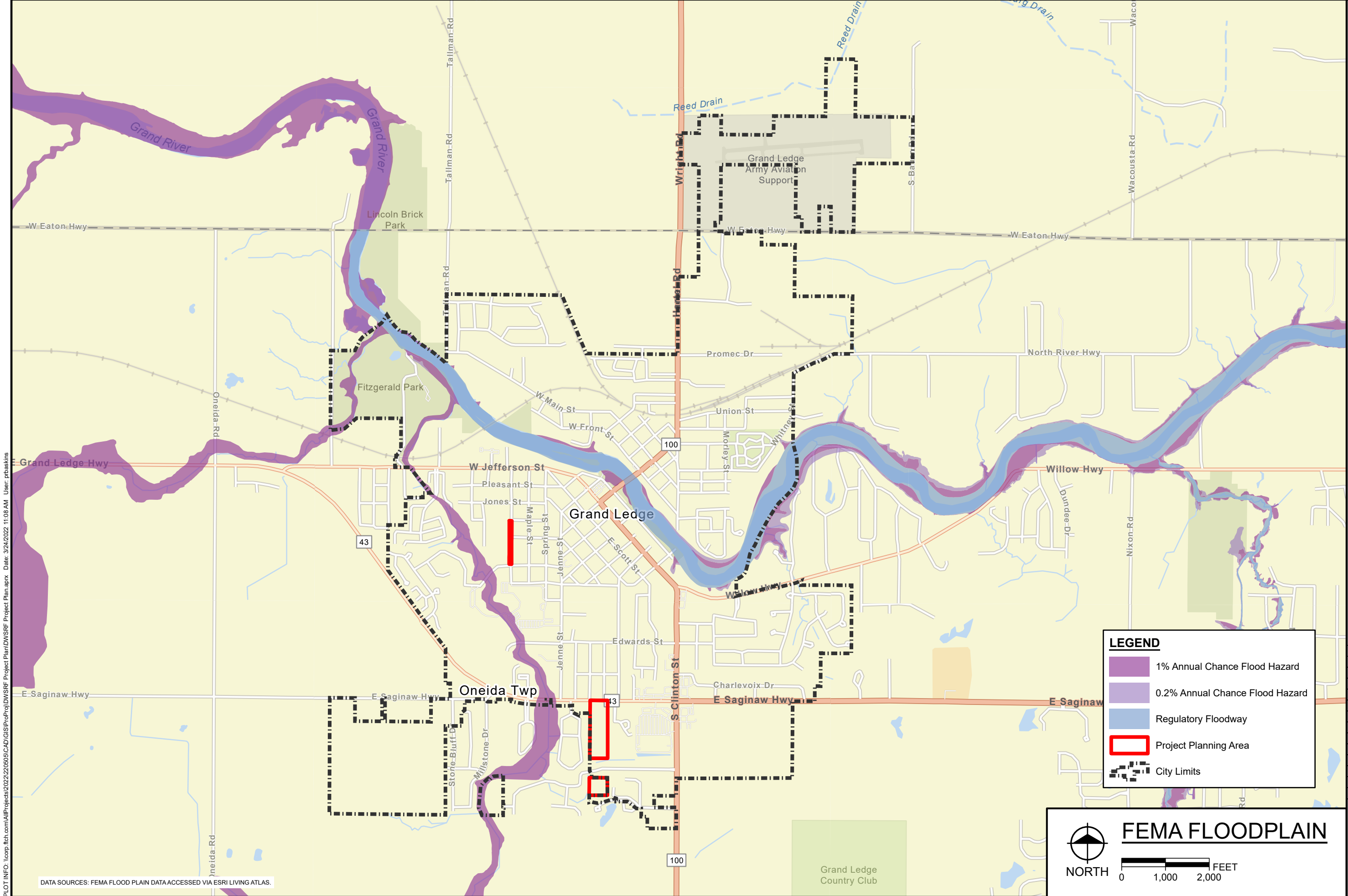
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City of Grand Ledge

Clinton County and Eaton County, Michigan

Drinking Water State Revolving Fund (DWSRF) Project Plan

PROJECT NO.	220505
MAP NO.	8



PLOT INFO: \\corp.fish.com\AI\Projects\2022\20505\CAD\GIS\Proj\UWSRF Project Plan\UWSRF Project Plan.aprx Date: 3/24/2022 11:08 AM User: pfbaskins

DATA SOURCES: FEMA FLOOD PLAIN DATA ACCESSED VIA ESRI LIVING ATLAS.

LEGEND

- 1% Annual Chance Flood Hazard
- 0.2% Annual Chance Flood Hazard
- Regulatory Floodway
- Project Planning Area
- City Limits

FEMA FLOODPLAIN

NORTH

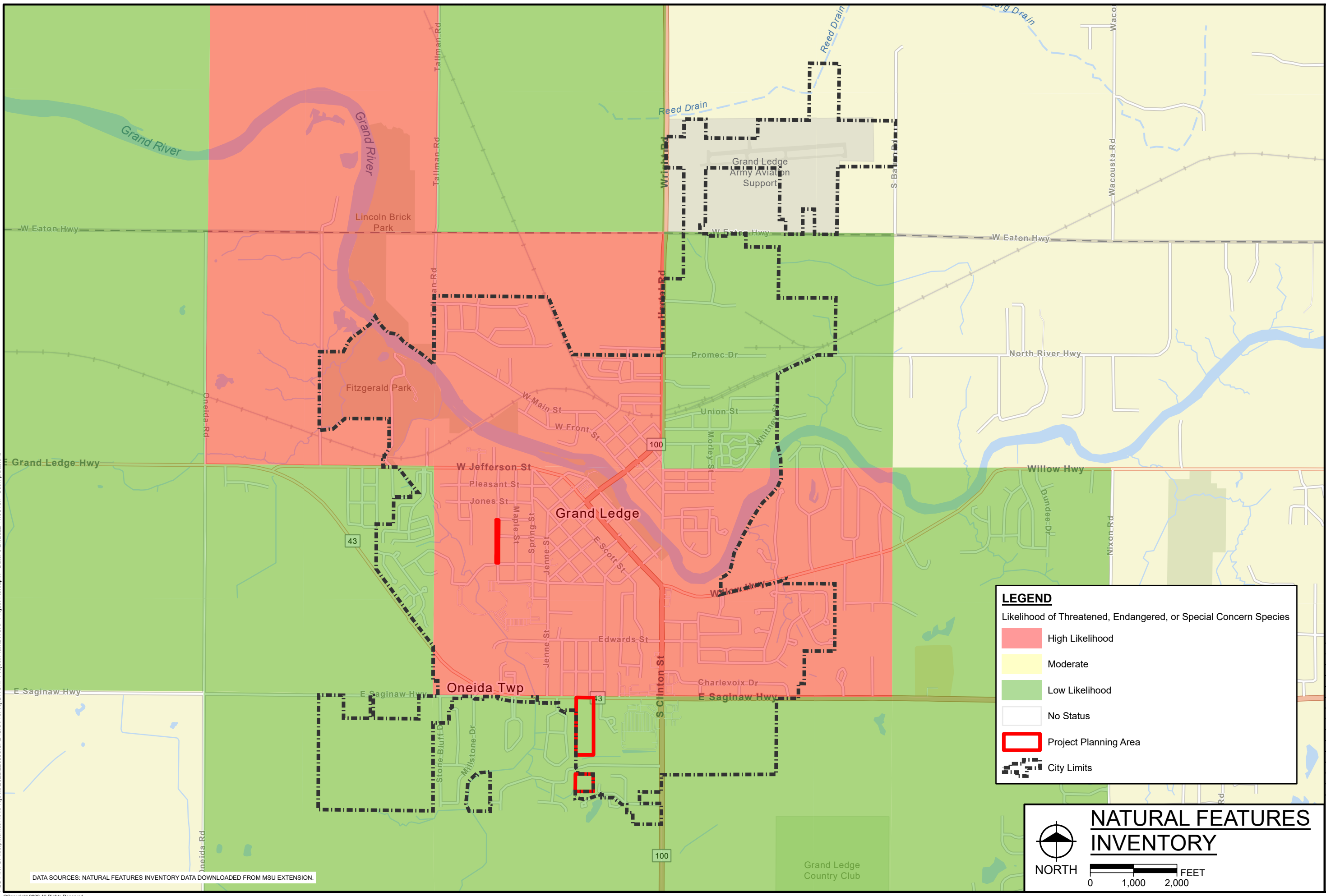
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City of Grand Ledge
Clinton County and Eaton County, Michigan
Drinking Water State Revolving Fund (DWSRF) Project Plan

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DATA SOURCES: NATURAL FEATURES INVENTORY DATA DOWNLOADED FROM MSU EXTENSION.



LEGEND
Likelihood of Threatened, Endangered, or Special Concern Species

- High Likelihood
- Moderate
- Low Likelihood
- No Status
- Project Planning Area
- City Limits

NATURAL FEATURES INVENTORY

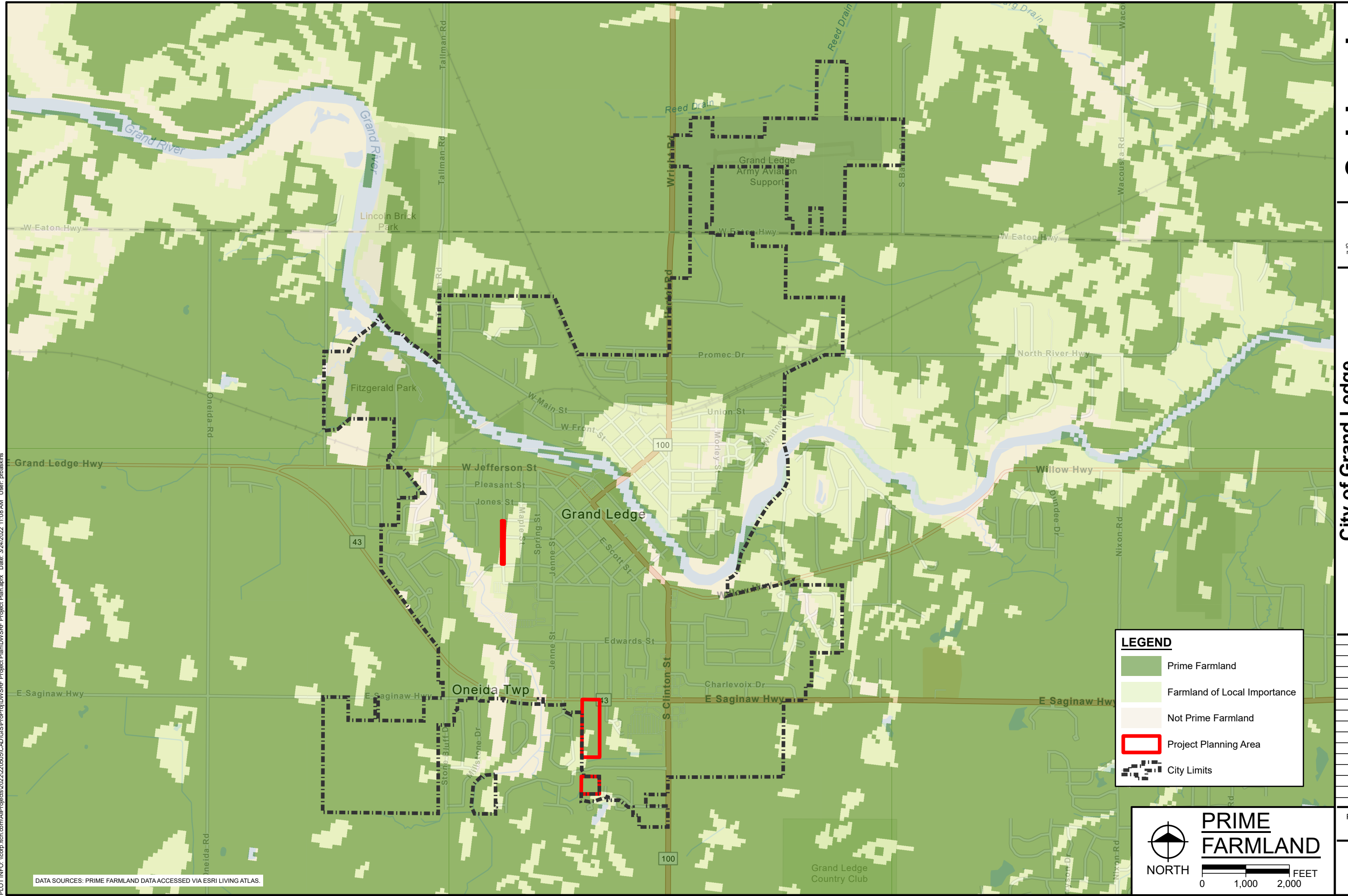
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FEET
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DATA SOURCES: PRIME FARMLAND DATA ACCESSED VIA ESRI LIVING ATLAS.



LEGEND

- Prime Farmland
- Farmland of Local Importance
- Not Prime Farmland
- Project Planning Area
- City Limits

PRIME FARMLAND

NORTH

0 1,000 2,000 FEET

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Appendix 1



2018 Master Plan



Acknowledgements

Planning Commission Members

Michael Stevens, Chairman
Todd Gute, Vice-Chairman
Matthew Salmon, Secretary
William Kane
Eric Morris
David Rademacher
Rodney VanDeCastele
Paul Viles
Stephen Rivet
Keith Mulder, Council Representative

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Keith Mulder, Mayor Pro-Tem
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Michael Doty
Richard Lantz
Thomas Jancek

City Manager

Adam Smith

Zoning Administrator

Susan Stachowiak

*In memory of Steve Baribeau who served on the Grand Ledge Planning Commission
for many years prior to his passing in March, 2016.*

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Chapter 1: Introduction

WHY DOES THE CITY OF GRAND LEDGE NEED A MASTER PLAN?

Grand Ledge is almost fully developed, although a few large tracts of vacant land still exist along the City boundary lines. The City of Grand Ledge is characterized by an attractive historic downtown, outstanding neighborhoods of both historic and contemporary homes, significant natural resources that provide unique recreational opportunities and a high quality of life for its residents. At first glance, it might appear that planning for the future is not needed. But things are not static. There is always change and always opportunity for improvement. This Master Plan reflects the desire to guide the future rather than just react to individual situations. A sound Master Plan helps ensure that decisions made on development, redevelopment, transportation, parks and various capital improvement projects will help preserve the City's many admirable qualities while addressing those areas that can be enhanced.

This Master Plan demonstrates the continued commitment of the City to protect the residential character of the community, improve and diversify its business corridors, and coordinate public improvements to support the community's vision for the future.

Recommendations in this plan are based on an evaluation of existing conditions, issues and goals that were identified by the public and officials through the planning process, and an analysis of options to meet those goals. The City's aspirations and future land use plan will assist City leaders (City Council, all City boards and commissions and the City's administrative staff) in making balanced and



thoughtful decisions which consider the long-term results for the community. These community-wide implications may not be immediately apparent to the individual property owner or citizen, but the impacts of each decision are linked and become visible over time.

The Master Plan can be viewed as a community blueprint for the future. Among the reasons to update the Grand Ledge Master Plan include:

- Grand Ledge has created an identity for itself based in large part on its residential character and “small town” atmosphere. The plan describes a multitude of actions to ensure this residential identity will be preserved. The overall framework provided in a Master Plan, combined with sound decisions by City leaders can ensure this vitality is

maintained and enhanced.

- The City’s prosperity is directly related to decisions on land use, recreation, traffic, public facilities and services, business corridors and decisions outside its borders. The planning process provides a forum to evaluate those related elements together, rather than separately.
- The Master Plan provides a legal foundation for zoning and other regulations on the type, intensity, arrangement and timing of development. The plan is established to balance the rights of individual land owners with the rights of adjacent landowners and the community overall. Therefore, the plan supports the protection of community values from a legal standpoint, as set forth in the state planning and zoning acts.
- The Master Plan provides an outline of the following specific strategies:
 1. Ensure new development, renovations and redevelopment is compatible with the existing historic character, including land uses, site design and building architecture.
 2. Balance land uses to provide a sound tax base for community facilities and services.
 3. Invigorate the community’s most unique built feature - the downtown.
 4. Carefully manage land uses and access along major roadways to provide vibrant, safe and attractive corridors through the City.
 5. Maintain and expand the non-motorized pathway system and arrange land uses to ensure Grand Ledge is a “walkable” community.
 6. Implement a complete streets policy to integrate people and place in the planning, design, construction, operation and maintenance of transportation networks.
 7. Promote both public and private investments to retain the neighborhood character.
 8. Preserve and emphasize the City’s greatest natural asset, the Grand River, riverfront parks and the ledges.
 9. Preserve the historic heritage of the downtown and neighborhoods.
 10. Continue wise public investment in community facilities and improve delivery of emergency and other City services for today and tomorrow.
 11. Provide specific direction for proper development of large undeveloped sites.
 12. Upgrade the transportation system for both motorized and non-motorized travel using the best traffic management tools available and through coordination with the MDOT and the implementation of a complete streets policy.

- The Master Plan assembles suggestions and recommendations from a variety of sources such as the Downtown Development Authority, the Non-Motorized Pathway Plan, the Parks and Recreation Master Plan, the road extension plan, the Eaton County Parks and Recreation Commission Plan and a 1997 “Walkability Audit” prepared by Dan Burden, Walkable Communities, Inc., a nationally recognized authority on creating walkable communities.

In order to ensure the plan continues to accomplish the above described intentions, the City is committed to taking on two important responsibilities. The first of which is continuing to follow the implementation strategies outlined in the plan. City officials, including the City Council, administrative staff and representatives from the Planning Commission, Downtown Development Authority and Parks and Recreation Commission should meet together at the beginning of each calendar year, fiscal year or when the fiscal budget is being planned and develop an annual action plan. This will set a framework for the specific tasks to complete within the given time period. These tasks will be directly linked to the goals and recommendations contained in this document. The City administrative staff, which includes the City administrator and all City department heads, will maintain a status of these projects throughout the year through status reports and joint meetings.

The second responsibility of the City is to continue to evaluate the goals and recommendations of the plan to ensure they are consistent with existing community conditions and development trends. As a result, specific sub area plans may be necessary or Master Plan amendments may also be appropriate.

PLANNING PROCESS

The original plan is based on the values of the community that were identified through a series of workshops. This process not only identified what was most important to the community, but also helped establish priorities, i.e. “what it most valued or needed”. These values are important when considering a development or capital improvement that may meet some goals, but not others.

Values of the Grand Ledge community and its vision for the future were documented through a lengthy, comprehensive and participatory planning process. This involved ample opportunity for residents and other landowners to provide comments and respond to preliminary alternatives. Additionally, this process provided an educational forum for residents, public officials, organizations, and representatives of adjacent communities to discuss community attitudes, success stories, current issues, and concerns.

1. Walking and driving tours by the Planning Commission, City staff and consultant team to discuss past planning efforts, history, issues and ideas.

GRAND LEDGE MASTER PLAN

2. Completion of background information on characteristics and trends of the City's population and housing, existing land use patterns and previous planning documents.
3. A community workshop was held to explain the process and receive input and ideas on the various components of the plan. Attendees included the public, City council members, and representatives of various community and civic groups.
4. City department heads met to discuss future facility needs and help establish priorities.
5. Based on the analysis, drafts of the document were prepared for Planning Commission work sessions. All meetings were open to the public and were devoted to receiving input and building consensus on recommendations.
6. Based on work sessions with the Planning Commission, changes were made to the draft plan, after which a public hearing was held and finally, the Master Plan was adopted.
7. In 2008, the Master Plan was updated in its entirety to reflect those items in the original document that have been completed or, based upon new information, are no longer deemed appropriate for the future planning of the community. In addition, all demographic data has been updated to reflect the 2010 U.S. Census figures.

Chapter 2: Community Profile

Located just ten miles west of the City of Lansing, the City of Grand Ledge covers an area that is roughly 3.65 square miles. Grand Ledge was first settled in 1848. The City was first known as “Big Rocks” by the Ojibwa Indians. “Grand Ledge” became the official name in 1850 when local settlers petitioned the legislature to create a post office in the City. The name comes from the ledges of rock found along the Grand River that runs through the City.

As the City grew, residential neighborhoods developed generally south of the Grand River and businesses were established along the north side, close to the railroad. Over time, the Central Business District (CBD) expanded along both sides of the river, surrounded by single family neighborhoods. The availability of public utilities allowed the City to develop more densely than the surrounding townships. Improvements to the highway system made it more convenient to live in Grand Ledge and work elsewhere, and vice versa.

Prospective residents were, and continue to be, attracted to the small town environment located in close proximity to Lansing’s major employment centers. Today’s population includes many who live in Grand Ledge but work in Lansing or somewhere else outside the City. With the ever increasing development in the Lansing area due to expansion of governmental employment, higher education, the auto industry and other emerging industries, the City has been impacted as seen in its population, traffic and economic growth.

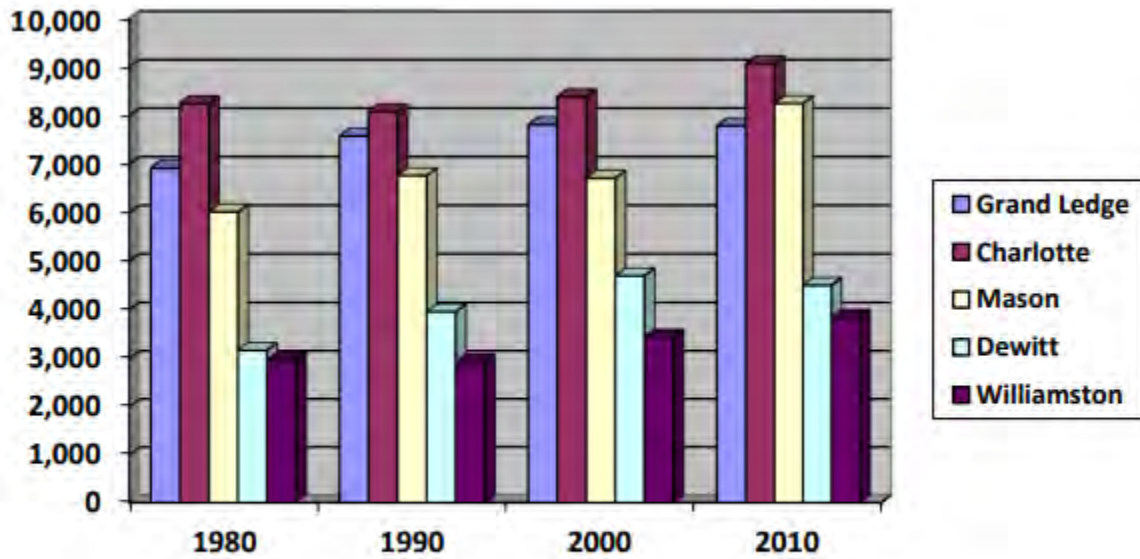
This section provides some general statistical information and comparisons to other communities. Generally, Grand Ledge is about average statistically when compared to similar sized cities in the Lansing area. Much of this information is based on figures in the most recent U.S. Census (2010), supplemented with projections from the Tri-County Regional Planning Commission.

POPULATION CHARACTERISTICS

The 2010 Census reported the population of Grand Ledge to be 7,786 persons. The City grew at a steady pace between 1960 and 1980 with a slow down between 1980 and 1990 due to the unavailability of land for residential development. The City experienced a slight (1%) increase in population between 1990 and 2000 and a slight (-2.3%) decrease in population between 2000 and 2010.

GRAND LEDGE MASTER PLAN

Table 1: Populations of Comparable Communities



Source: United States Census Bureau

The Tri-County Regional Planning Commission projects a 7.8% population increase between 2010 and 2020. The increases in population that have occurred over the past several decades and the projected increase over the next few years are due to annexations of surrounding property, residential developments currently under construction and available vacant land.

As part of this profile, the demographics of communities comparable to Grand Ledge, as determined by the planning commission were considered. The comparable communities include Dewitt, Charlotte, Williamston and Mason. The above table illustrates the population trends for these communities compared to Grand Ledge from 1980-2010. As the above table illustrates, the population changes among the various communities are relatively comparable.

Table 2: Population Trends

Population Trends in Grand Ledge and Surrounding Communities, 1980-2010

	% Change 1980 - 1990	% Change 1990 - 2000	% Change 2000 - 2010*
Grand Ledge	9.28%	10.52%	-0.3%
DeWitt City	25.24%	18.6%	-4.1%
Charlotte	-2.0%	3.8%	8.2%
Mason	12.4%	-0.8%	22.9%
Williamston City	-2.0%	17.8%	12.0%
Eaton County	5.1%	11.6%	4.0%

Sources: U.S. Census Bureau

Table 3: Persons per Household

2010 Persons per Household Grand Ledge and Comparable Communities	
Grand Ledge	2.36
Dewitt	2.60
Charlotte	2.53
Mason	2.26
Williamston	2.35
Eaton County	2.45

Household Size

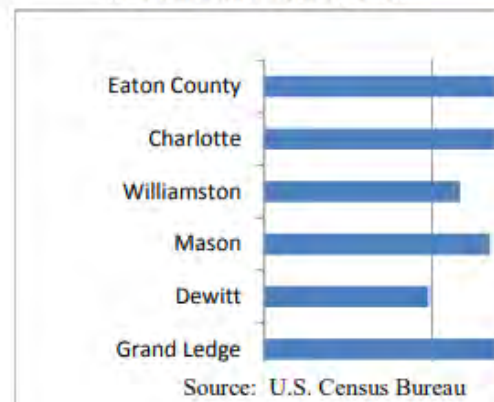
Table 3 indicates 2010 household sizes for Grand Ledge and comparable communities. The growth rate for Grand Ledge can be partially explained by a recent trend toward larger household sizes, i.e. more persons per dwelling unit than in the past few decades. This means that the City’s population may experience some population growth even without the addition of more dwellings.

Age Distribution

The median age in Grand Ledge 2010 was reported at 40.3 years, compared to 35.7 years in 2000. Most of the Grand Ledge population falls into the 25 to 44 year old age category according to the 2010 Census. Grand Ledge also has a significant percentage of people over 65 years of age.

Table 4: Population 65 Years and Older

65 Years and Older, 2010

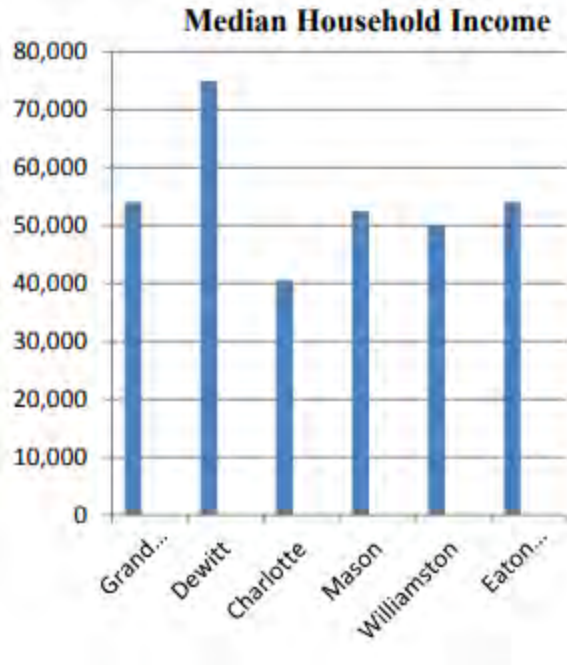


ECONOMICS

Education

Approximately 96.8 percent of Grand Ledge Residents older than 25 years in 2010 had attained the status of high school graduate or higher. This is slightly higher than the 93.4 percent reported for Eaton County. Approximately 25.9 percent of the same persons have a bachelor’s degree or higher as compared to 24.2 percent reported for Eaton County.

Table 5: Median Household Income



Income

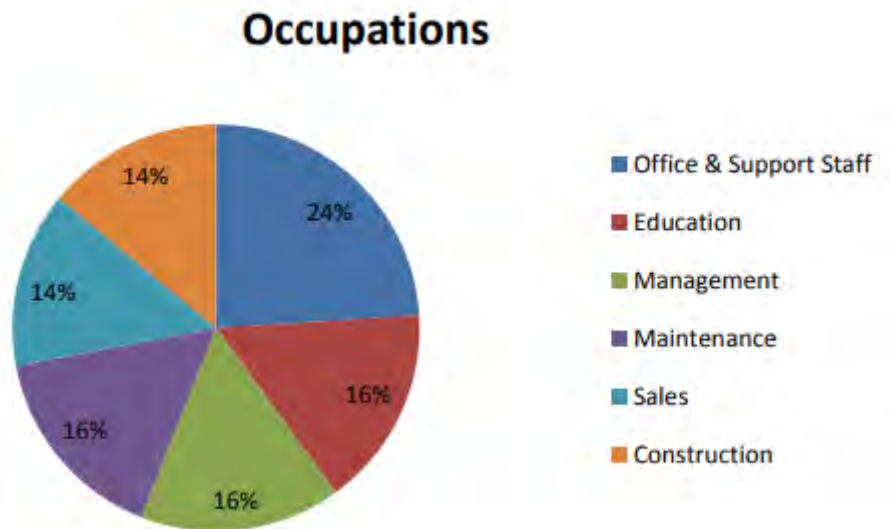
The 2010 median household income reported for Grand Ledge was \$54,104, slightly lower than Eaton County median income of \$54,115. As table 5 indicates, the median income for the City is equivalent to surrounding communities.

Table 6: Occupations

Labor Force

Approximately 70 percent of persons 16 years and over are in the civilian labor force.

Approximately 2.8 percent of the civilian labor force was reported in the 2010 Census as unemployed. The majority of occupations are still high skill.



HOUSING

There were 3,656 housing units reported in the 2010 Census. The following is a comparison of percent of occupied housing units for Grand Ledge and other communities. Table 8 compares median housing values. Grand Ledge offers several affordable housing options.

Table 7: Percent Owner-Occupied and Median Housing Values

Table 7 Percent of Owner Occupied Housing Units		Table 2010 Median Housing Values Grand Ledge and Surrounding Communities	
Grand Ledge	65.7	Grand Ledge	\$119,300
Dewitt	80.5	Dewitt	\$115,600
Mason	62.9	Mason	\$113,900
Charlotte	64.1	Charlotte	\$111,000
Williamston	66.2	Williamston	\$123,601
Eaton County	72.6	Eaton County	\$138,300

EXISTING LAND USE

Existing land use patterns and densities are a major determinant in decisions on the type, location and densities of future land uses. This section describes the existing land use patterns and how it relates to the future land use plan and other recommendations described later.

Development Pattern in General

Grand Ledge’s diverse existing land use pattern resembles a traditional developed Midwestern small city. One of the charms of a small city is that uses frequently defined as “incompatible” in modern zoning can co-exist and contribute to the unique sense of place and a walkable community. In fact, many suburban communities complain that they lack the sense of place which exists in places like Grand Ledge. Grand Ledge provides the community focal point for an area that extends well beyond the City limits because of the commercial, civic and entertainment uses.

The core CBD along the river includes many historic two and three story buildings, and a number of new buildings that have generally blended in with the historic character. The CBD is surrounded by mature stable neighborhoods with sidewalks and relatively narrow tree lined street. More recent residential areas developed around the core CBD. New



commercial establishments have located along the streets with the highest traffic volumes (M-43 and M-100). The most recent industrial development has taken place in the Grand Ledge Willis Industrial Park. The biggest difference in character between the older and newer areas is that the older areas are more historic and compact along grid streets whereas, more recent development has a more suburban atmosphere with bigger lots along curvilinear streets.

Most of the existing land uses are considered fixed, that is, change over time is not desired or likely. In some cases, however, existing land uses are not appropriate in consideration of factors such as compatibility with surrounding land use, capacity of infrastructure or availability of better sites for the use elsewhere in the City. Many of these improperly located uses were established years ago, before planning and zoning tools were available. An example might be a residential neighborhood located between a rail line and an industrial without sufficient buffering between.

The rich diversity of the community can be better understood through real life experience than any written description or map. Thus, this inventory of existing land uses is intended to describe how the City appears today and indicate where land uses need to change or sites need to be improved over time to meet the goals of the Master Plan.

Single-and Two-Family Residential

Single and two family residential uses are the most dominant in the City, as is typical for most small cities. Housing densities are moderately dense compared to surrounding areas, even in the new subdivisions, due in part to the availability of public utilities. Three eras of residential construction are easily discernable extending outward from both sides of the river in a pattern that resembles growth rings in a tree. The oldest neighborhoods were generally built in the early 1880's with relatively small lots and shallow setbacks placed on a grid street pattern at a right angle to the Grand River and immediately adjacent to the CBD. Some of these neighborhoods are eligible as historic districts. Several individual homes are on the national or state register of historic buildings.



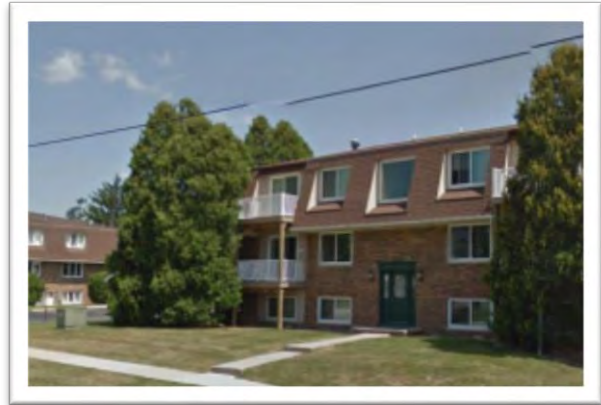
The second large phase of development occurred in the 1940's and is also set on a grid street pattern but on a true north and south direction. This pattern surrounds the previous building period. The most recent development has happened since the 1970's primarily on the outer edges of the City on annexed land. These newer subdivisions are characterized by larger homes with larger garages on larger lots along curvilinear and cul-de-sac streets. The newer subdivisions are

only marginally connected to the main fabric of the community. Two-family residences are scattered throughout the older neighborhoods and mainly consist of converted larger homes.

The average age of the housing stock is obviously older than in more suburban communities. However, most of the older homes have been well maintained. Many of the residential homes in and around the core area of the City have had significant renovations and improvements in the past few years.

Multiple-Family Residential

This category includes buildings that contain more than two dwelling units including converted homes, the adaptive reuse of the former chair factory on the west riverfront into loft apartments, apartment buildings, townhouse and the senior housing facilities on South Clinton Street. The largest multiple family complexes are situated along or in close proximity to the north frontage of Saginaw Highway (M-43) west of South Clinton Street (M-100). Smaller buildings are in scattered



areas throughout the City. Unfortunately, the architectural styles and site design do not reflect the established character of the surrounding single-family neighborhoods.

Mobile Home Parks

Grand Ledge has two large isolated manufactured housing communities. The largest contains 215 units and is south of the river near the far west portion of the City. A sole entrance is through a berm on West Jefferson Street. The other park has 168 units and is north of the rail lines with access from North Clinton Street and Burt Avenue in Oneida Township. This park is under new management and has undergone substantial improvements over the past year.

Commercial and Office

Commercial development occurs in two concentrations. The CBD is at the heart of the community. It is the historic center and spans both sides of the river through a bridge connection. Most buildings are two and three stories and abut against one another. A wide spectrum of uses include civic buildings, banks, convenience and comparison shopping, restaurants, specialty shops, gas stations, churches, offices, apartments, single-family houses and other businesses.



Over the past decade, several buildings in the CBD have undergone substantial façade and interior improvements. In addition, the City has constructed two new, thoughtfully designed parking lots on the north side of the river and has improved the appearance of its parking lots on the south side of the river. There are very few vacancies in the CBD at this time and numerous community events throughout the year draw large numbers of people to the area which helps support the CBD businesses. Speeding traffic and the prevalence of large trucks, however, as a result of Bridge Street being a designated State trunk line makes the downtown less inviting for pedestrians.

Saginaw Highway (M-43) and Clinton/Hartel Road (M-100) is the center point of more recent commercial and office development and functions as the front door to the community. In contrast to the more compact downtown environment, this corridor contains a wide variety of businesses that depend on a high volume of automobile turnover, characterized by larger lots with parking in front of the buildings such as fast food and franchise restaurants, pharmacies, banks, convenience retail, auto repair, auto parts, hardware, farm and outdoor machinery dealerships, offices and gas stations. New commercial development has created a more uniform setback pattern, increased landscaping, a reduction in the amount of driveways and a more consistent sign pattern along M-43. Ledges Commerce Park has continued to develop incorporating shared access, unified landscaping, appropriate site lighting, brick facades and attractive monument signs.



In addition to the major commercial areas, there are a few commercial uses scattered around the City. A number of these uses are either spot zones or nonconforming in terms of zoning.

Industrial

Industrial uses provide important employment opportunities and tax base to support improvements to capital facilities and municipal services. Most of the industrial sites in the City have existed for many years. Industrial concentrations are located along N. Clinton Street from the Bridge Street intersection to north of the CSX rail lines and near W. Jefferson Street in Oneida Township. The grain elevator, lumberyard, ETM Corporation, Robert Sinto Corporation and other uses have been established for many years. Some renovation is needed to correct deterioration of the buildings and sites.



The largest concentration of industrial uses is located within the Grand Ledge Willis Industrial Park which provides greater acreage and modern amenities not available at other industrial locations in the City.

Airport

Abrams Municipal Airport is located just north of Eaton Highway. The airport is operated by the City and includes a few spin-off industrial operations such as airport equipment storage. Several new hangars have been constructed to provide more modern facilities for the storage of airplanes.

Institutional

This category includes city, state and federal buildings, water towers, schools, churches and other public or quasi-public buildings. City offices, police and fire departments, the library, U.S. Post Office, and several churches are directly adjacent to or located within the CBD. These functions strengthen the focus of this district both locally and regionally and provide an important social need. The high and middle schools serve a seven township area. Three elementary (two public and one private) schools and the administration buildings are located in a tight proximity to larger schools. Government operations are discussed in greater detail in the Community Facilities section of this chapter.



Parks and Open Space

Parks, school playgrounds and cemeteries provide important social, recreation and greenspace needs for residents. Eight City and County parks (Fitzgerald Memorial Field, Oak, Jaycee, Fitzgerald, Island, Elaine Dible, Colonial and Riverside Parks) are aligned along the City’s most important natural resource, the Grand River, providing ready open space for several neighborhoods. The Holbrook, Neff, Beagle, and Greenwood elementary school playgrounds and Marsh Field function as parks for neighborhoods located away from the river. Subdivisions in the most recent annexed parcels do not appear to be adequately served. The community facilities chapter in this document and Parks and Recreation Master Plan more completely address service proximity and needs. Finally, a cemetery in the northeast section provides passive visual relief from the hard surfaces of adjacent uses.



Agriculture

There is one actively farmed tract of land in the City, located south of M-43, on the east side of M-100.

Vacant

There are a few tracts of vacant land in the City; the 2 largest of which are the City owned property located west of Fitzgerald Park and the recently annexed parcels located between Saginaw Highway and Old Saginaw Highway. There is also a 40 acre parcel and a 26 acre parcel located on the east side of S. Clinton Street, south of Saginaw Highway. Several modest and smaller areas are located on steep slopes, and adjacent to the railroad and Sandstone Creek.

Distribution of Land Uses

A useful facet of existing land use is comparing dwelling unit numbers and acreage percentages of specific uses to similar communities. By no means should comparisons dictate the community’s vision for the future and the type of environment it desires. However, comparisons can shed light on the other development patterns and potential excesses and deficiencies in land use types.

Table 8: Existing Land Use Acreage Comparison

Existing Land Use Acreage Comparison			
Unit Types	Grand Ledge Percentage	Williamston Percentage	Charlotte Percentage
<i>Residential</i>	41.9%	33.3%	42%
<i>Commercial & Office</i>	5%	6.2%	12%
<i>Industrial</i>	2.1%	8.7%	14%
<i>Institutional Facilities</i>	28%	19.7%	21%
<i>Vacant</i>	23%	32.1%	11%
TOTAL	100%	100%	100%

Sources: Williamston Master Plan, Charlotte Master Plan, Existing Land Use Survey, Grand Ledge

Distribution of dwelling unit type comparisons provide a meaningful foundation for zoning map amendments. The City can utilize the data to base future land use decisions, generate development policies and prepare zoning map amendments. It provides officials with one of several components in decision making. Williamston and Charlotte were selected as comparative examples. As shown, the primary distinctions are that the comparison communities have a significantly greater percentage of industrial land uses.

Existing land use location is used to determine future land use. Williamston and Charlotte provided comparative land acreage numbers from their master plans. The percentages of single and two-family residential land uses were greater in Grand Ledge than in Williamston and Charlotte, yet agricultural and vacant lands comprised a smaller percentage in Grand Ledge

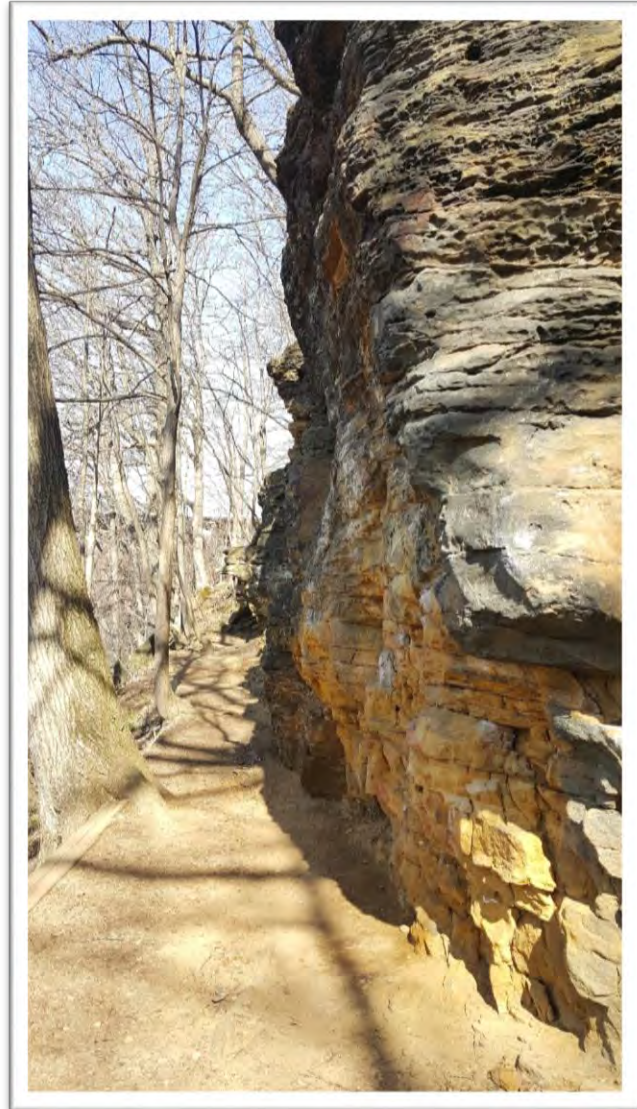
compared to Williamston and a significantly larger percentage in comparison to Charlotte. Map 1 indicates location of distinct uses.

NATURAL FEATURES

In terms of natural features, Grand Ledge is somewhat typical of towns in central Michigan, although some unique features are present. The City sits at an elevation of 860 feet and has some rolling terrain due to the river and glacial activity. This section briefly describes the natural features considered as the plan was developed. In some cases, development in sensitive areas should be limited, in others care should be taken or incentives offered to ensure responsible development.

General topography is characterized as being gently rolling with a downward slope from north to south. The most significant natural features in the City are the Grand River, the Sandstone Creek and the ledges. The Grand River traverses the City in a southeast to northwest fashion and takes a southerly dip in the eastern portion. Sandstone Creek traverses the western part of the City to the south side of the Grand River. The Grand River has a profound presence in the City. At some point, the river is nearly 400 feet wide and the only crossing in the City is by Bridge Street.

The name “Grand Ledge” is a result of the unique natural features created by the Grand River along the two mile stretch within the City. Unlike most river basins in mid-Michigan, this stretch of the Grand River is entrenched in a “valley” of sandstone with walls nearly sixty feet high in some places. The result is beautiful exposed sandstone ledges that gave the City its name and help to create a dramatic and scenic landscape unlike any other in the lower peninsula of Michigan.



Some areas that are located along the Grand River have more gradual banks and are more prone to flooding. Because of the steep ledges along the Grand River, the majority of its local

floodplain is located in the eastern half of the City. As a result of this floodplain, as well as steep slopes, development in this area is limited and reflects the topography.

COMMUNITY FACILITIES

Parks and Recreation

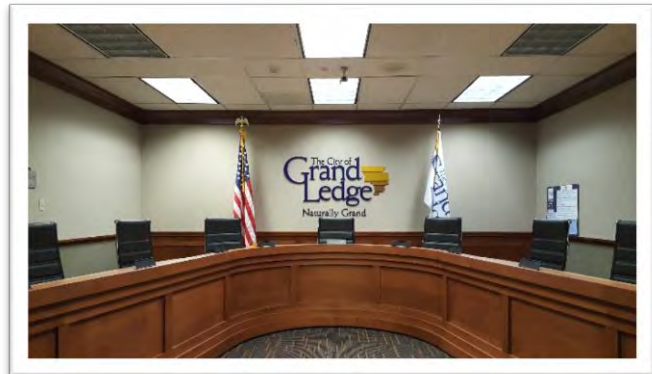


The City offers residents open space and recreation at 13 parks and open spaces totaling 110 +/- acres, including leasing the 78 acre Fitzgerald Park property to Eaton County. The parkland is primarily situated along the Grand River. Under the authority of the City Council, the parks are maintained by the Streets Department. Programs, budgets and improvements are guided by the direction of the Parks & Recreation Commission and the technical assistance provided by the

Director of Public Service and the City Administrator. The City's adopted Master Recreation Plan provides detailed insight into existing facilities and programming needs, and goals for the future.

City Hall

In 2014, the former Greenwood Elementary school at 310 Greenwood Street was renovated into the Grand Ledge city hall and police station. The new building provides state of-the-art facilities for meetings as well as offices for the city's administrative staff and police department. The gymnasium and the playground were retained to continue providing recreational facilities for the surrounding area. The building also serves as a community center as it is used on a regular basis by various community groups. The former city hall building at 200 E. Jefferson Street is now under private ownership and is in the process of being renovated into a customer-oriented commercial establishment.



Library



The library is located across the street from the former city hall property on E. Jefferson Street. The building includes the original library that fronts along E. Jefferson Street and now serves as a meeting room, and a later expansion that was constructed on the north side of the building. The library continues efforts to address barrier-free access to the building and the rapidly changing demands of extended hours, programs, and internet access, although expansion is constrained by adjacent

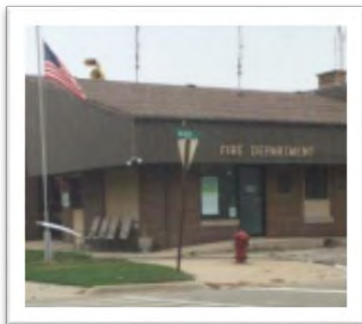
buildings and parking. In 2016, the library constructed a 1,300 square foot addition to the west side of the building that will allow for additional customer space and an elevator that will provide barrier free access to all areas of the building.

Police Department

The police department is currently located in the newly renovated city hall. The new facility provides adequate office space, parking, storage and training facilities that were not available at the former facility on E. Jefferson Street.



Fire Protection



The Fire Station was erected in 1952 and is located at N. Bridge and Halbert Streets. The Department is managed and operated by the Grand Ledge Area Emergency Services authority and serves the City and Oneida Township. Future needs for the Fire Department fall into two categories: fire stations and equipment. The fire station is located on the south side of the railroad tracks that cross N. Clinton Street. In the event of an emergency, problems occur when there is a crisis north of the railroad tracks and trains prohibit fire engines from crossing. In addition, the fire

station is located north of the bridge. If an emergency occurred on the bridge, it could prevent the Fire Department from responding to a call on the south side of the river. The present station is inadequate in size and the design of the buildings prohibits certain fire apparatuses from being stored or parked inside the building. New stations would provide faster responses to emergencies and contribute toward decreasing the ISO ratings for both the City and the Township.

Public Service Buildings and Vehicles

The Department of Public Services is based at a six acre site on Lawson Road in Oneida Township. As the City continues to grow, increased demands will be placed on the department and facilities. Expansion of the garage and the site may be needed. Assuming the City will continue to facilitate garbage collection through private contractors, these expansions will be

adequate to accommodate public services on an expanded scale in the future. The City Recycling Center site, located on Whitney Street, is adequate for the current program.

Sewer System

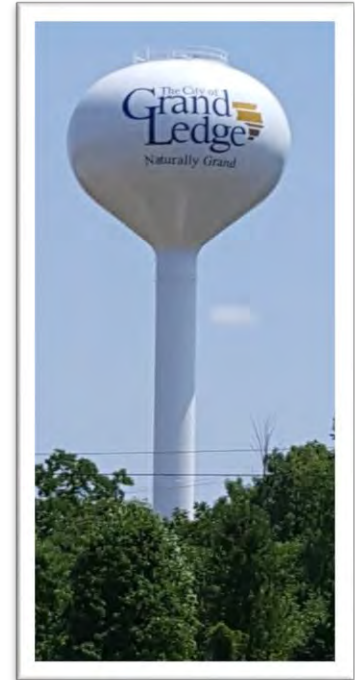
The existing sewage treatment plant is located at Fitzgerald Park. Built in 1975, and upgraded in 2009, the treatment facility may need to be upgraded again to correct any existing problems and to accommodate future demands. Underground lines are monitored and replaced as deficiencies occur.

Water System

Municipal water is an essential component of a City’s infrastructure. In general, the City water service appears to function adequately, although there is an apparent need for additional services as development continues.

Wellhead Protection

Due to the high volume and intensity of commercial activity along the M-43 corridor, wellhead protection continues to be a high. Wellhead protection involves regulations on land uses and activities within an identified area to reduce the potential for groundwater contamination. There are a number of potential sources of ground water contamination that may be controlled. These may include discharge of hazardous substances from commercial and industrial facilities, pesticides and fertilizer from residential and agricultural areas, overloaded septic systems, nonpoint source pollution from roadways and parking lots, leading underground storage tanks, and site containing environmental contamination. Additionally, there are a number of pathways by which contaminants can reach the groundwater including air contaminants, leaking underground storage tanks and floor drains that must be considered during development. The City has adopted a wellhead protection ordinance, the requirements of which should be strictly enforced and monitored.



KEY CHAPTER FINDINGS

The following are important findings that were determined as a result of the analysis of the existing conditions of the community. These findings have been utilized in determining the goals and recommendations contained in the Future Development Plan.

Population, Economic and Housing Characteristics

- Due to availability of vacant land for residential development and the consistent growth of the Lansing metropolitan area, Grand Ledge’s population is expected to increase at a steady pace in the next 20 years. This implies a need to plan for increased demand for residential, commercial and professional services; and an impact on infrastructure such as

roads and the public sanitary and water systems.

- The City has a relatively high median age due to the large percentage (14.1%) of citizens over the age of 65. The City must plan for various senior living accommodations in order to adequately serve these residents.
- The City has a relatively well-educated population which has allowed for a stable median income, high skill level occupations and higher housing values. Overall, the City has been able to accommodate a substantial amount of desirable affordable housing opportunities. The City should continue to maintain a balance in order to serve all segments of the population. Higher density single family development should be considered to accommodate an aging population that may want to downsize without giving up the option of home ownership.

Existing Land Use and Natural Features

- The residential areas of the community demonstrate traditional neighborhood design with tree lined streets, sidewalk and cozy spacing of homes. There are many signs of reinvestment that demonstrate the residents' devotion to the City's character. This must be preserved as vacant sites develop and existing sites redevelop.
- Commercial and office development is concentrated primarily in the downtown and along Saginaw Highway. Both are valuable to the community yet serve different functions. Future business development must be directed to these areas, as appropriate, and must preserve the character of each of these corridors.
- Industrial development is an important component of the City's tax base. The City should aggressively pursue new industrial businesses in the Grand Ledge Willis Industrial Park.
- Institutional land uses as well as parks and open space are scattered throughout the City and adequately serve the residents. This must continue as the population grows and new residential developments occur.
- Available vacant and agricultural land within the City and beyond the City limits are expected to develop in the next 2 years.
- The City possesses a number of significant natural features, primarily located along the scenic Grand River. This river and its distinct attributes are one of the greatest assets of the community and protection, preservation and enhancement should be continue to be held as a high priority.

Community Facilities and Services

- The Fire department is in need of facility upgrades.
- The current Master Recreation Plan outlines several goals and projects over a five year planning period. These projects should be implemented and at the end of the five year planning period, the plan should be updated.
- The City should continue to rigorously monitor its wells and enforce the City's wellhead protection ordinance.

Chapter 3: Future Development Plan

FUTURE LAND USE

The Future Land Use Plan serves to translate community goals into a narrative and graphic illustration. The Future Land Use map is to be used as a generalized guide to the location of growth and development in the future. Some of the future land use designations may be a reality now or in the near future, while others may take time before becoming an appropriate use of the land.

A number of factors were considered as the arrangement and intensity of land uses were designated. These factors are described below:

- **Growth in the metropolitan area** - The pace of development will be influenced by the economic health and growth in the Lansing metropolitan area.
- **Existing land use** - The core area of the City is built out and therefore, wholesale changes to the existing land use pattern would be difficult. The locations of existing single and multiple family residential, institutional, and parkland uses have been preserved, while commercial, office, and industrial land use have been somewhat refined. There are a few large tracts of undeveloped vacant land located along the City's boundaries that are master planned for residential land use.
- **Goal to remove incompatible uses** - The future land use plan strives to diminish incompatible land use relationships by consolidating areas for commercial, office, and industrial use. Commercial development is planned to be concentrated along Saginaw Highway and the CBD. Office development is directed to Clinton Street, Charlevoix Drive, and Saginaw Highway. Finally, industrial development is proposed to be directed to the Grand Ledge Willis Industrial Park located at northeast corner of the City on the east side of Clinton Street/M-100. Office areas and multiple family residential development serve as a transition between commercial activity and residential neighborhoods and prevents the sprawling of commercial development along Saginaw Highway. Gradually, it is intended that all businesses will be appropriately located within these areas which will protect surrounding neighborhoods.
- **Natural features** - The Grand River, natural topography, and woodlands provide marketable property for residential development. These can best be protected and appropriately developed under the Planned Residential designation. These sites present a

number of opportunities and challenges to development that warrant some flexibility in the design.

- **Infrastructure** - The capacity of the existing and planned sewer and water services and the road network, defines the intensity of uses that may be served without creation of capacity deficiencies or need for unplanned capital improvements.
- **Economic development** - The land use plan provides areas for business expansion and opportunity to diversify the employment and tax base of the City. Construction of a road along the south end of the parcels on Saginaw highway, east of M-100 would allow the south ½ of those parcels to be developed for commercial or office use.
- **Preferences of the City** - The land use pattern desired by City officials and property owners has been expressed with the objective of a diversified tax base, employment opportunities, provision of services for residents, preserving natural features and land along Grand River, and the desire for a mixture of uses and housing opportunities.
- **Planned regional land uses** - In order to fully assess the impacts of planned land uses within the City, the planned land uses within the region were considered. The Regional Future Land Use Map depicts the geographical area considered. The study area is bounded to the north by Grand River Avenue to include the Abrams Municipal Airport; the eastern boundary extends a mile or so past the Oneida Township limits; to the west the area is bounded by Oneida Road and the southern boundary is marked by St. Joseph Highway.

All these factors are depicted in the Future Land Use map and are represented in the various land use types and intensities. The Future Land Use map is a representation of the desired land use pattern for the build-out of the community.

Regional Land Use Pattern

In accordance with the Michigan Municipal Planning Act, it is the responsibility of the City to look beyond its boundaries when planning future land uses. The intent is to ensure that future development within both the City and surrounding townships is harmonious. It is also useful in evaluating traffic impacts on both communities and to plan for the possibility of shared services such as sewer and water. The Regional Future Land Use Map (Map 3) depicts the planned land use pattern within the area. The majority of the parcels outside the City limits are used, zoned, and planned by the townships for either single family homes or operating farms. The City supports the efforts of surrounding communities to continue preservation of agricultural operations to the extent possible, particularly in agricultural areas designated on the map. In the future, however, conditions may change and communities may see a conversion from agricultural operations. This is most likely in the southeast corner of region. If this trend occurs,

GRAND LEDGE MASTER PLAN

the most appropriate and compatible land use for these properties is single family residential developed at a density that is compatible with surrounding development conditions.

The largest amount of industrially zoned land in the city is located within the Grand Ledge Willis Industrial Park, located on the east side of Hartel Road (M-100), south of Eaton Highway. Highway commercial development is primarily concentrated along Saginaw Highway. Surrounding communities are primarily rural townships whose predominant land uses are single family residential and agricultural operations. North of the City, although planned industrial development, is primarily used for agricultural operations.



The Abrams Municipal Airport is a predominant land use to the north and is planned to be surrounded by primarily agricultural use, some single family development, and existing industrial operations. To the east of the City's boundaries, commercial development will continue along M-43 and single family development is planned to the north and south of the corridor. West of the City, single family residential and agricultural operations are planned along with some existing industrial uses. Finally, single family residential is planned to the south, creating a complete ring of single family residential land use around the City.

Analyzing the future land use pattern of this area is important to Grand Ledge for two main reasons. Number one, the development of surrounding communities can impact transportation, land use, natural features, and the economic development of the City. An understanding of their future plans provides the City foresight and the ability to plan and respond accordingly. For example, if surrounding communities planned for their agricultural land to develop as higher density residential development the City would be faced with major impacts to their road system and their businesses and services. There may also be an impact on community facilities such as sewer, water, and parkland

The second reason for analyzing regional land use is to ensure that the City's land use decisions are compatible with adjacent communities. For example, it would not be responsible planning if industrial development was encouraged within the City's boundaries where it directly abutted existing single family development where there was no potential for adequate screening and buffering.

Future Land Use Plan and Categories

The following are the key goals established that guide the recommendations contained in this portion of the document. They are based on input from the public and findings established during the analysis. All of the land use goals and recommendations must be evaluated together, not just

individually, to accomplish the desired vision of the community over the 10 year planning period.

Analysis of the regional future land use map, and other identified elements, assisted the City in preparing a future land use map that offers a strong urban core for the surrounding rural townships. The future land use map for the City offers a development plan that not only will serve the needs of City residents in a responsible manner but will also accommodate the planned growth of the surrounding communities. This section provides a narrative to explain the proposed development pattern illustrated on the future land use map.

Single Family Residential

Single family residential development occupies 41.9% of the land use area within the City. This category encompasses areas that are established residential neighborhoods with single family homes, large vacant parcels that should be developed for single family residential use, and sites that are used for some type of business that should be redeveloped for single family residential use in the future. The details of how these areas should be developed are described in the residential development subarea plan in Chapter 5. There are a few parcels that are designated for single family residential but are currently zoned and/or used for residential dwellings of two or more units and commercial businesses. Although these uses will likely remain for some time into the future, the City does not find them to be desirable within the areas in which they are located. Further, they are not consistent with the goal of concentrating multiple family and business development to more appropriate locations such as in the CBD, along Saginaw Highway and Clinton Street, and within the industrial park. If redevelopment or reuse of these sites is necessary, they will conform to the existing zoning ordinance.

As a City with the potential for future growth, it is important to plan beyond its boundaries to the abutting township. Although much of the land in Oneida Township was devoted to agricultural operations when the Master Plan was prepared, land use trends in the area indicate these areas will be ripe for other development such as residential and neighborhoods services. If the agricultural use changes, single family residential land use is planned for most of these parcels in an attempt to preserve the character of the City and accommodate future growth in and around the community.

An amendment to the zoning ordinance has recently been adopted to permit higher density single family residential development. Smaller single family dwellings (700-1,000 square feet in area) on reduced lot sizes would accommodate the needs of empty nesters, retirees, young professionals and other segments of the population that desire to own rather than rent their homes without having to maintain a 1,400 square foot home on an 8,450 square foot lot as required under the current zoning ordinance.

Multiple Family Residential

Multiple family residential designations include areas for buildings with two or more dwelling units. Although, by ordinance, density is calculated based on the number of rooms in the

structure, these developments typically are a minimum of 6-8 units per acre. It is important to provide and plan for multiple family development within the City in order to offer a variety of housing options for residents. Multiple family units above the businesses along Bridge Street are not shown on the map but are recommended to remain in the plan (see CBD section). Multiple family developments also provide an effective transition between single family residential uses and high intensity uses such as commercial and major thoroughfares.

Within the City limits, areas with this designation are primarily areas already occupied by multiple family uses and where expansion of those existing areas are appropriate. These are located in various small pockets throughout the City. The majority are located along major roadways such as M-43/Saginaw Highway and M-100/Clinton Street. These uses generate a higher concentration of activity and require adequate access and larger sites.

There are a number of areas where multiple family structures are not consistent with the intended character of the area and are planned for alternative uses. Spotty multiple family uses within existing established neighborhoods are not encouraged and should be phased out as the sites redevelop. Where redevelopment is not practical, at a minimum, the site design of these properties must be upgraded. East of M-100 and north of the railroad tracks on Grand Manor Drive is a small strip of multiple family dwellings that is nestled between existing industrial development and the railroad tracks. The land use pattern in this area is predominantly industrial and has resulted in a negative impact on the quality of the neighborhood. Attempting to preserve this multiple family development is not in the best interest of the City and should be converted to industrial use in the future.

The largest areas planned for multiple family residential use are located on the east side of m-100, south of the commercial uses along m-43. Adequate access coupled with the surrounding commercial development makes the sites ideal for multiple family residential.

The entire area east of M-100 should not, however, develop with one, consistently high density residential development. The intent for these sites is to create a natural transition between the commercial uses along M-43 and the agricultural and residential uses south of the City's boundaries. To accomplish this transition, the areas designated for multiple family should be high density (12-15 dwelling units per acre) near the commercial area and along the south access drive. This will provide safe access and circulation for the higher traffic volumes. The density should be less intense approaching Oneida Township in order to provide a more compatible land use with the nearby single family and agricultural operations. Appropriate development in this areas would be either duplexes, attached single family complexes or small lot single family neighborhoods.

Guidelines and recommendations for the design of future multiple family residential developments are described in the residential development subarea plan in Chapter 5.

Planned Unit Development

The Planned Unit Development (PUD) designation identifies sites that are appropriate for residential development of varying densities with accessory commercial use or commercial use along road frontages. Due to specific characteristics directly related to the site, there are a number of constraints that require departure from conventional site design in order to accomplish a successful project that both the City and developer can appreciate. Through the PUD ordinance, the developer should be allowed flexibility from the zoning ordinance requirements and standards to develop the site, provided an overall benefit is achieved for the community.

On the future land use map (Map 4) the PUD sites are numbered. For the development of each site, the City has established a specialized goal that should be accomplished in order to maximize the full potential of the property. Below is a description of how the City intends for each of these sites to be developed.

PUD #1

This site is located in the northwestern corner of the City fronting on Lawson Road. It shares the eastern boundary with Fitzgerald Park. This site presents a few key issues/constraints that need to be addressed in the development of the plan. These include the following:

- Adjacent to Fitzgerald Park
- Valuable natural features
- Nearby industrial development
- Significant frontage on Lawson Road
- Secluded from the rest of the neighborhoods
- Agricultural and single family residential to the north and west

Goal: Develop a single family residential neighborhood that maintains the traditional neighborhood characteristics of Grand Ledge with safe access to Lawson Road and adjacent residential neighborhoods while protecting the natural features of the site and the abutting park and prevents negative impacts that may result from the nearby industrial development.

To maximize the potential for this site and accomplish this goal, there are a number of methods that could be employed. To begin with, to prevent impacts from the industrial area, the City could consider allowing the home sites to be smaller than the minimum lot size and clustered away from the industrial uses, providing a well-designed buffer area. The density of the development could also be higher than typical single family of 5 units per acre to serve as a transition between the industrial and single family development in the surrounding area. In fact, it may be desirable to cluster the homes to attached housing to allow for more open space. Further, proper clustering of the units will allow for flexibility to protect woodlands on the site and along the border of the park.

The road system of the development should provide safe access and a connection to future development to the north. The right-of-way should be utilized in a manner that preserves the traditional neighborhood character of the City. Although it is secluded from the other neighborhoods, they should be designed under the same concepts that are described for single and multiple family residential development. For instance, sidewalks and street trees should be provided with building entrances oriented to the street. A pathway connection should be accomplished that will link the development with the rest of the City.

PUD #2

This site is located just east of PUD #1 and fronts on the north side of West Jefferson Street. The City believes there is a lot of potential in this area that cannot be overlooked. Through flexibility in the PUD development option, both the City and all other parties involved can benefit from a development that revitalizes the neighborhood.

The site is split into two components. The first is north of the railroad tracks along Gulf Street and is planned for higher density multiple family residential development. The second portion primarily fronts on West Jefferson Street and is south of the railroad tracks. This area is planned for lower density single family residential or commercial development. The site possesses the following characteristics that warrant the need for a planned development designation:

- Adjacent to Fitzgerald Park
- Presence of natural features such as a woodlands and Sandstone Creek
- Railroad tracks
- Mobile home park across West Jefferson
- Existing marginal uses on the site and surrounding area
- Renovated industrial building to multiple family

Goal: Redevelop the two components in a manner which preserves natural features on the site and results in high-quality development that is considered a significant reinvestment in the area that will serve as a catalyst for additional improvements to the area.

The northern component is planned for multiple family residential use with a minimum density of 6-8 units per acre and can be developed to meet this goal through a few simple elements. For instance, the road right-of-way must be improved to provide a paved road, curb and gutter for drainage, sidewalks, and street trees. A buffer zone should be established along the railroad tracks to offset noise and safety concerns. Extensive measures must be taken to prevent the clearing of trees and protect the Sandstone Creek, which feeds into the Grand River.

The southern portion of the site is ideal for Medium Density Residential or commercial development. To begin with, clearing existing buildings will be required to redevelop the area. In order for the redevelopment to have the possibility of a profitable investment, a density of

approximately 6-8 units per acre is necessary. While there is a trend of multiple family residential development in the area, there is also a substantial amount of single family and commercial development. A medium density residential development or convenience type commercial uses, designed in a manner that would be harmonious with the surrounding uses, would be most appropriate for the subject property.

To ensure that the project is desirable and that it promotes high quality redevelopment in the area, certain site design elements should be incorporated. First, the site should be configured so that the buildings front on West Jefferson and Perry Street and the required parking areas are in the rear, along the railroad tracks. Second, an effective buffer should be installed between the parking area and the railroad tracks to screen and minimize the impacts of noise from railroad activity. Finally, buildings should possess high quality architecture and materials which are consistent with the traditional neighborhood character of the community.

PUD #3

This development area is located on the south side of East River Street. The site faces Jaycees Park and offers an exceptional view of the Grand River. Existing office and residential uses of the properties do not fully appreciate the value of its view and access to both the river and downtown. Redevelopment of this area has phenomenal potential that can only be maximized through a PUD development option. Findings include:

- View and access to the river
- Close proximity to downtown
- City park across the street
- Shallow lots
- Steep topography
- Mixture of existing land uses
- Adjacent single family residential
- Minimal traffic

Goal: Redevelop this strip of valuable residential land in a manner which maximizes its views to the Grand River and its access to the CBD while preserving the surrounding single family residential character of the neighborhood.

The vision for this site is to develop “row housing”, or townhouse style development along the street front. Parking can be accommodated through a rear driving lane that accesses a carport or garage in the back of the unit and angled parking can be accommodated on the street. The buildings should be predominantly brick with entryways that are oriented to the street and sidewalk. Front porches and/or stoops are encouraged along with other site elements that create a pedestrian oriented environment such as benches and street lights along the roadway.

PUD #4

Situated along Saginaw Highway, this site is triangular in shape and backs up to the Beagle and high school property. To the east and west is an existing multiple family development. The topography of the land is relatively flat and woodlands on the site consist of a narrow tree line along the property boundaries. This site is ideal for recreation play fields and has been acquired by the Grand Ledge Public School District. The following are findings related to this site:

- Substantial frontage on a major roadway
- Adjacent to school property
- Flat land with minimal trees
- Citywide interest in providing more play fields
- Access either prohibited or restricted from Saginaw Highway

Goal: Maximize the potential for the site to provide additional residential or commercial development within the community, should the property become available for private development in the future, while accommodating a community-wide need for active parkland and other institutional facilities.

The City supports the use of the subject property for recreational use by the Grand Ledge School District. However, if the property becomes available for private development, the site should be developed to allow for the expansion of the existing multiple family development on the east side of the site with commercial development along the Saginaw Highway road frontage. The residential portion of the development should be designed to be compatible with traditional neighborhood design, allowing adequate connection to the existing neighborhood.

In exchange for allowing high density development clustered to the east side of the property, there is potential to utilize the remaining open space for active recreation space. It would be desirable to negotiate with the property owner/developer to allow the active recreation to be open to the public and possibly operated by the City or by the school district.

Mobile Home Community

This designation is located where there are established mobile home communities. These are located south of West Jefferson on the west side of the City and west of M-100 in the northern portion. Generally these developments are well-maintained and are located appropriately. The City should continue to monitor the condition of these developments and ensure they remain this way and offer a safe residential environment. These developments are important to the City because coupled with multiple family and single family neighborhoods, this designation allows the opportunity for various housing options within the community.

There is no additional area devoted to mobile home communities for a few reasons. To begin with, the existing developments are 3.2% of the land use acreage in the City which is almost equal to the amount devoted to multiple family residential use. Therefore, the City believes there is ample provision for this type of housing. Equally important, the sites that remain available for

development present a number of constraints such as natural features and have largely been designated for Planned Unit Development.

Central Business District

The Central Business District (CBD) is one of the core elements to the community. The historic character, walkability, diverse retail market and its link to the Grand River distinguishes Grand Ledge’s downtown from other communities in the area. These features have created a real draw to residents living in adjacent Townships and nearby cities such as Delta Township, Oneida Township and Lansing.

Through infrastructure improvements such as parking lot development and reconstruction, park improvements and a building façade grant program, the City has demonstrated its devotion to maintaining the strength and vitality of the CBD. Specific recommendations for the downtown are discussed in the subarea plan.

The area designated for CBD is generally consistent with the Downtown Development Authority boundaries. Along Bridge Street, retail and office activity is encouraged at the street level. These businesses should continue to be oriented to the street environment and accommodate the abundant pedestrian activity. Above the street level, more office development and residential units are encouraged. The mixture of residential, office and commercial is very complimentary in a downtown environment because each use generates activity for the other uses.

Commercial/Highway Services

Retail businesses and services which serve the City and Oneida Township that are not located within the CBD are designated with this category. They are primarily located along Saginaw Highway/M-43 and run a few blocks north and south along Clinton Street/M-100. Specific recommendations on the design and development of this corridor are addressed in the subarea plans. To summarize, the key design issues include:

- Access management
- Architectural design guidelines
- Landscaping/screening



- Lighting v
- Pedestrian circulation

Office

Office development includes uses such as professional offices, medical clinics, and banks. These are primarily located along Saginaw Highway/M-43 with a small pocket along Clinton Street. Offices serve as effective transitions between residential and commercial uses and thoroughfares. An access road south of M-43 on the east side of M-100 would allow for development of the south half of the commercial properties along M-43. Offices in this location would provide an appropriate transition between the commercial uses along Saginaw Highway and the planned multiple family residential development to the south.

Charlevoix Drive is a service drive that has gone a long way towards alleviating traffic on M-43 and has provided safe access for both the commercial and office sites. The planned access road on the opposite side of M-43 would also provide for safer operations along M-43 and at the M-43/M-100 intersection. West of the intersection there is limited area for installation of a service road, however, redevelopment in the area has resulted in the closure of several driveways on M-43 and M-100 and provided for shared and cross access between parking lots.

Industrial

Industrial operations include uses such as manufacturing, assembly and warehousing. Some of the areas designated for industrial operations are existing businesses. Many of these sites are located right at the street front and have outdoor storage. This activity should be controlled through code enforcement and gradually upgraded during site plan review to present an improved appearance along roadways.

New industrial development is concentrated at the northern end of the City in The Grand Ledge Willis Industrial Park. Site design and screening methods should be required to off-set any negative impacts of industrial operations on adjoining residential uses. In addition, a railroad spur should be installed to serve the businesses in the industrial park.

Institutional: Churches, Schools, Public Facilities

Institutional uses provide important services to the community and should be retained. If institutional sites are to be reused, they should be considered for other institutional development. This will ensure that residents will always be provided adequate community facilities.

Although no new parcels are shown for institutional use, there are plans for improvements, relocations and expansions to City owned and operated services. Through capital improvement programming, the City can plan reinvestment of these facilities five to six years in advance. The proposed capital improvement program is contained in a separate section of the document.

Public Open Space/Airport: City and County Parks, Cemeteries

These areas are public sites that should be preserved for the community. The majority of this land is along the Grand River. Preserving views and access along the river has been a tremendous benefit to the community and should continue to be protected. The other unique element to the City's public space is the Abrams Municipal Airport. The airport approach plan and layout plan as approved by the Michigan Aeronautics Commission are incorporated as part of this document. The future use, development, and improvements to the airport should be an integral part of the City's capital improvement programming. The expansion areas for the City cemetery should be prepared for use, as needed.

Similar to the institutional category, no new sites are designated for public open space because there is no available publicly owned land. Providing these facilities for the citizens of Grand Ledge is of paramount importance. Available opportunities include preserved open space areas that is either useable recreation or preserved natural features such as woodlands within Planned Residential Developments. These areas could either be private and maintained by associations or dedicated to the City as public space in the Planned Unit Developments.

ZONING PLAN

The Zoning Ordinance is one of the primary tools used to implement the Master Plan as it provides a guide to how vacant land in the City should develop and certain areas should be redeveloped over time. The Master Plan is a policy document, whereas, the Zoning Ordinance is a legal document that regulates allowable land uses and development requirements in the present. The Regional Future Land Use map, primarily serves as a guide to rezoning land that is annexed into the City.

Section 33 of the Michigan Planning Enabling Act mandates that if a community has adopted a zoning ordinance, a zoning plan describing how the land use categories on the future land use map relate to the districts on the zoning map must be included in the Master Plan. The following table provides a comparison between the land use classifications on the Future Land Use Maps (Maps 3 & 4) and the zoning districts in the Zoning Ordinance.

GRAND LEDGE MASTER PLAN

Table 9: Future Land Use & Zoning District

Future Land Use Designation	Zoning District
Agricultural	Ag, Agricultural District
Single Family Residential	R-LD & R-MD, Single Family Residential Districts
Planned Residential	R-PC, Residential Planned Community
Multiple Family Residential 2+ Units	R-HD, Multiple Family Residential District
Mobile Home Community	MH, Mobile Home District
Central Business District	CBD, Central Business District
Commercial/Highway Services	B-1, Highway Service District
Office	OS, Office Service District
Industrial	I-1, Light Industrial & I-2, Heavy Industrial Districts
Institutional: Churches, Schools, Public Facilities	R-LD & R-MD, Single Family Residential Districts
Public Open Spaces/Airport, City & County Parks, Cemeteries	R-LD & R-MD, Single Family Residential Districts
	Ag, Agricultural District
	I-1, Light Industrial & I-2, Heavy Industrial Districts

The various zoning districts and the uses permitted therein are consistent with the future land use categories contained in the Master Plan. The zoning map is also consistent with the future land use map, with the exception of certain areas that have been identified as being incompatible with surrounding uses. These areas include, but are not limited to, the multiple family residential uses along Grand Manor Drive and various parcels along W. Jefferson Street that contain commercial and quasi-industrial uses.

NATURAL FEATURES

The Master Plan emphasizes the importance of the resource base of the community. Protection of the City’s resources requires the adoption of policies directed toward specific resource problems including drainage, groundwater quality, natural topography, and vegetation. Resource protection regulations can be incorporated in subdivision, zoning, and PUD regulations. Where sites containing significant natural features are proposed for development, clustered development and other innovative site planning methods should be utilized to preserve and protect the natural features of the site.

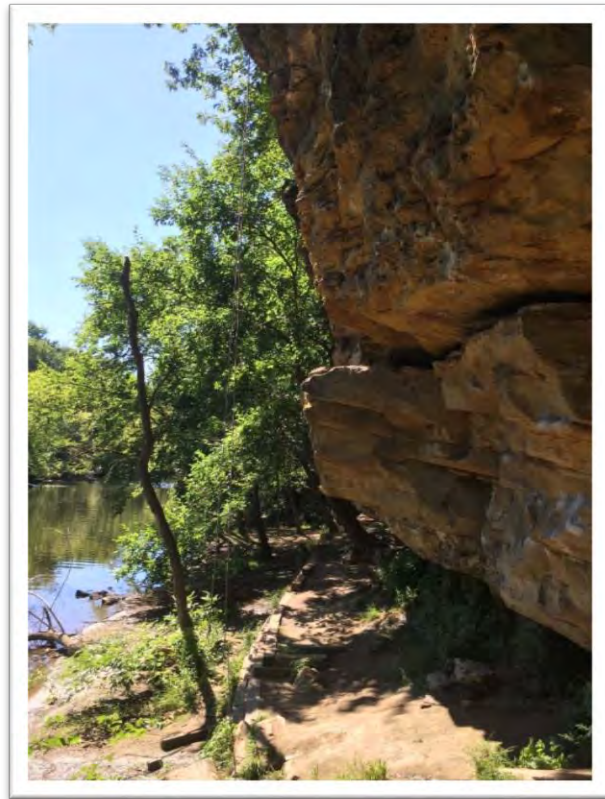
Natural Features Goals

- *Preserve the quality of life in Grand Ledge by retaining significant sensitive amenities within the community.*
- *Encourage integration of natural features such as woodlands and wetlands into site development as aesthetic and functional features while protecting the quality of the features.*
- *Protect the quality of the Grand River and its tributaries while at the same time promoting it as one of the City's greatest assets.*

Natural Features Setback

With the exception of the Grand River, wetlands and other waterways are very limited in the City. However, those that do exist contribute to the aesthetic character of the community and should be incorporated as part of any future development. This will allow the continuance of open and green space as well as contribute to retaining the rural, small-town setting. Maintaining a designated setback will go a long way towards protecting the eco system of any wetlands within the community.

There is a strong basis for this type of requirement. Development surrounding water features, particularly wetlands, affects the function of the water feature. For example, wetlands are dependent upon an interaction between the wetland and the surrounding upland. The upland soil and vegetation surrounding the wetland all affect the amount, the means and the rate at which water enters the wetland following a storm or snow melt. Development of the surrounding upland will alter water flow to the wetland. In other instances, physical improvements such as structures, roads, and storm sewer systems can intercept surface flow to the wetlands. The undisturbed soil between the site improvements and the wetlands acts as a buffer to try to maintain the natural upland/wetland interaction that existed prior to development.



Grand River Protection

The City has gone to great lengths to maintain the natural character and history along its stretch of the Grand River. All of Grand Ledge's beautiful City parks and a county park are located

along the banks of Grand River: Island Park, Jaycee Park, Fitzgerald Field, Riverwalk Park, Fitzgerald Park, and Oak Park. These facilities have allowed ample visual and physical accessibility to the river.

Many components of natural features protection are directly related to the river. The impacts of development throughout the City will slowly make its way to the waterway system. Grand Ledge must continue to emphasize natural features protection in order to prevent future damage to the river. Protection of the river can further be accomplished through the maintenance of open space along the river. As private property develops, there should be a consistent emphasis on the river as an asset to be preserved. Through zoning and PUD regulations, the City can ensure that the Grand River will continue to offer benefits to the community far into the future. A riverfront corridor overlay zoning district could be used to provide these type of regulations, modeled after the MDNR's suggestions.

Seven Islands Dam

The Seven Islands Dam was constructed in 1921 to raise the water level on the Grand River. The dam is approximately 310 feet long, including a fish ladder on the south river bank. The dam consists of two main components: the spillway and a gate structure made up of seven 6-foot wide gates that can be raised or lowered to control the water level behind or upstream of the dam.



A study by ENG. Surveying and Engineering was conducted in November, 2014 to evaluate the condition of the dam and outline various options to address the deteriorating condition of the gates and the ability of the dam to hold back water. The City should develop a plan to fund the implementation of option 3 described study. This option involves removing the dam completely, but maintaining upstream water levels. The dam would be replaced with a series of boulders, channels and pools which would maintain the water elevation upstream and gradually step down to the downstream elevation. This option provides for a more natural river flow.

The advantages to option 3 are:

1. More and better external state and federal financing opportunities (grants)
2. Better water quality and fish passage
3. Better recreational opportunities
4. Removal of the fish ladder

Until such time as option 3 can be implemented, the city should continue to monitor the condition of the dam and make repairs as necessary. In addition, the dam should be inspected at least once every five years by a qualified engineer.

Storm Water Management

For an almost built-out community with more construction planned in the future, one can anticipate additional burden on existing natural drainage systems. Problems with the system may involve localized flooding, environmental damage and costly drainage improvements to be borne by taxpayers. A comprehensive approach to storm water management should be considered which will encourage the preservation of the natural drainage systems of the community. The City should consider creating a storm water management program based on the state's "Best Management Practices" program. The guidelines and policies of this program address sensitive and responsible management of storm water in the City. The City may also consider working with the Eaton County Drain Commissioner's Office and surrounding communities to implement this program as storm water affects a more regional context.

Woodlands

While the City is primarily built-out, there are many sites that remain to be developed or could be redeveloped in the future. Some of the sites contain woodlands and significant trees. The City should regulate the extent of tree clearing and site grading that occurs by requiring an inventory of trees during site plan review and a demonstration that tree were preserved. Also, protection methods should be required during construction to prevent damage.

Fish and Wildlife Habitat

Waterways and natural open space corridors not only provide a benefit for people, they also serve as fish and wildlife habitats. In other words, development immediately adjacent to these areas has an impact on habitat. Protection of the area that lines natural features is also important to wildlife because this is the interface between the aquatic and terrestrial (upland) ecosystems. In Grand Ledge, the primary focus of corridor preservation is on the Grand River.

COMMUNITY FACILITIES AND SERVICES

Community Facilities and Services Goals

- *Provide quality responsive and cost effective services to the community such as prompt response to public inquiries, zoning enforcement, inspections, maintenance of public facilities and roads, recreation, recycling, and waste disposal.*
- *Improve emergency response times through modifications to the transportation to meet the needs of the entire service area.*
- *Continue to improve the park and recreation system, including regular updates of the*

Parks and Recreation Master Plan.

- *Assist with efforts to improve the environment through best management practices for storm water and consideration of environmental impacts on all major capital improvements and municipal operations.*
- *Provide safe quality drinking water and adequate sanitary sewer service through continuous improvements to the system.*

Parks and Recreation

Recommended improvements to the City’s park and recreation system are listed in the 2011 Master Recreation Plan. That document contains a number of recommendations regarding improvements and maintenance to the City’s parks, and is considered a chapter of this Master Plan. Updates to the plan are necessary every four to five years.

City Hall and Police Department

In 2014, The City completed renovations of the former Greenwood Elementary School building at 310 Greenwood Street for use as a city hall, police department, chamber of commerce and, community/senior center. The new facility includes all City administrative offices, a state-of-the-art police department and several community meeting rooms. Indoor and outdoor recreational facilities are also provided. The new facility should be adequate to accommodate the needs of the City for the foreseeable future.

Grand Ledge Area District Library

In 2016/2017, the library constructed a 1,300 square foot addition to the west side of the building. The addition will provide additional customer space as well as an elevator to make the building handicap accessible. Future expansions should also be considered as necessary to accommodate its growing needs. The most practical expansion seems to be from the rear, which would require relocation of all or part of the GTE fenced lot.

Grand Ledge Area Emergency Services Authority Station

To provide faster responses to emergencies and to contribute toward decreasing the Insurance Services Office (ISO) ratings for both the City and Oneida Township, a new station should be constructed south of the bridge. Substantial alterations to improve its functionality should be made to the existing station if it is to remain in use.

Public Services Department

The Public Service Department facility at 13253 Lawson Road should be evaluated for its adequacy and alterations or expansions made as necessary.

Sewer System

Existing sanitary and storm sewer systems should be monitored and upgraded as necessary to ensure compliance with all state environmental regulations. These systems should also be

evaluated to determine if there is adequate capacity to accommodate all existing demands as well as future growth. An overall plan for replacement of older lines should be considered.

Water System

Water lines should be monitored for problems and replacement coordinated with other capital improvements to maximize efficient use of spending. The water system should also be evaluated to determine whether there is adequate capacity for future needs.

Wellhead Protection

The City shall continue to monitor activities occurring near the City's wells to prevent groundwater contamination.

Chapter 4: Transportation Plan

As an established community that is facing potential growth pressures, Grand Ledge must address not only current transportation concerns, but those associated with increased traffic volumes in the future. Similar to land use, traffic volumes in the City are influenced by development patterns in the region, and the amount of through traffic. Thus, the City must look beyond its boundaries and jurisdiction in order to ensure responsible planning. This involves cooperation with the Eaton County Road Commission, the Michigan Department of Transportation (MDOT), and surrounding communities. In the Lansing area, the Tri-County Regional Planning Commission is available to ensure transportation decisions are based on a regional perspective. This Chapter describes improvements to the transportation system that involves small scale “fine tuning”, an increased emphasis on a walkable environment and more ambitious projects.



Grand Ledge’s development pattern has been greatly influenced by the motorized transportation system. The impact of the river crossing, rail line, convergence of two state highways, and nearby I-96 interchanges is clearly evident when one views the land use map. More intense uses have historically clustered near the river crossing or located along the higher volume state trunk lines (M-43 and M-100).

Streets have influenced the character of the City on a smaller scale. The width, continuity (or lack of it), alignment, and design of individual streets affects the types of vehicles that use it, travel patterns, traffic volumes, vehicular speeds, and its overall appearance. Therefore, the City

must also ensure that future road improvements and development do not jeopardize the pedestrian environment and small town atmosphere of the community. This includes not only in the location and design of the streets, but how they relate to existing and future land uses. In addition, this evaluation must be comprehensive looking not just at the street system for vehicles, but also the rail lines, airport, pedestrian circulation, and non-motorized transportation routes.

MOTORIZED TRANSPORTATION

Motorized Transportation Goals

- *Preserve the capacity, level of service, and safety of the road network to support current and future development.*
- *Utilize the roadway as a design element to create a positive image of the community.*
- *Coordinate road improvements with City policies on land use, non-motorized circulation, natural features preservation and provision of community facilities.*

General Motorized Transportation Issues and Recommendations

Street Pattern

Grand Ledge has three basic street system types that typify the time period of their construction. The innermost core developed from the City's first settlement to around 1910 with a grid pattern set at right angles to the river. In the next growth spurt through about 1950, the street pattern changed to a grid skewed at an angle to the original grid. More recent developments have used a curvilinear, or wrap grid, system. In general, the roads, right-of-way widths, and building setbacks have become wider over time. This pattern has created some distinct characteristics in various neighborhoods - more compact development with narrow streets in the more mature neighborhoods, larger lots and setbacks along wider curved streets in the newer subdivisions.

Jurisdiction

Planning for streets is complicated by the various governmental units that have control over decisions on access permits, improvements and maintenance. Though Grand Ledge has jurisdiction over most streets in the City, M-100 and M-43, are under the jurisdiction of the MDOT. In addition, the Eaton County Road Commission has jurisdiction over most of the roads just outside the City limits. Tri-County Regional Planning Commission has the responsibility to help ensure these three agencies coordinate decisions and investments on streets.

M-100 (Hartel Road/Clinton/Jefferson/Bridge Streets) runs generally north-south through the center of the City. M-100 connects M-43 with the downtown, the north side of the river, and crosses the rail line to connect with the airport and an I-96 interchange approximately 2.5 miles north of the City limits. M-43 (Saginaw Highway) runs east- west near the City's south border. Saginaw Highway carries the highest traffic volumes in the City and has become a significant

commercial corridor. Design, traffic operations, and character along those streets produces the image of Grand Ledge for many motorists since those streets carry the highest traffic volumes and are the primary entrances into the City.

The jurisdictional situation along M-100 and M-43 has caused several concerns. Some MDOT projects aimed at reducing crash potential have been in conflict, to some degree, with the City's vision for a "walkable" community with grand entryways, a median along M-43 and a reduction in the number of driveways. In addition to Grand Ledge, Delta Township to the east also envisions a median along M-43 in the future. The Tri-County long range plan does not currently identify this project.

Cooperation between the City, MDOT, and Eaton County Road Commission can help ensure that the goals of each are being considered with street and pathway projects. The Michigan Municipal Planning Act states that no street shall be constructed in conflict with City's adopted master plan unless approved by the City's Planning Commission. The Planning Commission decision can only be overturned by a 2/3 vote of the City Council (for City streets) or Michigan Transportation Commission (for state trunk lines). Communication early during project development can help ensure the type of cooperation envisioned in the Planning Act.

Cooperative ventures could increase the likelihood for the City to receive funding assistance through MDOT's discretionary funds to help implement recommendations in this plan for street and pathway improvements.

Street Maintenance

Street maintenance is generally the most significant cost to maintaining and improving the City infrastructure. Many City streets are in need of repair and/or resurfacing. The Public Services Department selects certain streets each year for resurfacing based on the condition of the streets and budget constraints. The City should focus on maintaining roads that are already in good shape while continuing to repair and reconstruct roads that are in a state of disrepair. The City should develop a plan to hard-surface all unpaved public streets.

Pedestrian Comfort and Safety

The small town character of Grand Ledge makes it very inviting to those who choose not to drive but rather walk or ride a bike. It is important, therefore, that amenities and safety provisions are in place to accommodate pedestrians.

The City should continue to improve its non-motorized transportation system by:

- Reducing street widths.
- Expanding the City's non-motorized pathway system including extending the riverwalk to Fitzgerald Park.
- Improving existing sidewalk and installing new sidewalk where it currently does not exist.

- Obtaining a study of the Jefferson/Bridge street intersection to determine what modifications would be necessary to increase pedestrian safety at that location, including curb bump outs and alternate pedestrian signal phasing.

Specific Transportation Issues and Recommended Improvements

Map 5 graphically identifies the key transportation issues and locations in the community. The following text directly corresponds to the items listed on this map. Following this map is Map 6 which illustrates some recommendations best represented by a map. Issues and recommendations are discussed below and are based on the above listed motorized transportation goals, with due consideration to the other community goals outlined in this plan.

It should be noted that a traffic operations analysis should be completed before implementation of any of the following recommendations to ensure that traffic and safety requirements are met.

Aesthetics Issues at City Entrances

Strong physical features should be provided at key entrance points to the community to alert motorists they are entering the City. This will accomplish a number of positive objectives. Entrance features will make a positive statement about the community character for visitors and residents as they enter. For motorists traveling through the City along major corridors it will signify the entrance to the community and differentiate the City from other communities located along that route. Providing entrance features to the community may also stimulate the economy and activity in the City as it can help guide motorists to downtown shopping, parks, and neighborhoods.

The key entrance points are identified on the map and include along M-43, M-100/Hartel Road and at West Jefferson. Entrances located along the key corridors should include landscaping and signage. The proposed median will assist in accomplishing a dramatic recognition of the community along M-43. Signage at the M-100/M-43 intersection and at M-100 to the north should include direction to the CBD. More subtle landscaping and signage that exemplifies the residential character of the community should be installed on West Jefferson Street.

Railroad Crossing Delays

Numerous trains each day along the CSX rail line (formerly Pere Marquette Railroad) that intersects M-100 near the north side of town are an impediment to traffic circulation through Grand Ledge. Rail activity at this single grade crossing not only produces long and inconvenient delays for motorists, it can also compromise emergency response service from the Grand Ledge fire, police, and EMS. Vehicles waiting for trains to pass can back-up as far south as the fire station, blocking its driveway. Alternative routes are limited for some distance away. An additional river crossing in closer proximity to Grand Ledge would relieve some of the traffic and provide an alternate route for traffic.

Vehicular Bridge

Bridge Street provides the only crossing of the Grand River within the City and nearby areas. This single crossing results in a large volume of traffic through the downtown and limits the options for emergency response vehicles.

A second river crossing has been discussed on numerous occasions as a viable consideration to evaluate. The future road improvement maps identify two possible locations to consider; one at Nixon Road and the other at Broadbent Road. The most viable option is an extension of Broadbent Road connecting Willow Highway to Eaton Highway.

Traffic Calming

Vehicular speeds through downtown and throughout the community have become a concern. Map 5 identifies two main focus areas - item number 5 at West Jefferson and item number 8 - along Bridge Street in downtown. This segment, however, addresses traffic calming concern throughout the entire community.

Community-Wide Action

Historically, a primary goal of traffic engineering was to provide an efficient, fast, and safe movement of traffic through the road network. As areas develop and traffic volumes increase, fast and efficient roadway design in neighborhoods contributes to problems related to cut-through traffic, especially when the adjacent arterial streets become congested and motorists begin seeking alternate routes. In order to alleviate these traffic problems, traffic calming measures can be employed, particularly in residential neighborhoods.

The Institute of Transportation Engineers defines traffic calming as “the combination of mainly physical measures that reduce the negative effects of motor vehicle use, alter driver behavior and improve conditions for non-motorized street users.” Traffic calming measures are both regulatory features and/or design of a street that causes drivers to slow-down and be more attentive. Traffic calming is a way to visually and physically reduce speeding in residential areas. The physical change is in the road parameters and the psychological change is the “feel” of the driving. The intent is that this reduction in speed will reduce crashes, air pollution, congestion levels, noise pollution, and generally improve the environment of the street. Some of the most desirable traffic calming devices are as follows:

- **Street narrowing, slow points, or chokers** include curb bump-outs, channelization, and landscaping features that narrow the street to a minimum safe width. They are often installed at intersections to reduce speed and/or redirect traffic. They provide for larger areas for landscaping, enhance the neighborhood, facilitate loading and unloading and reduce the distance for pedestrians to cross the streets.
- **Angle points or chicanes** are curbed horizontal deflections in the path of vehicle travel. They are built along the edge of travel-way similar to street narrowing treatments. They

use physical obstacles and parking bays, and are staggered so drivers must slowdown in order to maneuver through the street. Trees are often used at the slow point to restrict driver vision and create a feeling of a “closed” street.

- **Median slow points or channelization** include center located islands that divides the opposing travel lanes at intersections or at mid-blocks, pedestrian refuge treatments and the other standard forms of intersection traffic control islands. These are aimed at reducing speeds while enhancing the pedestrian crossing points and safety.
- **Intersection diverters** are features that partially close an intersection to limit the allowable turning movements and divert traffic. They are used to convert an intersection into two unconnected streets, each making a sharp turn. This alters traffic flow patterns and limits the ability of vehicles to cut-through residential neighborhoods.
- **Street closures** are highly constrictive and affect the network traffic flow by eliminating neighborhood traffic from cutting-through.
- **Getaways or perimeter treatments** are visual and physical treatments used to communicate a message to drivers entering residential neighborhood. Traffic signs, intersection narrowing, medians, textured pavement surfaces such as brick and landscaping features are often used to create this effect. Entry treatments are used to increase driver awareness to changes in roadway environment.

Traffic Calming on the Bridge

Traffic speeds must be specifically addressed in the downtown in order to ensure a safe pedestrian environment and to stimulate activity and exposure for the businesses. To that end, the recommendations of the 2006 traffic calming study should continue to be implemented in coordination with MDOT. The specific recommendations of the 2006 traffic study included a reduction in the number of lanes on Bridge and Jefferson Streets, which has been accomplished, on-street pathways, curb bump-outs at certain intersections and parallel parking on the bridge.

A lane of on-street parking may act as a “visual obstacle” and cause drivers to decrease their speeds. On-street parking also creates a buffer between the sidewalk and the street, having the potential to improve pedestrian safety for those walking across the bridge or watching a baseball game.

Effective Implementation

Implementing a traffic clamming program should consider the following:

- Traffic calming measures should be looked at from an area-wide traffic calming

prospective.

- Traffic calming measures should be used as speed controls rather than volume controls to prevent the diversion of through-traffic to parallel residential streets.
- It is important to highlight the presence of traffic calming measures by landscaping and treating the street edges. These measures complement the engineering design by softening the appearance of speed humps and enhancing the appearance of more aesthetic measures such as chicanes and traffic circles. Also, landscaping measures can enhance engineering measures and make them more effective and safer by highlighting their presence.
- Traffic calming devices should be designed in coordination with emergency services to ensure that safe emergency vehicle access is maintained to all areas. Details such as mountable curbs and gutters can often help resolve the problem.
- A risk management program should be implemented to minimize liability issues through proper design, signage, and lighting of traffic calming devices.

Due to the predominance of residential neighborhoods in the community, the City could turn to the residents to assist in effective traffic calming. The most effective method applied in other communities begins and ends with community involvement. By forming a “Citizens Traffic Committee” the neighborhood creates an organized forum to identify, discuss and resolve traffic speed problems. The components and process the committee should follow is listed below:

1. Problem Identification: Isolate and establish the real problems and dangers.
2. Education: Public campaigns on traffic speed calming can “spread the word” and raise awareness about the issue. This could also involve a neighborhood speed watch program where residents work with the police department to control speeds.
3. Enforcement: If the citizen’s committee worked with the police department, this organized group may have better luck enforcing speeds in this neighborhood.
4. Engineering: If community education policies do not prove to be effective, traffic management tools should be evaluated. These include traffic control devices, traffic calming methods, and roadway markings.

Access Management Issues

Within the community and along the major corridors, access management should continue to be improved. The goal of access management is to provide standards which will facilitate through

traffic operations and improve public safety along major roadways. The access guidelines have two functions: 1) to protect the public investment in the roadway by minimizing congestion and accident potential; and 2) providing property owners with reasonable, though not always direct, access.

Community-Wide Access Management

The City should continue to carefully evaluate the number and placement of driveways in relation to intersections and other driveways throughout the community. Fewer and better spaced driveways will preserve the capacity of the streets and reduce the potential for crashes.

Specific recommendations for traffic management along M-43 are discussed in greater detail in the subarea plan. Essentially, a newly constructed and designed median discussed would create a new and improved environment for access management. The location of the proposed median is noted as item “D” on Map 6.

Truck Traffic in the Downtown Area

Although not perceived as an industrial town, there are two substantial industrial areas at the west and northeast sides of Grand Ledge. These areas require deliveries and pickups from large trucks, and therefore generate daily truck traffic in the downtown area. The majority of this truck traffic enters the City via M-43 (onto M-100 or West Jefferson Street) or M-100 from either the north or south side of town. Trucks often travel through the center of the CBD since Bridge Street offers the most convenient crossing of the Grand River. While recent improvements to the geometrics of the Bridge Street/Jefferson Street intersection have improved turning movements, heavy truck traffic and high speeds continue to create hazards for pedestrians. An alternative crossing of the Grand River would help to reduce the amount of truck traffic in the downtown making it a more inviting atmosphere for pedestrians.

City Street Master Plan

The following are the recommended locations for road extensions that have been prepared as part of the City of Grand Ledge Street Master Plan and are represented on Map 6.

Connect Tallman Road to M-100

A road connection should be constructed along the north line of Meadow Woods Subdivision connecting Tallman Road to M-100. The intent of this road is to provide an alternative traffic route for existing and future development in the West Main Street/Tallman Road area. The proposed road would be designed to alleviate traffic from primarily West Main Street and also Tallman Road. This road and the extension of Eaton Highway described below would be designed in a manner that would not adversely affect the operations at the grain elevator to the north.

Extend Eaton Highway to Tallman Road

Eaton Highway should be extended west to Tallman Road. The intent of this road is to provide an alternative traffic route from Tallman Road to M-100. Currently, a driver trying to get from

Tallman Road to M-100 would need to either take Tallman Road north to State Road or take West Main Street into the City. If the property north of Meadow Woods Subdivision develops, this road would provide a traffic route to M-100 that would not only be more convenient for the future residents of that area; but would also relieve traffic from Tallman Road, State Road and West Main Street.

South Access Road

An access road should be established running parallel with M-43 that extends east from Hartel Road/M-100 to the City limits. The northern boundary of the easement should be 660 feet south of the centerline of M-43. The road should turn north to M-43 to create a four-way intersection with Charlevoix Drive. The easement should be 66 feet wide and serve as an east-west transportation utility corridor.

New Road from M-100 to Fieldview Drive

Access to M-100 for the parcel directly east of Woodview Estates should align with Fieldview Drive.

New Road from School Property to M-43

A new road should be constructed connecting Jenne Street to M-43, through the school property, to align with Old Saginaw highway. A signalized intersection at the new road and Old Saginaw Highway would mitigate safety concerns regarding limited sight lines for turning movements at this location. Another option is to align a new road through the school property with an entrance into the commercially zoned parcel of land just west of where Old Saginaw Highway connects to M-43.

NON-MOTORIZED TRANSPORTATION

Non-Motorized Goals

- *Continue to provide and expand a comprehensive, multi-modal pathway system throughout the community that promotes walkability as well as accessibility for non-motorized traffic.*
- *Ensure that facilities are designed to be safe and accommodate a variety of intended.*
- *Increase accessibility through the City by utilizing pathways to link various points of interest within the community.*
- *Promote the development of new facilities as well as integrated facilities within the developed portions of the community as appropriate.*

Non-motorized circulation throughout a community provides enormous benefits to residents from a social, economic, and environmental perspective that improves the quality of life within the community. These benefits include:

- An alternative to automobiles so traffic volumes can be reduced.
- Improved accessibility to schools, churches, the library and others public or institutional uses.
- Designation of specific areas for non-motorized travel can improve safety since it separates bicyclists (especially the younger and casual bicyclists) from vehicular travel lanes.
- Increased public access to natural features such as the Grand River, woodlands, and wetlands. This will heighten awareness and preservation of sensitive resources.
- Increased access to the river and riverfront parks improves opportunities for recreation.
- Affordable, year round active recreation available to all age groups that improves community health, family togetherness, and neighborhood cohesion.
- Contributions to economic development efforts in the downtown and along other business corridors.
- Improves the value of property situated along the pathway.

The City continues to implement a comprehensive sidewalk and non-motorized pathway system throughout the community. The system is well used by City residents but there remains a number of gaps in the system, particularly along M-43, and expansions are needed to reach newer development on the outskirts of town. In some areas, the pathways are not wide enough to accommodate the higher pedestrian traffic volumes and road crossings are not well marked for safety.

Implement Non-Motorized Pathways Plan

A pathway plan is included as part of this document. There are four significant features to the Plan:

1. Pathways are planned along the following roadways.
 - a. M-100/Clinton Street/Hartel Road
 - b. North and South Bridge Street
 - c. Saginaw Highway
2. A pathway connection is proposed to connect West Jefferson Street through Fitzgerald Park and across the river to Lincoln Brick Park.

3. The riverwalk should be extended from Island Park along the south bank of the river to Fitzgerald Park.



4. A non-motorized bridge connecting South Clinton Street to North Clinton Street would provide a safe location for pedestrians to cross the river without having

to mix with the heavy vehicular traffic that is present in the downtown. A pedestrian bridge at M-100 would also provide another means of connectivity between the north and south sides of the bridge and greater opportunities to expand the City's non-motorized transportation system.

Sidewalk Program

The City should continue to repair, replace, and install new sidewalks as necessary, throughout the City. In accordance with City ordinance, sidewalk is required to be provided along all public street frontages as new development occurs. The gaps in the sidewalk system along M-43 will continue to close as new development or redevelopment occurs.



Additional Recommendations

More consideration must be given towards the design of pedestrian crosswalks to ensure the safety of the pedestrian. This includes pedestrian signals and enough space for pedestrians to stand a safe distance from moving traffic. Pavement should be striped or treated in some way that will alert motorists of common pedestrian crossing areas. Finally, at

larger intersections where pedestrians have to cross four or more lanes of traffic, the sidewalk should project out as much as possible at the corners to decrease the length of the walk.

Funding

Various sources of funding should be explored to implement construction of the pathways. MDOT administers a federal grant program called Transportation Equity Act for the 21st century. This program funds projects that are related to the enhancement and development of transportation facilities such as non-motorized pathways, streetscape, and landscape improvements and historic preservation of transportation related facilities. Finally, the City can assist in funding pathway improvements by incorporating it into the general fiscal year budget through existing revenues, a bond issue or possible special millage.

Coordination

In order to ensure the pathway system is comprehensive, the City must continue to coordinate with neighboring communities such as Delta and Oneida Township to provide pathway connections. There are also many regional efforts to link pathways. The City should support these agencies and organizations by getting involved in their plans and initiatives. For example, in the future if the railroad becomes abandoned, the City and surrounding townships may be in a position to acquire the right-of-way for pathway connections.

Chapter 5: Subarea Plans



The subarea component of the Master Plan offers specific guidance and recommendations on how to achieve the goals for certain areas within the City. The overall intent is to establish strategies and policies which ensure these areas develop in a manner consistent with the unique character of the City of Grand Ledge.



These areas are the residential neighborhoods, Saginaw Highway/M-43 Corridor and the CBD. The residential component embodies all residential areas within the city. Project limits for the corridor discussion is bound to the west where Saginaw Highway and the State Highway Bypass split off and to the east by the city limits at Charlevoix Drive. This is primarily a regional commercial corridor serving motorists traveling through the City at this point. The CBD boundaries are along Bridge Street between North Clinton Street and Lincoln Street.

NEIGHBORHOOD DEVELOPMENT

Neighborhoods are a critical component of the overall community. In the City of Grand Ledge, single family and multiple family residential development can be categorized into three types: the National Register historic district, the traditional neighborhoods, and the newer subdivisions. Although each possesses its own attributes, as neighborhoods within the City, the overall goals are the similar.

Neighborhood Development Goals

- *Preserve the historic, small-town character of the existing neighborhoods.*
- *Ensure new residential development creates neighborhoods that embody sound community design and are consistent with the traditional character of the community.*
- *Promote neighborhoods that possess their own unique and definable sense of identity*

while also being integral parts of the community.

- *Provide connections to safe locations within each neighborhood for recreation.*
- *Ensure property land use transitions between commercial and residential uses.*
- *Ensure in-fill development has compatible design with neighborhood architecture and character.*
- *Provide a well-balanced, sound and diverse mixture of housing types, opportunities, and prices in the City.*

Neighborhood Planning Framework

As described previously in the document, Grand Ledge is characterized primarily by stable traditional neighborhoods that offer a variety of housing options with sidewalks, street trees, neighborhood parks and schools, historic architecture, and inviting front porches. These elements, among others, have contributed to a strong sense of community for residents. This subarea plan includes all areas that provide housing for the City’s residents ranging from large historic homes near downtown to affordable manufactured housing. The plan also addresses multiple family housing.

A majority of the areas designated for residential on the future land use map are established neighborhoods that possess the predominant characteristics described above. The neighborhoods concentrated around the core of the City are part of the grid pattern street network and possess many attributes that define it as the traditional neighborhoods. Directly adjacent to the CBD is a smaller neighborhood area about seven blocks long and three blocks deep that is on the National Register of Historic Places, and is considered the historic neighborhood. Regardless of official designations, both areas possess many important elements that define the traditional, small-town character of the City. Preserving the character of these areas is of utmost importance to the citizens of Grand Ledge. Therefore, they should be preserved and protected in the future as the City changes and develops.

In addition to the established, historic neighborhoods, Grand Ledge has experienced newer “suburban” style residential development on the outskirts of the City. These developments are distinguishable from the older neighborhoods because the roads are designed with a wider cross section, are curvilinear, have longer block faces, and use cul-de-sacs to maximize development of the land. The homes in these developments possess modern architecture and have attached two-car garages. Lot dimensions are somewhat similar however, the new neighborhoods tend to have a larger width to accommodate the two-car garage and driveway.

Neighborhood Design

Although the majority of the City is built-out, there are some larger parcels that have the potential for residential redevelopment. These sites should be developed in a manner which is

consistent with the traditional neighborhood character of the established residential areas but should also possess the modern amenities of the new developments.

As the predominant land use within the City, the residential neighborhoods should be developed and redeveloped in a manner which is consistent with the surrounding character of the area. As mentioned above, there are three categories (historic, traditional and suburban) that describe single family and multiple family neighborhoods that must be considered. Regulations must be developed that will guide the design and layout of these areas. These regulations should apply to both single family and multiple family projects located in the three types of neighborhoods. All attributes and design considerations listed below should be included in the regulations. There are a few considerations that area specific to multiple family residential that are described separately.

Architecture

Residential structures should have curb appeal that creates a friendly environment and promotes interaction between neighbors. The dominant feature as viewed from the street should be the entryway to the home through design features such as a front porch, front walkway, and living area. Garages and garage doors should not dominate the front façade of the home. To prevent this dominance, garages should be recessed, or setback, from the front building line or should be side or rear entry so that the doors are not directly visible from the street. In keeping with the historic character of the neighborhood, detached garages located to the rear of the lot are encouraged.

Building materials should be high quality such as brick, carved stone or wood siding. For in-fill development and renovations, the use and type of materials must possess the high quality elements of adjacent housing. The intent is to ensure new construction is compatible with the existing neighborhood. New residential development should attempt to preserve historic characteristics and at the same time, work to achieve its own unique design theme.

Lot sizes/width

Residential development is recommended throughout the City in the future land use map at varying densities. It is permitted under the three land use designations: single family, multiple family and planned residential. These densities are consistent with existing development and with the intended character of the particular area. The typical minimum lot size for single family development throughout the City is 8,450 square feet, which translates to a lot width of approximately 65 feet. Lot sizes, widths and required setbacks within the single family districts allow for “close-knit:”, yet comfortable spacing between homes. For new single-family development on large tracts of land on the outskirts of the city, these same densities and dimensions should continue in order to perpetuate and enhance the existing traditional neighborhood atmosphere. The Zoning Ordinance has been amended to permit higher density single family residential development (smaller single family dwellings on reduced lot sizes) to accommodate the needs of empty nesters, retirees, young professionals and other segments of the population that desire to own rather than rent their homes without having to maintain a 1,400

square foot minimum home size on an 8,450 square foot lot as previously required under the current Zoning Ordinance.

Multiple family housing includes townhouses, apartments, duplexes, and senior housing. The density of these developments is currently based upon the number of total rooms proposed and the acreage of the site. Planned densities are a minimum of 6 units per acre and no greater than 15 units per acre for stacked flats. The lower density multiple family developments are encouraged to be townhouse style housing with each having an individual entrance to the units. Higher density development may be townhouse style as well, but more likely apartments to increase the number of units.

Neighborhood Parks

Neighborhood parks are a key design element to any quality neighborhood. These can take the form of a public park, a school playground, or a common area held by a subdivision or condominium association. The City should pursue opportunities to create pocket parks or small open space areas within established neighborhoods where accessibility of green space is not currently available. Further, as new residential projects develop, neighborhood parks and open space areas should be required to accommodate the increased demand created by new residents. These parks may either be public and dedicated to the City, or the developer may maintain the land as private under the control and ownership of an association.

Sidewalks/Pathways

Neighborhoods need an integrated pedestrian circulation system which conveniently and safely links residents to other neighborhoods, public gathering places and other key destination points within the City. Currently, the City strictly follows a yearly sidewalk replacement and construction program for the existing system. As new residential development is proposed, the City should ensure that sidewalks are provided throughout the neighborhoods. Additionally, it is important to ensure that appropriate connections are made to adjacent sidewalk and pathway systems and to key, nearby destinations. Pathways and sidewalks should be enhanced by abutting green space and street trees.

Street Lighting

In order to promote activity in the neighborhoods and to establish a safe environment for residents, street lighting should be provided along roadways and sidewalks. Ideally, the lighting should be decorative to ensure consistency with the neighborhood. In some instances, such as intersections, a more powerful light fixture may be more appropriate. Lighting should be reasonably spaced and should by no means negatively impact nearby sites or motorists driving along the road.

Street Design

A traditional street cross-section should be applied throughout the community. This consists of concrete curb and gutter and not excessively wide pavement which accomplishes on-street parking. Streets should be designed to keep speeds and volumes low. Methods to accomplish this

goal include maintaining a narrow pavement with, creating short block faces and accommodating some curves in the road. The use of stop signs should be avoided. Additionally, streets should be interconnecting and provide ample and safe access to the existing network. Where a vehicular connection is not possible, a pedestrian link should be provided.

Streetscape Design

Design feature within the streetscape such as street trees between the sidewalk and curb can also be used to alert a driver to slow down. Streetscape elements also establish the roadway as a design feature and not just an impervious surface for vehicles. Street trees should be provided within a 5'-8' curb lawn area between the street and the sidewalk. Street trees should generally be spaced 30 to 40 feet along the road.

Landmarks

Landmarks are features that create a distinct neighborhood identifier or focal point. Many of the existing neighborhoods possess a landmark and all new development should incorporate such a feature. They can be in the form of natural plantings such as trees and flowers, or a man-made feature such as a sculpture or a fountain situated in a neighborhood park or public gathering area. Often times the landmark feature is a building such as a school or a church. Landmarks provide a sense of place at key locations and create visual focal points by which people can identify. Landmarks can also provide a sense of arrival and identity to a neighborhood.

Walkability

The design and density of new residential development should be at a walkable scale. The actual size of a defined neighborhood should be a reasonable walking distance of ½ mile across. There should be a neighborhood such as a park or school. Residential uses need to be within walkable distance to some form of recreation, civic and/or shopping opportunity to maintain this sense of a “walkable community”.

Blocks

As key aspect of maintaining physical connections throughout the community is an interconnected series of streets and blocks. While new streets do not necessarily need to follow a rigid grid pattern, at a minimum, maintaining street connections should be provided. These links are vital to shortening driving and walking distance within the community. The typical suburban street design element of cul-de-sacs contributes to creating isolated neighborhoods and interruptions of traffic patterns and should, therefore, be avoided.

Signs

Older platted subdivisions within the City have individual names, but are fully integrated into the overall network and do not have any type of signage to delineate their boundary. On the contrary, most subdivisions developed in other communities during the mid 1900's up to the present day have been designed to be separate entities, thereby creating the desire for separate identification. This was not only accomplished through disconnected road systems, it was also perpetuated by the use of subdivision names. Residents no longer referred to their place of residence by the

street name, it was by the subdivision name. The concept is not consistent with the traditional neighborhood design of the community within the core City. Single family residential development within this area should not be provided signs. Multiple family development may provide a sign, however, it must be subtle and low to the ground with planting beds. Illumination of the sign should not be permitted unless the light serves to identify the entrance to the development for motorists. Signs may also be allowed in single family developments located along the outskirts of the City where there is existing “suburban style” neighborhoods. Again, the signage must be subtle.

HISTORIC NEIGHBORHOOD DISTRICT

Within the existing traditional neighborhood framework, there is a segment that is listed on the National Register of Historic Places. The site is seven blocks in length and three blocks deep, less the CBD and a few other properties. The three main roads which home front on are W. Jefferson, Scott and Lincoln. It extends to the southeast to Franklin and to the northwest to Maple.



Establishing local regulations should be considered in this area, if not a great boundary, to control development in this area. This may be accomplished through the establishment of a local Historic Preservation District under the guidelines of Michigan P.A. 213, 1957 and P.A. 169 of 1970, as amended.

The purpose of a Historic Preservation Commission is typically to assist the local body of government in the preservation, protection, enhancement, rehabilitation, reconstruction, or use of historic structures, buildings, site, or areas in the community, and to educate residents regarding the importance of such historic preservation.

To begin with, the legislative body of the local unit of government must first adopt policies and processes relating to historic preservation and create a Historic Preservation Commission to oversee the procedures.

The first step towards adopting such policies is to appoint a historic district study committee to assess the historical merit of portions of the community or community as a whole. In particular, the primary responsibilities of the study committee is to inventory proposed districts, evaluate the significance of existing historic resources based upon the criteria used for inclusion of resources in the National Register of Historic Places, and prepare related summary reports and recommendations for the legislative body of the local units of government.

If the recommendations determine that a historic district or districts are warranted, the final report shall include a draft of the proposed ordinance language defining the membership, qualifications, functions, duties, and duration of appointment of historic commission members. The ordinance shall also delineate boundaries for each proposed district and historical significance of each district as a whole and shall provide for review of alterations of buildings and structures, based upon state rehabilitation standards and guidelines, through Certificates of Appropriateness.

Upon adoption of the local historic preservation ordinance, a historic district commission shall be established and included member with demonstrated interest or knowledge of historic preservation. Upon appointment, historic commission members shall educate and inform on historic preservation issues, review applications for any changes to the exterior appearance or interior arrangement of any resources within a historic district and provide input to government entities on historic preservation issues.

The City shall seek guidance and support for the long established Historic Society which is active in all aspects in the heritage of the community and the historical significance of sites and buildings within the community. The non-governmental organization is 200 members strong and is headed by an appointed ten member board. The Society's activities include creation and operation of the museum and maintenance of the historic archives in the library. The Society also sponsors civic functions and serves as an information advisory role to public officials on matters related to historical preservation in the community.

Multiple Family Residential

The design elements described above for neighborhood developments apply to both single and multiple family developments. However, there are a few recommendations that are only applicable to multiple family or high density housing to ensure they are quality developments and are consistent with the traditional character of the City.

Building Orientation/Space

Multiple family housing is typically a more massive building than single family housing. Therefore, buildings should be set back from the roadway slightly more than a single family home. However, if the structure emulates the scale of a single family home through the use of

front porches or stoops, peaked rooflines and a maximum of two stories, similar setbacks are appropriate. In either case, the entrances should be oriented to the street, providing a sidewalk connection to the right-of-way. For developments which include multiple buildings, the spacing of the structures should be directly related to their size, the acreage of the site and the natural features on the property. Ideally, they should be fairly well spaced. In an attempt to preserve natural features, however, closer spacing may be acceptable.

Open Space

Open space must be provided to adequately serve the recreational needs of the additional population. The required amount of open space must be based on the number of units or rooms in the development. Preservation and protection of natural features is encouraged whenever possible, however, a portion of the open space must be determined to be usable for recreation.

Parking

Multiple family developments commonly provide parking areas for guests and residents. These areas must be appropriately located so as not to be directly visible from the street. Where they are located abutting single family residential, enhanced screening is necessary to offset impacts of noise and lighting. For developments that provide garages for the units, the same design guidelines would be applied as described above which states that garages must not dominate the front façade of the structure as it is viewed from the roadway.

Landscaping/Screening

Although traditional design supports the mixture of uses, there are some instances where screening is appropriate. As discussed above, parking areas and dumpsters should be screened from view of the street and adjacent uses. Sensitivity should be given to nearby single family residential development. Although compatibility is encouraged, there are some instances where the two uses should be buffered in some manner.

Senior Housing Options

The demographic information analyzed in Chapter 2 indicates a large percentage of the population in 2010 is over the age of 65. This percentage has only slightly increased since the 2000 Census. While there is senior citizen housing in the City of Grand Ledge (Serenity Place, Independence Village, Maguire Senior Apartments), it is clear the City must consider more housing options for seniors. Many reasons support this recommendation, the primary motivation being that residents do not want their parents and grandparents to be forced to move out of the community in order to find proper housing. This includes the provision of medium density, single family residential condominium development that allows seniors, as well as other segments of the population to continue as home owners but with less maintenance due to smaller lot and house sizes. Currently, the basic facilities are covered as required by law and are described below. However, there are new trends that have expanded the market for senior housing options that should be considered and accommodated in the Zoning Ordinance.

Adult Foster Care

Currently, the City accommodates state regulated adult foster care facilities in some fashion in a majority of the zoning districts. By this, they are accommodating residential facilities for seniors that are primarily independent but required some medical assistance or simply prefer daily assistance with household activities such as cooking. These facilities range in size from a traditional home environment of six (6) people to congregate facilities of twenty (20) or more. The intent of these facilities is to provide a “group home” environment where facilities are shared by all residents to a certain extent.

Nursing Homes

A few of the districts allow state licensed nursing homes which are facilities for seniors significantly more dependent and require more intensive assistance both medically and in daily activities. These facilities function similar to a hospital where around-the-clock medical assistance is provided.

Recent Trends

Recent trends have expanded the market and offer seniors a variety of housing options that vary in not only the extent of the services offered but also the amenities. This newly created market, coupled with high demand and a strong economy, has developed fierce competition amongst the senior living development community. This has been a benefit for communities because they are seeing higher quality senior living facilities for their current residents as well as future residents.

SAGINAW HIGHWAY



Saginaw Highway, also called M-43, is a state trunk line that functions as the “front door” of the community. This corridor has slowly developed into a thriving regional commercial center for the area. Generally, recent development has produced quality architecture, landscaping and site design. However, further analysis of the corridor reveals that it is missing cohesive elements and the necessary strong visual statement that is needed as one enters Grand Ledge.

Through the recommendations contained in this plan and the commitment of the City, both private and public investment can provide the catalyst to turn this gateway into a positive announcement and welcome into the City.

Saginaw Highway Corridor Goals

- *Limit the number of access points and carefully manage their spacing and placement to preserve street capacity, reduce crash potential, and improve the environment for non-motorized travel.*
- *Ensure new construction and building renovations are harmonious with the established “character” of Grand Ledge.*
- *Maintain strong visual relationships and continuity between the building, the site, and adjacent development.*
- *Commit to enhancing the environment for safe pedestrian movement from within the City and along the corridor.*
- *Construct service drives to allow travel between uses outside of M-43 and increase motorists safety and convenience.*
- *Upgrade new and existing sites with additional landscaping to provide screening, buffering, circulation and site enhancements.*

Development patterns and building placement along Saginaw Highway and South Clinton Street need to be sensitive and complimentary to the overall character of this area of the City. The corridor should not be “suburbanized” with excessive building setbacks and large front parking lots. Excessive building setbacks create an impersonal atmosphere, overemphasized reliance on the automobile, diminish pedestrian activity and produce sterile, unattractive environments. Development in this area needs to relate to the identity of the rest of the community.

Signs

Signs are an aspect of site design which has a major effect on the streetscape. While having adequate signage to advertise and draw customers is important for the viability of a business, uncontrolled proliferation of large, unattractive signs not only degrades the appearance of the community, but also distracts motorists. The City should continue to require the use of monument signs to minimize the negative effects created by large signs that compete for attention. Sign materials and color should match the building materials.

Landscaping

Development should maximize the amount of green through street trees and plantings, landscape parking lot setbacks, providing trees within parking lots, and discouraging large and uninterrupted pavement areas. As new development or redevelopment occurs, parking lot

greenbelt buffers for parking areas between the road and building area are needed. A greenbelt may include berms, hedge rows, and street trees.

In addition to walls, the city should promote the use of landscaping to help buffer residential areas from non-residential uses. The intensity of landscaping should be related to the potential for land use conflict. A combination of preserving existing trees, new landscaping, and walls should be required.

Architecture

Because this area serves as the primary entrance to the community, commercial architecture is of vital importance. The development of franchise commercial tends to homogenize communities and increase a lack of unique identity.

Building architecture is a key component of good site design. Quality architecture can help ensure that a building/use is compatible with surrounding uses and can help protect the investment of adjacent landowners.

Building shapes such as peaked roof lines, archways, and other treatments should be used to provide variety while complementing the existing buildings in the area. Brick with traditional windows are preferred for most commercial, office, and industrial buildings. Concrete block, aluminum siding, dry-vit, and metal panels should be discouraged. Building walls over 100 feet in length should be broken up with varying building lines, architectural accents, and trees.

Lighting

To minimize conflicts between commercial site lighting and adjacent residential areas, special consideration needs to be given to the site lighting plan. The height and intensity of light fixtures need to be minimized. Special attention should be paid to the location and orientation of light location, in relationship to nearby residences. Areas of the site which require more intense lighting, such as parking lots, should be physically located on the site to minimize the impacts of lighting.

Access Management

Saginaw Highway is a critical roadway for traffic. The lack of controls over the number and placement of driveways will increase potential for traffic congestion and crashes. A pattern of closely spaced driveways, which serve individual businesses and homes, will hamper the corridor's ability to accommodate additional traffic without severe congestion. Continued implementation of the City's access management standards will reduce traffic conflicts and preserve the capacity of through-traffic flow.

Service Drives/Shared Access

In addition to recent intersection improvements at M-100 and M-43, the City has begun efforts to alleviate traffic congestion along the corridor through the development of service drives. Charlevoix Drive provides a rear service lane providing road frontage for office development to the north and allows for interconnection of access points for developments that front onto

Saginaw Highway. This allows motorists to access these sites without entering back onto the highway.



The service drive has been so successful, another service drive is planned to run parallel to Saginaw Highway on the southeast side of the road. This will serve a substantial portion of the commercial development along this segment of the corridor. At this point, the only area lacking in plans for connections is the developments on the west side of the intersection. There is a mixture of land uses planned along this segment. Although many of these sites are too shallow for accommodation of a service drive, shared access between parking should be encouraged.

Pedestrian Circulation

As the area develops, pedestrian circulation and non-motorized connections should be accommodated. Consistent with the City’s Non-Motorized Pathway Plan, sidewalks or pathways should be constructed along the Saginaw Highway/M-43 corridor where it does not currently exist. Other sidewalk/pathways connections along the corridor should be provided along existing and planned service drives. Promoting sidewalks along service drives ensures a safer pedestrian environment because it is separated from heavy traffic. To further enhance the benefit of pathways, connections to buildings should be required as well. While there exists an opportunity to connect to adjacent residential neighborhoods, this should also be encouraged.

Identification to Downtown

The downtown area is not identified which causes confusion for visitors unfamiliar to the area as to the core of the community. As a result, motorists pass by without venturing into the City. Better signage should be provided at the M-100/M-43 intersection to enhance way-finding to the downtown area.

CENTRAL BUSINESS DISTRICT

The CBD is the traditional heart of Grand Ledge and provides a strong sense of community for residents and visitors. New residential lofts, parking lot, and building façade improvements over the past decade have provided a renewed sense of vitality to the downtown.



CBD Goals

- *Ensure the economic viability of the downtown through a diversified mixture of complementary commercial, office, residential, and civic uses.*
- *Preserve the historic, small-town character of the downtown.*
- *Maintain and strengthen the “sense of place” which currently exists in the downtown area.*
- *Ensure that renovation of historic buildings in the downtown retains the existing historical and architectural integrity.*
- *Ensure new infill development is compatible with the downtown’s historic architecture, scale, proportion and character.*
- *Ensure proper land use transitions and design treatment between the downtown district and the surrounding residential neighborhoods.*

The CBD possess a mid-western, small-town setting with a variety of land uses, small lots, commercial buildings, built up to the front lot line, and an overall quaint historic appearance. The structures within the downtown are mainly two story buildings, with some buildings one and three stories. The downtown streetscape is characterized by wider sidewalks, pedestrian furniture, formal street trees, ornamental streetlights, and on-street parking.

The CBD generally follows Bridge Street, with the Grand River being the central feature of the downtown. In addition to the elements that define the urban form and character of the downtown, the Grand River and the bridge are key landmarks that help define Grand Ledge as a distinct place.

The downtown is split into two distinct areas that are split by the Grand River. These areas are linked by the bridge which includes pedestrian walkways and ornamental lighting that visually tie the two halves of the downtown together.

Historic Preservation

The CBD contains significant historic, architectural and cultural resources that are a major asset to the community. The Planning Commission needs to carefully consider renovations to older structures in order to ensure that the historic character of these buildings is retained. In addition, development or redevelopment in the district should be designed in keeping with the established building character. In order to ensure consistent enhancements in the future, the City should adopt architectural design guidelines which must be followed by developers to regulate development and redevelopment of property within the area.

Downtown Uses

The desired form of development within the downtown is retail on the first floor, with residential and offices on upper floors. This mixture of uses creates more vitality and strengthens the downtown. While the downtown is relatively small in scale, having some office workers within the downtown helps support the market for commercial uses, particularly restaurants. Redevelopment of some of the currently vacant upper floors of buildings provides an excellent opportunity to introduce additional office space. Upper story apartments and residential neighborhoods within close proximity to the downtown maintain a population within the downtown during evening hours and enhances its vitality. The development of upper story apartments should be encouraged in the downtown.

A mixture of uses should be continued and encouraged. While specific uses will be dictated largely by market factors, the City needs to ensure that a proper mix of uses evolve which are mutually supportive of creating a strong and viable downtown. The City needs to ensure that the physical manifestation of the downtown, including architecture, building height, building location and design of parking areas fosters a cohesive unit that continues to result in a desirable place to live, shop, and work.

Civic Uses

The Post Office and Library bring people and add vitality to the CBD and therefore, these civic uses should remain connected to the downtown area. Criteria should be established to ensure that expansion or redevelopment of these facilities will be compatible with the character of the CBD. For example, the buildings should be located near each other to create a “civic complex”. They should be oriented toward the downtown, the river, and nearby park land so that there is a continuous connection between the various uses. This will generate more activity in the downtown. Also, the architecture should be consistent with the historic downtown.

Proper Scale: Development and redevelopment needs to be consistent with the historic architecture, mixture of uses and compact layout of a traditional small town. The density and design of development needs to be at a scale that puts uses within a walkable distance. There should be a complimentary and integrated mixture of employment, shopping, entertainment, civic, and residential uses within a walkable town. To reinforce the downtown as a distinctive place, it is important that there be a proper transition between the downtown and surrounding neighborhoods.

Relationship to Pedestrians: Buildings should be designed to relate to the pedestrian scale. Pedestrians respond differently to different building frontages. The most attractive and comfortable building frontages to pedestrians are shopfronts with large windows and displayed merchandise. Commercial structures need to have windows that relate to the public sidewalk and provide interest. Building entrances should utilize windows, canopies and awning, provide unity of scale, texture, color, and provide a sense of place. In addition, long, concrete block walls along the sidewalk should be avoided.

Architecture: Special consideration should be given to architecture within the downtown area, as well as other areas of the City. Individual innovation in building design should be allowed, provided the form of an individual development does not detract from the traditional small-town character. Renovations and infill development needs to be compatible with surrounding uses, provide visual harmony between old and new buildings, blend into the streetscape and create a positive image for the City. The primary goal is to maintain architectural styles that foster the intended traditional small-town character and blend with the context of the traditional urban form. The downtown needs to be maintained as a community center that fosters a sense of civic pride. The following standards should be applied to renovations, additions and infill development in the CBD:

- Commercial architecture should contribute to the overall small-town character as a place that has history and substance. Each structure needs to have its own identity and provide variety to the streetscape.
- Architectural styles should be compatible with and not detract from the historic integrity of the downtown. Buildings should provide individualized architectural features, details and ornaments such as archways, colonnades, and cornices to make them distinctive. Building materials and colors need to relate well and be harmonious with the surrounding area. The use of natural building materials such as brick and wood should be encouraged.
- The first floor of the building's front façade should be primarily glass. Upper stores should contain less glass and upper-story windows should be vertical in proportion. The ratio of void to solid of the upper story façade should create a consistent rhythm from one building to another.
- Because many of the commercial buildings back toward residential neighborhoods, the appearance of the rear facades of buildings need to be considered in relation to the front façade.

Corner Locations: Special treatment to the corners of street intersections is an important and effective means to create community landmarks. Buildings located on corner lots can be designed to become very distinct and prominent architectural features. Special consideration towards architecture and site elements should reflect the importance of the building's corner

location and create a positive visual landmark. Particular attention should be given to any redevelopment or renovation of buildings at the corner of Jefferson and Bridge Street and where Bridge Street terminates at Clinton Street.

Creation of Defined Streetscape

Commercial developments need to front towards and relate to the street. Buildings need to be maintained at the front lot line in order to create a defined streetscape through uniform setbacks and proper relationship to adjacent structures.

Landmarks

Landmarks are features that create a distinct community center and focal point such as the bridge over the Grand River. More subtle landmark features can also be provided at key locations such as at “gateways” at prominent corners and at the end of visual corridors. Landmarks are intended to announce entry to a unique area, provide a sense of place at key locations and create visual focal points at the terminus of vistas.

Street Trees

The City currently has street trees along most City streets. Over time, trees will need to be replaced as they overgrow their environment. While the placement of trees along main commercial streets is necessary to give a property a sense of rhythm and enclosure, consideration also needs to be given to the relationship of trees to buildings and signs. Where possible, trees should be planted at lot lines to properly frame the building as seen from the street and opposing sidewalks. As trees are replaced, their location should be determined with consideration given to the spacing from other trees, architectural elements, adjacent buildings and way finding mechanisms within the City. New street trees should also be of a species that creates a canopy and can withstand salt from snow plowing in the winter.

Street Lights

The City currently has good quality, ornamental lighting that is part of the streetscape for the downtown. Using a consistent style of lighting along major streets in other areas of the City such as East and West Jefferson Streets, North and South Clinton Streets and Saginaw Highway is a unifying element that provides a linkage between these areas and the downtown and a “Grand Ledge” identity that is lacking along some of these streets. Ornamental lighting also reinforces linkages by leading pedestrians to other areas of the city such as the riverfront park. It is important that a consistent style of ornamental lighting be used throughout the City.

Public Spaces/Connections to Grand River

Finally, one of the most important aspects of a positive downtown environment is open public spaces in the form of parks and plazas. The Grand River and associated parks throughout the City is a great strength of the community. Development must continue to promote and enhance the connections to the Grand River, Island Park and other parks along the River that have been

preserved through public open space along its banks. The City should continue to maintain and expand park areas along the riverbank within the downtown whenever possible.

Circulation

Vehicle speeds across the bridge are excessive and need to be controlled to give pedestrians a more comfortable environment. Recommendations contained in Chapter 4 offer solutions through lane reductions, curb bump-outs, on street pathways and on-street parking to slow speeds down. Slowing speeds generates more economic activity because motorists have time to read business signs and view what is in the downtown.



Another element of circulation is non-motorized circulation. There are a number of recommendations contained in this plan as an update to the Non-Motorized Plan relate to pedestrian circulation in and around the downtown that should be considered. These comments include extension of pathways along the river and Bridge Street and improving pedestrian crosswalks to increase safety. Finally, the recommendation above regarding slowing traffic on the bridge will strengthen pedestrian safety and encourage more cross activity between the two sides of the river.

The overall design of parking areas on the south side of the bridge should be enhanced to improve the visual impacts. Enhancements needed include redesigning and repaving certain parking lots to more efficiently use space. Landscaping is the most effective method for screening and enhancing parking areas. To provide shade and green space within parking lots, curbed islands should be installed within parking lots in place of striping. The islands should be large enough to accommodate lawn area and one or two large canopy trees. Where rows of parking must be screened from view, a continuous evergreen hedgerow or decorative brick seat wall is recommended. All lots should provide safe, decorative lighting.

Business Retention and Recruitment

In cooperation with the Downtown Development Authority, a marketing strategy should be developed that outlines short and long term goals and implementation strategies for the district. There are a number of potential problems that can be addressed through this recommendation. To begin with, many current and future merchants are small business owners that do not have the benefit of either experience or funding to invest in this type of development plan on their own. If it is done as a team, there is a greater likelihood of success.

A second issue that would be addressed is strengthening the foundation of the downtown small businesses which will allow them to more successfully differentiate themselves with the

businesses along Saginaw Highway. It is not the intention of the City to create direct competition between the two districts. They should develop their own identity and their own market. This can be more clearly defined through a marketing strategy plan. This plan will also serve a dual purpose in retaining existing businesses and also work to promote new businesses to fill vacant spaces. A business district that is dedicated to stabilizing the market for merchants is one that will be significantly more desirable for potential business owners.

Master Plan Implementation Table

PLAN RECOMMENDATION	ACTIONS	FUTURE PLANNING
Plan Overall and Future Land Use		
Schedule Review of Master Plan and Implementation	<ul style="list-style-type: none"> ➤ The Planning Commission should review the Master Plan, particularly the goals, and affirm or modify them on an annual basis ➤ An annual joint meeting with City Council to re-familiarize them with the Master Plan and Planning Commission roles could be considered, especially as new members are elected or appointed ➤ Incorporate a thorough process for proposed amendments to the Master Plan 	<ul style="list-style-type: none"> ➤ Update sections on the Master Plan as appropriate to keep it current ➤ Update the Master Plan in its entirety ever five years as required by the Michigan Planning Enabling Act
Motorized Transportation System (see Capital Improvement list for construction projects)		
Explore opportunities and feasibility for second river crossing	<ul style="list-style-type: none"> ➤ Work with Tri-County Regional Planning Commission and nearby municipalities to create a second river crossing in the area 	<ul style="list-style-type: none"> ➤ Improve pedestrian safety in downtown ➤ Explore potential for additional crossing over river to provide alternate traffic routes
Incorporate traffic calming measures in the downtown where appropriate	<ul style="list-style-type: none"> ➤ Obtain a study to determine the appropriate measures for improving pedestrian safety in the downtown and at the Jefferson/Bridge Street intersection in particular ➤ The City should work with MDOT to address the feasibility of installing curb bump-outs at all intersections in the downtown ➤ The City should work with MDOT on traffic signal changes that would improve pedestrian safety at the Jefferson/Bridge Street intersection ➤ Work with TCRPC and surrounding communities to develop a second bridge crossing in the area 	<ul style="list-style-type: none"> ➤ Develop design plans based on action items listed
Improve traffic calming on city streets	<ul style="list-style-type: none"> ➤ The City should review its road design standards to allow streets to be developed similar to those in the historic neighborhoods where appropriate. This may include amendments to the zoning ordinance to allow lots and setbacks similar to those neighborhoods for projects that provide amenities such as sidewalks, street trees, ornamental lighting, traditional home design 	<ul style="list-style-type: none"> ➤ Planning Commission could assist police and Dept. of Public Services in evaluation of any traffic speed problem areas. Could also consider formation of citizens

Master Plan Implementation Table

PLAN RECOMMENDATION	ACTIONS	FUTURE PLANNING
	and public open space ➤ Consider traffic calming measures when there are concerns about traffic speeds in neighborhoods rather than stop signs that may be ineffective	traffic committee with business and resident representatives modeled after other successful programs in Michigan ➤ Work with MDOT to implement the recommendations of the 2006 Traffic Calming Study
Non-Motorized Transportation		
Develop additional connections to the current non-motorized	➤ Continue to implement and support the Non- Motorized Pathways Plan, as amended ➤ Continue to require installation of sidewalks and pathways for new site plans and major redevelopment projects ➤ Continue to seek funding for the installation of planned pathway routes from both internal and external sources	➤ Prepare detailed engineering plans to establish the actual location and design of proposed pathways ➤ Update the non-motorized plan as needed
Create a safe pedestrian environment throughout the City	➤ Secure funding to extend the riverwalk-from Island Park to Fitzgerald, Oak And Lincoln Brick Parks ➤ Provide a pedestrian crossing over the Grand River from S. Clinton Street to N. Clinton Street ➤ Utilize pavement markings to create a wide pedestrian crossing areas ➤ Pavement marking coupled with other signage should be utilized to effectively alert motorists of a pedestrian crossing area ➤ Allow ample space at intersections and install curb bump-outs in certain locations in the downtown to provide a safe waiting area for pedestrians	➤ Take into consideration all possible destinations and open space corridors to ensure they are planned for in the future
Coordinate with neighboring communities and outside agencies to provide a regional system	➤ Ensure that pathway connections link to existing and planned networks of surrounding communities	➤ Participate in future initiatives to establish a regional pathway and greenway system ➤ Plan for potential abandonment of rail lines to convert to pathways
Explore funding opportunities	➤ Grant funding, bond issues, special assessment districts and special millage levies have been successful in other communities in obtaining funding for pathway installation	➤ The City should continue to apply for TEA -21 grant funding for qualifying pathway and

Master Plan Implementation Table

PLAN RECOMMENDATION	ACTIONS	FUTURE PLANNING
		streetscape enhancement projects
Natural Features		
Protect the City’s natural features as new development occurs	<ul style="list-style-type: none"> ➤ Consider a minimum setback from natural features in the zoning ordinance ➤ Revise the R-PC district regulations to allow flexibility in site design with additional incentives to preserve natural features such as Grand River, wetlands, steep slope and woodlands ➤ Consider overlay zoning along the Grand River to protect its banks, vegetation and views 	<ul style="list-style-type: none"> ➤ Work with the MDNR/MDEQ, adjacent communities and other groups to evaluate the river corridor and determine improvements to protect its ecosystem
Preserve open space throughout the community	<ul style="list-style-type: none"> ➤ Revise the subdivision control regulations, the R-PC design standards and other applicable districts to require open space and parkland for all new projects that may be dedicated to the public or used as private parkland for the homeowners or condominium association ➤ Evaluate available vacant lots and explore the feasibility of acquisition for small neighborhood park 	
Neighborhood Development		
Ensure residential architecture is high quality and compatible with the neighborhood	<ul style="list-style-type: none"> ➤ Develop architectural design standards that require homes to possess traditional characteristics yet allows them to achieve its own unique design theme ➤ Require building materials to be high quality and durable 	
Provide neighborhoods with adequate open spaces and recreation areas	<ul style="list-style-type: none"> ➤ Require new residential development to provide open space that is usable as parkland for the association or entire community 	
Ensure the right-of-way of residential neighborhoods is appropriately enhanced and designed	<ul style="list-style-type: none"> ➤ Continue to require all new construction to provide sidewalks along the roadways and require linkages to nearby destinations ➤ Require that all new residential developments provide street lighting along sidewalks and at major intersections ➤ The City should evaluate existing neighborhoods to determine deficiencies and 	<ul style="list-style-type: none"> ➤ Update the City’s Non-Motorized Pathway Plan as needed

Master Plan Implementation Table

PLAN RECOMMENDATION	ACTIONS	FUTURE PLANNING
	develop a strategy for implementation	
Residential streets should be designed to reinforce the traditional street network	<ul style="list-style-type: none"> ➤ Require road connections to existing neighborhoods and other adjacent land uses ➤ Limit the pavement width to the minimum necessary to allow two driving lanes and on-street parking ➤ All streets should have a concrete curb and gutter 	
All residential neighborhoods should provide traditional neighborhood characteristics	<ul style="list-style-type: none"> ➤ Promote the provision of landmarks within the neighborhood as a focal point and gathering area for residents ➤ The street layout and use of blocks should promote walkability 	
Preserve the historic residential neighborhoods	<ul style="list-style-type: none"> ➤ Establish a local historic district ➤ Regulate construction within the district through architectural guidelines ➤ Establish an Historical Commission to review architecture and serve as an advisory board for all permits and approvals for sites within the district 	<ul style="list-style-type: none"> ➤ An historic preservation plan may be necessary that identifies key attributes and guidelines that set the framework for requirements
Ensure high quality multiple family development	<ul style="list-style-type: none"> ➤ Establish design guidelines that are promote similar characteristics as the single family neighborhoods ➤ Require buildings and the main entrances to be oriented towards the street with similar setbacks as single family ➤ Require open space and park land based on occupancy ➤ Restrict parking to rear and side yards with appropriate screening ➤ Require screening/buffer areas where appropriate 	
Saginaw Highway		
Improve coordination with outside agencies on project development	<ul style="list-style-type: none"> ➤ The Planning Commission should affirm its role with MDOT in reviewing major road improvements and ensure its involvement early in the project development phase so Master Plan goals are considered ➤ The City should work with Oneida Township , Tri-County Regional Planning Commission and other nearby communities to evaluate M-43 as it relates to land use, traffic management and overall appearance ➤ Coordination with outside agency should present funding opportunities and potential joint grant applications 	

Master Plan Implementation Table

PLAN RECOMMENDATION	ACTIONS	FUTURE PLANNING
Ensure high quality site design that projects a positive image as the entrance to the community	<ul style="list-style-type: none"> ➤ Require business signs that adequately serve businesses but are subtle, low to the ground and offer materials, colors and landscaping that complement the building ➤ Landscaping should be required that enhances the site along the street and within the parking lot ➤ Landscaping should also be used to screen and buffer between sites ➤ Buildings should be required to be designed to offer a compatible and high quality design element to the site ➤ Site lighting should be the minimum amount necessary to avoid negative off site glares. It is appropriate to use lighting as an ornamental feature ➤ Create an image along Saginaw Highway and at the M-43/M-100 Intersection in particular that distinguishes Grand Ledge from any other highway commercial intersection 	<ul style="list-style-type: none"> ➤ A more detailed corridor plan may be necessary which identifies landscape designs, specific driveway locations and lighting locations to better guide regulations ➤ Provide signage at the M-43/M-100 intersection identifying the route to the downtown ➤ Install lighting along all major streets and at the M-43/M-100 intersection consistent with the lighting along Bridge Street ➤ Install signage on the light poles identifying the City of Grand Ledge
Provide safe and adequate circulation along the corridor and within the sites	<ul style="list-style-type: none"> ➤ Driveway spacing and location standards should continue to be enforced ➤ Shared access and rear service drives should be accommodated for all sites located along the corridor ➤ Pedestrian circulation must be accommodated through sidewalk connections and clear and easy access for pedestrians to businesses 	
Central Business District		
Accommodate a variety of uses within the CBD that promote the traditional character of the city	<ul style="list-style-type: none"> ➤ The list of permitted uses in the downtown should comprise of office, commercial, civic and residential ➤ Encourage infill development of “Maypole Park” in the 200 block of S. Bridge Street with building(s) that are consistent in design, scale & materials with the majority of the other buildings in the downtown area 	
Sites should preserve the historic integrity of the downtown and offer a positive pedestrian environment	<ul style="list-style-type: none"> ➤ Develop detailed architectural design guidelines which regulate scale, design, prominence and building materials of all buildings within the CBD ➤ Maintain a consistent building setback along the road ➤ Continue to provide street trees and ornamental lighting ➤ Provide for landmark features at key locations such as the entrances to the 	<ul style="list-style-type: none"> ➤ A historic preservation plan may be appropriate for the CBD to better establish key issues and set the framework for design guidelines or requirements

Master Plan Implementation Table

PLAN RECOMMENDATION	ACTIONS	FUTURE PLANNING
	downtown to establish a sense of place ➤ Accommodate public open spaces for people to gather ➤ Utilize open spaces to create safe connections to the river	
Accommodate safe circulation throughout the downtown	➤ Utilize methods such as curb bump-outs, designated pedestrian crosswalks and traffic signal changes to calm speeds in the downtown ➤ Provide for sidewalk and pathway connections for non-motorized access to the downtown	

Capital Improvement Program Outline

IDENTIFIED ISSUES	ADDITIONAL STUDIES NEED OR ALTERNATIVES	RECOMMENDED ACTIONS
CITY FACILITIES		
Fire Station		
<ul style="list-style-type: none"> ➤ Insufficient building size ➤ Functionally inadequate ➤ Poor access due to location and rail crossing ➤ Only one bridge crossing over river 	<ul style="list-style-type: none"> ➤ Expand existing building ➤ Rebuild on new site(s) 	<ul style="list-style-type: none"> ➤ Construct a new fire station on property already owned by the Fire Department south of the City limits on M-100 ➤ Use existing building for EMS Station
Parks and Recreation		
<ul style="list-style-type: none"> ➤ Few neighborhood parks ➤ No barrier at Oak Park identifying where extra caution is required ➤ 	<ul style="list-style-type: none"> ➤ Determine the proper location and type of barrier needed for Oak Park ➤ Research grant funding opportunities for completion of goals outlined in the 2017-2021-Parks & Recreation Master Plan ➤ Implement the Jaycee Park Master Plan ➤ Extend riverwalk to connect to Island, Oak, Lincoln Brick and Fitzgerald Parks 	<ul style="list-style-type: none"> ➤ Amend Subdivision Ordinance to require neighborhood parks ➤ Construct wall or other barrier along top of Ledges in Oak Park ➤ Utilize Parks & Recreation Master Plan as a guide for completion of all parks projects Including implementation of the Jaycee Park Master Plan ➤ Develop a complete riverwalk system that connects to all parks and non-motorized pathways
Department of Public Services		
<ul style="list-style-type: none"> ➤ Aging Facility on Lawson Road 	<ul style="list-style-type: none"> ➤ Renovate and Expand existing buildings ➤ Tear down and rebuild new buildings 	<ul style="list-style-type: none"> ➤ Continue to monitor and accommodate the needs of the Public Service Dept.
Sanitary Sewer/Storm Sewer/Drainage System		

Capital Improvement Program Outline

IDENTIFIED ISSUES	ADDITIONAL STUDIES NEED OR ALTERNATIVES	RECOMMENDED ACTIONS
<ul style="list-style-type: none"> ➤ Expansion needed for treatment facilities ➤ Systems Need To Be Expanded And Upgraded 	<ul style="list-style-type: none"> ➤ Wastewater Collection and Treatment Master Plan 	<ul style="list-style-type: none"> ➤ Upgrade sanitary and storm sewer in needed areas
Water System		
<ul style="list-style-type: none"> ➤ Water mains need to be expanded and upgraded 	<ul style="list-style-type: none"> ➤ Water System Master Plan 	<ul style="list-style-type: none"> ➤ Upgrade water mains in needed areas
City Street Maintenance and Reconstruction		
<ul style="list-style-type: none"> ➤ Gravel/dirt roads ➤ Streets in poor or failed condition ➤ Traffic calming ➤ Poor access management in certain areas 	<ul style="list-style-type: none"> ➤ Pave all gravel/dirt roads ➤ Continue to improve access management on M-43 and M-100 as new development occurs ➤ Implement traffic calming measures including reducing the width of local streets, installing curb bump-outs, pedestrian cross walks and traffic signal controls 	<ul style="list-style-type: none"> ➤ Focus resources on maintaining streets already in good condition to prevent deterioration ➤ Use traffic operations analysis to determine appropriate traffic calming measures ➤ Use “Street Condition Survey” as a guide for prioritizing resurfacing projects ➤ Reconstruct streets as necessary ➤ Construct boulevard on M-43
New Access Road along M-43		
<ul style="list-style-type: none"> ➤ Need alternative to numerous poorly spaced driveways along the south side of M-43 ➤ Need to complete gaps in the street system per City’s Street Master Plan 	<ul style="list-style-type: none"> ➤ A number of alternatives were considered before the City platted the road alignment ➤ Traffic operations analysis and preliminary engineering would need to be completed to refine concepts 	<ul style="list-style-type: none"> ➤ Construct future roads identified in the Master Plan ➤ Work with MDOT and surrounding communities to build median boulevard on M-43 east of M-100 and further manage traffic ➤ Connect Tallman Road to M-100 ➤ Extend Eaton Highway to Tallman Road ➤ Require that access to the property on the east side of M-100 align with Fieldview

Capital Improvement Program Outline

IDENTIFIED ISSUES	ADDITIONAL STUDIES NEED OR ALTERNATIVES	RECOMMENDED ACTIONS
		Drive
Sidewalks/Pathways		
<ul style="list-style-type: none"> ➤ Deteriorated and dangerous sidewalks ➤ No sidewalks in certain areas ➤ Limited non-motorized pathways ➤ Certain sidewalks lack barrier free ramps 	<ul style="list-style-type: none"> ➤ Construct pathways on/off streets in those areas designated on the map included with this Plan ➤ Construct sidewalks along all City streets ➤ Obtain funding for the continued development of a pedestrian riverwalk 	<ul style="list-style-type: none"> ➤ Repair all deteriorated or dangerous sidewalks ➤ Construct new sidewalks where currently does not exist ➤ Make all sidewalks barrier-free ➤ Install pathways as designated in Master Plan ➤ Continued development of the riverwalk connecting ALL City and county parks

Map 2 Community Facilities

Grand Ledge Master Plan
City of Grand Ledge, Michigan

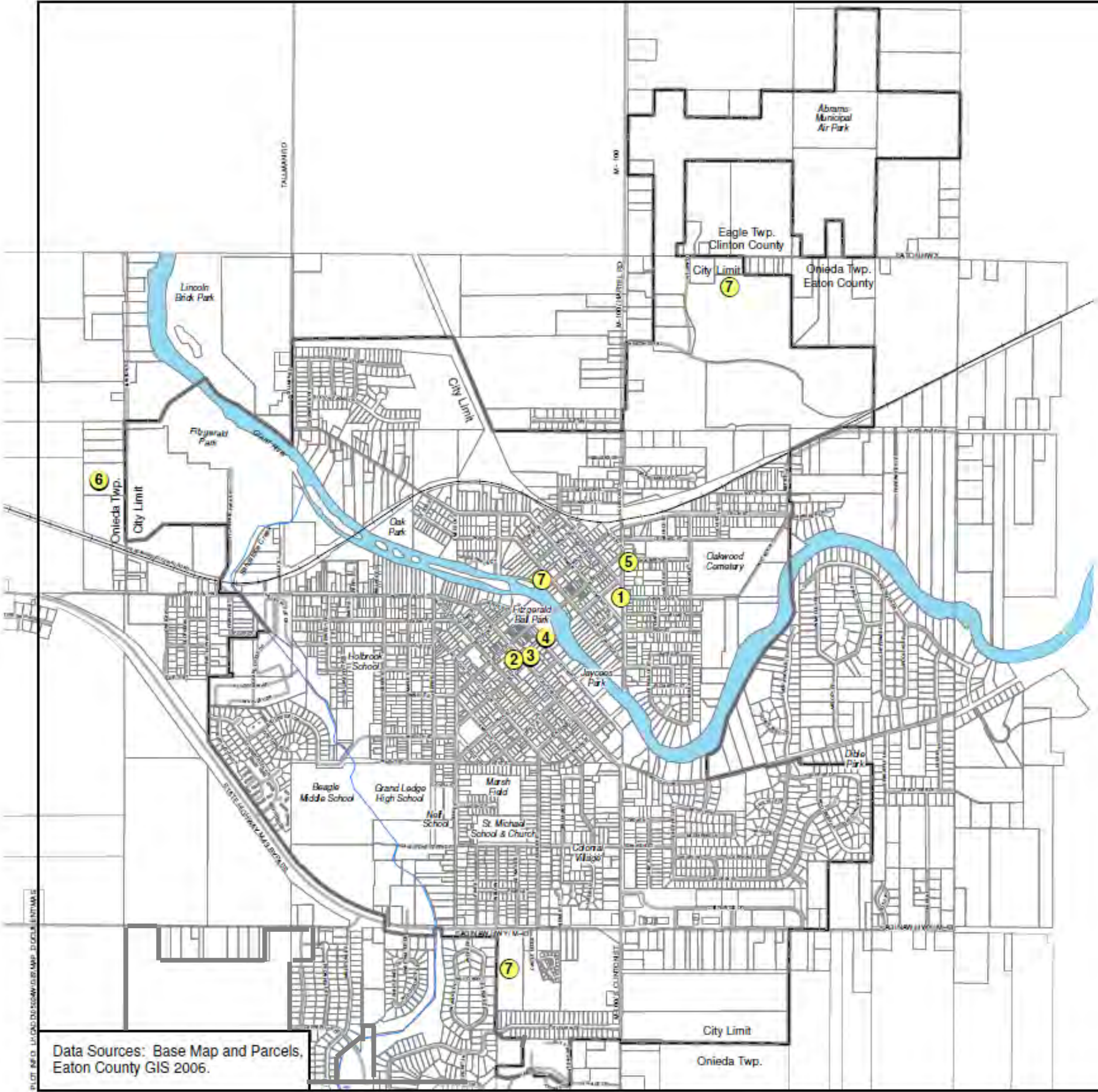
Legend

- ① City Hall, Police Department, Chamber of Commerce
- ② U.S. Post Office
- ③ Public Library
- ④ Opera House
- ⑤ Fire Department
- ⑥ DPW Lot
- ⑦ City Water Tower



January, 2018

0 1,500 Feet

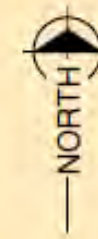


Data Sources: Base Map and Parcels,
Eaton County GIS 2006.

Map 3
**Regional
 Future Land Use**
 Grand Ledge Master Plan
 City of Grand Ledge, Michigan

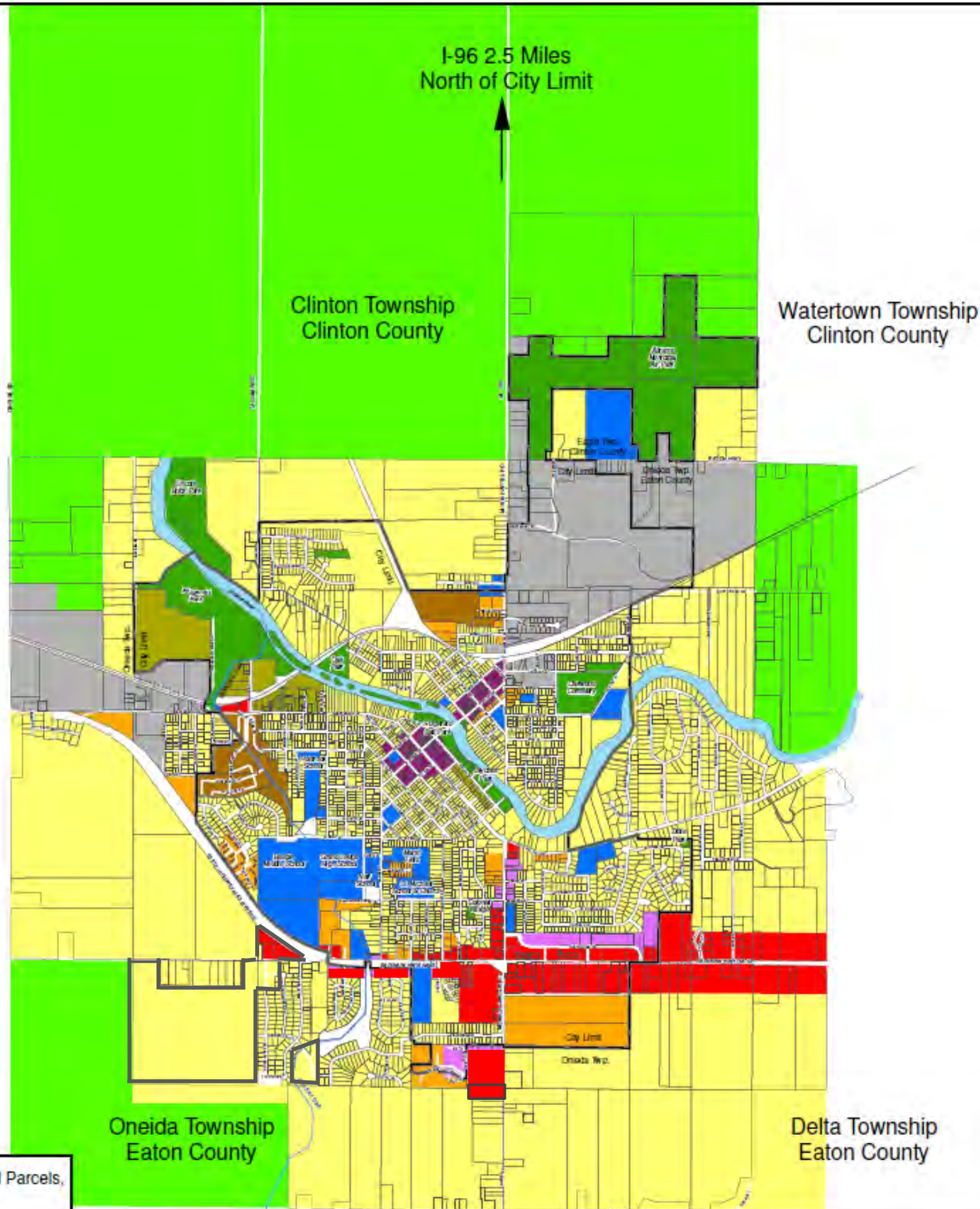
Legend

- Single Family Residential
- Planned Unit Development
- Multiple Family Residential 2+ Units
- Mobile Home Community
- Central Business District
- Commercial/Highway Services
- Office
- Industrial
- Institutional: Churches, Schools, Public Facilities
- Public Open Space/Airport, City & County Parks, Cemeteries
- Agricultural



January, 2018

0 1,500 Feet



I-96 2.5 Miles
 North of City Limit

Clinton Township
 Clinton County

Watertown Township
 Clinton County

Oneida Township
 Eaton County

Delta Township
 Eaton County

Data Sources: Base Map and Parcels,
 Eaton County GIS 2006.

ELECT INFO: U:\00000000\GIS\000\DOCUMENT\MASTERPLAN_070208\MAPS\REGIONAL\FUTURELANDUSE.MXD DATE: 3/13/2008 10:58:11 AM

Map 5 Transportation Issues

Grand Ledge Master Plan City of Grand Ledge, Michigan

Legend

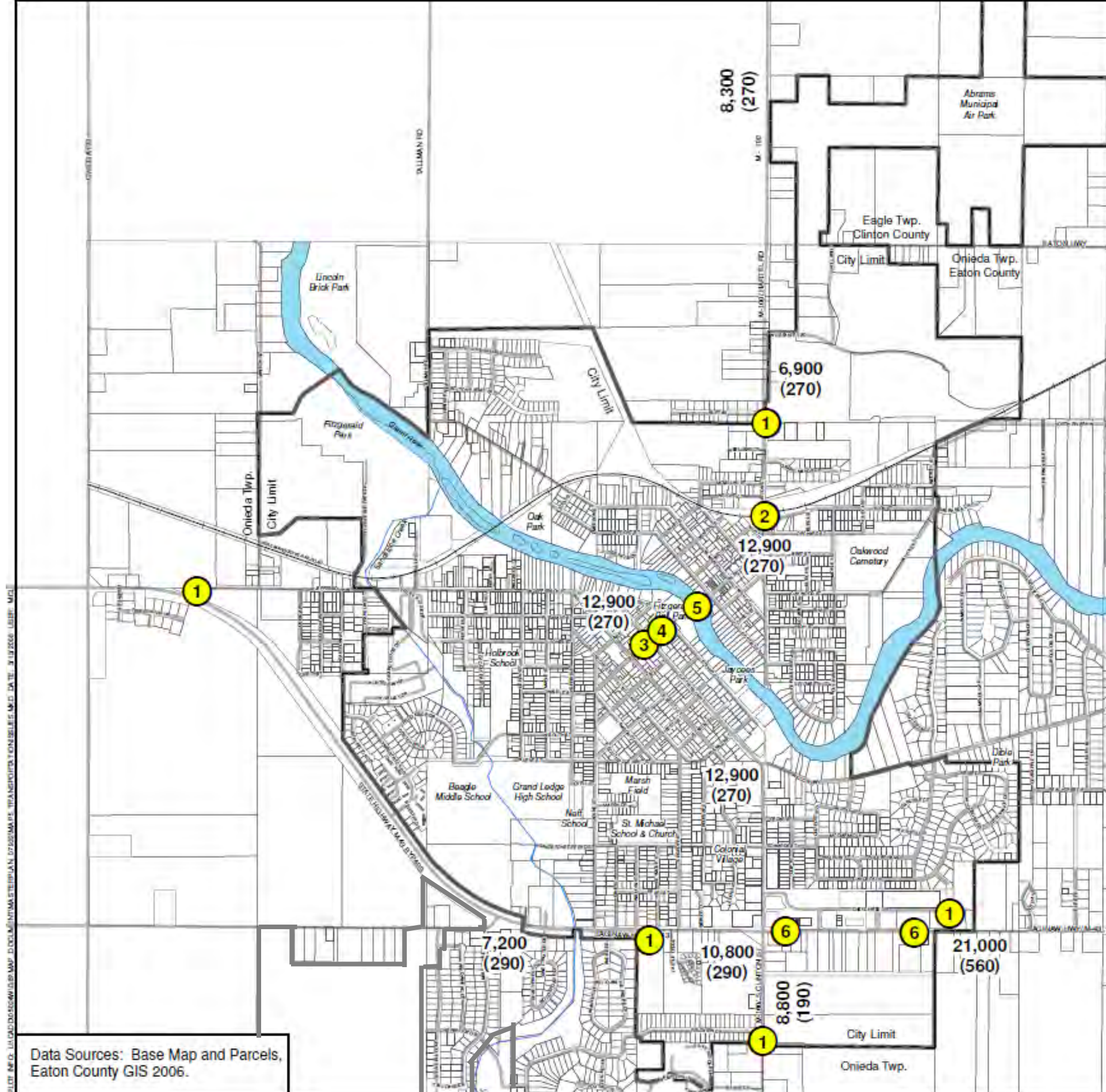
- 0000 — 2015 Annual Average Daily Traffic
- (000) — Commercial Annual Average Daily Traffic
- ① Aesthetics Issues at City Entrances
- ② Railroad Crossing Delays
- ③ Traffic Calming
- ④ Truck Traffic in the Downtown Area
- ⑤ High Speed Bridge Traffic
- ⑥ Median / Boulevard - M100 to E. City Limits

Note: Refer to text for description and discussion of citywide transportation issues.



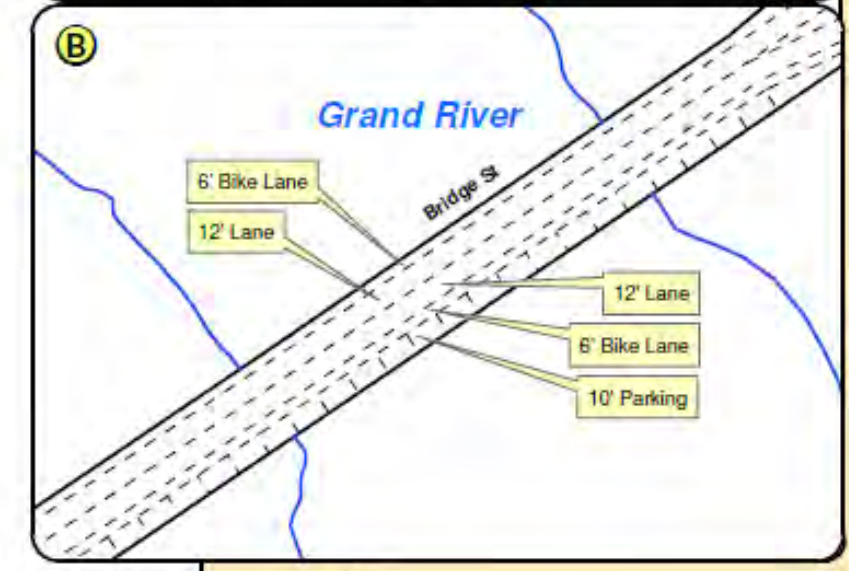
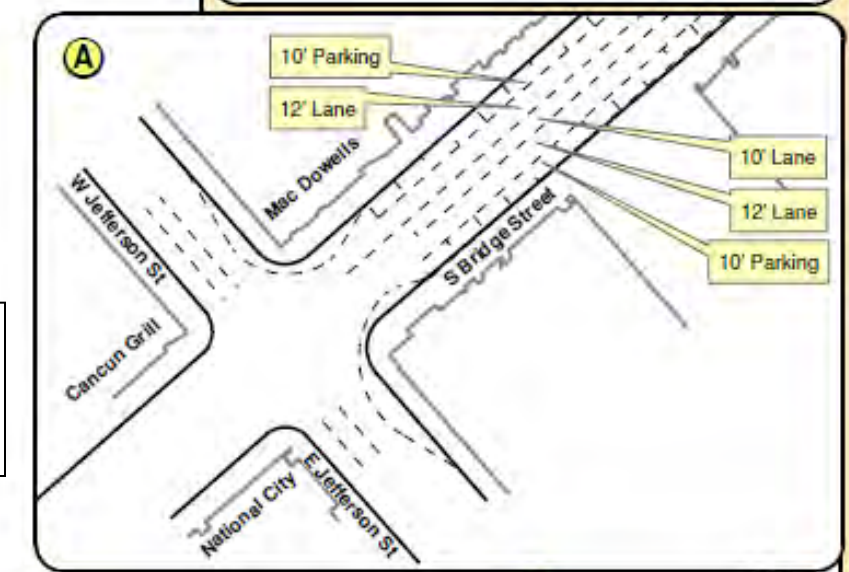
January, 2018

0 1,500 Feet



Data Sources: Base Map and Parcels, Eaton County GIS 2006.

Map 6
Future Street
Improvements
 Grand Ledge Master Plan
 City of Grand Ledge, Michigan



Change to:
 Possible Crossing
 at Broadbent Road

Possible Crossing
 at Nixon Road

Remove proposed streets in red
 and replace with street in green

- Legend**
- Proposed Streets
 - Proposed Bridge Crossing (Vehicular Traffic)
 - Evaluate alternatives to improve intersection traffic operation and safety.
 - Utilize traffic calming measures where appropriate (refer to text).

January, 2018

0 1,500 Feet

NORTH

PLOT INFO: LA CROIX DESIGN GROUP, DOCUMENT MASTER PLAN, UTILITY IMPROVEMENT SALES, DATE: 2/13/2018, USER: MCL

Data Sources: Base Map and Parcels,
 Eaton County GIS 2006.

Appendix 2

Dept.	Project	Total Estimated Cost	Primary Funding Source	Additional Funding Source
DPS-S	W.South – Jenne to Green	\$181,500	Water/Sewer Fund	
DPS-S	Union St – Church to Whitney	\$237,204	Water/Sewer Fund	

FY26 - Project Description: Per Water & Sewer Rate Study CIP

W&S DPS-W: WATER & SEWER - DEPT. OF PUBLIC SERVICES - WATER				
Per State of Michigan Department of Environmental Quality Asset Management requirements. See Michigan Rural Water Association Worksheet--Capital Project Listing.				
Dept.	Project	Total Estimated Cost	Primary Funding Source	Additional Funding Source
DPS-W	Orchard St - Reconstruction	\$324,209	Water/Sewer Fund	Bond Proceeds
DPS-W	Railroad crossing pipe replacement	\$175,500	Water/Sewer Fund	Bond Proceeds
DPS-W	Front St Elevated Tank	\$199,975	Water/Sewer Fund	Bond Proceeds
DPS-W	Iron Removal Plant	\$665,400	Water/Sewer Fund	
DPS-W	Corrosion Control Study	\$180,000	Water/Sewer Fund	
DPS-W	Pilot Study	\$75,000	Water/Sewer Fund	

FY22 - Project Description: City Council Tier 1, 2 & 3 Priorities; Per Water & Sewer Rate Study CIP

Dept.	Project	Total Estimated Cost	Primary Funding Source	Additional Funding Source
DPS-W	Well Development	\$5,000,000	Water/Sewer Fund	Bond Proceeds

FY22-24 - Project Description: City Council Tier 1 Priority Water System Improvements (Development of well(s) to meet current and future capacity demand.)

Dept.	Project	Total Estimated Cost	Primary Funding Source	Additional Funding Source
DPS-W	Green St – Reconstruction, Seminary to W. South	\$178,330	Water/Sewer Fund	
DPS-W	Backhoe (50%)	\$57,500	Water/Sewer Fund	
DPS-W	Iron Removal Plant Alternative	\$14,810,000	Bond Proceeds	Water/Sewer Fund

FY23 - Project Description: Per Water & Sewer Rate Study CIP

Dept.	Project	Total Estimated Cost	Primary Funding Source	Additional Funding Source
DPS-W	Spring St. Walnut to Kent	\$175,000	Water/Sewer Fund	

FY24 - Project Description:

Dept.	Project	Total Estimated Cost	Primary Funding Source	Additional Funding Source
DPS-W	Union St – Clinton to Church	\$323,460	Water/Sewer Fund	
DPS-W	Jackson St.- Lincoln to Scott	\$62,500	Water/Sewer Fund	
DPS-W	River Crossing	\$2,500,000	Bond Proceeds	Water/Sewer Fund
DPS-W	2X Dump Truck	\$37,500	Water/Sewer Fund	

FY25 - Project Description: Per Water & Sewer Rate Study CIP and Equipment Replacement Plan

Dept.	Project	Total Estimated Cost	Primary Funding Source	Additional Funding Source
DPS-W	W.South – Jenne to Green	\$181,500	Water/Sewer Fund	
DPS-W	Union St – Church to Whitney	\$237,204	Water/Sewer Fund	

FY26 - Project Description: Per Water & Sewer Rate Study CIP

Capital Improvements Plan –

From 2017 Reliability Study

10.0 RECOMMENDED IMPROVEMENTS

Recommended improvements to the system are presented in this section. Where applicable, total cost estimates are provided. Distribution system improvements are shown on Figures 7 and 8. Each improvement is labeled with a number that corresponds to those in Figures 7 and 8.

10.1 HIGH SERVICE PUMPS

The projected 2035 MDD is 160% of the current firm capacity of the high service pumps. The pumps need to be restored to their design capacity to meet the projected MDDs. This could be accomplished by rebuilding or full replacement of the pumps.

10.2 ELEVATED TANKS

The elevated tanks in the system have begun to show delamination of their coatings. The 500,000-gallon elevated tank is recommended to be sandblasted and painted. The 100,000-gallon elevated tank is reaching the end of its useful life. It is recommended that the exterior of the tank be high-pressure water cleaned, spot power-tool cleaned, and recoated with a polyurethane system. There are a few health/safety appurtenance upgrades recommended to be done to the 100,000-gallon tank along with the recoating if it is to remain in service.

10.3 GROUND STORAGE TANKS

The ground storage tanks are in need of inspection within the next 5 years. The costs of these inspections are included in the 5-Year Improvements below.

10.4 WELL NO. 9

Well No. 9 was drilled in 1998 and has been approved for intermittent pumping of 500 gpm for eight hours per day, but has not been equipped with a pump or well house. The projected 2035 MDD is 85.4% of the firm capacity of the wells without the operation of Well No. 9. Developing Well No. 9 would allow the City to limit the use of Well No. 8 to the MDEQ recommended 8 hours a day and maintain adequate firm capacity to meet the projected demands. The cost of outfitting the well is included in the 20-Year Improvements below.

10.5 5-YEAR IMPROVEMENTS

The following are recommended improvements to the distribution system, with corresponding total cost estimates, to be done within the next 5 years. The location of each 5-Year main improvement is shown on Figure 7 and the effects of the improvements on available fire flow are shown in Figure 9. All of the 5-Year improvements are listed on Table 13 with the total estimated costs of each improvement.

Table 13 - 5-Year Improvements

Project No.	Project Description/Location	8-Inch Main Length (feet)	12-Inch Main Length (feet)	Unit Cost per foot of Main (\$/ft)	Total Cost
1	Replace main on Jones Street - Green St. to Kennedy St.	900	-	155	\$139,500
2	Replace main on S. Bridge St. - Scott St. to Jenne St.	750	-	155	\$116,250
3	Replace main on W. South St. - Green St. to Jenne St.	1,150	-	155	\$178,250
N/A	Rehabilitate High Service Pumps	-	-	-	\$50,000
N/A	Recoat and upgrade appurtenances on 100,000 gallon tank	-	-	-	\$240,000
N/A	Sandblast and Repaint 500,000 gallon tank	-	-	-	\$300,000
N/A	Inspect 100,000 gallon ground storage tank at plant	-	-	-	\$2,000
N/A	Inspect 750,000 gallon ground storage tank at armory	-	-	-	\$2,000

Total Cost of 5-Year Improvements \$1,028,000

10.5 20-YEAR IMPROVEMENTS

The following are recommended improvements to the distribution system, with corresponding construction cost estimates, to be done within the next 20 years. The location of each 20-Year main improvement is shown on Figure 8 and the effects of the improvements on available fire flow are shown in Figure 10. All of the 20-Year improvements are listed on Table 14 with the estimated costs of each improvement. All main improvements utilize an 8-inch main unless otherwise noted.

Table 14 - 20-Year Improvements

Project No.	Project Description/Location	8-Inch Main Length (feet)	12-Inch Main Length (feet)	Unit Cost per foot of Main (\$/ft)	Total Cost
4	Replace main on Cedar St. - Old Post Rd. to S. Clinton St.	850	-	155	\$131,750
5	Replace main on Green St. - Jones St. to W. South St.	1,425	-	155	\$220,875
6	Replace main on Spring St. - Walnut St. to W. Kent St.	1,000	-	155	\$155,000
7	Replace main on Schoolcraft St. - Jones St. to D/E.	1,866	-	155	\$289,230
8	Replace main on Union St. - N. Clinton to Morley St.	1,085	-	155	\$168,175
9	Replace main on Union St. - Church St. to Whitney St.	1,085	-	155	\$168,175
10	Replace main on Lamson St. - Jenne St. to E. Kent St.	1,400	-	155	\$217,000
11	Replace main on Liberty St. - E. Scott St. to E. Kent St.	1,100	-	155	\$170,500
12	Install main on Jackson St. - E. Scott St. to E. Lincoln St.	360	-	155	\$55,800
13	Replace main on Greenwood St./E. Washington St. - E. Main St. to N. Bridge St.	750	-	155	\$116,250
14	Replace main on Elm St. - N. Clinton St. to D/E	592	-	155	\$91,760
15	Replace main on High St. - N. Clinton St. to D/E	1,200	-	155	\$186,000
16	Replace main on Taylor St. - E. Scott St. to Jenne St.	1,075	-	155	\$166,625
17	West-side River Crossing - W. Jefferson St. to W. Main St.	-	3,150	230	\$724,500
N/A	Completion of Well House No. 9	-	-	-	\$600,000

Total Cost of 20-Year Improvements

\$2,861,640

10.6 NOTES ON COST ESTIMATIONS

Costs for distribution system improvements include total project costs, engineering, and contingencies for replacement of the water main and restoration of the driving surface directly above the main. Costs for replacement of adjacent utilities and road reconstruction are not included. Improvements should be coordinated with other utility and road replacement projects wherever feasible to maximize the benefit for the investment.

The construction cost estimates presented in this report reflect October 2016 costs. These opinions of cost were prepared to determine approximate project costs. There are a number of factors that could

cause the actual project costs to deviate from these estimates. These include the competitive bidding climate at the time the construction bids are received, inflation, and additions to or changes in the scope of the project that may occur during the design process. The City should review estimated costs prior to proceeding with any future work and make necessary adjustments to determine the bidding climate in the year the work is proposed to be completed.

Appendix 3

Present Worth Analysis

Community Name: City of Grand Ledge

Federal Discount Rate for Water Resources Planning (Interest Rate) i = -0.03
Number of Years, n = 20 years

Construction of New Iron Removal Treatment Plant	
Initial Capital Costs =	\$14,957,000
Annual Operations & Maintenance Costs =	\$1,516,989
Future Salvage Value =	\$10,506,000
Present Worth of 20 years of O & M =	\$42,422,000
PW =	$\text{Annual OM} \frac{(1+i)^n - 1}{i(1+i)^n}$
Present Worth of 20 yr Salvage Value =	\$19,320,000
PW =	$\text{FSV} \frac{1}{(1+i)^n}$
Alternate 1	
Total Present Worth =	\$38,059,000

Short Lived Depreciated Assets (items listed, life expectancy, are just examples, use your own data)

Item	Years of Life Expectancy	Number of Units	Replacement Cost	Funds to Set Aside Yearly	<u>Note:</u>
General Instrumentation (includes float switches, pressure transmitters, etc.)	15	1	\$50,000	\$3,333	This is not intended to include every piece of equipment in the system. It is to itemize the critical equipment or maintenance items that money should be set aside for via rates and charges.
Chlorinator	15	4	\$10,000	\$2,667	
Metering Pumps	15	8	\$4,000	\$2,133	
Mixers	10	4	\$3,500	\$1,400	
Flow Meters	15	11	\$10,000	\$7,333	

Note: Rather than labeling Alternatives 1, 2, & 3, etc. give a short description of what they are (e.g. lagoon, regional trtment, mech plant, new well, etc.)

No short lived assets > 15 years of life expectancy

Appendix 4



GRETCHEN WHITMER
GOVERNOR

STATE OF MICHIGAN
MICHIGAN STRATEGIC FUND
STATE HISTORIC PRESERVATION OFFICE

QUENTIN L. MESSER, JR.
PRESIDENT

March 17, 2022

ANDREW GRANSKOG
ENVIRONMENTAL COORDINATOR
USDA RURAL DEVELOPMENT OFFICE
3001 COOLIDGE ROAD SUITE 200
EAST LANSING MI 48823

RE: ER22-468 City of Grand Ledge Water Treatment Plant, 320 E. Saginaw Highway, Grand Ledge,
Eaton County (USDA/RD)

Dear Mr. Granskog:

Under the authority of Section 106 of the National Historic Preservation Act of 1966, as amended, we have reviewed the above-cited undertaking at the location noted above. Based on the information provided for our review, the State Historic Preservation Officer (SHPO) concurs with the determination of the USDA/RD that **no historic properties are affected** within the area of potential effects of this undertaking.

This letter evidences the USDA/RD's compliance with 36 CFR § 800.4 "Identification of historic properties," and the fulfillment of the USDA/RD's responsibility to notify the SHPO, as a consulting party in the Section 106 process, under 36 CFR § 800.4(d)(1) "No historic properties affected." **If the scope of work changes in any way, or if artifacts or bones are discovered, please notify this office immediately.**

We remind you that federal agency officials or their delegated authorities are required to involve the public in a manner that reflects the nature and complexity of the undertaking and its effects on historic properties per 36 CFR § 800.2(d). The National Historic Preservation Act also requires that federal agencies consult with any Indian tribe and/or Tribal Historic Preservation Officer (THPO) that attach religious and cultural significance to historic properties that may be affected by the agency's undertakings per 36 CFR § 800.2(c)(2)(ii).

The State Historic Preservation Office is not the office of record for this undertaking. You are therefore asked to maintain a copy of this letter with your environmental review record for this undertaking.

If you have any questions, please contact Brian Grennell, Cultural Resource Management Coordinator, at 517-335-2721 or by email at GrennellB@michigan.gov. **Please reference our project number in all communication with this office regarding this undertaking.** Thank you for this opportunity to review and comment, and for your cooperation.

Sincerely,

Brian G. Grennell
Cultural Resource Management Coordinator

for Brian D. Conway
State Historic Preservation Officer

AK:BGG

Copy: Adam Smith, City of Grand Ledge
Jason Laney, RCAP
Ethan Epstein, Commonwealth Heritage Group, Inc.



Appendix 5

Present Worth Analysis

Community Name: City of Grand Ledge

Federal Discount Rate for Water Resources Planning (Interest Rate) $i =$ -0.03
 Number of Years, $n =$ 20 years

Green Street Water Main Replacement

Initial Capital Costs =	\$179,000
Annual Operations & Maintenance Costs =	\$9,900
Future Salvage Value =	\$125,000
Present Worth of 20 years of O & M =	\$277,000
PW =	$\text{Annual OM} \frac{(1+i)^n - 1}{i(1+i)^n}$
Present Worth of 20 yr Salvage Value =	\$230,000
PW =	$\text{FSV} \frac{1}{(1+i)^n}$
Alternate 1	
Total Present Worth =	\$226,000

Appendix 6

Present Worth Analysis

Community Name:

City of Grand Ledge

Federal Discount Rate for Water Resources Planning (Interest Rate) $i =$

-0.03

Number of Years, $n =$

20 years

Construction of Well Nos. 9 and 10

Initial Capital Costs = \$4,487,000

Annual Operations
& Maintenance Costs = \$55,000

Future Salvage Value = \$1,627,000

Present Worth
of 20 years of O & M = \$1,539,000

$$PW = \text{Annual OM} \frac{(1+i)^n - 1}{i(1+i)^n}$$

Present Worth
of 20 yr Salvage Value = \$2,992,000

$$PW = \text{FSV} \frac{1}{(1+i)^n}$$

Total Present Worth = \$3,034,000

Appendix 7

Present Worth Analysis

Community Name:

City of Grand Ledge

Federal Discount Rate for Water Resources Planning (Interest Rate) $i =$

-0.03

Number of Years, $n =$

20 years

Identification and Construction of New Wellfield

Initial Capital Costs = \$23,072,000

Annual Operations
& Maintenance Costs = \$275,000

Future Salvage Value = \$10,638,000

Present Worth
of 20 years of O & M = \$7,691,000

$$PW = \text{Annual OM} \frac{(1+i)^n - 1}{i(1+i)^n}$$

Present Worth
of 20 yr Salvage Value = \$19,563,000

$$PW = \text{FSV} \frac{1}{(1+i)^n}$$

Total Present Worth = \$11,200,000

Appendix 8

Treatment Plant Design Capacity (mgd)

Ultimate Design Plant Capacity (mgd)	Initial Design Plant Capacity (mgd)
4.00	2.85

Projected Demands

Year	Average Water Demands (mgd)	Maximum Water Demands (mgd)	Peak Hourly Flow Demands (mgd)
2020	0.86	1.65	2.48
2025	0.87	1.67	2.51
2040	0.91	1.74	2.61

Current Raw Water Capacity

Well Capacities	mgd
Well No. 2	0.58
Well No. 6	1.58
Well No. 7	0.72
Well No. 8	0.58
Total Capacity	3.46
Firm Capacity	1.87
Total Capacity w/o Well 2	2.88
Firm Capacity w/o Well 2	1.30

Future Raw Water Capacity (to WTP)

Well Capacities	gpm	mgd
Well No. 2 (Standby, direct to system, not included)	400	0.58
Well No. 6	1100	1.58
Well No. 7	500	0.72
Well No. 8	400	0.58
Well No. 9 (Proposed)	500	0.72
Well No. 10 (Proposed)	500	0.72
Well No. 11 (Proposed)	500	0.72
Well No. 12 (Proposed)	500	0.72
Total Capacity w/o Well 2	4,000	5.76
Firm Capacity w/o Well 2	2,900	4.18

Pressure Filter Design (Note: Only 3 filters will be installed initially)

Pressure Filters		
Filter Type	Horizontal Pressure Filters	
Filtration Media Makeup - Top Media Layer		
Media Type	Anthracite	
Layer Depth	12	inches
Middle Media Layer		
Media Type	Sand	
Layer Depth	18	inches
Bottom Media Layer		
Media Type	Garnet Sand	
Layer Depth	6	inches
Total Media Depth	36	inches
No. of Filter Vessels	4	
No. of Filter Cells per Vessel	2	
No. of Filter Cells	8	
Filter Dimensions - Diameter	10	
Length	28	
Filtration Area, each cell	135	ft ²
Filtration Area, each Filter	270	ft ²
Total Filtration Area	1,081	ft ²
Maximum Normal Filtration Rate	3.0	gpm/ft ²
Maximum Firm Filtration Rate	3.0	gpm/ft ²
Minimum Filtration Rate	1.0	gpm/ft ²
Flow Distribution	<u>gpm</u>	<u>mgd</u>
Flow per Cell (at normal filtration rate)	405	0.58
Flow per Filter (at normal filtration rate)	811	1.17
Maximum Filter Flow Rates	<u>gpm</u>	<u>mgd</u>
Total Maximum Filtration Flow Rate	3,242	4.67
Firm Maximum Filtration Flow Rate w/ one cell out	2,837	4.09
Firm Maximum Filtration Flow Rate w/ one filter out	2,432	3.50
Minimum Filter Flow Rates	<u>gpm</u>	<u>mgd</u>
Total Minimum Filtration Flow Rate	1,081	1.56
Minimum Flow Rate per filter	270	0.39
Minimum Flow Rate per cell	135	0.19
Minimum Flow Rate with 1 Filter OOS	811	1.17
Minimum Flow Rate with 2 Filters OOS	540	0.78

Backwash System Design

Backwash System		
Air Scour Backwash		
Backwash Rate with Air Scour	5	gpm/ft ²
Backwash flow for one cell	676	gpm
Backwash Duration with Air Scour	10	minutes
Backwash with Air Scour Volume from one cell wash	6,755	gallons
Restratification Backwash		
Restratification Backwash Rate	12	gpm/ft ²
Backwash flow for one cell	1,621	gpm
Backwash Duration	5	minutes
Backwash volume from one cell wash	8,106	gallons
Filter to Waste		
Filter to Waste Rate	3	gpm/ft ²
Filter to Waste Flow for one cell	405	gpm
Filter to Waste Duration	5	minutes
Filter to Waste volume from one cell wash	2,027	gallons
Filter Air Wash Blowers		
Quantity	2	
Type	Positive Displacement	
Airwash Rate	3.0	scfm/sf
Blower Capacity	811	scfm
Discharge Pressure	6.15	psi
Horsepower	30	HP

Residuals Design (Designed for Ultimate Capacity)

Residuals		
	Daily Average	Daily Maximum
Washwater Production per Backwash	16,888	16,888
No. of Backwashes per Day	2	4
Total Washwater Volume per Day	33,775	67,550
Raw Water Iron Concentration (mg/L)	1.3	2.03
Raw Water Manganese Concentration (mg/L)	0.15	0.2
Raw Water Radium Concentration (pCi/L)	2	6
Backwash Residual Solids (lb/day)	60	340
Average Iron Residual Solids (lb/day)	41	130
Average Manganese Residual Solids (lb/day)	9	11

Backwash Equalization Basin		
Needed Backwash Volume	101,325	gallons
Tank Type	Belowground Poured Concrete	1.5 Maximum Daily Volume
Tank Dimensions		
Length	50	feet
Width	30	feet
East Height	8	feet
West Height	10	feet
Tank Volume	100,980	gallons
Tank Overflow	848.0	feet
Tank Bottom Elevation	838.0	feet
	Daily Average	Daily Maximum
Residence Time of Backwash Volume in Basin	2.99	1.49

Chemical Feed Design (Designed for Ultimate Capacity)

System:	Chlorine Gas	
Chemical:	Cl ₂	
Form:	Gas	
Average Chemical Concentration Desired for Iron Oxidation	2.00	mg/L
Maximum Chemical Concentration for Oxidation	5.00	mg/L
Average Chemical Concentration for Disinfection	1.00	mg/L
Maximum Chemical Concentration for Disinfection	2.00	mg/L
Average dose	3.00	mg/l as Cl ₂
Design average use	50.04	lb/gal as Cl ₂
Upper range dose	7.00	mg/l as Cl ₂
Design max. day use	233.52	lb/gal as Cl ₂
Minimum range dose	3.00	mg/l as Cl ₂
Design min. day use	25.02	lb/gal as Cl ₂

Oxidation can occur in 15-30 minutes. Theoretical Oxidant dose is 2 mg/L. Additional is needed due to organic content in the water.

Based on Current Chlorine Applied, understood that chemistry will change with different chemical treatment.

Feed units	Chlorinators	
Total max feed rate required	233.5	lb/day
Firm Capacity of Chlorinators	600.0	lb/day
No. of Chlorinators	4	Initial Install

Chlorinator needs to be sized to meet residual of 2 mg/L.

Storage		
30 day avg. use, bulk	1,501.2	lb
Delivery (150 lb Cylinder)	150.0	lb
30 day + delivery	1,651.2	lb
Storage units (150 lb Cylinders)	12	
Usable storage	1,800.0	lb
Daily Maximum use	233.5	lb
Cylinders hooked up	10	
Available Capacity	500	lb

Note: Assumed that only 50 lbs per cylinder can be used per day

Types of Cylinders (Praxair)	Volume (pounds)
48x10	150

Cylinders used Weekly at:

Current Average Day Demands	2	Cylinders
Current Maximum Day Demands	3	Cylinders
Future Average Day Demands	3	Cylinders
Future Maximum Day Demands	5	Cylinders

Volume of Pipe/Pressure Filter above media	34,650	Gallons
Estimated Detention Time	12.47	Minutes

This assumes that all filters are online to meet 4.0 mgd.

System:	Fluoridation
Chemical:	H ₂ SiF ₆
Form:	Hydrofluosilicic Acid Solution
Chemical conc.	23%
Bulk density	10.2 lb/gal as F
Chemical density/solution strength	1.9 lb/gal as F
Background Fluoride in Raw Water	0.3 mg/L as f
Average dose	0.4 mg/l as F
Design average use	6.7 lb/gal as F
	3.6 gal/day solution
Upper range dose	0.7 mg/l as F
Design max. day use	23.4 lb/gal as F
	12.6 gal/day solution
Minimum range dose	0.4 mg/l as F
Design min. day use	3.3 lb/gal as F
	1.8 gal/day solution

Based on existing feed

Used maximum final concentration in distribution system for this.

Feed units	Metering Pumps
Total max feed rate required	0.5 gal/hr
Firm Capacity of Pumps	1.0 gal/hr
Quantity	2
Max Feed Required each pump or unit	1.00 gal/hr
Capacity for each Pump	1.00 gal/hr
Avg design feed rate	0.150 gal/hr
Min design feed rate	0.075 gal/hr
Ratio of Max to Min Feed Rate	14.3%

Ten States' recommends above 20% on this. Here it may not be possible or make sense. Would get close with 3 pumps.

Storage	
30 day avg. use, bulk	110.0 gal
Storage units (bulk/day)	Drums
Volume per drum	55.0 gal
Number of Drums	3
Total 30 day storage	165.0 gal

Additional drum you are feeding from

System:	Phosphate
Chemical:	Orthophosphate
Form:	PO ₄
Chemical conc.	32%
Bulk density	11.3 lb/gal as PO ₄
Chemical density/solution strength	3.6 lb/gal as PO ₄
Maximum Chemical Concentration Desired	2.0 mg/L
Average Chemical Concentration Desired	1.3 mg/L
Background Phosphate in Raw Water	0.2 mg/L as PO ₄
Average dose	1.0 mg/l as PO ₄
Design average use	17.0 lb/gal as PO ₄
	4.7 gal/day solution
Upper range dose	2.0 mg/l as PO ₄
Design max. day use	66.7 lb/gal as PO ₄
	18.4 gal/day solution
Minimum range dose	1.0 mg/l as PO ₄
Design min. day use	8.5 lb/gal as PO ₄
	2.3 gal/day solution

Based on existing feed

Feed units	Metering Pumps
Total max feed rate required	0.8 gal/hr
Firm Capacity of Pumps	1.0 gal/hr
Quantity	2
Max Feed Required each pump or unit	1.00 gal/hr
Capacity for each Pump	2.00 gal/hr
Avg design feed rate	0.196 gal/hr
Min design feed rate	0.098 gal/hr
Ratio of Max to Min Feed Rate	12.8%

Ten States' recommends above 20% on this. Here it may not be possible or make sense. Would get close with 3 pumps.

Storage	
30 day avg. use, bulk	150.0 gal
Storage units (bulk/day)	Drums
Volume per drum	55.0 gal
Number of Drums	4
Total 30 day storage	220.0 gal

Additional drum you are feeding from

System:	HMO (MnO2)			
System Purpose	Radium Removal	Radium Removal	Radium Removal	HMO Production
Chemical:	HMO (MnO ₂)	HMO (MnO ₂)	HMO (MnO ₂)	Sodium Permanganate (NaMnO ₄)
Form:	Dilution of 10% HMO	Solution	Concentrate	Solution
Molecular Weight	86.9 g/mol	86.9 g/mol	86.9 g/mol	169.0 g/mol
Chemical concentration	1.0 %	10.0 %	100.0 %	29.4 %
Bulk density	8.7 lb/gal	11.7 lb/gal	41.9 lb/gal	10.9 lb/gal
Chemical density	0.05 lb/gal as Mn	0.74 lb/gal as Mn	26.5 lb/gal as Mn	3.2 lb/gal
Dose	1.0 mg/l as Mn	1.0 mg/l as Mn	1.0 mg/l as Mn	1.0 mg/l as NaMnO ₄
	158.2 mg/l as soln.	15.8 mg/l as soln.	1.6 mg/l as soln.	1.0 mg/l as soln.
Design maximum day use	7.2 lb/day as Mn	7.2 lb/day as Mn		7.2 lb/day as Mn
	131.3 gal/day soln.	9.7 gal/day soln.		4.3 gal/day soln.
	5.5 gal/hr	0.4 gal/hr		
	0.09 gpm	0.01 gpm		
Design average use	7.3 lb/day Mn	7.3 lb/day Mn		14.0 lb/day Mn
	133.0 gal/day soln.	9.9 gal/day soln.		4.4 gal/day soln.
	5.5 gal/hr	0.4 gal/hr		
	0.09 gpm	0.01 gpm		

Transfer Pump Units	Apex 28 Hose Pumps	Peristaltic Metering Pump Watson Marlow 630 DuN	Peristaltic Metering Pump Watson Marlow 630 DuN
Quantity	2	2	2
Tube Size (mm)	19.1 mm	17.0 mm	17.0 mm
Capacity each unit	2.00 gpm	5.02 gpm	5.02 gpm
Pressure Needed to Overcome Filter	30.00 psi	30.00 psi	30.00 psi

Time to transfer (gallons)	Apex 28 Hose Pumps	Peristaltic Metering Pump Watson Marlow 630 DuN	Peristaltic Metering Pump Watson Marlow 630 DuN
10	5.0 min	2.0 min	2.0 min
20	10.0 min	4.0 min	4.0 min
30	15.0 min	6.0 min	6.0 min
40	20.0 min	8.0 min	8.0 min
50	25.0 min	10.0 min	10.0 min

Feed Pumps	Apex 10 Hose Pumps		
Quantity	2		
Capacity each pump	60.0 gal/hr		
Hose Diameter	10.0 mm	Hose Area	0.0008 ft ²
Max feed rate required	5.5 gal/hr	Max Velocity	0.240 ft/s
Max use to capacity ratio	9%		
Average design feed rate	5.5 gal/hr		0.243 ft/s
Average use to capacity ratio	9.2%		
Pressure Needed to Overcome Filter	75.10 psi	Does not include headloss through chem lines. Does include cracking pressure.	

Storage units	Day Tank	Batch Tank	275 gal IBC tote	275 gal IBC tote
Quantity	2	2	2	2
30 day average use	3989 gal	296 gal	131 gal	116 gal
Chemical Tote Volume			275 gal	275 gal
Total Stored Volume			550 gal	550 gal
Days of storage at average use			126 days	142 days
30 Hour average use	166 gal	173 gal		
24 Hour maximum use	131 gal	136 gal		
Tank Dimensions:				
Tank Diameter	4.0 feet	4.0 feet		
Tank Height	4.75 feet	4.75 feet		
Volume per inch of height	7.83 gal	7.83 gal		
Volume Usable	399 gal	384 gal		
Total Stored Volume	799 gal	767 gal		
Avg days between batches	3.0 days	38.9 days		
Max days between batches	3.0 days	39.4 days		

10% calculated at 2 weeks of use.

Weighs as much as 3,000 pounds.

Appendix 9

RECEIVED

JUL 23 1987

United States Department of the Interior
National Park Service

NATIONAL
REGISTER

National Register of Historic Places
Registration Form

This form is for use in nominating or requesting determinations of eligibility for individual properties or districts. See instructions in *Guidelines for Completing National Register Forms* (National Register Bulletin 16). Complete each item by marking "x" in the appropriate box or by entering the requested information. If an item does not apply to the property being documented, enter "N/A" for "not applicable." For functions, styles, materials, and areas of significance, enter only the categories and subcategories listed in the instructions. For additional space use continuation sheets (Form 10-900a). Type all entries.

1. Name of Property

historic name Grand Ledge Chair Company Plant
other names/site number _____

2. Location

street & number 101 Perry Street N/A not for publication
city, town Grand Ledge N/A vicinity
state Michigan code MI county Eaton code 045 zip code 48837

3. Classification

Ownership of Property	Category of Property	Number of Resources within Property	
<input checked="" type="checkbox"/> private	<input type="checkbox"/> building(s)	Contributing	Noncontributing
<input type="checkbox"/> public-local	<input checked="" type="checkbox"/> district	<u>2</u>	<u>1</u> buildings
<input type="checkbox"/> public-State	<input type="checkbox"/> site	<u>0</u>	<u>0</u> sites
<input type="checkbox"/> public-Federal	<input type="checkbox"/> structure	<u>2</u>	<u>2</u> structures
	<input type="checkbox"/> object	<u>0</u>	<u>0</u> objects
		<u>4</u>	<u>3</u> Total

Name of related multiple property listing: N/A
Number of contributing resources previously listed in the National Register 0

4. State/Federal Agency Certification

As the designated authority under the National Historic Preservation Act of 1966, as amended, I hereby certify that this nomination request for determination of eligibility meets the documentation standards for registering properties in the National Register of Historic Places and meets the procedural and professional requirements set forth in 36 CFR Part 60. In my opinion, the property meets does not meet the National Register criteria. See continuation sheet.

[Signature] 7-21-87
Signature of certifying official Date
Director, Bureau of History Admnty SHPO
State or Federal agency and bureau

In my opinion, the property meets does not meet the National Register criteria. See continuation sheet.

Signature of commenting or other official Date

State or Federal agency and bureau

5. National Park Service Certification

I, hereby, certify that this property is:

entered in the National Register.
 See continuation sheet.

determined eligible for the National Register. See continuation sheet.

determined not eligible for the National Register.

removed from the National Register.

other, (explain:) _____

Signature of the Keeper

Date of Action

6. Function or Use

Historic Functions (enter categories from instructions)

Industry/Processing/Extraction
manufacturing facility

Current Functions (enter categories from instructions)

Vacant/Not in Use

7. Description

Architectural Classification
(enter categories from instructions)

No Style

Materials (enter categories from instructions)

foundation Stone

walls Brick

wood/weatherboard

roof Asphalt

other

Describe present and historic physical appearance.

The Grand Ledge Chair Company Plant is located near the western edge of the city of Grand Ledge. It occupies a seven-acre site on level ground atop a wooded bluff overlooking the Grand River. A Pere Marquette Railroad line forms the northwest border of the complex and crosses the Grand River directly adjacent to the plant's river frontage. The plant contains three buildings, two of which contribute to its historic character, and four structures, two of which are contributing. The principal building, which terminates the view along the short street providing access to the site, is a long and narrow, three-story, brick factory building built in 1906. The site also contains a small, frame factory building, brick power house, and veneer storage shed built of clay tile.

The factory complex is located at the end of Perry Street, a short, minor street containing several modest, turn-of-the-century, frame houses. The 1906 factory stands at the end of the street and is highly visible from the West Jefferson Street intersection, the ornamental central part of the facade, crowned by a water tower, being positioned directly in line with Perry Street. The grounds in front of the 1906 building to the right of Perry Street and behind the 1906 building back to the river bluff are level lawn areas containing a scattering of old deciduous trees. Some parts of the grounds have become somewhat overgrown in the years since furniture-manufacturing ceased.

The 1906 factory building (contributing) is 353.5 feet long by fifty feet wide and is three stories in height and built of cream-color brick with red brick accents. This structure, which housed the assembly, finishing, and shipping processes of the chair company, exemplifies heavy, timber, mill construction typical of the turn-of-the-century period. The building has a flat, built-up roof. Except for enclosed staircases, the building interior on each floor is largely a single open space with exposed plank flooring above floor joists for a ceiling and chamfered-edge vertical posts. The building's facade has a regular fenestration of double-hung windows set into segmental-arch heads. The portion of the facade fronting on Perry Street is treated in a somewhat more ornamental fashion, with a stepped-gable design containing in its center the main entrance and tripartite windows in the second and third stories above it. The parapets have corbelled brick detailing below the cornice line. Perched atop the roof on a square, brick base and in line with the main entrance is a wood-slat water tank held together with steel bands. Water penetration since the closing of the furniture operation has caused considerable damage to framing members as well as brickwork in parts of the building.

Immediately to the west of the 1906 building is a low, steel-frame, sheet-steel-sided warehouse structure (non-contributing) constructed in 1957-58. Used originally for cutting, shaping, and assembly operations, this replaced the original three-story, frame factory building at this site.

To the north of the 1957-58 structure is a thirty-two by one hundred twelve-foot, one-story, frame building that was part of the original factory building (contributing). Part of this building has collapsed and the remainder is ruinous.

See continuation sheet

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Continuation Sheet**

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West of the 1957-58 structure and the frame factory building are the foundation remains and rubble from a bending room, engineering room and storage, and drying kiln demolished several years ago.

North of the frame factory building remnant is a red brick boiler house structure (contributing) which dates from 1902. This flat-roof, steel-frame structure was enlarged at some undetermined time after the original construction to contain an additional boiler. The structure adjoined a railroad siding and the steel-frame canopy covering the siding survives on the structure's north side. The boiler house is severely deteriorated.

The final contributing structure on the grounds is a one-story, twenty by fifty-three-foot, clay tile veneer storage shed. This gable-roof structure has settled unevenly and one part of a wall has collapsed.

The property also contains a one-story, modern, brick house (non-contributing building) and garage behind it (non-contributing structure). These are located on the east side of Perry Street in front of the 1906 factory building. On the west side of Perry Street in front of the 1906 building is a parking lot.

At one time, smaller structures existed on the site, including an oil house and storage structure near the center of the property, a storage and glue structure north of the original wood factory and east of the boiler house, and a stock shed and storage structure in the southwest corner of the site. Railroad sidings penetrated the site near the boiler house, the kiln, and along the north side of the brick factory. Only minor above ground remains of these improvements exist.

Rehabilitation of this property for apartment use is now under way and will likely result in the demolition of all buildings and structures on the property except for the 1906 factory and the modern house and garage standing in front.

8. Statement of Significance

Certifying official has considered the significance of this property in relation to other properties:

nationally statewide locally

Applicable National Register Criteria A B C D

Criteria Considerations (Exceptions) A B C D E F G

Areas of Significance (enter categories from instructions)

Architecture
Engineering
Industry

Period of Significance

1902-1906
1906
1902-1930s

Significant Dates

N/A
N/A
1902-1906

Cultural Affiliation

N/A

Significant Person

Edward Turnbull

Architect/Builder

Unknown

State significance of property, and justify criteria, criteria considerations, and areas and periods of significance noted above.

The Grand Ledge Chair Company Plant is the only example surviving in the Grand Ledge-Lansing area of a furniture-manufacturing complex built during the heyday of the furniture-manufacturing industry in southern Michigan in the late nineteenth and early twentieth centuries. It housed one of Grand Ledge's principal industrial concerns and largest employers in the early twentieth century. The 1906, brick factory building is the best preserved and least altered example of turn-of-the-century factory design in the Grand Ledge-Lansing area and exemplifies the use of fire-resistant mill construction techniques characteristic of Michigan factory design of the period.

Furniture manufacturing flourished in southern Michigan in the late nineteenth and early twentieth centuries, because of the availability of high quality wood from the deciduous forests of the central and northern Lower Peninsula and the development of railroad lines which facilitated the shipping of raw materials as well as finished products. The reputation for fine quality furniture which Grand Rapids had achieved in the wake of its furniture manufacturers' popular displays at the 1876 Centennial Exposition perhaps also had a spin-off effect. The result was that plants manufacturing furniture for the home, school, church, lodge hall, and other commercial and institutional uses were established in many smaller southern Michigan towns — such as Sturgis, Allegan, Hastings, Ionia, Northville, and Ann Arbor — beginning in the 1880s and down to the 1920s. The Grand Ledge Chair Company fits into the general pattern.

The Grand Ledge Chair Company originated in 1874 as a small furniture shop located near the corner of Bridge and River Streets in the center of Grand Ledge. The original firm, variously called the Grand Ledge or Michigan Chair Company, was reorganized and incorporated December 1, 1888 as the Grand Ledge Chair Company by the three original owners, Thomas Garrett, Harry Jordan, and Edward Crawford of Grand Rapids. The three sold out in 1893 to Edward H. Turnbull and George W. Fletcher. Turnbull soon bought out Fletcher's interests.

Under the management of Turnbull, who lived nearby on West Jefferson Street, the company prospered. In 1902, Turnbull, along with relatives David Bell and George Coryell, founded the Grand Ledge Table Company and constructed a three-story factory, a power house, and a one-story mill building on the newly acquired Perry Street site. The company intended to manufacture living room tables, but chair orders increased to the point of requiring additional facilities, and some of the chair production was relocated to the Perry Street site. Between 1902 and 1905, Turnbull purchased both the Coryell and Bell interests. He then expanded his operations in 1906 by constructing a large three-story brick building adjacent to the existing Table Company Building and connecting them at the third floors. This new building provided the product finishing on the third floor, upholstering and storage on the second, and shipping and offices on the first floor.

See continuation sheet

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Edward Turnbull died in 1916, leaving the chair company to his wife, Emma A. Turnbull. Emma, along with trusted key employees, continued to manage the company through the Depression years and a 1941 unionization, until her death in 1944. At that time, the company was willed to her youngest sister, Mrs. Raymond Hull, who, along with her husband Raymond, managed the company through a lengthy strike and incorporation in 1949. Mrs. Hull died in 1950, leaving the company to her family. The firm was managed by her husband until 1966 and for the next seven years by Mrs. Hull's grandsons. In December 1973 the company became the Grand Ledge Chair Company, Division of Holabird Company, a manufacturing holding company. Finally, due to falling sales, the factory was permanently closed in the fall of 1981.

One of the most significant historical impacts of this company is its employment over the years of the company's existence. The population of Grand Ledge grew from 1,378 in 1890 to about 3,000 in 1910. This same period saw the development of the chair factory, along with a brick works and two sewer/conduit pipe plants, as the principal industries in town. Although accurate accounts are difficult to obtain, an 1884 account listed "17 hands employed" at the Chair Company. A later report in the Detroit Free Press in 1901 noted 100 employees. In early 1906, the Grand Ledge Independent reported that the business employed 225 men the full year with a payroll of \$8,000 per month and, with the completion of the new brick building, Mr. Turnbull was predicting employing an additional 400 men. However, in a November 13, 1926 article in the Lansing State Journal, only 200 employees were reported. In 1936, 130 men and women were employed with a payroll at the peak of 15,000 every two weeks. Another State Journal report on November 23, 1941 (the year of unionization) claimed 250 were employed. In 1948, there were 116 employees and "many home workers," mostly women weavers creating cattail chair seats and backs. By August 2, 1964 the work force had dwindled to 70 workers.

Research into the Annual Reports of the State Bureau of Labor noted the employment of 113 men and 2 women in 1902, 158 men and 6 women in 1906, 110 men and 3 women in 1912, 77 men and 7 women in 1915 and 110 men and 26 women in 1920, the last of the Annual Reports.

In summary it appears that the optimistic 1906 report by Mr. Turnbull of being able to employ 600 men and women was a bit of "chest thumping." However, it is very apparent the factory was the largest employer for many years in the Grand Ledge community. There was hardly a family in the area that didn't have at least one member as a Chair Factory employee.

A second significant historical impact of the company is the product that was produced. The company, though with very small beginnings in a carpenter shop, soon received substantial acclaim for the quality and design of the chair produced. Even in 1934, an account in the local newspaper identified the Grand Ledge Chair Company product as being distributed world wide. The company sold primarily to the quantity buyer or large contract sales. Locals could, however, purchase a variety of the chairs in the Tucker Department Store. Meanwhile, entire shipments of chairs were arriving at institutions such as Michigan State University, University of Michigan, Indiana University, and others. The chairs also graced the parlours of hotels, embassies, corporate offices and similar businesses. Perhaps the company's greatest glory and national recognition came when 2,800 chairs were chosen to furnish the Library of Congress and the Rayburn Office Building in Washington, D.C. in 1964. Today many of the remaining chairs grace homes and museums as collectors pieces, remnants of an era of fine woods, craftsmanship, and elegant design.

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The Chair Company's three-story, brick, factory building is today unique in the Grand Ledge-Lansing area as a little altered example of turn-of-the-century factory design constructed with a timber framing system. The building's design exemplifies the standard "mill construction" of the period that was designed to be fire resistant and to reduce fire damage to a minimum. The ideal, fire-resistant factory building of the period had masonry exterior walls to discourage the entrance into the building of a fire originating outside and a heavy timber frame substantial enough that it would continue to provide support even if the timbers were reduced in section dimensions through burning or the floors had unusually heavy loading from water poured on the fire. Finally, the interior was designed with the framing and flooring fully exposed to view and without crawl spaces or hollow partitions. This made fighting any fire which did break out much simpler. The Grand Ledge Chair Company 1906 building seems to exemplify all these design innovations, which were coming into common use in Michigan only in the 1890s.

9. Major Bibliographical References

Previous documentation on file (NPS): N/A
 preliminary determination of individual listing (36 CFR 67) has been requested
 previously listed in the National Register
 previously determined eligible by the National Register
 designated a National Historic Landmark
 recorded by Historic American Buildings Survey # _____
 recorded by Historic American Engineering Record # _____

See continuation sheet

Primary location of additional data:

State historic preservation office
 Other State agency
 Federal agency
 Local government
 University
 Other

Specify repository:

Grand Ledge Library

10. Geographical Data

Acres of property About seven acres

UTM References

A

16	18	3	64	0	4	7	36	0	50
Zone	Easting		Northing						

B

Zone	Easting		Northing						

C

Zone	Easting		Northing						

D

Zone	Easting		Northing						

See continuation sheet

Verbal Boundary Description

See continuation sheet

Boundary Justification

This tract includes the entire site associated with the Chair Company plant.

See continuation sheet

11. Form Prepared By

name/title Les Linsemier/R. O. Christensen
organization Linsemier and Associates date 6-1987
street & number 422 W. Lenawee telephone 517/372-1372
city or town Lansing state MI zip code 48933

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Bibliographic References

Abstract of Title, Sec. 2, T4N, R4W, Eaton County.

Annual Report, Michigan Bureau of Labor, 19th thru 37th Annual Reports.

"Fine Furniture Still A Grand Ledge Trademark," The Independent, Sept. 11, 1974.

"Firm Saluted in Michigan Week," The Independent, May 25, 1978.

"Grand Ledge," Lansing State Journal, Nov. 13, 1926.

Grand Ledge Area Historical Society, 1984. Greetings from Grand Ledge. Grand Ledge, Michigan.

Grand Ledge Area American Revolution Bicentennial Commission, 1978. The Nature of Grand Ledge.

Grand Ledge, Michigan.

"Grand Ledge Chair Company Carries on Areas Long Furniture Tradition," The Independent, May 13, 1976.

"Grand Ledge Chair Company Is Celebrating Its Golden Anniversary," The Independent, May 11, 1934.

Grand Ledge Historical Society, 1976. Grand Ledge Remembered. Grand Ledge, Michigan.

Michigan Historical Commission, The Past and Present of Eaton County, Chapter XVIII, Banks and Manufacturers, page 127, no published date, but around 1905.

"Know Your Michigan...Grand Ledge," Lansing State Journal, Nov. 23, 1941.

Lansing's Neighbor...Grand Ledge," Lansing State Journal, August 2, 1964.

Odenkirk, Thomas, 1959. History & Geography of Grand Ledge. A thesis presented to Michigan State University, East Lansing, Michigan.

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AENR87180A AENR87180F

7/29/87

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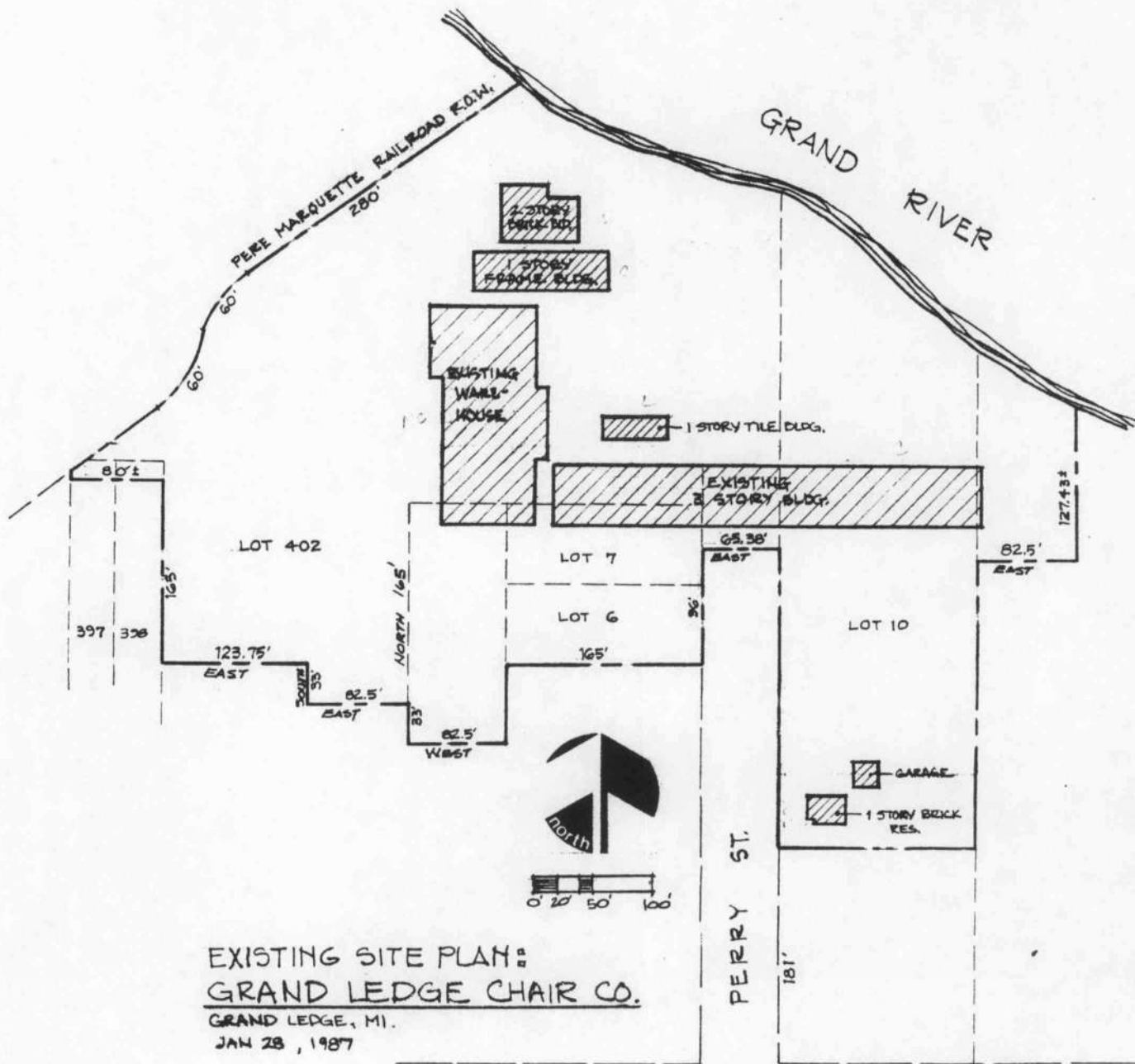
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LEGAL DESCRIPTION

- A. Land situated in Section 2, T4N, R4W, City of Grand Ledge, Eaton County, Michigan, described as: commencing on the East line of Lot 10, Block 1, Riverside Addition to the City of Grand Ledge, at a point 30 feet South from the South wall of the brick factory building of the Grand Ledge Chair Company; thence due East 5 rods; thence North to Grand River; thence Northwesterly along the river to the East line of Lot 10; thence South along the line of Lot 10 to the place of beginning.
- B. Lot 10, Block 1, Riverside Addition, except the South 181 feet thereof, City of Grand Ledge, Eaton County, Michigan, as recorded in Liber 1 of Plats, Page 63, Eaton County Records.
- C. Lots 6 and 7, Block 2, Riverside Addition, City of Grand Ledge, Eaton County, Michigan, as recorded in Liber 1 of Plats, Page 63, Eaton County Records.
- D. Commencing at a point on the West line of Perry Street, 30 feet North from the South line of Lot 7, Block 2, Riverside Addition; thence East to the East line of Perry Street; thence North to Grand River; thence Northwesterly down said river to the Southeasterly line of right of way of Pere Marquette Railroad; thence Southwesterly along the Southeasterly line of the right of way of said railroad to a point 32 rods North of the South line of Section 2; thence East parallel to said South 10 rods; thence East $7\frac{1}{2}$ rods; thence South 2 rods; thence South 2 rods; thence East 5 rods; thence North 10 rods; thence East on the South line of Dillon Street, so-called, to the Northeast corner of Lot 7, Block 2, Riverside Addition; thence South 36 feet to the place of beginning, being a part of Supervisor's Plat No. 6, City of Grand Ledge, Eaton County, Michigan is recorded in Liber 2 of Plats, page 49, Eaton County Records.
- E. Commencing 46 rods East and 18 rods North of the Southwest corner of said Section 2; thence North 12 rods; thence East 5 rods; thence South 12 rods; thence West 5 rods to the point of beginning, City of Grand Ledge, Eaton County, Michigan.
- F. The North 15 feet of Lots 397 and 398, Supervisor's Plat No. 6, City of Grand Ledge, Eaton County, Michigan, as recorded in Liber 2 of Plats, Page 49, Eaton County Records.

Subject to the rights of the public and any governmental unit in any part thereof, taken, used or deeded for street, road or highway purposes.

Subject to easements and restrictions of record.



EXISTING SITE PLAN:
GRAND LEDGE CHAIR CO.
 GRAND LEDGE, MI.
 JAN 28, 1987

WEST JEFFERSON ST.

M-43

United States Department of the Interior
National Park Service

RECEIVED

AUG 10 1987

National Register of Historic Places
Registration Form

NATIONAL
REGISTER

This form is for use in nominating or requesting determinations of eligibility for individual properties or districts. See instructions in *Guidelines for Completing National Register Forms* (National Register Bulletin 16). Complete each item by marking "x" in the appropriate box or by entering the requested information. If an item does not apply to the property being documented, enter "N/A" for "not applicable." For functions, styles, materials, and areas of significance, enter only the categories and subcategories listed in the instructions. For additional space use continuation sheets (Form 10-900a). Type all entries.

1. Name of Property

historic name None
other names/site number River Ledge Historic District

2. Location Jefferson, Scott, and Lincoln Streets

street & number between Franklin and Maple Streets N/A not for publication
city, town Grand Ledge N/A vicinity
state Michigan code 026 county Eaton code 045 zip code 48837

3. Classification

Ownership of Property	Category of Property	Number of Resources within Property	
		Contributing	Noncontributing
<input checked="" type="checkbox"/> private	<input type="checkbox"/> building(s)	<u>235</u>	<u>47</u> buildings
<input checked="" type="checkbox"/> public-local	<input checked="" type="checkbox"/> district	_____	_____ sites
<input type="checkbox"/> public-State	<input type="checkbox"/> site	_____	_____ structures
<input type="checkbox"/> public-Federal	<input type="checkbox"/> structure	_____	_____ objects
	<input type="checkbox"/> object	<u>235</u>	<u>47</u> Total

Name of related multiple property listing:
N/A

Number of contributing resources previously listed in the National Register 0

4. State/Federal Agency Certification

As the designated authority under the National Historic Preservation Act of 1966, as amended, I hereby certify that this nomination request for determination of eligibility meets the documentation standards for registering properties in the National Register of Historic Places and meets the procedural and professional requirements set forth in 36 CFR Part 60. In my opinion, the property meets does not meet the National Register criteria. See continuation sheet.

Martha M. Bigelow 7/31/87
Signature of certifying official Date
Director, Bureau of History
State or Federal agency and bureau

In my opinion, the property meets does not meet the National Register criteria. See continuation sheet.

Signature of commenting or other official Date

State or Federal agency and bureau

5. National Park Service Certification

I, hereby, certify that this property is:

entered in the National Register. *Beth Casanova* 9/24/87
 See continuation sheet. _____
 determined eligible for the National Register. See continuation sheet. _____
 determined not eligible for the National Register. _____
 removed from the National Register. _____
 other, (explain:) _____

Signature of the Keeper Date of Action

6. Function or Use

Historic Functions (enter categories from instructions)

Domestic/single dwelling

Religion/religious structure

Current Functions (enter categories from instructions)

Domestic/single dwelling

Religion/religious structure

Government/city hall

7. Description

Architectural Classification

(enter categories from instructions)

Italianate

Queen Anne

Colonial Revival

Materials (enter categories from instructions)

foundation Stone

walls Wood/weatherboard

Brick

roof Asphalt

other

Describe present and historic physical appearance.

The River Ledge Historic District is an irregularly shaped residential area about one-half mile in length and 700 feet in width located on the southwest side of the Grand River in the city of Grand Ledge. The district contains a total of 282 buildings (235 of them contributing), of which all but eight were constructed as housing. Virtually all the houses were built as single-family residences. The structures date generally from the 1850s to 1920s and exemplify a broad range of architectural styles and building types popular in southern Michigan in that period.

The River Ledge district contains the historic core of Grand Ledge's southside residential neighborhood. Located on a plateau atop the yellow-brown, Pennsylvanian sandstone and shale bluffs (which give the city its name) overlooking the Grand River, the district skirts around the south side of the city's small central business district, located along Bridge Street (M-100) south of the Grand River bridge. Streets are laid out at right angles, forming square blocks, except at the district's west end, where the streets often intersect at angles, creating pleasant vistas. Most of the streets are narrow. Even East Jefferson, a four-lane roadway which serves as part of state route M-100, appears narrow because of its narrow traffic lanes and lack of flanking parking lanes. Large, old trees, particularly maples, flank many roadsides and shade many houses. The plentiful shade trees and the siting of the houses well back from the street line and separate from each other give the district a spacious character.

The Grand Ledge district contains four brick or stuccoed, late nineteenth- and early twentieth-century churches located around the fringes of the downtown area, a fifth church that has in recent years been converted into the Grand Ledge City Hall, and the early twentieth-century public library, with its large, modern addition — actually the main structure — tucked unobtrusively behind it.

Out of the district's 282 structures, however, 264 were built as houses. Although several now serve as funeral homes or contain real estate offices or other commercial uses, nearly all serve as houses. Clapboard or clapboard and shingle exteriors predominate, but some brick and stone structures, and a few cement block ones, are present. Ten large carriage houses/barns are present. One has walls constructed of glazed-finish, locally manufactured conduit tile.

Most houses in the district are relatively modest in size and simple in their detailing. The largest and most elaborately detailed homes are generally concentrated along East and West Jefferson. The district houses exemplify Greek and Gothic Revival, Italianate, Queen Anne, Colonial Revival, and bungalow/craftsman styling. Frame, one- or two-story, cubical Italianate houses, L-shaped houses with Gothic gable windows, and narrow-fronted and deep Queen Anne/Colonial Revival houses establish the district character. However, a large number of Late Victorian homes are very simply detailed structures which contain no identifiable stylistic references, but have plain, square-head windows and simple raking cornices without returns.

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Alterations which some district structures have undergone include the modernization with colonial or craftsman detailing of numerous nineteenth-century structures and, more recently, siding with asphalt, asbestos, aluminum, and vinyl sidings and the removal of porches or replacement of old wooden porch supports with wrought iron ones. However, these changes have not affected a high proportion of the district structures or greatly affected the district's historic character.

The following buildings contribute to the historic character of the district (all are wood-frame houses unless otherwise indicated):

205 Adams St.	c. 1900 end-gable
406 S. Bridge St.	Free Methodist Church (now 1st United Methodist Church annex): c. 1900 stucco-clad structure with corner tower
417 S. Bridge St.	c. 1900 end-gable
418 " " "	c. 1900 Colonial Revival
419 " " "	Late Victorian hip-roof cottage
426 " " "	c. 1900 cement block with stuccoed gables
427 " " "	Late Victorian L-plan
501 " " "	c. 1900 gambrel-roof Colonial Revival
700 DeGroff St.	Late Victorian hip-roof cottage
211 Franklin St.	Late Victorian L-plan
214 " " "	Bungalow
316 " " "	Bungalow-style
319 " " "	Late Victorian L-plan
327 " " "	2-story, hip-roof, Late Victorian
212 Harrison St.	Late Victorian hip-roof
216 " " "	Late Victorian L-plan
314 " " "	Late Victorian with Gothic windows
315 " " "	Queen Anne
316 " " "	Late Victorian hip-roof cottage
321 " " "	Queen Anne
326 " " "	Queen Anne
327 " " "	Queen Anne
410 " " "	Colonial Revival
411 " " "	First United Methodist Church (1911-12): brick Gothic structure
418 " " "	c. 1900 hip-roof cottage
426 " " "	Queen Anne
312 Jackson St.	Bungalow-style
317 " " "	Hip-roof Late Victorian
320 " " "	Queen Anne/Colonial Revival
327 " " "	Late Victorian L-plan
328 " " "	Brick Queen Anne/Colonial Revival
410 " " "	Late Victorian end-gable
411 " " "	Late Victorian/early 20th-c. cottage
418 " " "	Bungalow
419 " " "	Queen Anne/Colonial Revival
423 " " "	Brick Queen Anne/Colonial Revival
427 " " "	Late Victorian L-plan

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131 E. Jefferson St.	Grand Ledge Public Library (1931): red-brick, Renaissance Revival-style structure with green tile roof. Large rear wing (1958) is now the main library.
201 E. Jefferson St.	Trinity Episcopal Church (1911-13): brick, Gothic structure with corner tower
207 " " "	Buff brick Italianate with belvedere (1872-73)
214 " " "	Queen Anne
219 " " "	Queen Anne
220 " " "	Queen Anne
301 " " "	Brick Italianate
302 " " "	Italianate
308 " " "	Queen Anne/Colonial Revival
310 " " "	Italianate
315 " " "	Gambrel-roof Colonial Revival
318 " " "	Brick Queen Anne
324 " " "	Late Victorian L-plan
327 " " "	Brick Italianate
328 " " "	Queen Anne/Colonial Revival
332 " " "	Late Victorian
400 " " "	Bungalow-style
403 " " "	Late Victorian L-plan
406 " " "	Brick Italianate
407 " " "	Brick c. 1900
411 " " "	Stuccoed Italianate
412 " " "	Brick early 20th-C., hip-roof
419 " " "	Brick c. 1900
420 " " "	Italianate
424 " " "	c. 1900 Colonial Revival
431 " " "	Late Victorian L-plan
500 " " "	c. 1900 end-gable
501 " " "	Brick bungalow
504 " " "	Late Victorian L-plan
510 " " "	c. 1900 end-gable
511 " " "	c. 1900 flank-gable
514 " " "	Late Victorian brick L-plan
515 " " "	Bungalow
520 " " "	Italianate
521 " " "	c. 1900 end-gable
527 " " "	c. 1900 end-gable
600 " " "	Brick Queen Anne
603 " " "	Colonial flank-gable (1928)
119 W. Jefferson St.	Brick Late Victorian
200 " " "	Shingle Style
204 " " "	Evidently c. 1900 house modernized in the 1920s
207 " " "	c. 1900 cement block end-gable
210 " " "	c. 1900 brick end-gable
211 " " "	c. 1900 cement block Colonial Revival
219 " " "	Brick flank-gable Colonial Revival
226 " " "	Late Victorian L-plan
227 " " "	Flank-gable Late Victorian

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304	"	"	"	Queen Anne
315	"	"	"	Brick Colonial Revival
316	"	"	"	Queen Anne
324	"	"	"	Cement block bungalow
325	"	"	"	Queen Anne
330	"	"	"	Bungalow
333	"	"	"	Foursquare
334	"	"	"	Late Victorian
335	"	"	"	Foursquare
339	"	"	"	Flank-gable Colonial Revival
342	W. Jefferson St.	"	"	c. 1900 saltbox
345	"	"	"	c. 1900 end-gable
348	"	"	"	c. 1900 brick end-gable
354	"	"	"	c. 1900
360	"	"	"	Bungalow
400	"	"	"	Modern English c. 1920s
405-407	"	"	"	L-plan with Gothic windows
408	"	"	"	c. 1920s jerkinhead-roof
412	"	"	"	c. 1900 brick Queen Anne/Colonial Revival
413	"	"	"	Queen Anne/Colonial Revival
420	"	"	"	c. 1900 end-gable
421	"	"	"	Queen Anne
427	"	"	"	Queen Anne
430	"	"	"	Brick bungalow-style
502	"	"	"	Queen Anne
503	"	"	"	Queen Anne/Colonial Revival
508	"	"	"	Queen Anne
109	E. Lincoln St.	"	"	Queen Anne/Colonial Revival
115	"	"	"	Late Victorian flank-gable
116	"	"	"	Bungalow-style
119	"	"	"	Late Victorian hip-roof cottage
125	"	"	"	c. 1900 end-gable
200	"	"	"	L-plan with Gothic windows
209	"	"	"	Late Victorian hip-roof cottage
216	"	"	"	c. 1900 L-plan
219	"	"	"	Stuccoed cross-gable, 1920s
224	"	"	"	Brick Italianate
227	"	"	"	Flank-gable Late Victorian
301	"	"	"	L-plan with Gothic windows
304	"	"	"	Late Victorian flank-gable
307	"	"	"	Late Victorian hip-roof cottage
308	"	"	"	Late Victorian flank-gable
315	"	"	"	Late Victorian hip-roof
316	"	"	"	Late Victorian hip-roof
320	"	"	"	Late Victorian flank-gable
325	"	"	"	Flank-gable Colonial
326	"	"	"	c. 1900 flank-gable
401	"	"	"	L-plan with Gothic windows

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409	"	"	"	Bungalow
412	"	"	"	Bungalow
414	"	"	"	Bungalow
428	"	"	"	Strobel Funeral Home (1930): flank-gable, brick, Federal Revival structure, now a house
112-114	W.	Lincoln	St.	Late Victorian L-plan
118	"	"	"	Jerkinhead-roof Late Victorian with pendentive ornaments under eaves
201	"	"	"	Late Victorian L-plan
208	"	"	"	Late Victorian hip-roof
215	"	"	"	Towered brick Late Victorian
219	"	"	"	c. 1900 cross-gable
220	"	"	"	Queen Anne
223	"	"	"	Queen Anne
226	"	"	"	Queen Anne/Colonial Revival
227	"	"	"	c. 1900 end-gable
232	"	"	"	Queen Anne
236	"	"	"	Late Victorian flank-gable
240	"	"	"	End-gambrel-roof Colonial Revival
213	Maple	St.		c. 1900 end-gable
214	"	"		c. 1900 end-gable
217	"	"		Late Victorian flank-gable
218	"	"		Late Victorian hip-roof
313	Pleasant	St.		Late Victorian hip-roof
316	"	"		Late Victorian L-plan
321	"	"		Late Victorian L-plan
408	"	"		c. 1900 end-gable
409	"	"		Late Victorian hip-roof
414	"	"		c. 1900 end-gable
415	"	"		Queen Anne/Colonial Revival
421	"	"		Late Victorian hip-roof
422	"	"		c. 1900 end-gable
426	"	"		c. 1900 end-gable
427	"	"		Late Victorian hip-roof
205	W.	River	St.	Late Victorian L-plan
213	"	"	"	Late Victorian L-plan
228	"	"	"	Late Victorian L-plan
238	"	"	"	Stuccoed bungalow
207	Russell	St.		Greek Revival L-plan
114	E.	Scott	St.	Queen Anne
118	"	"	"	Towered Late Victorian
200	"	"	"	Stuccoed Late Victorian hip-roof
206	"	"	"	Late Victorian hip-roof
212	"	"	"	Queen Anne
220	"	"	"	Bungalow-style
221	"	"	"	Large Colonial Revival
226	"	"	"	Queen Anne
231	"	"	"	Colonial Revival
235	"	"	"	c. 1900 end-gable

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300	"	"	"	Late Victorian cross-gable
306	"	"	"	Queen Anne
313	"	"	"	Late Victorian hip-roof
322	"	"	"	Late Victorian L-plan
323	"	"	"	c. 1900 cross-gable
328	"	"	"	Queen Anne/Colonial Revival
400	"	"	"	Brick Queen Anne
409-411	"	"	"	Early 20th-C. hip-roof
415	"	"	"	Late Victorian L-plan
421	"	"	"	c. 1900 end-gable
502	"	"	"	Late Victorian hip-roof
514	"	"	"	Bungalow-style
518	"	"	"	c. 1900
519	"	"	"	Colonial
521	"	"	"	Colonial
524	"	"	"	Late Victorian hip-roof
600	"	"	"	Stuccoed 1920s English
204 W. Scott St.				Queen Anne/Colonial Revival
205	"	"	"	First Baptist Church, now Church of God (1874, 1931): brick, Gothic structure with 1931 tower at corner
212	"	"	"	Late Victorian L-plan
216	"	"	"	Queen Anne
220	"	"	"	Queen Anne
225	"	"	"	Queen Anne/Colonial Revival
226	"	"	"	Queen Anne/Colonial Revival
231	"	"	"	L-plan with Gothic windows
303	"	"	"	Late Victorian L-plan
304	"	"	"	Greek Revival end-gable
307	"	"	"	Late Victorian hip-roof
317	"	"	"	Late Victorian hip-roof
325	"	"	"	Late Victorian L-plan
218 Spring St.				Late Victorian end-gable
224	"	"	"	Late Victorian end-gable
309	"	"	"	Late Victorian hip-roof
311 Summer St.				Italianate
312 Taylor St.				Queen Anne
316-316 1/2	"	"	"	Queen Anne/Colonial Revival
318-20	"	"	"	Brick Late Victorian
319	"	"	"	Italianate
327	"	"	"	Late Victorian L-plan
409	"	"	"	Queen Anne
410	"	"	"	Queen Anne/Colonial Revival
418	"	"	"	Queen Anne/Colonial Revival
419	"	"	"	Bungalow
421	"	"	"	Cross-gable c. 1900
427	"	"	"	Queen Anne
500	"	"	"	L-plan with Gothic windows
407 E. Jefferson St.				Barn

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119 W. Jefferson St. Carriage house
315 " " " Carriage house/barn
408 " " " Carriage house/barn
412 " " " Carriage house/barn
430 " " " Carriage house/barn
432 " " " Carriage house/barn
428 E. Lincoln St. Carriage house (1909) built of conduit tile from
Local Grand Ledge Clay Products Co.
238 W. River St. Carriage house
518 E. Scott St. Barn

The following buildings do not contribute to the district's historic character:

209 Adams St. Denatured c. 1900 end-gable
311 Harrison St. Modern house
321 Jackson St. Modern House
426 Jackson St. Denatured Queen Anne
200 E. Jefferson St. City Hall, built 1940 as Catholic church, remodeled 1970 as city hall
319 " " " Denatured Queen Anne
425 " " " Denatured Late Victorian L-plan
524 " " " Modern house
127 W. Jefferson St. Denatured Late Victorian
201 " " " Former service station
214 " " " Denatured Late Victorian L-plan
220 " " " Denatured Late Victorian L-plan
310 " " " Denatured Queen Anne
432 " " " Denatured Queen Anne
410 Liberty St. Modern house
411 " " " Denatured c. 1900
415 " " " Modern house
211 E. Lincoln St. Modern house
300 " " " Modern house
319 " " " Denatured old house
400 " " " Denatured Late Victorian
416 " " " Denatured early 20th-C.
108 W. Lincoln St. Denatured Late Victorian hip-roof
124 " " " Denatured Colonial Revival
214 " " " Denatured Queen Anne
229 " " " Denatured Late Victorian L-plan
415 Park St. Modern house
303 Pleasant St. Denatured Late Victorian L-plan
307 " " " Denatured c. 1900
310 " " " Denatured c. 1900 end-gable
401 " " " Denatured Late Victorian hip-roof
209 W. River St. Denatured Late Victorian L-plan
222 " " " Denatured old house
211 Russell St. Denatured Late Victorian end-gable
218 " " " Denatured Queen Anne

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124 E. Scott St.	Italianate remodeled as church
213 " " "	Modern house
303 " " "	Denatured Late Victorian hip-roof
305 " " "	Denatured Late Victorian hip-roof
312 " " "	Denatured Late Victorian
401 " " "	Denatured Queen Anne
408 " " "	Denatured c. 1900
412 " " "	Denatured early 20th-C.
418 " " "	Denatured Italianate
515 " " "	Denatured old house
219 W. Scott St.	Denatured Queen Anne
317 Summer St.	Modern House



Front - Title/Description

Fitzgerald Park

Migrant Indian tribes led by the famous Chief Okemos called this area "Big Rocks." They came here in early spring to tap the sugar maples. Later, the beauty of the ledges and woods attracted the Grand Ledge Spiritualist Camp Association, which, in 1894, established a summer campground and erected the large pavilion which still stands. Thousands of spiritualists came here for summer encampments until the turn of the century. In 1919 the city of Grand Ledge bought the property and named it Riverside Park. The pavilion was used for dances, roller skating, and basketball. During World War II it housed a factory. This park's name commemorates Grand Ledge native Governor Frank D. Fitzgerald, who died in office in 1939. The pavilion was refurbished as a summer theater by the Grand Ledge Improvement Association in 1955.

Significant Date:

Industry and Invention (1875-1915)

Registry Year: 1978 **Erected Date:** 1978

Marker Location

Address: 3808 Grand Ledge Highway

City: Grand Ledge

State: MI **ZipCode:**

County: Eaton

Township: Oneida

Lat: 42.75979900 / **Long:** -84.76086800

Web URL:

Back - Title/Description

Historical Marker - S511A - Governor Frank D. Fitzgerald Home / Governor Frank D. Fitzgerald Home (Marker ID#:S511A)



Front - Title/Description

Governor Frank D. Fitzgerald Home

Here lived Frank D. Fitzgerald who served his first term as governor 1935-1936. His second term, starting in January 1939, was cut short by his death in this house in March of that year. Born in Grand Ledge in 1885, Fitzgerald earned wide respect from local citizens. A Republican, he was secretary of state 1930-1934. State chief executive during some tumultuous depression years, Fitzgerald advocated government reorganization measures, including a civil service system for state employees.

Back - Title/Description

Governor Frank D. Fitzgerald Home

Governor Fitzgerald acquired this house during his first gubernatorial term. At that time the state did not provide an official mansion; thus Fitzgerald used this home as the governor's residence. Out of office 1937-38, he planned his successful reelection campaign from here. Lansing architect Edwyn C. Bowd designed the residence in 1907. It was built for eighteen thousand dollars. The house was set on a high foundation. The tile roof, massive chimneys, and rounded bay windows are Romanesque style.

Significant Date:

Industry and Invention (1875-1915)

Registry Year: 1978 **Erected Date:** 1979

Marker Location

Address: 219 West Jefferson

City: Grand Ledge

State: MI **ZipCode:**

County: Eaton

Township: Oneida

Lat: 42.75454000 / **Long:** -84.74798000

Web URL:

Historical Marker - L592 - Second Island (Marker ID#:L592)



Front - Title/Description

Second Island

Graced by the natural beauty of these soaring sandstone ledges, Grand Ledge was once famous for its Seven Islands Resort, a recreation area centered on this island from 1870 to 1910. At the turn of the century the ledges made this city one of the most popular resort areas in lower Michigan. Excursion trains brought thousands to enjoy this area, which featured steamboat rides, a boat livery, a hotel and vaudeville theater, mineral wells, a roller coaster, and fishing. In 1976 the Grand Ledge Area Bicentennial Commission erected the band pavilion.

Significant Date:

Civil War and After (1860-1875)

Registry Year: 1978 **Erected Date:** 1989

Marker Location

Address: Second Island, Grand River

City: Grand Ledge

State: MI **ZipCode:**

County: Eaton

Township: Oneida

Lat: 42.75514900 / **Long:** -84.74620900

Web URL:

Back - Title/Description

Historical Marker - L1943 - Blake's Opera House (Marker ID#:L1943)



Front - Title/Description

Blake's Opera House

Constructed in 1884 as a roller skating rink, this building was purchased by Peter Blake and opened as Blake's Opera House in 1886. Here audiences enjoyed talent shows, vaudeville, silent movies, and athletic contests. Between 1928 and 1984 the Stephens and Mapes families used the building as a furniture store. The Mapes family donated the building for a community center. It was restored by the Grand Ledge Area Historical Society and the chamber of commerce.

Significant Date:

Industry and Invention (1875-1915)

Registry Year: 1995 **Erected Date:** 2000

Back - Title/Description

Marker Location

Address: 121 S. Bridge Street

City: Grand Ledge

State: MI **ZipCode:**

County: Eaton

Township: Oneida

Lat: 42.75394000 / **Long:** -84.74491500

Web URL: