Allendale Charter Township est. 1849

Allendale Charter Township WWTP & Collection System Improvements

SRF Project Plan DRAFT

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Prepared for the

State of Michigan Clean Water
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AGS – Activated Granular Sludge

AMP – Asset Management Program

BOD – Biochemical Oxygen Demand

CSO – Combined Sewer Overflow

EGLE – Environment, Great Lakes, and Energy

FEMA – Federal Emergency Management Agency

IPP – Industrial Pretreatment Program

MGD – Million Gallons per Day

MNFI – Michigan Natural Features Inventory

NPDES – National Pollutant Discharge Elimination System

NPS – Non-Point Sources

RBCs – Rotating Biological Contactors

REU – Residential Equivalent Unit

RMP – Residuals Management Program

SHPO – State Historic Preservation Office

THPO – Tribal Historic Preservation Office

TKN – Total Kjeldhal Nitrogen

TSS – Total Suspended Solids

WAS – Waste Activated Sludge

WRRF – Water Resource Recovery Facility

WWTP – Waste Water Treatment Plant

1.0 BACKGROUND AND NEED FOR PROJECT

The purpose of this project is to expand the current Wastewater Treatment Plant (WWTP) in Allendale Charter Township to allow for the treatment of more wastewater flow due to an increasing population within the area. Currently, the plant treats an average flow of 1.30 Million Gallons per Day (MGD), with a peak hydraulic loading of 4.20 MGD. The proposed expansion will allow for the plant to treat an average of 3.20 MGD, with a peak of 7.50 MGD. The plant will undergo a name change in the future to change the name from Wastewater Treatment Plant to Water Resource Recovery Facility

Currently, the plant utilizes Rotating Biological Contactors (RBCs) to achieve the biological treatment required in a wastewater plant. However, these are not efficient in the removal of ammonia as nitrogen (NH_3-N) in the waste water. These pieces of equipment are also nearing the end of their useful life, so a replacement is necessary regardless. A replacement in conjunction with a plant expansion allows for the most efficient project. This project plan will outline the existing and proposed conditions, how these conditions were decided, and the implications of these conditions on the the environment, treatment plant, and the community in which it servces.

1.1 Delineation of the Study Area

The Allendale Charter Township WWTP is located at the eastern boundary of the Township, located at 11624 40th Ave, Allendale Charter Twp, MI 49401 in Section 20 of MI T7N R13W. The plant is located just west of the Grand River and north of Lake Michigan Drive (M-45). The WWTP operates under the jurisdiction of the Michigan Department of Environment, Great Lakes, and Energy (EGLE). The WWTP is authorized to discharge under its National Pollutant Discharge Elimination System (NPDES) Permit no. MI0057679. This permit expires October 1, 2020 and is in the process of being renewed with the indication of a future expansion.

The Allendale Township sewer district is located between the approximate boundaries as follows: from the eastern boundary of 40th Ave. north to Warner St., west to 78th Ave. and south to Filmore St. located in sections 18, 19, 20, 29, 30, 31 in T7N R13W and sections 13, 14, 21, 22, 23, 24, 25, 26, 27, 28, 33, 34, 35, 36 in T7N R14W. Currently, the collection system does not occupy the entire district and there is a significant amount of space for expansion with the Township's sewer district. Refer to the district boundary atlas and collection system atlases found in **Exhibit A** for detailed georgraphic information about the area which this WWTP serves.

1.2 Environmental Setting

The environmental setting in which the project will occur for this project plan includes the areas within the boundary of the Township's sewer district.

1.2.1 Cultural Resources

The area of impact for this project plan is the WWTP property where construction activities are to occur. An archaeological map was obtained from the State Historic Preservation Office (SHPO). There are no known archaeological or historical implications on the WWTP site. There are also no known archaeological or historical implications in the project limits for the proposed lift station and influent sewer portion of the project. There are confirmed surveyed archaeological features in sites within the Township that are outside the project area. These will not be affected by construction activities and the proper precautions and regulatory devices will be in place to ensure this.

1.2.2 The Natural Environment

A. Air Quality – The current average air quality is "GOOD". There is no anticipated changes to the air quality in the service area in the future.

B. Wetlands – There are a few wetland areas through Allendale Township. Ottawa Creek runs through the east half of the township to the Grand River. This creek also runs along the south side of the WWTP. A conceptual map of the WWTP area is included in **Exhibit B.1.** This map is not to be used as a delineation, and a delineation will be performed if the proposed construction activities will impact a potential wetland area. Little Bass Creek runs along the south and west sides of the Township and eventually discharges to the Grand River as well. Along these water bodies there are wetland-related soils or defined wetlands. There are also various other areas throughout the Township with wetland-similar soils. A wetland map for the Township is included in **Exhibit B.2**.

C. Coastal Zones – There are no coastal zones within the Township service area as defined by EGLE.

D. Floodplains – There are not many areas of flood hazards within the Township boundary as defined by the Federal Emergency Management Agency (FEMA) maps. The only areas are along the Grand River and along the Ottawa Creek near the WWTP. See **Exhibit C** for a map of the WWTP with the proposed construction area outlined. If there are implications within the 100-yr floodplain for the proposed construction activities, these will be properly mitigated per EGLE guidelines throughout the proper permitting process.

E. Natural or Wild and Scenic Rivers – There are no designated natural or wild rivers within the study area as defined by the Michigan Department of Natural Resources.

F. Major Surface Waters – The study area includes the Grand River that runs along the eastern and northern boundaries of the township. The Township gets its drinking water supply from the City of Grand Rapids' transmission main, ultimately provided by Lake Michigan. There are a few feeder streams that run through the Township and discharge into the Grand River. A map of the Township's surface waters is shown in **Exhibit D.**

G. Recreational Facilities – There are many parks and recreational sites in and around Allendale Township, especially near the Grand River. These are displayed on the map found in **Exhibit E**. There are no planned activities in these areas for the project.

H. Topography – The entire service area of Allendale Township is within the Grand River watershed. The river runs along the eastern and northern boundaries of the Township, and all collecting streams and creeks flow into the Grand River. Four topographic quadrangle maps from USGS are included in **Exhibit F** to show the entire Township service area.

I. Geology – The bedrock underneath these soils is primarily part of the "Marshall Formation" as defined by the Michigan Department of Natural Resources. The soils and structures in this region and at the WWTP are generally favorable for construction activities.

J. Soil – The soils found in the region where Allendale Township is located primarily consist of glacial outwash sand, gravel, postglacial alluvium, fine-textured glacial till, end moraines of fine-textured till, and lacustrine sand and gravel.

K. Agricultural Resources – According to the 2019 Zoning Map for Allendale Township, there is an abundant amount of land designated for agriculture. The construction activities will not impact these lands. A zoning map outlining the agricultural/farming lands is shown in **Exhibit G.**

L. Flora and Fauna – The vegetation in Allendale Township and along the Grand River is consistent with native vegetation found in the southern lower peninsula of Michigan. **Exhibit H** shows a map of Michigan with vegetation types described by location. The Township is predominantly farms, open wetlands, other treeless areas; and deciduous maples, ash, birch, hemlock, beech, oak, and elm trees in the wooded areas.

1.2.3 Land Use in the Study Area

An existing zoning map and a future land use map are included in **Exhibit I** on the following pages. These were last revised in January 2020. These maps describe all of the current and future agricultural, rural, residential, commercial, industrial, public, and recreational areas. A future land use / master plan map is being developed currently and will not be completed before this project plan is submitted.

1.3 Population

Population in Allendale Township has grown significantly in the last 30 years. This is mostly due to Urban sprawl from the Grand Rapids area. Much of the land within Allendale Township is uninhabited and this has been reduced over the years. However, as shown in the land use maps, there is still a significant amount of land designated as agricultural. Because of this, there is still high potential of population increases in the future.

1.3.1 Existing Population in the Study Area

There are 26,059 people living within Allendale Charter Township according to 2017 data.

1.3.2 Existing Population Served by the Existing Sanitary Sewer Facilities

There are currently approximately 14,900 residents served by the existing sanitary sewer collection and treatment facilities. This number includes 2,113 residential, 143 school, 8 industrial, 798 commercial, 20 government, and 17 church connections. There are 7,700 total Residential Equivalent Units (REUs) within the existing system.

1.3.3 Current and Future Population Served by Proposed Project

The proposed project will still serve the current 14,900 residents. Over time, as population growth continues, this number is expected to reach about 31,800 residents by 2040.

1.3.4 Population Projections for the Study Area for the Next 5, 10, and 20 Years

Allendale Township's total population is expected to continue to rise over the next 20 years. As of 2019, the population projections are as follows: 5 year – 34,000, 10 year – 41,000, and 20 year – 56,000 residents. This is based on a 3.5% growth for the next 20 years.

1.4 Econominc Characteristics

1.4.1 The Economic Structure and Major Employers

Allendale Charter Township includes a diverse economic spectrum of employers. The major employers in the Township are:

- Grand Valley State University – Higher Education (3,500 employees)
- Allendale Public Schools – K-12 Education (325 employees)
- Leprino Foods – Cheese Manufacturer (300 employees)
- Countryside Greenhouse – Agricultural (125 employees)
- Laser Dynamics – Metal Fabrication (95 employees)

The remaining employers include miscellaneous healthcare, convenience store, grocery, retail, and restaurant establishments.

1.4.2 Median Annual Household Income

The annual median household income within Allendale Township is $46,553 based on 2017 data.

The poverty rate within the Township boundary is around 27% as of 2018. The median property value within the Township is $187,700

1.4.3 Major Economic Characteristics that Might Affect Population

Grand Valley State University has doubled its enrollment since 1990. The current enrollment numbers hover around 24,000 students. This has remained fairly constant in the last ten years.

Rural development has increased every year since 2008 in Allendale Township. This is expected to continue in the next 20 years. This will impact the flows and loadings on the sewage collection and treatment system for Allendale Township.

There are no major industrial changes that will affect the treatment plant at this time.

1.5 Existing Facilities

1.5.1 Existing Treatment Plant Facilities

A. Existing Influent Wastewater Characteristics **Table 1** describes the existing treatment plant's design and peak flows and loadings coming into the system.

Table 1 – Existing Influent Wastewater Characteristics

Parameter	Existing Plant *Design* Flows	Existing Plant *Peak* Flows
Flow	1.60 MGD	4.20 MGD
BOD_5	250 mg/L	220 mg/L
Suspended Solids	200 mg/L	150 mg/L
Phosphorus	6.0 mg/L	5 mg/L
Ammonia-N	30.0 mg/L	25 mg/L
TKN	N/A	N/A

B. Screening – One (1) mechanical drum screen with ¼" perforated plate. Manual bar screen in redundant channel.

C. Grit Removal – Vortex Grit System with an air lift pump and classifier

D. Primary Treatment – Four (4) rectangular motorized chain and flight settling basins.

E. Biological Treatment – Eight (8) Rotating Biological Contactors (RBCs)

F. Secondary Clarification – Two (2) circular tanks, 0.233 MG each = 0.466 MG total.

G. Disinfection – Chlorine tablets dissolved in effluent chamber with 0.113 MG contact tank and 2.0 MG de-chlorination pond.

H. Existing Treated Effluent Water Characteristics – Currently, the plant does a good job treating BOD, suspended solids, and phosphorus. However, the ammonia-nitrogen levels are quite high in the effluent stream discharged to the Grand River. Design values are displayed in **Table 2.**

Table 2 – Existing WWTP Effluent Design Parameters

Parameter	Effluent Design Value
BOD_5	≤15 mg/L
Suspended Solids	≤15 mg/L
Phosphorus	≤0.80 mg/L
Ammonia-N	≤20 mg/L

I. Condition of Existing Facilities – The existing equipment and tankage at the Allendale WWTP is aging and in need of replacement. Half of the treatment equipment/tanks were installed in 1980, and the other half was added in the 1999 expansion. The RBCs are at the end of their useful life, and although the electrical efficiency is desirable, the ammonia treatment provided by them is not acceptable. In order to comply with an effluent NPDES permit limit for ammonia, the number of the existing RBCs would need to be tripled even at current flows.

1.5.2 Existing Sludge Handling Methods

A. Sludge Streams – Currently, Waste Activated Sludge (WAS) from the secondary clarifiers is pumped to the Headworks Building and co-settled with the primary sludge. This co-settled sludge is pumped directly to the digestion process. Scum from the primary and secondary clarifiers is pumped directly to the sludge storage lagoons. Digested sludge is pumped to the sludge storage lagoons as well. Decant from the sludge storage lagoons flows through the supernatant pump station and is pumped back to the head of the plant.

B. Anaerobic Digesters – Two 33-foot diameter digesters are used for high-rate anaerobic digestion of these sludge streams. Each tank is 26.5-feet deep, with 3-feet of foam headspace allocation, corresponding to 23.5-feet of working depth providing 150,000 gallons of capacity in each tank. The digesters are used to produce biogas (65% methane; 35% $CO2$) which can then be burned to provide heat back to the digesting sludge. Sludge is stabilized in the digestion process. The digesters are designed for an average incoming flow rate of 15,000 gpd which totals a solids retention time of 20 days. One digester has a fixed cover while the other digester has a gas holding cover that is able to move up and down depending on gas storage volume and pressure. The digesters are in good condition, but may need to be replaced with a larger tank to accommodate future flows and loadings.

C. Biosolids Disposal – Every few years, the WWTP hires a biosolids hauling company to empty the sludge storage lagoon and spread the Class B biosolids onto nearby farm fields in accordance with Allendale's Biosolids Residuals Management Program (RMP). This RMP can be found in **Appendix A.**

1.5.3 Existing Collection System Facilities

A. Wastewater Collection and Conveyance – Wastewater flows by series of gravity sewer and lift stations in the collection system to the influent pressure sewers to the WWTP. The collection system consists of gravity sewer ranging in size from 6-inch to 27-inch as well as force mains ranging in size from 2-inch to 12-inch in diameter. The influent pressure sewers enter the Headworks Building on the north side. The existing facilities are in overall good shape, with replacements occurring as needed based on an asset management program (AMP). An AMP was completed in 2018. This can be found in **Appendix B**.

B. Influent Pressure Sewer – The influent pressure sewer conveys all flow from the collection system to the treatment plant through a 14-inch and/or 20-inch ductile iron pipe. Since the WWTP is at a lower elevation than the majority of the Township, a lift station has not been required to provide flow to the treatment plant. The combined capacity of the influent pressure sewers is approximately 6.0 mgd. This sewer is located along a creek bed that has experienced significant erosion over the years. Because of this, the influent sewer is scheduled for replacement as part of this overall SRF Project Plan. The replacement will entail a series of trunk sewers and a lift station with force main. It will be sized to handle the proposed peak flows of 7.50 MGD.

1.5.4 Location of all Treatment Plant, Sludge Management and Industrial Pretreatment, Lift Stations, and Collection Facilities

The existing WWTP is located at 11624 40th Ave, Allendale Charter Township, MI 49401. The longitude/latitude is approximately 42.979548, -85.881538. The biosolids storage lagoons are located on site here. The biosolids are land-applied to various fields in the West Michigan area. The collection system piping and lift stations that convey sewage to this WWTP are located throughout Allendale Township as shown in the sewer system atlas from **Exhibit A.2**. The following facilities are part of the Industrial Pretreatment Program (IPP): Leprino Foods, Anterior Quest (categorical).

1.5.5 Design Capacity, Existing Flows, and Characteristics of Wastes

Currently, the WWTP is designed to treat 1.60 MGD on average, and 4.20 MGD for peak flows. The wastewater being treated by the WWTP is mostly residential, with some being commercial and industrial. Because of this, the waste concentrations are comparable to those of a residential waste. Refer to **Table 3** for average influent sewage characteristics from testing conducted from 2013-2018.

Table 3 – Current Influent Raw Sewage Characteristics

Parameter	Concentration
BOD_5	272 mg/L
Suspended Solids	261 mg/L
Phosphorus	6.6 mg/L
Ammonia-N	41 mg/L

1.5.6 Septage Facilities

There are no septage receiving or treatment facilities within the Allendale Township sewer district.

1.5.7 Major Industrial Discharges

Leprino Foods operates their own wastewater treatment facility, but they discharge their effluent under the Township's NPDES permit. Their flow is conveyed from their facility to a lagoon on site at the WWTP. Their discharge out of the lagoon is then combined with the effluent flow from Allendale WWTP before the singular outfall to the Grand River. The average flow out of their facility is 600,000 gallons per day. The other largest sewer users (industrial, residential, and commercial) consist of: Grand Valley State University, Knollwood Estates, Allendale Meadows, Sun Communities, Allendale Charter Public Works, Community Centre Group, Boulder Ridge Partners LLC, Allendale Auto Wash, Nicholas Plastics, Basecamp Deerfield LLC, Taco Bell, B-B-G Corporation, Allendale Public Schools, Sleep Inn, Allendale Charter Township, Campus West Apartments, Main Street Pub, Speedway, Allendale Partners, and Stonebridge Apartments.

1.5.8 Average and Peak Flows

Because of Grand Valley State University being within the sewer collection area, flows at the WWTP are significantly lower during summer months than the rest of the year. Refer to **Table 4** for varying flows during different times of the year.

Table 4 – Average and Peak Flows at Different Times of the Year (2013-2018)

Parameter	Flow
Design Average	1.60 MGD
Annual Average	1.08 MGD
Summer Average	0.88 MGD
School Year Average	1.27 MGD
Design Peak	4.20 MGD
Maximum Day	2.90 MGD
Peak Hour Wet Weather	3.84 MGD

1.5.9 Infiltration and Inflow Issues

The collection system experiences increased flows after major wet weather events by about 5-7%. These problem areas are being addressed in the Township's capital improvement plan as funds allow.

The influent trunk/pressure sewer to the plant experiences some infiltration and also presents a risk of being structurally compromised due to its location and proximity to an eroding stream bed. This, coupled with the poor access to this line, is causing Allendale Township to relocate this line within this SRF Project.

1.5.10 Combined Sewers

There are no combined sewers within the collection system in Allendale Township.

1.5.11 System Bypasses and Sanitary Sewer Overflows (SSOs)

There are engineered system bypasses in place at the WWTP that are only used under emergency situations. These have not been needed during an emergency situation. There has been one recorded SSO recently (January 2020) where a lift station wet well level transducer malfunctioned due to rag build-up. This issue was addressed and the risk was minimized.

1.5.12 Lift Station Capacities

There are seven (7) lift stations within the collection system. Their conditions and reliability range from poor to good. These were assessed during the Asset Management Plan, which can be referenced in **Appendix B.** The following tables, **Table 5** and **Table 6**, are taken from that plan and describe each stations capacity and inflow.

Table 5 – Lift Station Flow Rates Calculated from SCADA System

Station Name	Pump	Design Flow Rate	Average Daily Drawdown Flow Rate	Percent of Rated Capacity
60th Ave Lift Station (North)	Pump 1	130 GPM	142.1	109%
	Pump 2	130 GPM	162.8	125%
Park Lift Station	Pump 1	850 GPM	911.9	107%
	Pump 2	850 GPM	912.0	107%
Brown Street Lift Station	Pump 1	125 GPM	151.5	121%
	Pump 2	125 GPM	155.5	124%
60th Ave Lift Station (South)	Pump 1	215 GPM	175.3	82%
	Pump 2	215 GPM	169.5	79%
Timber Creek Lift Station	Pump 1	185 GPM	283.1	153%
	Pump 2	185 GPM	316.2	171%
Hidden Shores Lift Station	Pump 1	360 GPM	377.6	105%
	Pump 2	360 GPM	380.2	106%
64th Ave Lift Station	Pump 1	120 GPM	*	*
	Pump 2	120 GPM	*	*

* - Data not available for the newly constructed 64th Ave Lift Station at the time of this report.

Table 6 – Lift Station Drawdown Results (2013)

Station Name	Pump	Design Flow Rate	Average Daily Drawdown Flow Rate	Percent of Rated Capacity
60th Ave Lift Station (North)	Pump 1	130 GPM	198.0	152%
	Pump 2	130 GPM	134.1	103%
Park Lift Station*	Pump 1	850 GPM	910.6	107%
	Pump 2	850 GPM	922.4	109%
Brown Street Lift Station*	Pump 1	125 GPM	99.0	79%
	Pump 2	125 GPM	99.0	79%
60th Ave Lift Station (South)	Pump 1	215 GPM	216.2	101%
	Pump 2	215 GPM	212.4	99%
Timber Creek Lift Station	Pump 1	185 GPM	298.9	162%
	Pump 2	185 GPM	306.4	166%
Hidden Shores Lift Station	Pump 1	360 GPM	387.3	108%
	Pump 2	360 GPM	379.8	106%

* - The pumps in the Park Lift Station and Brown Street Lift Station were replaced after the drawdown test was completed.

Necessary improvements will be made to these lift stations as outlined in the capital improvements plan put together as part of the Asset Management Program (**Appendix B**).

1.5.13 Lift Station Adequacies

There are a total of 7 lift stations. 6 of these have portable generator connection points and 1 has a permanent generator on site. All 7 stations can output the following alarms to the Township staff via the SCADA system:

- High Level
- Low Level
- Lag Pump Run
- Seal Fail
- High Amp Draw

- Over-temp
- Power Fail
- Communication failure

1.5.14 Operation and Maintenance Problems

There are no major maintenance issues within the collection system, lift stations, or treatment plant. There are aging assets that require more attention and upkeep than a newer piece of equipment, but there are no major concerns that need emergency or immediate attention.

1.5.15 Climatic Resilliency

The WWTP is located near the Grand River. The 100-yr flood stage of the Grand River in this area is 599.10 NAVD88 according to FEMA's interactive web map. The existing dechlorination pond at the WWTP has an effluent weir elevation of 599.46. Therefore, a 100-year event would have no impact on the treatment process. The 500-year flood stage is approximately 603.00 according to FEMA's map. An event like this would back up the treatment process from the Grand River up to the effluent weir of the RBCs. The secondary clarifiers and chlorine contact chambers would be fully submerged by the flood waters. The WWTP currently has one 250 kW generator that can completely power the plant if there were to be a complete utility power outage.

1.6 Fiscal Sustainability Plan

This section will describe the existing assets at the WWTP. Much of this information can be found in an Asset Management Program (AMP) that Allendale Township compiled in 2019. The report generated from the AMP can be found in **Appendix B.**

1.6.1 Inventory of Critical Assets

An inventory of assets at the WWTP was conducted during the AMP process. A detailed inventory can be found in **Appendix B.** A summary of major assets is shown here:

- Mechanical drum screen / motor
- Vortex grit mixer / motor
- Grit classifier
- Grit air-lift pump
- (4) Primary tanks w/ motorized chain & flights
    - (3) Primary sludge pumps
- (8) RBCs with air driven rotating assemblies
    - (3) Air blowers
- (2) Secondary clarifiers with rotating mechanisms and motors
    - (3) WAS pumps
    - (2) Scum pumps
- Chlorination Tanks
    - Flocculation mixer
    - (2) Supernate pumps
- (2) Anaerobic digesters
    - (3) Air blowers
    - (3) Re-circulation pumps

- Bio-gas boiler
- Bio-gas flare
- Miscellaneous Equipment
  - Flow meters
  - Polymer feed skids
  - Positive displacement blower
  - 250 kW emergency backup generator
- Buildings
  - Misc. HVAC/lighting/Electrical systems
  - Control Building
  - Headworks Building
  - Sludge Blower Building
  - Clarifier Building

1.6.2 Condition Evaluation

The condition of the collection system assets was assessed in the 2018 Asset Management Program. The asset conditions for the WWTP was not included in the report. Most of the major assets at the WWTP will be replaced with this proposed project. The remaining assets will be evaluated individually and upgrades will be made as needed. Some of these upgrades include the existing grit pump and existing MCC gear.

1.6.3 Water and Energy Conservation

An important aspect of this project will be energy and water conservation. Capital cost evaluations were conducted to choose the selected alternative, as well as ongoing maintenance, energy, and water use calculations. The selected alternative is an innovative technology that greatly reduces chemical usage, improves ammonia treatment, and provides electrical efficiencies comparable to the other treatment alternatives. Refer to **Section 2.1.4** for the evaluation of alternatives and the calculations associated with energy and water conservation.

1.6.4 Long Term Maintenance Plan

As part of the Asset Management Program, the WWTP currently has a proper maintenance program in place to proactively perform necessary maintenance on existing equipment. The same principals will be applied once the proposed project is complete. Refer to the AMP in **Appendix B** for more information.

1.7 Need for Project

The plant has not only seen increased flows over the last 20 years, but the existing treatment equipment is out of date and at the end of its useful life. On top of this, the ammonia concentrations in the effluent discharge are much higher than a potential permitted amount would be.

1.7.1 Compliance Status

A. NPDES Compliance Status – The WWTP has a good historical record of compliance based on their current NPDES permit. However, the WWTP currently does not have an ammonia limit for their effluent discharge to the

Grand River. If EGLE were to require an ammonia limit, the WWTP would need to triple the amount of RBCs on site just to treat current flows. If the proposed expansion were to occur with RBCs, they would need to install 48 units. This would dramatically increase capital costs and also take up most of the available land at the WWTP, even if the dechlorination pond was removed. Because of these reasons, it is necessary to consider an alternative treatment method to meet future flows and effluent nutrient limits.

B. A copy of the most recent NPDES permit can be found in **Appendix C.**

1.7.2 Orders

There are no historical court orders against Allendale Township pertaining to the sewage collection and/or treatment systems.

1.7.3 Water Quality Problems

There have been past violations in effluent water quality from the WWTP. These were reported to EGLE. The risk of these will greatly be reduced by implementing the proposed treatment system. There has been a recorded SSO at a lift station in January of 2020 as well. This was due to the level transducer being covered in rags. This issue was addressed and risk was minimized for a repeat occurrence by adding redundant level alarms.

1.7.4 Projected Needs for the Next 20 Years

The Township has developed a Capital Improvement Plan (CIP) for the next 20 years. This can be found in **Appendix L**. It should be noted that this document is fluid and will be adjusted each year as necessary to maintain the best possible level of service for the public. The Township is proactively planning for improvements needed within the collection system based on testing and data gathered from the 2018 AMP.

The current pipe sizes for collections from industrial and commercial users are adequate. Future expansions or increases in flow from these entities will be discussed with the Township and appropriate upgrades will be made to accommodate these.

1.7.5 Future Environment without the Proposed Project

If the WWTP were to continue the operation of their current treatment system, the RBCs would need to all be replaced within the next 5 years. On top of this, the ammonia concentrations in the discharge to the Grand River will be undesirable for the environment. The average discharge concentration of ammonia-nitrogen in 2018 was 20 mg/L, which assists in the depletion of dissolved oxygen in the downsteam waters.

If EGLE were to enforce an ammonia limit in the next NPDES permit, the plant would be required to expand its treatment to accommodate this. If RBCs were utilized, the current number of RBCs would need to be tripled to meet the ammonia limit at current flows. This number only grows as flows increase, which is another important reason for the treatment plant expansion project. There isn't sufficient land available at the plant without removing the dechlorination pond.

Also, the WWTP currently uses Ferric Chloride to treat phosphorus in the biological treatment phase. With new treatment technologies, biological phosphorus removal can be utilized to greatly reduce, or eliminate, the use of Ferric Chloride for phosphorus removal. Because of these reasons, it is necessary to consider an alternative treatment method to meet future flows and effluent nutrient limits.

2.0 Analysis of Alternatives

2.1 Identification of Potential Alternatives

A feasibility study was conducted in 2018 to analyze different alternatives for the WWTP expansion. This complete study can be found in **Appendix D**. After this feasibility study was completed, further evaluation and conceptual design was performed for one of the alternatives that was described, but not chosen, in the feasibility study. After this further evaluation, it was determined that this alternative was the best option for the WWTP based on their objectives.

The purpose of this project is to evaluate and design a sustainable treatment process so that the WWTP can meet the long-term wastewater treatment needs of the service area. In order to accomplish this objective, historical influent data, effluent permit limits and Township population growth were reviewed to determine the magnitude of the expansion. An evaluation of the existing facility, projected flows and loadings, and future economic and environmental considerations have been used to identify the prioritized needs and improvements necessary at the WWTP. These results have been used to identify and analyze principal alternatives of treatment process equipment for the best long-term use of the WWTP.

The alternatives explored are based on the current and projected influent sewage conditions as displayed in Table 7. These projections are based on data compiled from the 2018 feasibility study found in **Appendix D.**

Table 7 – Current and Projected Influent Raw Sewage Characteristics

Parameter	Existing Plant *Design* Flows	Existing Plant *Peak* Flows	Proposed Expansion *Design* Flows	Proposed Expansion *Peak* Flows
Flow	1.60 MGD	4.20 MGD	3.20 MGD	7.50 MGD
BOD_5	250 mg/L	220 mg/L	300 mg/L	200 mg/L
Suspended Solids	200 mg/L	150 mg/L	300 mg/L	200 mg/L
Phosphorus	6.0 mg/L	5 mg/L	8.0 mg/L	6.0 mg/L
Ammonia-N	30.0 mg/L	25 mg/L	41 mg/L	30 mg/L
TKN	N/A	N/A	55 mg/L	40 mg/L
Ntrification Temp.	10ºc		10ºc	10ºc

2.1.1 Alternative no. 1 – No Action

As mentioned previously, the Allendale WWTP is currently in compliance with its existing NPDES permit. However, if an ammonia discharge limit was added to the permit, the WWTP would have to increase its current treatment process to handle this. Because of the inefficiencies incurred by expanding the RBCs to meet an ammonia limit, a different treatment technology was determined to be the most economical and environmentally conscious option. In addition to this, the WWTP has seen constantly increasing flows over the last 20 years. The current system is only designed to treat 1.60 MGD consistently. Because of these reasons, the "no action" option is not a feasible option for the WWTP at this time.

2.1.2 Alternative no. 2 – Optimum Performance of Existing Facilities

A. Optimum Performance with Existing Process – The existing facilities cannot meet future ammonia limits without the addition of more dissolved oxygen introduced to the biological treatment system. To do this, more blowers and tankage would need to be installed to allow for sufficient oxygen transfer and enough time for the microbiology to properly go through the nitrogen cycle. Without these upgrades it would not be feasible for the existing facilities to function with an effluent ammonia limit.

B. Age and Reliability of Existing Equipment – The existing equipment at the WWTP ranges from 20 to 40 years old (most of the equipment was either installed in the 1980 or 1999 expansions). As a result, half of the equipment at the plant is at or past its expected useful life. The remaining half is nearing or at its expected useful life.

C. Additional Operational Controls – The addition of operating controls and/or extra facilities will not improve treatment capacity or quality.

D. Process Modifications – The RBC tanks could be converted to attached-growth aeration tanks. They would still need to be expanded to meet future ammonia discharge limits. Also, this would be a large capital expenditure to replace the RBC's with blowers and proper media for the biology to attach to.

E. IPP – The Plant currently has an IPP program with two facilities: Leprino Foods and Anterior Quest (a categorical entit).

F. Infiltration and Inflow – There has been some issues with I&I during wet weather, but the dry weather flows have been increasing consistently over the last 20 years and the plant should be expanded to accommodate the normal design flows for the next 20 years.

2.1.3 Alternative no. 3 – Regional Alternative

A regional alternative was considered for this project plan. The closest waste water treatment facilities in the region are Coopersville and Grandville. The plant in Coopersville is a lagoon plant. This plant would need full-scale upgrades and new process tankage and equipment. This option was not explored in more detail and this would be dramatically more costly than improving the existing facilities on site. Grandville's Clean Water Plant is approximately 9 miles away from the Allendale WWTP. Conveying waste water to this plant would include a cross-country force main, intermediate lift station, and upgrades to the facilities in Grandville. A conceptual cost estimate was performed for this alternative. This is shown in **Exhibit J** on the following sheet. The total estimated cost for this alternative is $42.3 million. This is over $10 million more than the proposed expansion to take place at the Allendale WWTP and influent sewer modifications. As a result, this alternative was not explored any further.

2.1.4 Water and Energy Efficiency Considerations

The selected alternative provides an innovative efficient treatment technology that has not yet been utilized in the state of Michigan at this time. As for water conservation at the WWTP, there will not be any increase in drinking water usage at the plant.

2.2 Analysis of Principal Alternatives

Most of the principal alternatives were evaluated and compared during the 2018 feasibility study. The AquaNereda® Alternative was further evaluated during 2019 in the AquaNereda® Conceptual Evaluation study, attached as **Appendix E.** The results of the analyses are shown in this section.

2.2.1 The Monetary Evaluation

For the four alternatives evaluated in the 2018 Feasibility Study, **Table 1** shows a summary of the total net present worth over the 20-year period. Refer to Section D.1 of **Appendix D** for more information regarding the monetary evaluation for these four alternatives.

Table 8 – Alternatives Present Worth Summary

Alternative	Project Cost	Annual OM&R Cost (1)	Net Present Worth of OM&R Cost (2)	Salvage Value	Net Present Worth
Alternative 1 - WWTP Expansion with MBBR and Nitrification Tower	$27,500,000	$1,970,000	$38,600,000	$2,420,000	**$63,680,000**
Alternative 2 - WWTP Expansion Extended Aeration (VLR)	$27,300,000	$1,810,000	$35,500,000	$2,780,000	**$60,020,000**
Alternative 3 - WWTP Expansion Extended Aeration (Oxidation Ditch)	$30,800,000	$1,850,000	$36,200,000	$3,880,000	**$63,120,000**
Alternative 4 - WWTP Expansion with Activated Sludge	$26,700,000	$1,890,000	$37,000,000	$2,140,000	**$61,560,000**

Note: This table represents budgetary estimates for planning purposes. Further definition of the scope of the projects through preliminary and final design will provide details necessary to improve the accuracy of the costs.

(1) Annual OM&R Cost based on the existing 2019 Sewer Fund Budget (including collection system) with adjustments for the upgraded system, assuming treatment at design flow rate and loading. 2019 Sewer Fund Budget = $1,405,051.

(2) Net Present Worth calculated using the real discount rate for a 20-year period (i = 0.2%) based on MDEQ guidance for fiscal year 2019.

The final alternative evaluated and compared to these four alternatives was the AquaNereda® Activated Granular Sludge (AGS) Reactors. To be consistent, the following cost comparison details were specifically addressed and were applied in the present worth analysis as per the EGLE guidance. These were the same standards used in the feasibility study evaluation of the previous 4 alternatives.

- Capital costs were included for all identified improvements.
- Sunk costs were excluded from the present worth cost. Sunk costs for the project include existing land, existing waterworks facilities, and outstanding bond indebtedness.

- Operation, Maintenance, and Replacement, (OM&R) costs were included in the present worth cost. The Operation costs were compared at treating the design flow and loading over the 20-year planning period.

- The economic comparison is based on a 20-year planning period and a discount rate of 0.2%, per EGLE/EPA guidance for FY2019.

- Salvage values were included in the present worth cost.

- Interest costs were not evaluated in the feasibility study, thus were not included in the AquaNereda® alternative as well.

- Energy costs escalation was assumed equal between the alternatives and therefore are not adjusted over the 20-year period.

- The costs to the users will be evaluated by Allendale Charter Township during their next rate study. Since the project affects all users within the collection system, this will be addressed uniformly across the entire customer community.

The 20-year present worth cost for the AquaNereda® alternative was compared to the most desirable alternative from the previous Feasibility Study. The summary is shown in **Table 9.**

Table 9 – AquaNereda 20-year Present Worth Analysis

	Project Cost	Annual OM&R	Net Present Worth of OM&R	Salvage Value	Net Present Worth
AquaNereda® Option	$26,118,000.00	$1,847,000.00	$ 36,940,000.00	$(3,500,000.00)	$59,558,000.00
Extended Aeration	$27,300,000.00	$1,810,000.00	$ 35,500,000.00	$(2,780,000.00)	$60,020,000.00

It should be noted that these values were calculated using the same basis as the feasibility study, which included the total budget for the OM&R category. For the AquaNereda® Conceptual Evaluation, shown in **Appendix E,** the annual cost comparison only included costs directly related to the operation and maintenance of the compared alternatives.

2.2.2 Partitioning the Project

Partitioning the project is not intended.

2.2.3 The Environmental Evaluation

The five alternatives have similar impacts, as all of these alternatives include construction at the WWTP to expand the plant's treatment capacity.

<u>Footprint</u>

The alternatives with the smallest footprint implications include the MBBR and the AquaNereda® alternatives.

Floodplain

The alternatives with the smallest impact on the 100-year floodplain are the MBBR and AquaNereda® Alternatives. These minimal impacts will be compensated on site via excavation within the 100-year floodplain.

Wetlands

There might be existing wetlands on or near the site for all alternatives. The proper wetland evaluation will be conducted during the preliminary design phase and proper permitting will be acquired as required per EGLE guidelines.

Lakes and Streams

The WWTP is currently authorized to discharge to the Grand River under NPDES Permit No. MI0057679. A revised NPDES permit will be required to account for the increased design flow of the WWTP for any of the principal alternatives (current permit is found in **Appendix C)**. Preliminary effluent limit recommendations were requested from EGLE for the revised permit. Based on the model previously used to develop effluent limits in the vicinity of Grand Rapids, no specific recommendations were made to protect against chronic toxicity in the receiving water based on federal secondary treatment standards. However, federal secondary treatment standards assume a daily maximum ammonia (NH3-N) concentration of 30 mg/L. Based on recent sampling data, higher concentrations of ammonia are anticipated with the expanded system. A copy of the Effluent Limits Only Report is included in The 2018 Feasibility Study in **Appendix D.**

Customer Impacts

Each of the alternatives will result in an increased user rate charge that will be evaluated and implemented by Allendale Charter Township.

2.2.4 Implementability and Public Participation

Allendale Charter Township has provided public participation opportunities during the SRF Application phase and conducted a public hearing before the commencement of the preliminary design phase. Because the proposed project will impact all sewer users within the collection systems that discharge to the WWTP, all users are aware of the potential future rate change and will be given the opportunity to comment on any proposed changes.

2.2.5 Technical and Other Considerations

Infiltration and Inflow Removal

The project for the influent pressure sewer improvements will likely reduce the risk of infiltration/inflow as well as the risk of wastewater sewage spilling. The existing trunk sewer is in a low lying creek bed that has experienced erosion over the years. This trunk sewer project is proposed to reduce the environmental risk of sewage spilling rather than solely to reduce the operational cost of additional flow into the WWTP. A reduction in infiltration will allow for extra capacity within the proposed WWTP expansion, so that the proposed treatment option does not need to account for treating additional clear water.

Based on 2019 daily flow data and respective weather events for each day, it was found that the flow into the WWTP increases by 5-7% during wet weather. The Township is aware of this, and is planning replacements for problematic areas in the coming years.

Structural Integrity

The structural integrity of the influent pressure sewers are of concern. They are located along the creek bed where erosion of the stream banks has occurred over the years. This has resulted in some areas compromised structural integrity of the trunk sewer, because it has been exposed in some areas. If this were to continue, the trunk sewer could become more exposed and eventually fail, resulting in a catastrophic sewage spill. Currently, based on the AMP report (**Appendix B**) this pressure sewer has a condition rating of 3 – medium. Coupled with a consequence of failure of 5, the business risk becomes a 15. Because of these factors, this project was added to the scope of the entire SRF project application.

Sludge and Residuals

Currently, the WWTP stores digested sludge in their large sludge lagoons, which are cleaned once every 3-5 years. This results in about 1.5 million gallons of sludge to be land applied per year. This translates to approximately 3,000,000 gallons per year under the proposed design daily flows. Because of the increasing costs and decreasing availability of land application, this project will include the addition of a biosolids dewatering facility to give the WWTP more flexibility with their biosolids disposal methods. A dewatering facility, if utilized to treat 100% of the daily solids at the WWTP, would reduce the annual volume of solids disposal to 832,000 gallons. There has not been a concern of heavy metals or polychlorinated biphenyls (PCB) within the WWTP disposal solids. This is not expected to change.

Industrial Pretreatment

One customer under the current IPP for the WWTP have violated their permit limits recently. Leprino Foods violated their coliform limit in 2019. Proper sampling has been conducted for these facilities and a good relationship exists between these entities and Allendale WWTP.

Growth Capacity

The project is intended to provide wastewater treatment capacity for at least the next twenty years. ***Figure 1*** from the Feasibility Study shows the projected population growth through the year 2039.

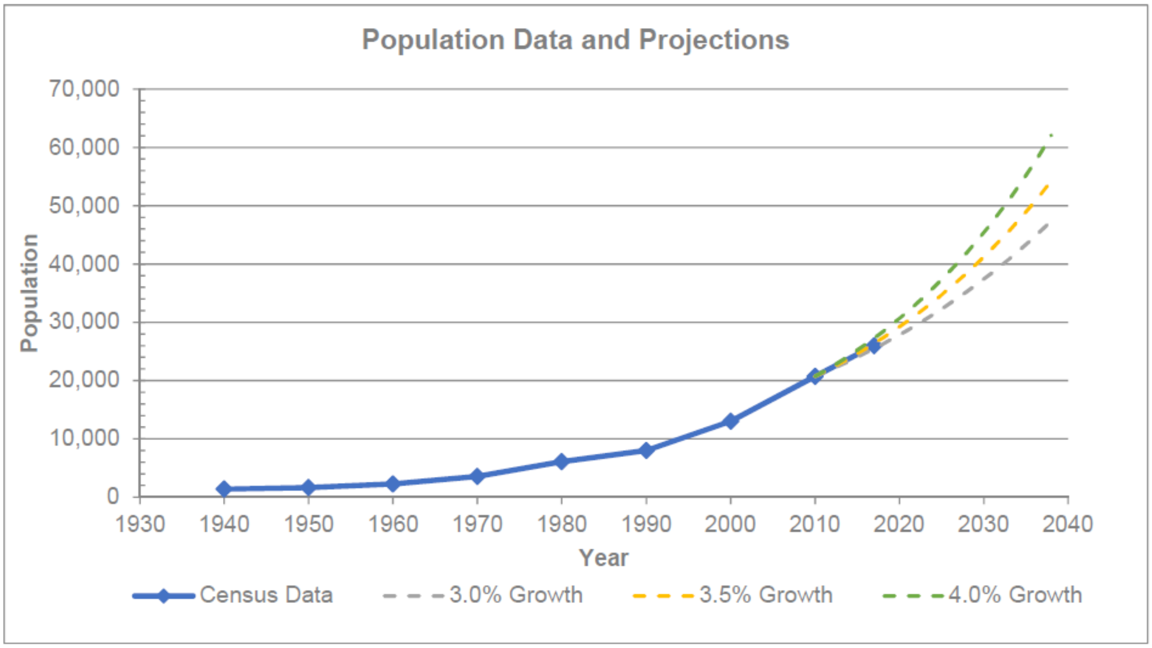


Figure 1 – Allendale Charter Township Population Projections

The total Township annual population increase expected is 3.5% (refer to **Appendix D**). Based on the current service population of 14,900 residents, the projected population of sewer customers in 2040 will be approximately 29,850 residents. This includes seasonal residents attending Grand Valley State University (GVSU), which is located within the service area. The expected average flow rate into the WWTP will be 2.55 MGD. The design flow rate of 3.20 MGD will provide a buffer of capacity for unexpected growth occurring before 2040. The projected flows equal 80% of the proposed design flow, which complies with EGLE's guidance for wastewater treatment facility design capacities.

Areas Currently Without Sewers

This project does not include current areas without sewers or sewage treatment. The expansion for the WWTP and the influent pressure sewer replacement will only affect existing wastewater utilities. The increased capacity will allow for future connections/expansions to those areas without existing sewer utilities, but these projects will be addressed at a later date.

Alternative Sites and Routings

For the WWTP expansion portion of the project, alternate areas of the WWTP facility were conceptualized throughout the analysis of the alternatives. However, all alternatives were considered to take place within the existing WWTP property. Constructing wastewater treatment facilities elsewhere would be too cost intensive for the Township, since the infrastructure is already in place. For this reason, the WWTP is the only location considered. The orientations and placements of proposed equipment, tanks, and buildings was addressed within the Feasibility Study as well as the AquaNereda® Conceptual Evaluation.

For the influent pressure sewer replacement project, different routing alternatives were addressed and explored. These included the existing routes, alternatives to the south along M-45 and 40th Ave., and an alternative to the north along 48th and Rich Ave.

Combined Sewer Overflows

Combined Sewer Overflows (CSOs) are not considered in this project and therefore were not explored. The Township is not aware of any CSOs within the system.

Contamination at the Project Site

The WWTP site has no history of known contaminated soils or materials encountered during past construction activities. Proper precautions and disposal methods will implemented should there be any unexpected contamination encountered during the proposed construction activities. Soil Borings will be executed prior to final design and should provide some insight into current soil conditions. Other necessary visual inspections will be conducted at the site prior to final design.

The existing and proposed influent pressure sewer sites have no previous histories of contaminated soils or materials. Visual inspections will be conducted on site prior to final design, as well as any necessary soil borings. Proper precautions will be implemented should there be an unexpected contamination encounter.

Green Project Reserve

The WWTP project is eligible for Green Project Reserve desigination under the environmentally innovative label, as well as the energy efficiency criteria. A separate "Business Case" document was compiled to portray the necessary information to build the case for Green Project Reserve designation. This business case can be found in **Appendix G**.

3.0 Selected Alternative

3.1 WWTP Project Selection Process

For the selected alternative section for the WWTP expansion, reference the AquaNereda® Conceptual Evaluation report in **Appendix E**, as well as the Preliminary AquaNereda® Process Design Report in **Appendix F.**

3.1.1 Relevant Design Parameters

The following information was taken from the conceptual evaluation report found in **Appendix E**.

a. Headworks

i. Screening

The plant currently has two motorized drum screens. One is relatively new and properly sized. The other is undersized and due for replacement. This smaller drum screen also has a manually raked bypass channel. This smaller drum screen will be replaced to match the newer larger screen. This project will also include upgrades to the disposal system for these screens to provide more compaction and reduce waste. These upgrades will alleviate operator maintenance labor, reduce waste, and allow for an increased flow capacity through the system.

ii. Grit Removal

The existing vortex grit system will remain, but the mechanism and the grit pump will be replaced in this project. A Gorman Rupp suction lift pump is the suggested option to replace the existing air lift grit pump.

iii. Headworks Effluent Chamber

The proposed AquaNereda® system will be directly after the headworks process. The conceptual design shows the installation of a 30” pipe from the raw sewage chamber to the south of the headworks building.

b. AquaNereda® System

The conceptual design for this system includes (3) reactor tanks, a new building, (4) positive displacement (PD) blowers, air piping in, process water piping in/out, solids piping out, and buffer water piping out. Refer to the conceptual site layout in **Appendix E.** The individual components are described in the following sections.

i. Reactor Tanks

Table 10 – Aqua-Nereda® Reactor Tanks	
Quantity	3
Material	Concrete
Capacity (each tank)	620,000 gallons
Size	49’ x 80’ x 21’ deep
Total HRT	0.56 days

Three concrete tanks are proposed to function as the batch reactors for the system. Their physical parameters are described in **Table 10**.

These tanks will each operate in batch cycles. Each cycle takes 4 hours to complete. **Table 11** describes each influent/effluent pipe pertaining to the reactor tanks.

Table 11 – Major Process Piping Schedule

Process Description	From Location	To Location
Air	PD Blowers in Bldg.	Reactors
Process Influent	Headworks Chamber	Reactors
Process Effluent	Reactors	UV system
Solids Effluent	Reactors	Solids Holding Tank
Water Buffer Effluent	Reactors	Supernatant Lift Station

ii. Reactor Building

The proposed conceptual design includes a building next to the reactors to house the blowers, UV system, necessary control equipment, and any automatic valves on various process piping. The estimated size of this building is approximately 2,400 square feet.

iii. Positive Displacement Blowers

Four positive displacement blowers will provide the proper aeration capabilities and redundancy for the three reactors. These blowers will turn on during the "react" phase of each cycle. Estimated blower data can be seen in **Table 12**.

Table 12 – Reactor Blowers	
Quantity	4
Type	Positive Displacement
Size	125 hp

iv. Process Water

The conceptual design shows each reactor being fed via a 30" line that will extend up into the proposed building and through the east wall of each tank. Each tank will have an automatic valve to control which tank is to be fed with raw sewage influent. This will occur during the "fill/draw" cycle.

The reactors will also have automatic valves on the 30" process effluent lines that release effluent water collected from each reactor's weirs at the surface during the "fill/draw" cycle. This water will be fed to the UV disinfection stage (**Section c**) via gravity.

v. Waste Solids

During the "waste solids" cycle, suspended solids will be drawn out of the reactor(s) from the middle of each tank, allowing the heavier granules to remain in the bottom of the tank(s). The waste solids will be routed via gravity to the proposed Solids Holding/Thickening Tank (modified final clarifier). Refer to **Subsection e.i** for details on the solids handling process.

vi. Buffer Water

After the reactor completes the fill/draw cycle, the water level is lowered before the "react" cycle begins. This prevents the process water from overtopping the effluent launders while the tank is being aerated. This buffer water will be routed via gravity to the proposed Supernatant Lift Station (modified Primary Tank). Refer to **Section f** for details on the Supernatant Lift Station.

c. Ultraviolet (UV) Disinfection

Currently, the WWTP utilizes chlorine tablets to achieve proper disinfection within the final effluent water. This system is labor intensive, cumbersome, and requires a large footprint for de-chlorination downstream. In order to address these issues, an ultraviolet disinfection system is proposed in this conceptual basis of design.

There are two proposed conceptual UV options presented for this project: an in-pipe installation or a channel installation. Both options will function properly and adequate space is available for each.

i. Option 1 – UV in Pipe

The proposed conceptual Reactor Building was sized to include three in-pipe UV units at the south end on the reactor effluent piping. Refer to ***Figure 2*** for an example installation of this type of in-pipe UV.

Figure 2 – Example in-pipe UV installation (Credit: Aquionics)

This option provides a compact, accessible UV system that can be inspected and maintained within a building. These systems often require more attention due to the possibility of clogging within the closed vessels. It is recommended to further evaluate the expected effluent water quality from the reactors during the design phase of this project to determine the effectiveness of an in-pipe system.

ii. Option 2 – UV in Channel

There is ample existing tankage available to retrofit an in-channel UV system within. An in-channel system can provide simple visuals of functionality, but would require an additional structure to be installed over the channels if the plant staff desires a controlled climate to access and maintain the system. An example of a UV channel installation can be seen in ***Figure 3***.

Figure 3 – Example UV Installation in a Channel

This is the recommended system at this point in the design. This system will require higher capital costs, but will provide the plant staff with a simple system that is easily maintainable.

d. Final Effluent Water

A proposed 30" pipe would connect the UV effluent to the existing final effluent chamber at the existing de-chlorination pond.

e. Solids Handling Process

i. Solids Holding/Thickening Tank

The existing Final Clarifier no. 2 will be modified to accommodate waste solids holding/settling from the reactor tanks. Waste solids will be released to this tank every 80 minutes from the reactors. This tank will gravity thicken and equalize waste solids before being mechanically thickened before digestion.

The existing solids collector mechanism and pumps will be re-used for this process. A decant system will be installed to allow decant water to flow into the suction side of the existing scum pumps. These pumps will transfer decant water to the existing Digester Building where the line will be extended to the headworks effluent chamber. Details of the proposed Solids Holding/Thickening Tank are shown in **Table 13**.

Table 13 – Solids Holding/Thickening Tank	
Quantity	1
Capacity	220,000 gallons
Total Waste Solids In	475,000 gpd @ 0.2%
Total Supernatant Out	427,500 gpd
Total Solids Out	47,500 gpd @ 2.0%

The existing pumps in the clarifier building will be re-used to pump solids from the holding tank to the proposed solids thickening equipment. The existing force main will be re-used up to the proposed tie-in point as shown in the conceptual layout (**Appendix E**).

ii. Solids Thickening Equipment

This conceptual evaluation proposes modifying the existing Primary Clarifier Tanks 1-2 for new mechanical thickening equipment. There will also be a proposed structure around this equipment above the tanks. The two solids thickening technologies evaluated were gravity belt thickening and volute thickening. Both options provide adequate thickening performance. The volute thickeners come at a higher capital cost, but are cleaner and require less footprint. Refer to **Table 14** for the design parameters pertaining to this proposed equipment.

Table 14 – Solids Thickening Equipment	
Quantity	2
Throughput	1,500 dry lb/hour
Daily Solids In	47,500 gpd @ 2.0%
Daily Supernatant Out	28,500 gpd
Daily Solids Out	19,000 gpd @ 5.0%
Equipment Operation	8 hrs/day
Equipment Flow Rate	99 gpm

A conservative solids content of 5% was used for calculation purposes. The volute thickener can likely thicken solids up to 8% and the GBT can likely thicken up to 7%. Existing Primary Tanks 1-2 will be modified to accommodate the thickened solids discharge and the existing primary solids hoppers and pumps will be re-used for thickened solids transfer to the digester.

iii. Existing Anaerobic Digester

The operation of the digester shall be similar to current operations. Solids will be fed from the existing Primary Solids pumps. Because the solids will be thickened to 5%, further evaluation of the digester performance with a higher organic loading will be performed during the design phase. Refer to **Table 15** for the design parameters pertaining to the digester tanks.

Table 15 – Existing Anaerobic Digesters

Quantity	2
Capacity (each tank)	150,000 gallons
Daily Solids In	19,000 gpd @ 5.0% = 7,923 lb
*HRT**	15.8 days
Expected VS content	70%
*Organic Loading Rate***	137.9 lb VS / 1000 ft^3
Expected TS Reduction	40.0%
Daily Solids Out	19,000 gpd @ 3.0% = 4,754 lb
Avg. Flow Rate	13.2 gpm

*If solids were fed to the digesters at 2% (only gravity thickened), the HRT of the digesters would only be 12 days.
**Ten States Standards recommends a maximum of 80 lb VS / 1000 ft^3, but there are many proven instances of operating at higher OLRs, up to 4 times higher than the recommended value.

The existing solids draw-off lines from the digesters will be re-used, and one of the existing three solids pumps in the Control Building will be dedicated for digested solids transfer, utilizing the swing pump for redundancy. The existing pumping/mixing system for the two digester tanks will be further evaluated during the design phase of the project.

iv. Biosolids Dewatering

These dewatering improvements will include the construction of a dewatering system in the solids handling process to dispose of biosolids in a landfill. This will be a proposed building to the east end of the entrance drive. This area provides adequate space and a convenient location for biosolids dewatering and dumpster load-out. This conceptual evaluation and the cost estimate associated with it is based constructing a building to accommodate dewatering equipment, a conveying system, and two dumpsters for hauling solids.

There are many different types of equipment that could satisfy the dewatering needs of a treatment plant. To be conservative in this conceptual layout with the size requirements of certain equipment, two screw presses are shown in the design and cost estimate. These are usually the largest pieces of equipment of the different options, but provide effective dewatering at a low energy cost. Refer to **Table 16** for details on the evaluated dewatering equipment.

Table 16 – Solids Dewatering Equipment	
Quantity	2
Total power (per unit)	7.5 HP
Avg. Daily Throughput	4,754 dry lb/day
Avg. Daily Solids In	19,000 gpd @ 3.0%
Avg. Daily Supernatant Out	16,720 gpd
Avg. Daily Solids Out	9.5 wet tons @ 25.0%
Equipment Operation	8 hrs/day
Avg. Equipment Flow Rate	40 gpm
Avg. Equipment Throughput	595 dry lb/hour
Max. Daily Throughput	7,923 dry lb/day
Max. Equipment Throughput	990 dry lb/hour
Max. Equipment Flow Rate	100 gpm
Max. Daily Solids Out	15.8 wet tons/day

The dewatering equipment shall be sized to handle the average solids flows, assuming 40% reduction of solids in the digestion process. The equipment shall also be able to handle the maximum flows shown, assuming no reduction in solids and a higher flow rate.

f. Supernatant Lift Station

This evaluation proposes renovating Primary Tanks 3 and 4 to create a supernatant recycle lift station that will collect supernatant/decant from multiple processes throughout the plant. It is proposed to remove the floor of the primary tank and make a deep pit to allow all water to flow here by gravity. The data for this proposed lift station can be seen in **Table 17**.

Table 17 – Supernatant Lift Station	
Required Size of Wet Well	25,000 gallons
Quantity of Pumps	2
Type of Pump	Submersible
Capacity (per pump)	700 gpm @ 40 ft. TDH
Maximum Flows into Station	
Reactor Buffer Water	460 gpm
Thickening Equipment Filtrate	100 gpm
Dewatering Equipment Pressate	80 gpm

This lift station would be designed to handle the slugs of the different recycle streams in order to gradually pump back to the headworks chamber at a constant rate.

3.1.2 Project Maps

The conceptual evaluation report also included the development of a conceptual layout and a conceptual PFD for the proposed WWTP expansion project. These are shown at the end of the full report in **Appendix E**.

3.1.3 Controlling Factors

Based on the previously discussed Feasibility Study conducted in 2018, the determined design flow was 3.20 MGD, with a hydraulic peak of 7.50 MGD. The wastewater loading parameters used for the conceptual design are shown in **Table 18**.

Table 18 – Influent WWTP Design Wastewater Characteristics	
Carbonaceous Biochemical Oxygen Demand (BOD5)	300 mg/L
Total Suspended Solids (TSS)	300 mg/L
Total Kjeldahl Nitrogen (TKN)	55 mg/L
Total Phosphorus	8 mg/L

The current NPDES discharge requirements are shown in **Table 19**. It should be noted that these values may change in the next reissuance of the NPDES permit.

Table 19 – Effluent NPDES Limits

Parameter	**7-day Avg.**	**Monthly Avg.**
Carbonaceous Biochemical Oxygen Demand (CBOD5)	40 mg/L	25 mg/L
Total Suspended Solids (TSS)	45 mg/L	30 mg/L
Ammonia-N	Report	Report
Total Phosphorus	N/A	1.0 mg/L
Fecal Coliform	400 cts /100 mL	200 cts / 100 mL
Residual Chlorine	N/A	38 µg/L

3.1.4 Special Assessment District Projects

There are no expected special assessment requirements for the WWTP expansion project.

3.1.5 Sensitive Features

After contacting the State Historic Preservation Office (SHPO), it was determined that there are no known protected historic archaeological features within the project impact areas.

The WWTP project may impact the 100-year floodplain in small portions of the proposed upgrades. This impact will be mitigated on site at the WWTP facility. Wetland impacts are expected to be non-existent or less than the threshold for required mitigation as defined by EGLE in the Joint Permit Application guidance documents. Maps of the WWTP and these sensitive areas are shown in **Exhibits B & C.**

3.1.6 Schedule for Design and Construction

An anticipated design and construction schedule was developed for this Project Plan. A preliminary application, design, and construction schedule is shown in **Table 20**.

Table 20 – Preliminary Schedule

Preliminary Allendale WWTP AquaNereda Improvements Project Timeline			Date	5/11/2020
Item #	Description	Start Date	End Date	Number of Days
1	SRF Intent to Apply Form	2/7/2020	4/1/2020	54.00
2	Draft SRF Project Plan Submitted	5/30/2020	5/31/2020	1.00
3	SRF Project Plan	3/1/2020	6/30/2020	121.00
4	Preliminary Design	7/1/2020	9/1/2020	62.00
5	30% Plans	9/1/2020	1/1/2021	122.00
6	80% Plans	1/1/2021	5/1/2021	120.00
7	Part I and II Applications	1/1/2021	5/17/2021	136.00
8	EGLE Permit Applications	3/1/2021	6/1/2021	92.00
9	EGLE Review Set Submitted	5/1/2021	6/1/2021	31.00
10	Plan Set for Bid	6/1/2021	6/15/2021	14.00
11	Project Out to Bid	6/15/2021	7/1/2021	16.00
12	Part III Application	6/15/2021	7/7/2021	22.00
13	Construction	9/1/2021	10/1/2023	760.00

Allendale Charter Township anticipates being in the FY2021 Quarter 4 schedule for SRF financing.

3.1.7 Cost Summary

The total estimated SRF cost associated with the WWTP and Influent Pressure Sewer projects is: $41,872,000.00

This is further broken down per project as follows:

- WWTP Expansion Project: $30,872,000.00
  - Green Project Reserve Eligible: $28,888,000.00
  - Non-GPR Elibigible: $1,984,000.00
- Influent Pressure Sewer Project: $11,000,000.00

The total cost breakdown can be found in **Appendix H**.

3.2 Influent Pressure Sewer Selection Process

The following information was taken from the conceptual evaluation report that will be placed in **Appendix Q** once reviewed with Allendale Charter Township.

3.2.1 Relevant Design Parameters

The Relevant Design parameter is to design the sewer to accommodate all of the future growth in the township. This Trunk Sewer leads directly into the WWTP.

3.2.2 Project Maps

The sewers in question run from just west of 48th ave and M-45 to the plant drive off 40th ave approximately a half a mile north of M-45 as seen in Figure 4.

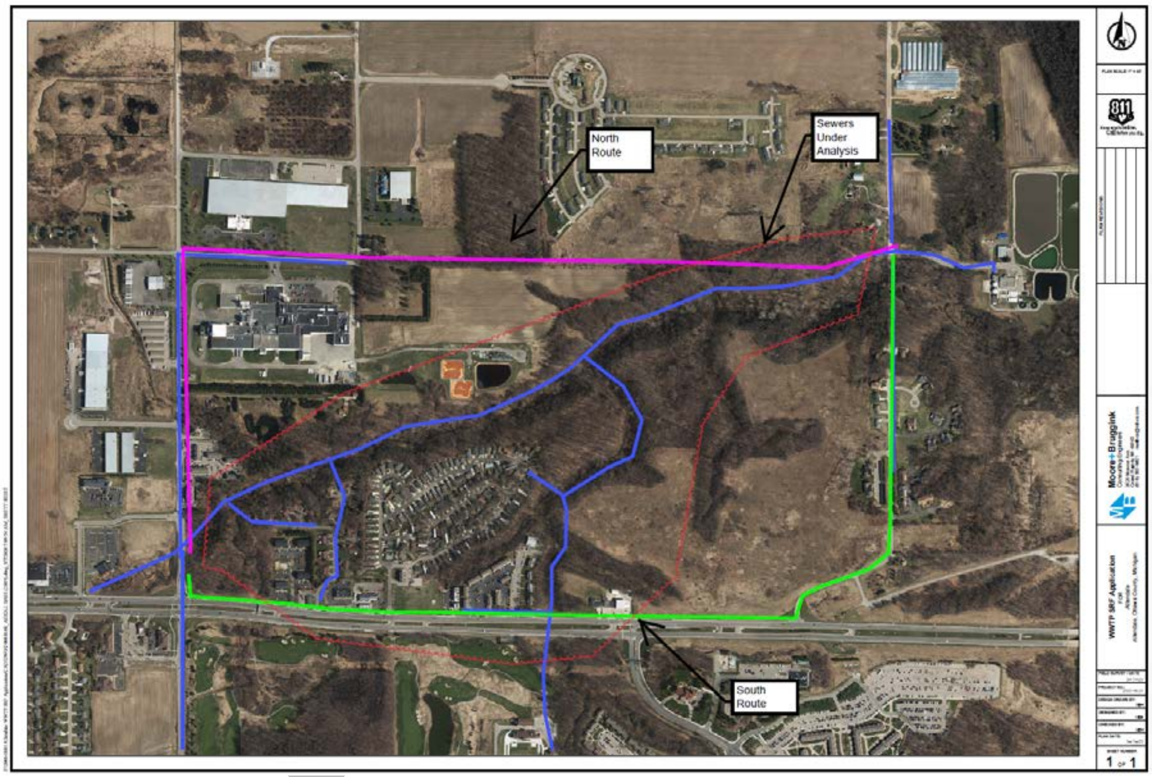


Figure 4 - Existing Sewer Map (NTS)

The main sewer runs to a deep natural drainage. This makes the sewer system vernerable to weather conditions. Additional maps can be seen in the Report.

3.2.3 Controlling Factors

The controlling Factors are the same as the Design Parameters with the addition to following the 10 States Standards for Sanitary Sewer construction.

3.2.4 Special Assessment District Projects

There are no expected special assessment requirements for the WWTP expansion project.

3.2.5 Sensitive Features

The Trunk Sewer currently runs through a drainage way. Any project will reduce the current drainage quality to the area. Also, after contacting the State Historic Preservation Office (SHPO), it was determined that there are no known protected historic archaeological features within the project impact areas.

3.2.6 Schedule for Design and Construction

An anticipated design and construction schedule was developed for this Project Plan. A preliminary application, design, and construction schedule is shown in **Table 20**.

Table 21 – Preliminary Schedule

Tentative Allendale Trunk Sewer Improvements Project Timeline			Date	5/28/2020
Item #	Description	Start Date	End Date	Number of Days
1	SRF Intent to Apply Form	2/7/2020	4/1/2020	54.00
2	Draft EGLE Project Plan Review	5/15/2020	5/16/2020	1.00
3	SRF Project Plan	3/1/2020	6/30/2020	121.00
4	Preliminary Design	3/1/2021	4/30/2021	60.00
5	30% Plans	4/30/2021	6/29/2021	60.00
6	80% Plans	6/29/2021	8/28/2021	60.00
7	EGLE Permit Applications	8/28/2021	9/11/2021	14.00
8	EGLE Review Set Submitted	9/11/2021	1/9/2022	120.00
9	Plan Set for Bid	1/23/2022	1/24/2022	1.00
10	Project Out to Bid	1/24/2022	3/5/2022	40.00
11	Construction	6/3/2022	6/2/2024	730.00

Allendale Charter Township anticipates being in the FY2021 Quarter 4 schedule for SRF financing.

3.2.7 Cost Summary

The Cost are dependent on the alternative selected. Right now the most conservative cost alternative is to Option A from the Trunk Sewer Evalation Report.

Table 22 – Cost Summary for Trunk Sewer Relocation

Option A			
Item	Description	Cost	Notes
1	Trunk Sewer Lift station	**$4,000,000**	
2	Trunk sewer force main and gravity sewer	**$4,000,000**	
3	Grand Valley Lift station	**$1,800,000**	Serves M-45 frontage as well and goes to the west
4	Grand Valley Force main	**$250,000**	
5	Gravity sewer fronting m-45	**$350,000**	Flows into 48th Lift Station
6	Grinder Stations for Whispering Creek and force main	**$200,000**	E.one Grinders Manifolded together
7	Knollwood Estates Lift station and force main	**$400,000**	
Total		**$11,000,000**	

This cost alternative removes all of the sanitary features out of the drainage and into road ROW or easements.

3.3 Authority to Implement the Selected Alternative

Allendale Charter Township currently owns, operates, and maintains the Wastewater Treatment Plant. They reserve the sole discretion to implement projects at the WWTP upon public approval. There are a few sewer customers located outside of Allendale Township jurisdiction. The agreement set between these townships states that Allendale Township has the authority to implement rates to the customers located within these Townships. The external Township has the right to review the rates, but Allendale Township directly sets rates for these users.

3.4 User Costs

In order to determine the user cost, the total cost of the project was divided into a monthly amount over the expected useful life of the project.

User Costs: $41,872,000 / 30 [years] / 12 [months/year] = $116,311 / month. The township currently has 3,099 service connections including 2,113 residential, 143 school, 8 industrial, 798 commercial, 20 government, and 17 church connections. The total amount of Residential Equivalent Units are 7,700 REUs. This was calculated by using flow data and creating a residential flow proportion to distribute to the non-residential type connections. These costs would equal $15.10 per REU per month.

The Township is currently planning on adjusting rates in such a way in order to achieve an increased revenue of 17.9% per year for the next 5 years. Allendale Charter Township will be working with a financial advisor to ensure they stay on an economically viable path.

3.5 Disadvantaged Community

Allendale Charter Township does not qualify as a Disadvantaged Community, as defined by Part 53 of the Clean Water Assistance of the Natural Resources Environmental Protection Act, 1994 PA 451.

3.6 Useful Life

The useful life used to calculate the user costs is 30 years. This was calculated by assigning each major asset a useful life based on industry standards and manufacturer recommendations. These useful life values were multiplied by their associated costs to implement. These products were summed and then divided by the total sum of the useful life values for the assets. The total cost for these assets was divided by this number to arrive at a weighted average useful life. This resulted in 31 years. 30 years was used because that is a standard time period for SRF loans. Refer to spreadsheet shown in **Appendix H** for more information on these calculations.

4.0 EVALUATION OF ENVIRONMENTAL IMPACTS

4.1 Analysis of the Impacts

4.1.1 Direct Impacts

Construction Impacts

The construction project at the WWTP will involve general construction vehicle traffic and construction equipment activities. This will involve minor dusting and major earth excavations. Proper soil erosion control measures will be implemented to minimize sedimentation runoff and soil erosion. Groundwater dewatering efforts may be needed when excavating for the reactor tanks. Proper calculations and permitting will be evaluated during the design phase. The 100-year floodplain may be impacted by the proposed construction activities, depending on the chosen location of the reactors during the design phase. Proper permitting and mitigation efforts will be implemented to provide compensating cut within the WWTP property boundary. There are some wetlands shown near the site based on the EGLE wetland map. Because of this, a delineation may be needed if the construction activities required to construct the reactor tanks impede on these areas. The proper permitting will be applied for to address and/or mitigate these issues. There will be a minimal amount of vegetation removal at the WWTP. There will be a few trees removed on the south edge of the entrance driveway just west of the headworks building. Impacts to man made structures will be minimal apart from the intended upgrades within them. There are several buildings, tanks, and miscellaneous structures at the WWTP used to support the conveyance and treatment of wastewater. The de-chlorination ponds will likely remain in place although not needed for proper treatment after construction. The State Historic Preservation Office (SHPO) was contacted about any known archaeological features at the WWTP. None were identified. Refer to the attached application and letters in **Appendix I.** The proper Tribal Historic Preservation Office (THPO) contacts were informed via letters about the proposed construction activities. They were each given a 30-day response period to provide comments. These letters can be found in **Appendix J.** The project will adhere to the stipulations regarding any identified endangered species. The Michigan Natural Features Inventory (MNFI) was contacted regarding any data known about endangered species within and/or near the project areas. The proper procedures and regulations will be followed to protect these species. The gathered information and correspondence can be found in **Appendix K.** Ottawa Creek and the Grand River are the two nearest bodies of water. These will be protected from contamination and sediment runoff by use of sufficient soil erosion protection methods. Any soil excavated on site for construction will be contained on site until ultimate removal and disposal.

The construction project for the influent pressure sewer and lift station will ultimately benefit the environment in a significant way. The existing trunk and pressure sewers that feed the WWTP are located in an erosion-prone creek bed to the west of the WWTP. The water quality in this stream will be improved by any rehabilitation of the lines to reduce the risk of sewage spill from the area. The improvements to the sewers are likely to have routing along existing developed roadway corridors where utilities already exist. There will be minimal floodplain and wetland impacts, since these areas are generally upland and developed. Construction methods for the sewer improvements are likely to include open trench construction with proper shoring and horizontal directional drilling. This project will adhere to the stipulations regarding any identified endangered species. The State Historic Preservation Office (SHPO) was contacted about any known archaeological features at the WWTP. None were identified. Refer to the attached application and letters in **Appendix I.** The proper Tribal Historic Preservation Office (THPO) contacts were informed via letters about the proposed construction activities. They were each given a 30-day response period to provide comments. These letters can be found in **Appendix J.** The project will adhere to the stipulations regarding any identified endangered species. The Michigan Natural Features Inventory (MNFI) was contacted regarding any data known about endangered species within and/or near the project areas. The proper procedures and regulations will be followed to protect these species. The gathered information and correspondence can be found in **Appendix K.** In the areas with deep trench construction, proper groundwater dewatering methods will be used and permitted if expected to exceed the regulated threshold amount. Soil erosion control methods will be implemented to sufficiently minimize any impacts to nearby water bodies. All excavated materials will be contained on site until ultimate removal and disposal.

Operational Impacts

The WWTP will still operate and treat wastewater to NPDES requirements during construction. Proper phasing will be implemented to ensure that wastewater can still be treated with minimal disruptions and/or spills. The WWTP will still discharge treated water to the Grand River during this time.

For the influent sewer and lift station portion of the project, temporary accommodations for sewage may need to be implemented, such as, bypass pumping, pump and haul, or off-site disposal. These methods may need to be implemented for a period of time while new facilities are being constructed and/or tie-ins are made to the existing system. All proper care and caution will be taken to prevent spills, and any spillage will be contained and cleaned immediately.

Social Impacts

This project will likely coincide with some future rate increases. Proper meetings and discussions will be held to minimize these increases in order to maintain a positive relationship between the Township and its sewer customers.There will be no road closures or detours blocking off businesses or residences during the time of construction at WWTP.

This project will allow for an increase in capacity to the WWTP, which creates opportunities for more residents and businesses to develop within the Township service area. The WWTP also services a major State University in GVSU. This project will allow them to construct new facilities or expand existing facilities. Access to existing businesses and residencnes will be maintained throughout the duration of the project, with short and minimal down times.

4.1.2 Indirect Impacts

Some of the indirect impacts of these projects include the possibility for more residential and commercial development within the Township. The WWTP will double the current treatment capacity, which allows for continued population growth and commercial/industrial development. The influent trunk sewer and force main project will allow for safe conveyance of sewage waste to the WWTP. It will be sized to accommodate the proposed flow rates to align with those at the WWTP. There is currently ample land available for constructive developments without impacting designated agricultural lands or wetlands.

Allendale Charter Township has experienced consistent population growth over the last 20 years and has adjusted well to maintain the proper infrastructure and facilities to accommodate this growth. Because of this, they are well prepared growth within the next 20-30 years. They are anticipating an annual population increase of 3.5%, and their budgets and planning will be created with this projection in mind.

The Township will maintain its parks and agricultural lands, avoid the destruction of wetlands, and allow commercial/residential growth to occur only in those areas currently zones for such activities. If, in the future, the Township desires to re-zone an area to accommodate residential, commercial, or industrial development, careful precautions will be taken to choose land that does not contain wetlands, numerous vegetation, or other unique natural habitats. The Township will ensure that a similar ratio of population to recreational areas is maintained throughout future developments.

With an increase in treatment capacity, the WWTP will also produce a larger number of dry tons of solid waste per day. However, by implementing a dewatering facility, the WWTP will actually dispose of less volume of solids per day than existing.

4.1.3 Cumulative Impacts

The WWTP discharges treated water to the Grand River watershed. As long as the WWTP is operating compliantly under their NPDES permit, the discharge of this water will not have a negative impact on the Grand River watershed. On the other hand, with the evolving information regarding PFAS/PFOA, there is a chance of the bioaccumulation of these substances within the Grand River. The WWTP will abide by EGLE guidelines for detection and testing of these substances. There are currently no reasons to believe that there are significant levels within the WWTP.

There are few adverse cumulative impacts from this project. However, some of the possible minor cumulative impacts are:

- Increased truck traffic on 40th Avenue by the WWTP to dispose of dewatered biosolids. One benefit of this would be that 40th might be paved to accommodate this traffic, which would be a benefit to neighboring residences.

- Increased fiscal obligations for the Township and its sewer customers. The Township will do everything possible to keep rate changes to a minimum, but there will be some obligations to cover the costs of these projects and the associated loan(s).

These impacts are thought to be minor in scale, and overall the WWTP and influent sewer projects will not impact the community in a negative way, either short term or long term.

5.0 MITIGATION

There will be both structural and non-structural mitigation methods to minimize adverse impacts on the physical and social environment. These can further be broken down into short term and long term mitigation.

5.1 Short-Term Construction-Related Mitigation

5.1.1 General Construction

If the proposed construction activities will temporarily or permanently impact or affect any sensitive features, such as floodplains or wetlands, the proper permitting will be applied for. To comply with these regulations, proper soil erosion and contamination protection measures will be practiced during and after the construction period. Floodplain mitigation will occur in order to provide a compensating cut for any fill within the 100-yr floodplain. Wetland impacts will be addressed during design and proper mitigation and/or credit purchasing will be conducted according to state and/or federal guidelines as required.

Spoils will not be disposed within wetlands, floodplain or other sensitive areas. Other recommended methods and procedures will be followed to ensure compliance with regulations. The relevant permitting authorities will be contacted in early stages of design to explore what sensitive features might be within the construction areas.

5.2 Mitigation of Long-Term Impacts

5.2.1 Siting Decisions

The reason for implementing the influent sewer re-routing project is to avoid impacts like this. The re-routing of this sewer will greatly reduce the risk of a sewage spill into the natural environment. All of the proposed activities are intended to benefit the natural environment by minimizing risk, reducing chemical use, and reducing energy consumption.

5.2.2 Operational Impacts

The WWTP portion of the project will improve operational impacts in a few ways. First, an odor control system will be implemented in the headworks building at the WWTP. Second, hazardous chemicals like ferric chloride and chlorine will be reduced and eliminated, respectively. This will not only allow for a healthier effluent water product, but also improve the safety of the staff handling these chemicals.

5.3 Mitigation of Indirect Impacts

The proposed projects for this SRF loan application will be sized to accommodate future developments, but are not directly related to any developments in currently undeveloped areas.

5.3.1 Master Plan and Zoning

The zoning map (shown previously in **Exhibit I**) displays many areas that are currently zoned to support residential and/or commercial developments. These areas include the planned unit development, low and medium-density residential, and commercial areas. If future growth requires the Township to re-zone certain areas, they will be sure to protect the areas that have distinct cultural, historical, agricultural, or natural significances. Floodplains, wetlands, historical structures, and endangered species will be protected per the guidelines and regulations set forth by the state and federal agencies at the time of future re-zoning procedures.

5.3.2 Ordinances

For future developments, the Township will ensure that substantial ordinances are in place to minimize storm water runoff as well as noise, odors, and/or pollution from these developed areas. The Township will adhere to the required storm water designs set forth by the county drain commission and Michigan Department of EGLE.

5.3.3 Staging of Construction

The Township will carefully plan and stage future collection system expansion projects in order to spread out the burden of large capital costs on its users. This will allow rate changes to be smaller or incrementally implemented over a longer period of time.

6.0 PUBLIC PARTICIPATION

6.1 The Formal Public Hearing

6.1.1 Public Hearing Advertisement

The notice for the Public Hearing was advertised at least 30 days before the hearing was scheduled. The notice for the public hearing can be found in **Appendix M.**

6.1.2 Public Hearing Transcript

The public hearing transcript can be found in **Appendix O.**

6.1.3 Public Hearing Contents

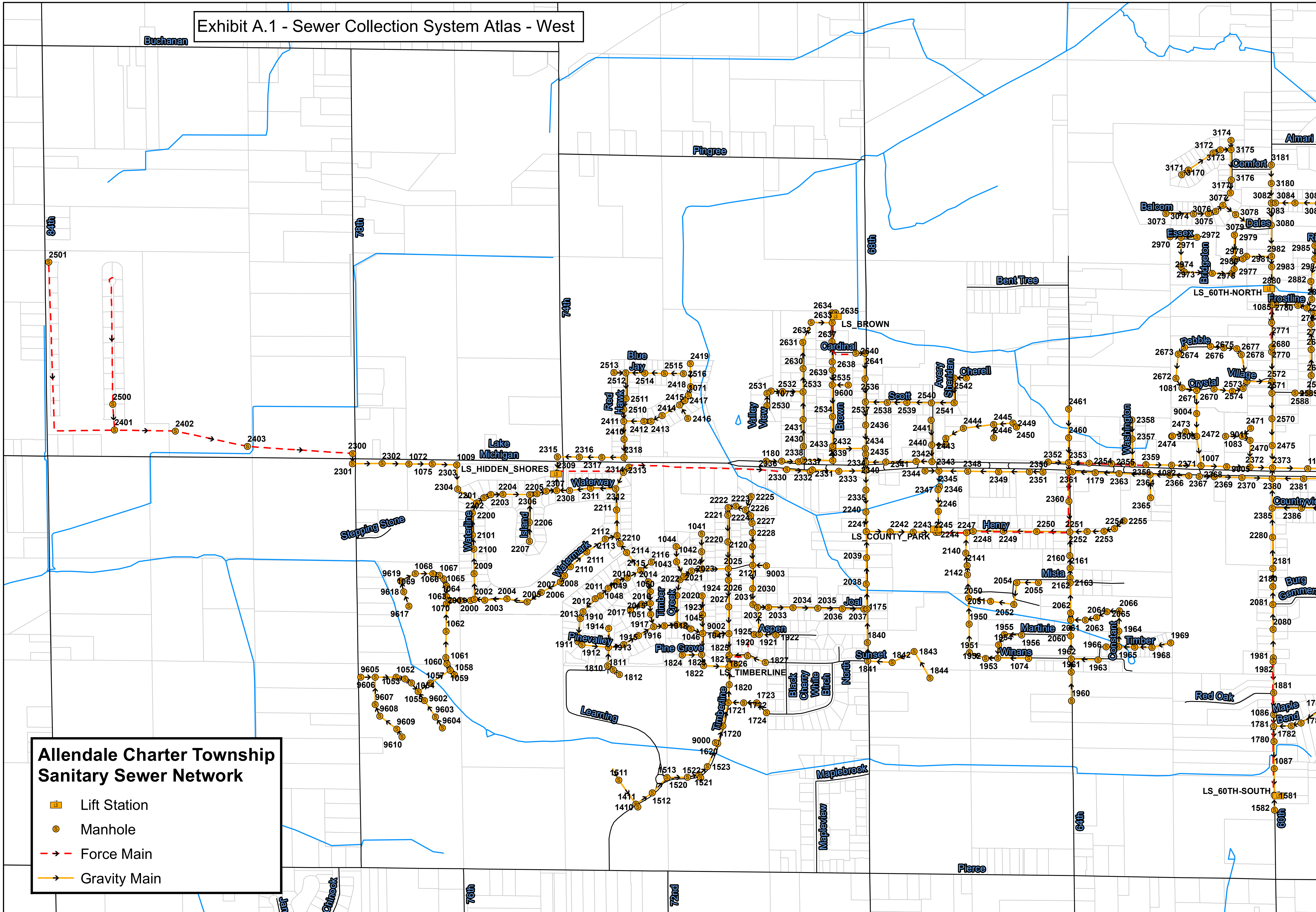
An agenda was developed for the public hearing that will cover the recommended outline set forth in the SRF Project Plan guidance document. The agenda is attached as **Appendix N.**

6.1.4 Comments Received and Answered

6.2 Adoption of the Project Plan

After the Public Hearing, Allendale Township formally adopted the Project Plan via resolution. This resolution is attached as **Appendix P**.

Exhibits to Reference



FLEIS & VANDENBRINK
DESIGN. BUILD. OPERATE.

Sanitary Collection System (WEST)

Allendale Charter Township, Michigan

DRAWN BY	DATE
BSR	9/5/2018
PROJECT NO.	SCALE
814975	1:13,500

FILE LOCATION

SOURCES

NORTH

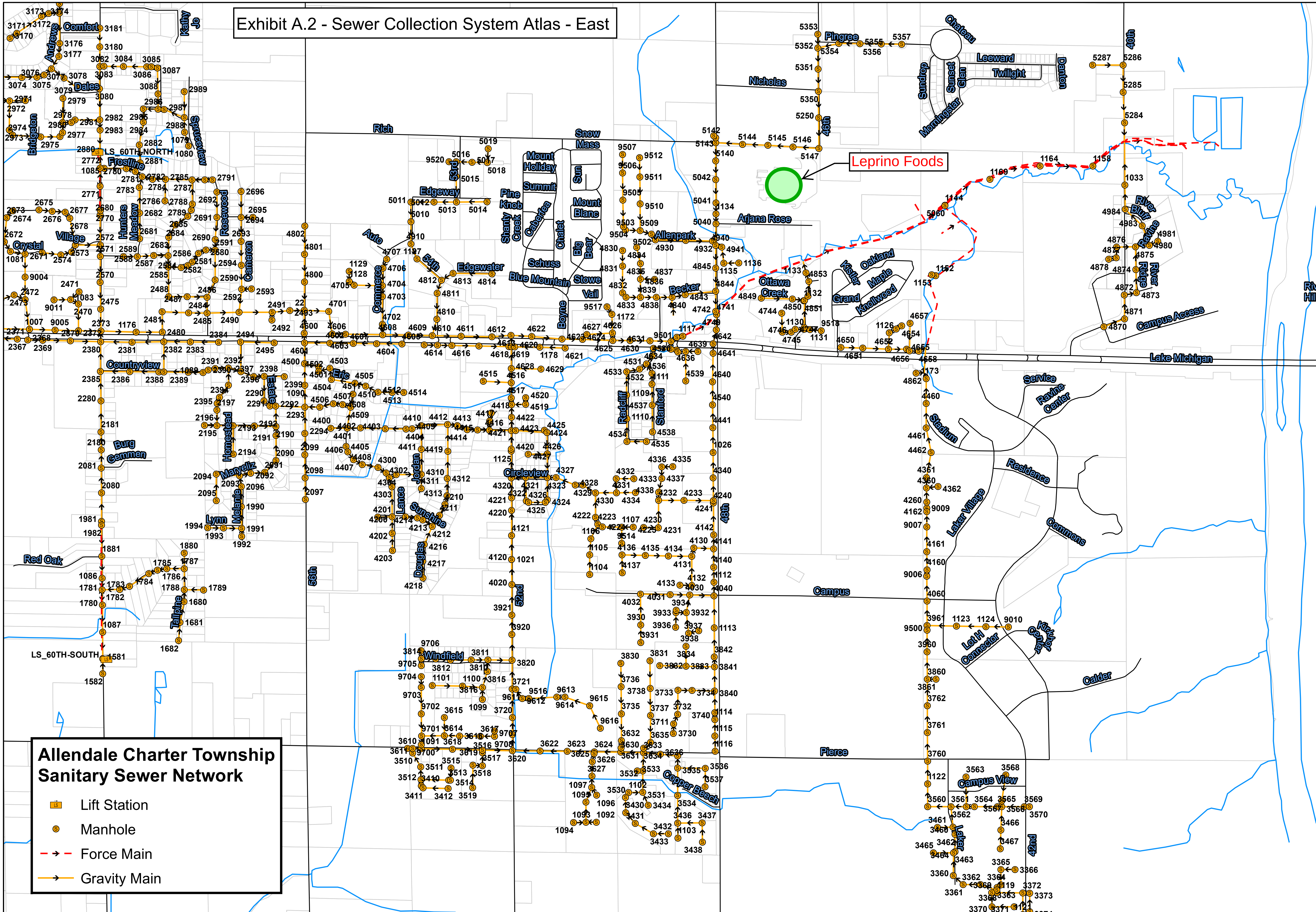
0 560 1,120

SCALE IN FEET

FIGURE

A-1A

Exhibit A.2 - Sewer Collection System Atlas - East



Allendale Charter Township Sanitary Sewer Network

- Lift Station
- Manhole
- Force Main
- Gravity Main

FLEIS & VANDENBRINK
DESIGN. BUILD. OPERATE.

Sanitary Collection System (EAST)

Allendale Charter Township, Michigan

DRAWN BY	DATE
BSR	9/5/2018
PROJECT NO.	SCALE
814975	1:13,500
FILE LOCATION	
SOURCES	

NORTH

0 560 1,120
SCALE IN FEET

FIGURE
A-1B

Exhibit A.3 - Sewer District Atlas

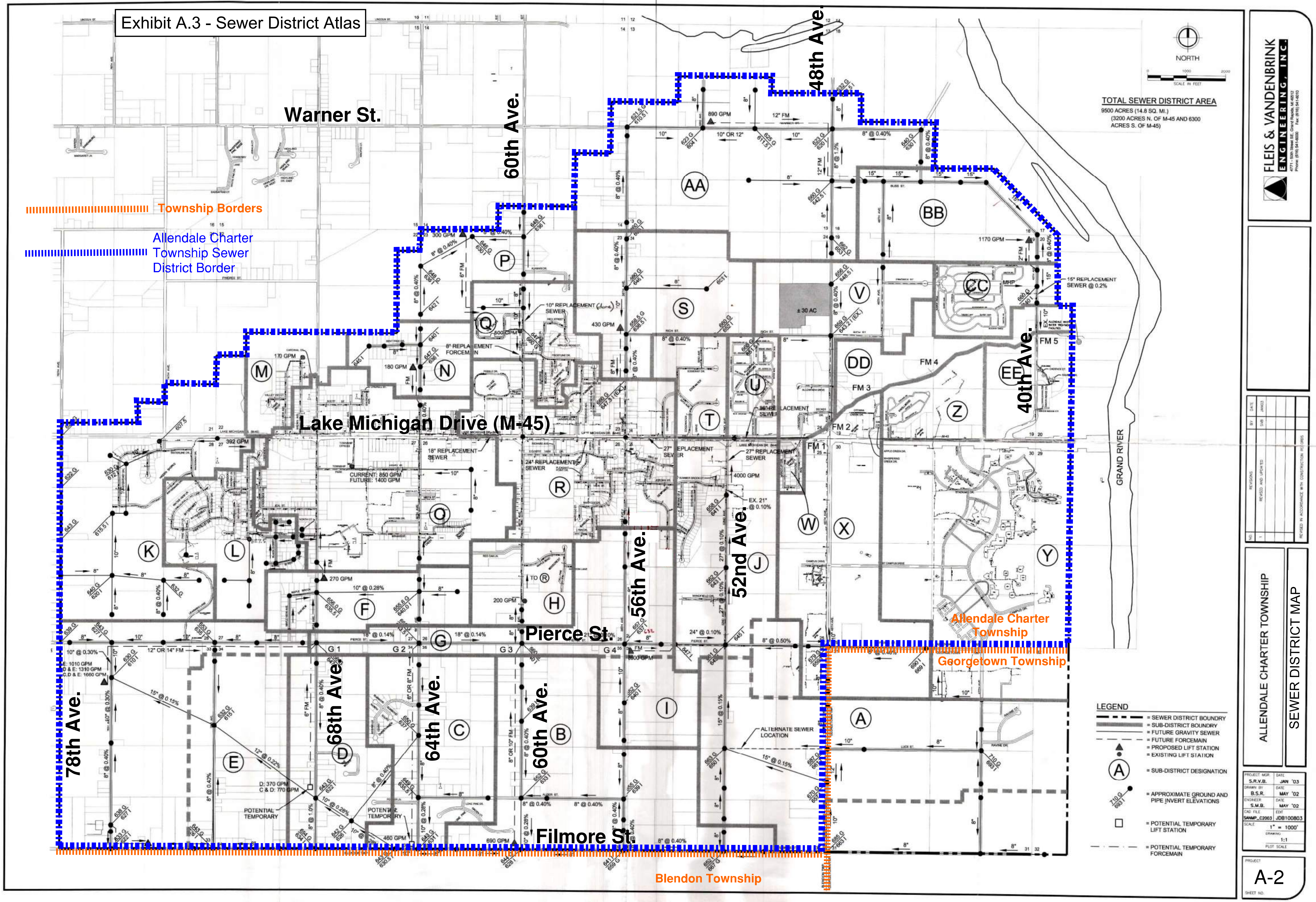


Exhibit B.1 – EGLE Wetlands Map of Allendale Township WWTP

Exhibit B.2 – EGLE Wetlands Map of Allendale Charter Township

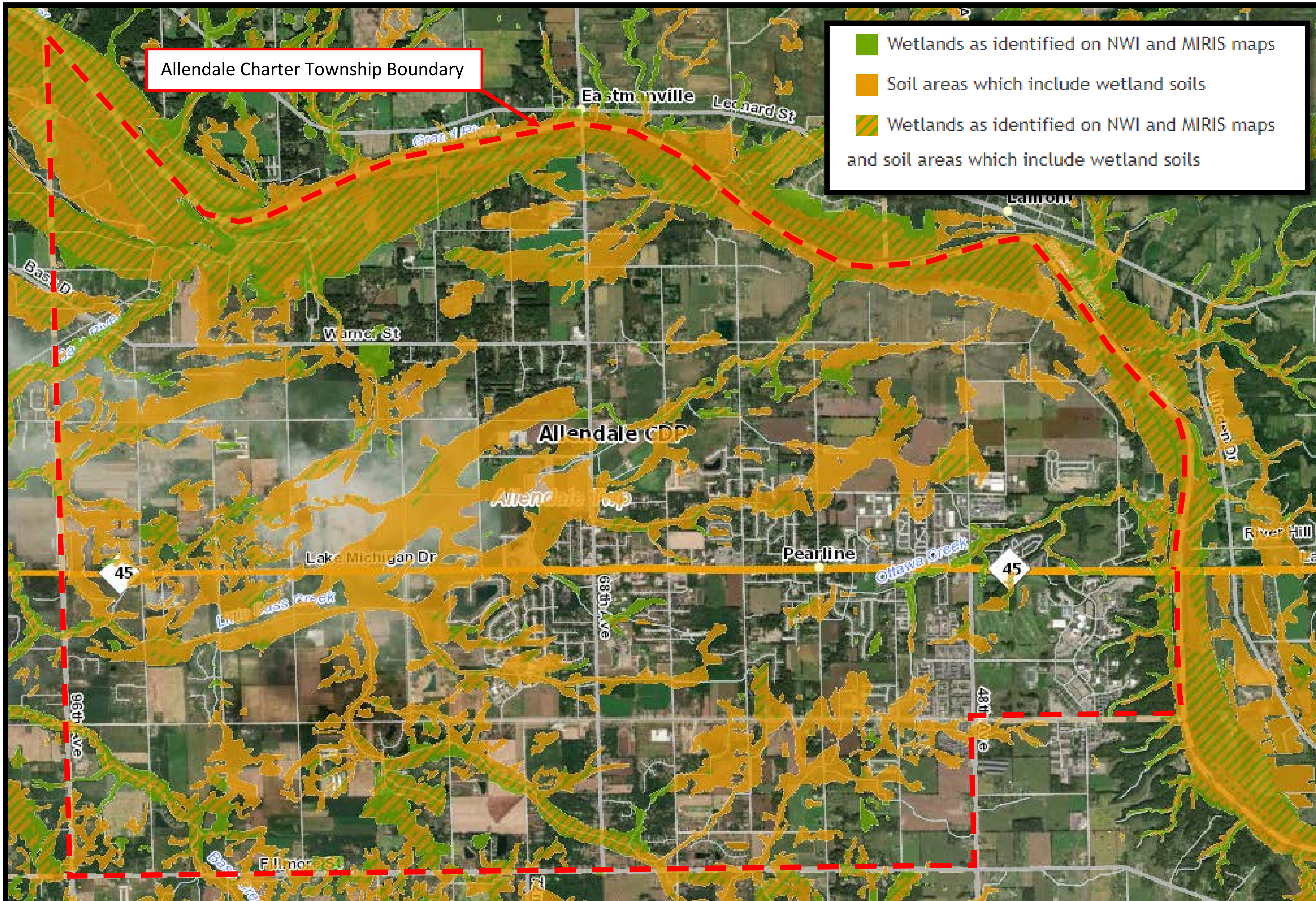


Exhibit C – FEMA Floodplain Map at Allendale Township WWTP

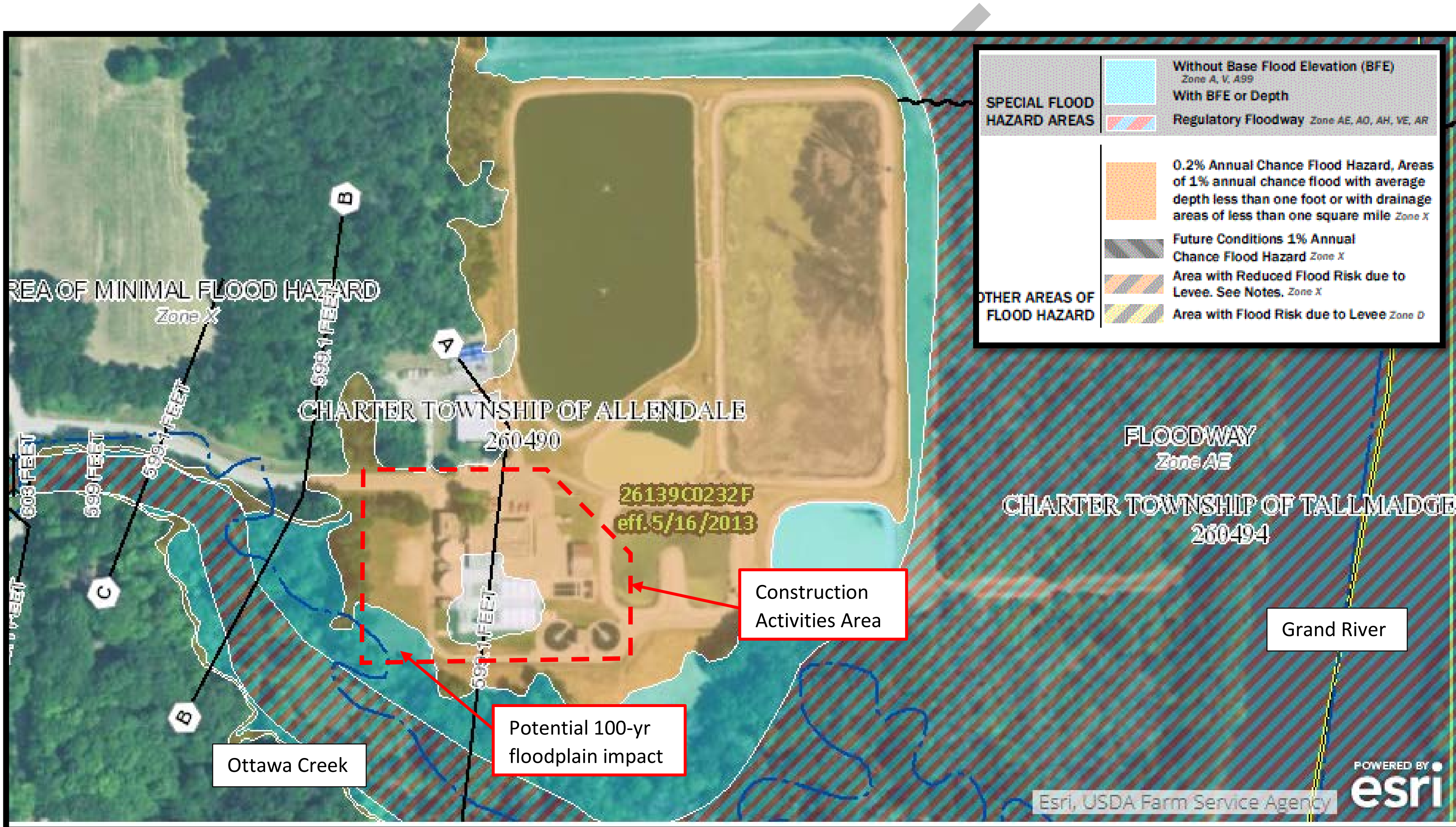


Exhibit D – Allendale Charter Township Major Surface Waters Map

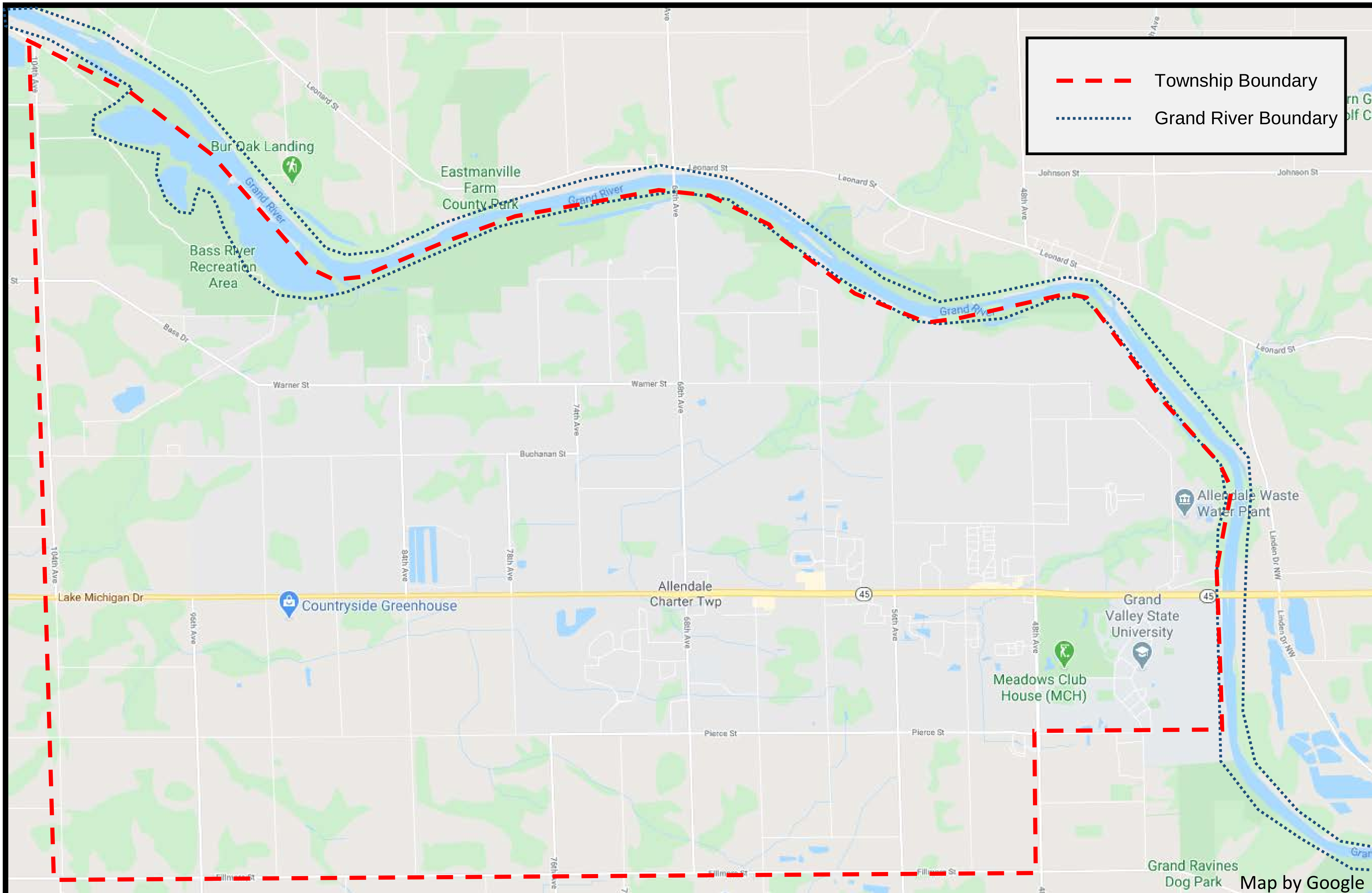


Exhibit E – Allendale Charter Township Recreational Areas

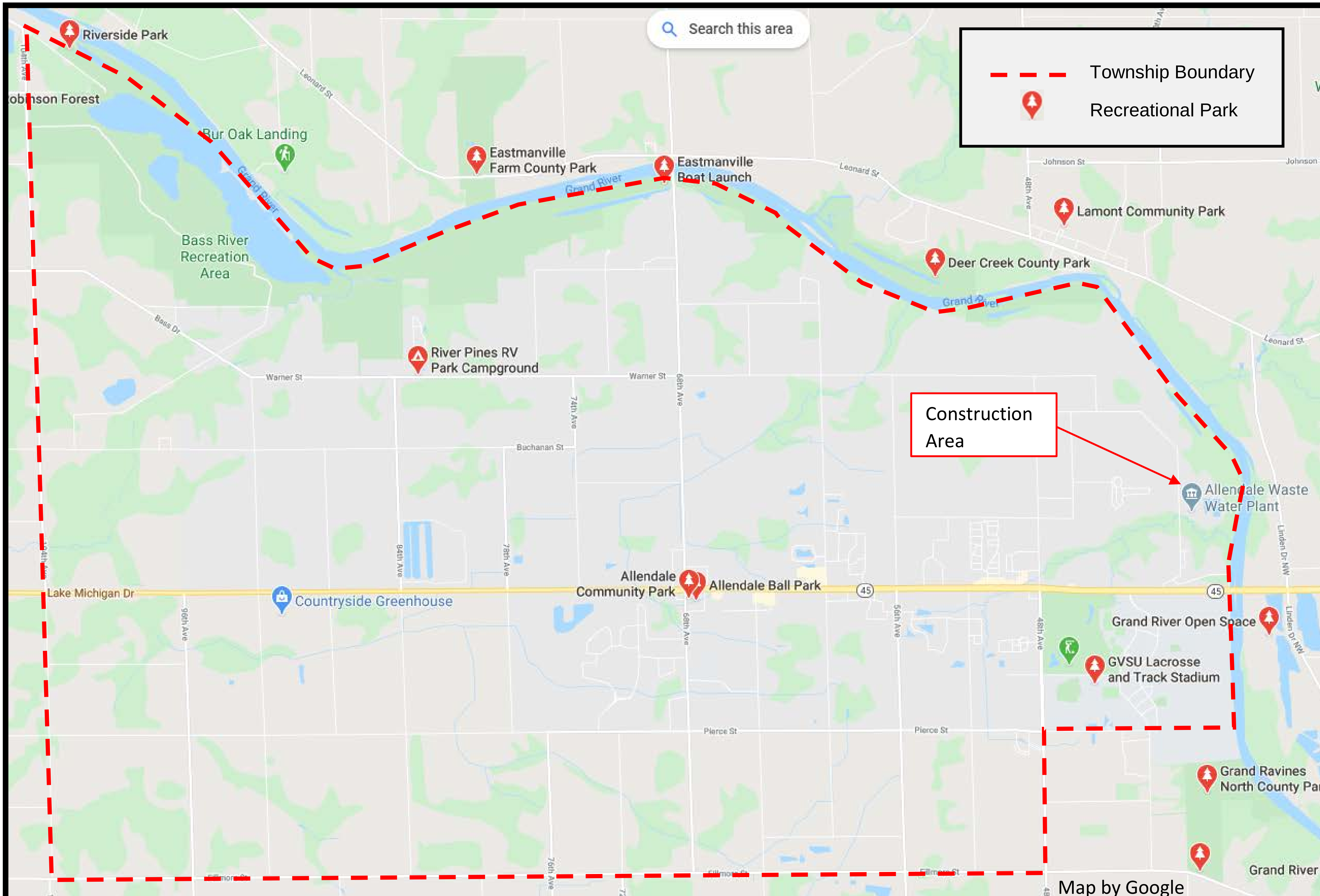


Exhibit F.1 - Allendale Township Quadrangle Topo Map

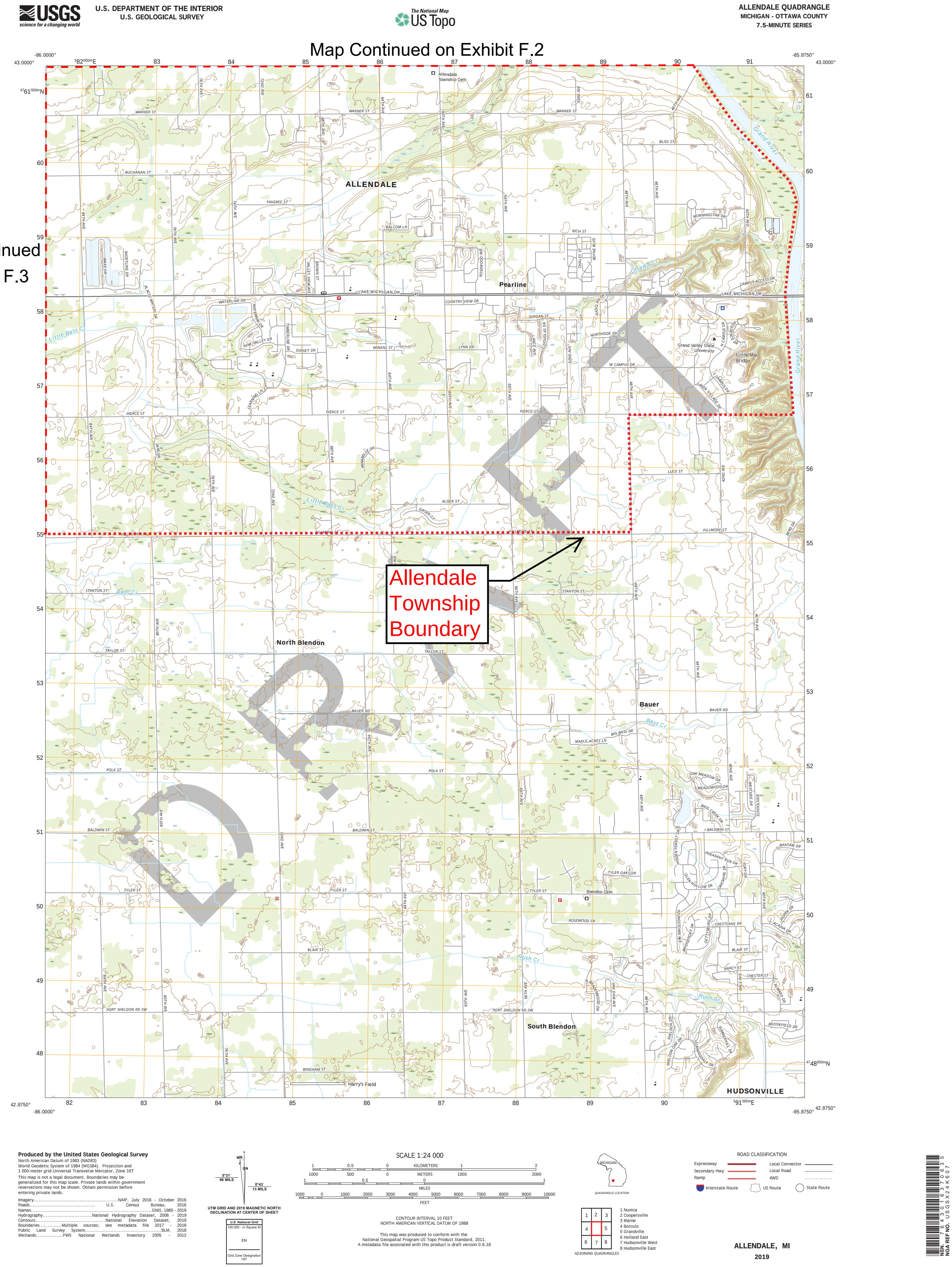
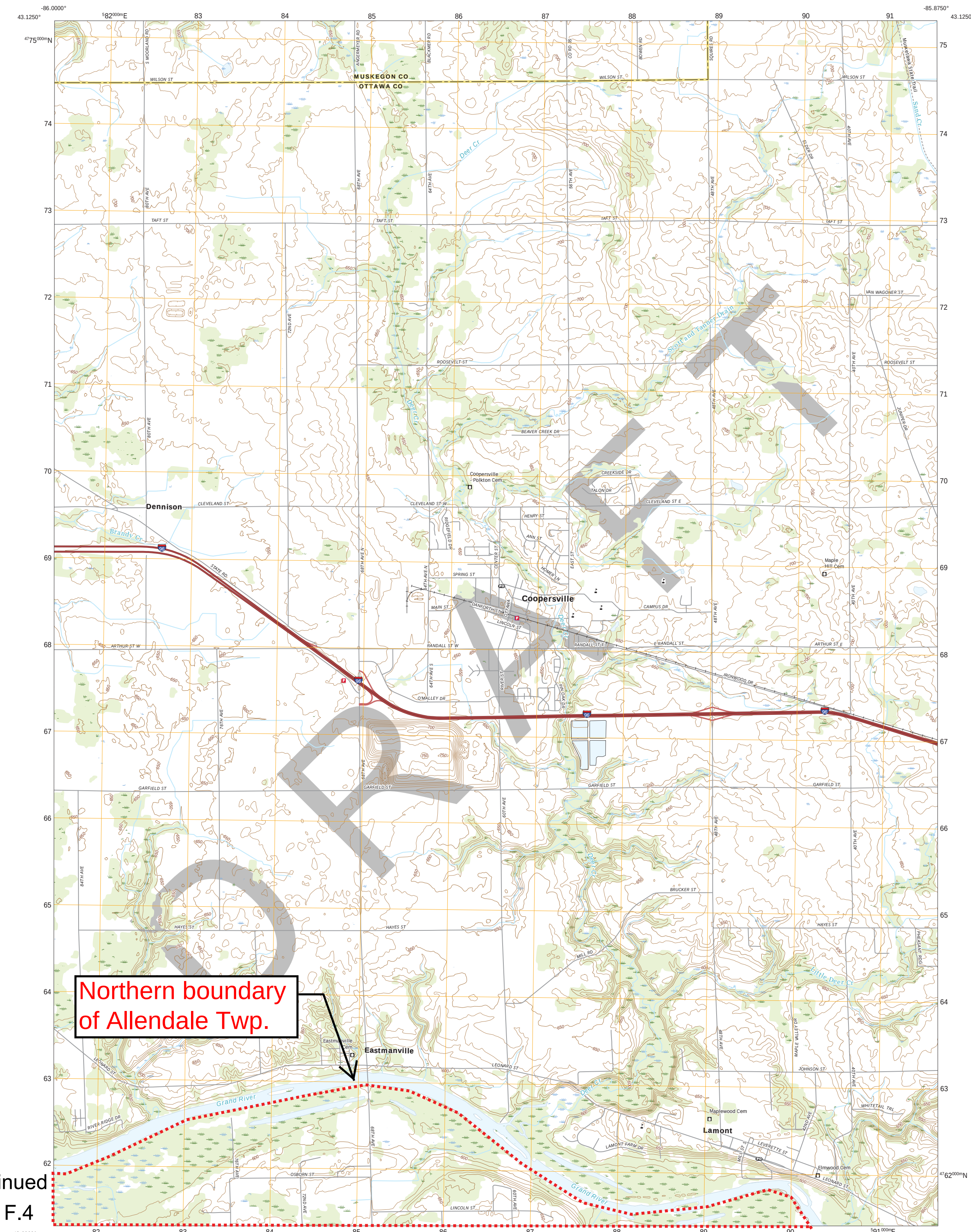


Exhibit F.2 - Coopersville Quadrangle Topo Map

U.S. DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

The National Map
US Topo

COOPERSVILLE QUADRANGLE
MICHIGAN
7.5-MINUTE SERIES



Map Continued on Exhibit F.4

Map continued on Exhibit F.1

Produced by the United States Geological Survey
North American Datum of 1983 (NAD83)
World Geodetic System of 1984 (WGS84). Projection and 1 000-meter grid: Universal Transverse Mercator, Zone 16T

This map is not a legal document. Boundaries may be generalized for this map scale. Private lands within government reservations may not be shown. Obtain permission before entering private lands.

Imagery.......NAIP, July 2016 - October 2016
Roads.......U.S. Census Bureau, 2016
Names.......GNIS, 1980 - 2019
Hydrography.......National Hydrography Dataset, 1899 - 2019
Contours.......National Elevation Dataset, 2019
Boundaries.......Multiple sources; see metadata file 2017 - 2018
Public Land Survey System.......BLM, 2018
Wetlands.......FWS National Wetlands Inventory 2005

UTM GRID AND 2019 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET
5°33′ 99 MILS
0°44′ 13 MILS

U.S. National Grid
100,000 - m Square ID
EN
Grid Zone Designation 16T

SCALE 1:24 000

CONTOUR INTERVAL 10 FEET
NORTH AMERICAN VERTICAL DATUM OF 1988

This map was produced to conform with the National Geospatial Program US Topo Product Standard, 2011.
A metadata file associated with this product is draft version 0.6.18

QUADRANGLE LOCATION

ADJOINING QUADRANGLES
1 Sullivan
2 Ravenna
3 Casnovia
4 Nunica
5 Marne
6 Borculo
7 Allendale
8 Grandville

ROAD CLASSIFICATION
Expressway
Secondary Hwy
Ramp
Local Connector
Local Road
4WD
Interstate Route
US Route
State Route

COOPERSVILLE, MI
2019

Exhibit F.3 - Borculo Quadrangle Topo Map

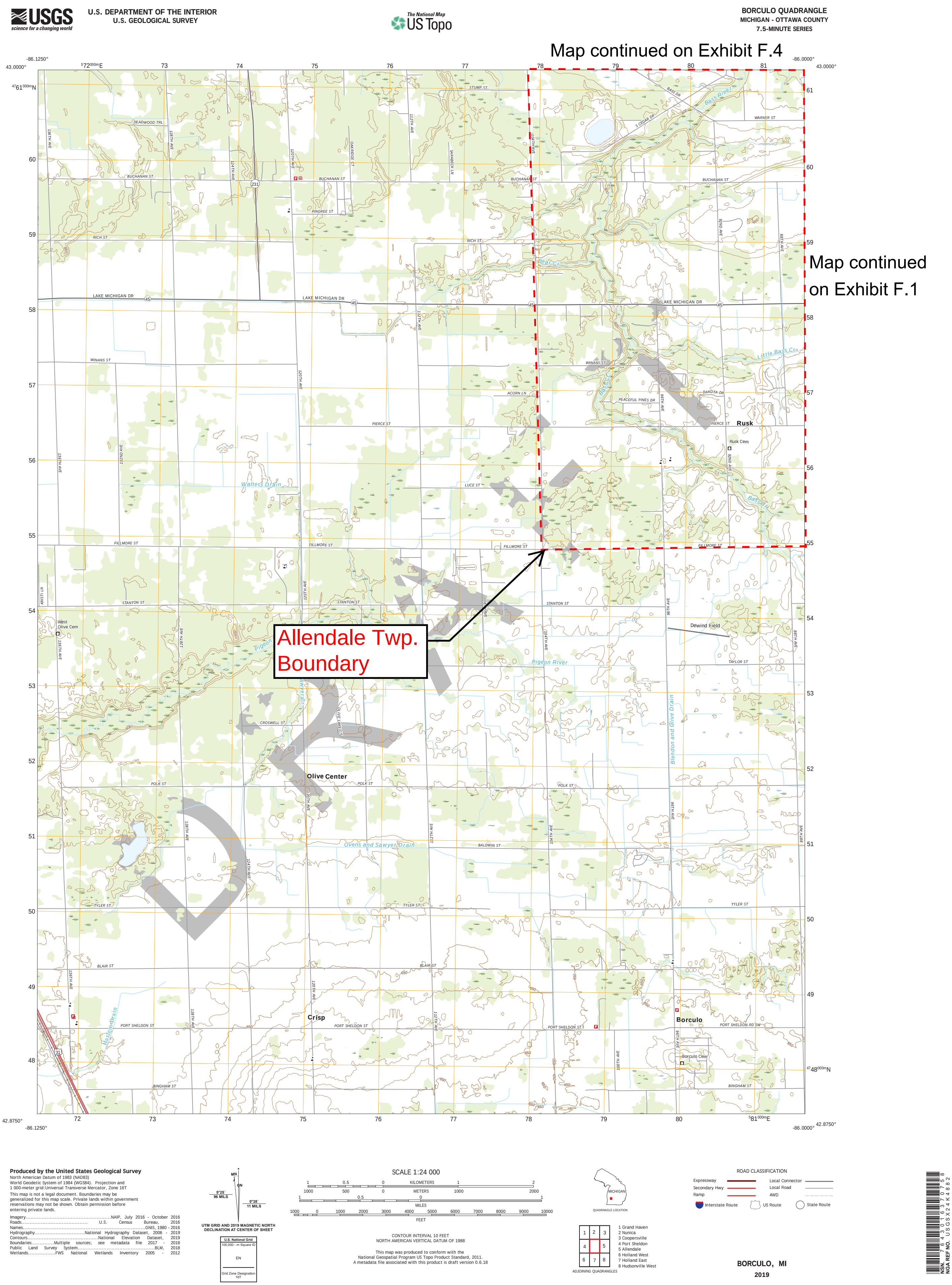
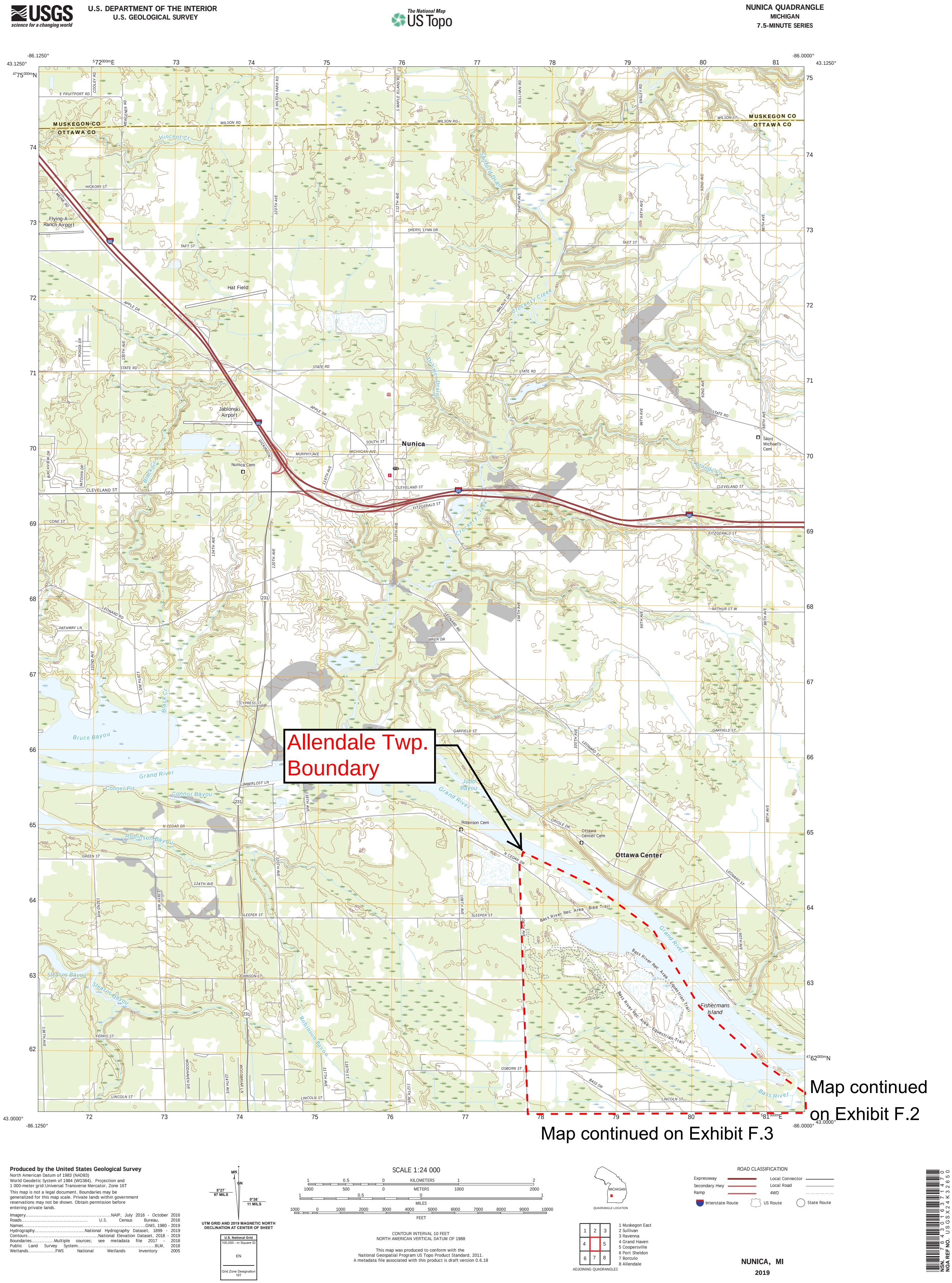


Exhibit F.4 - Nunica Quadrangle Topo Map



Map continued on Exhibit F.2

Map continued on Exhibit F.3

Exhibit G - Agricultural Lands Map

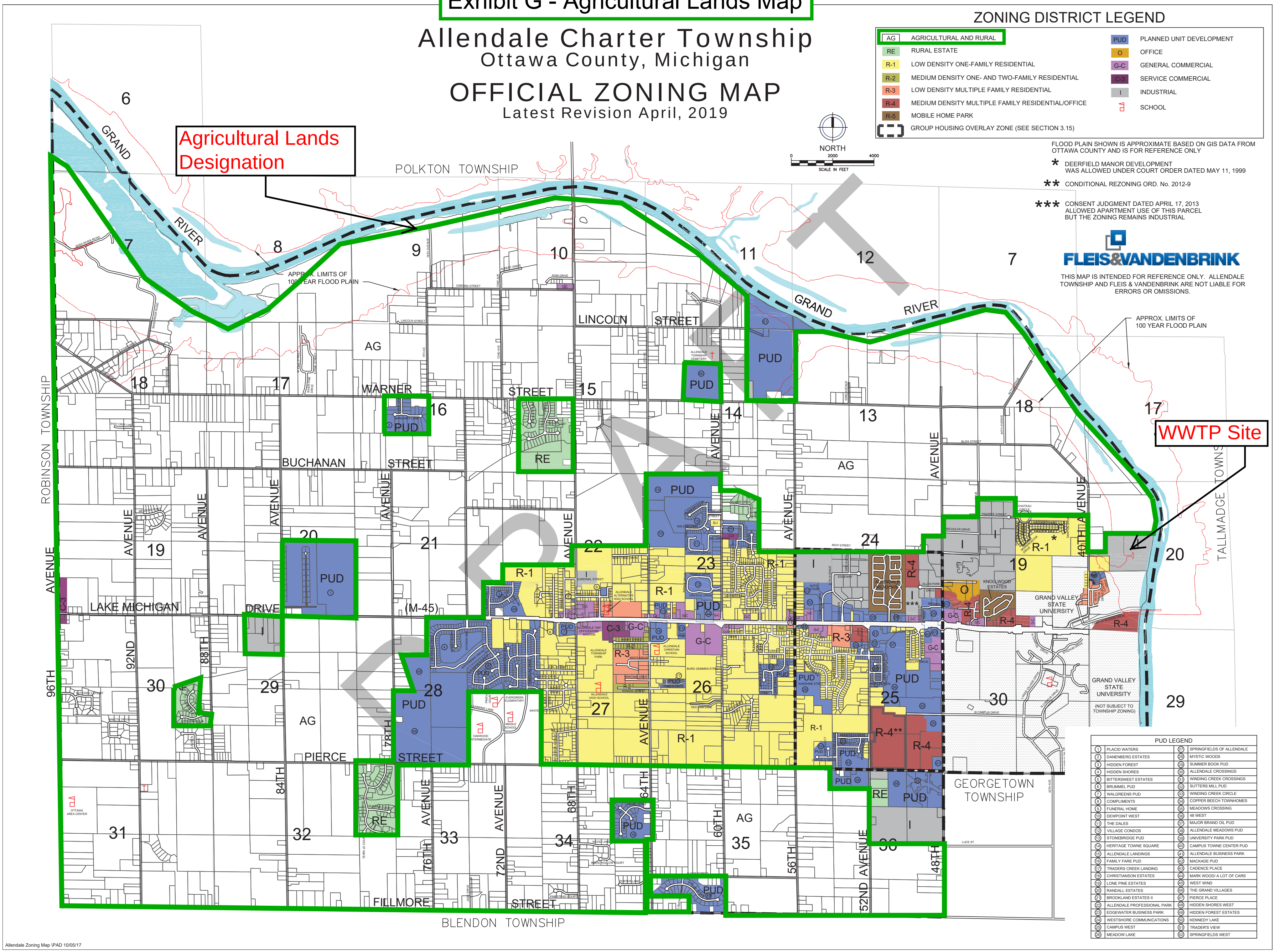
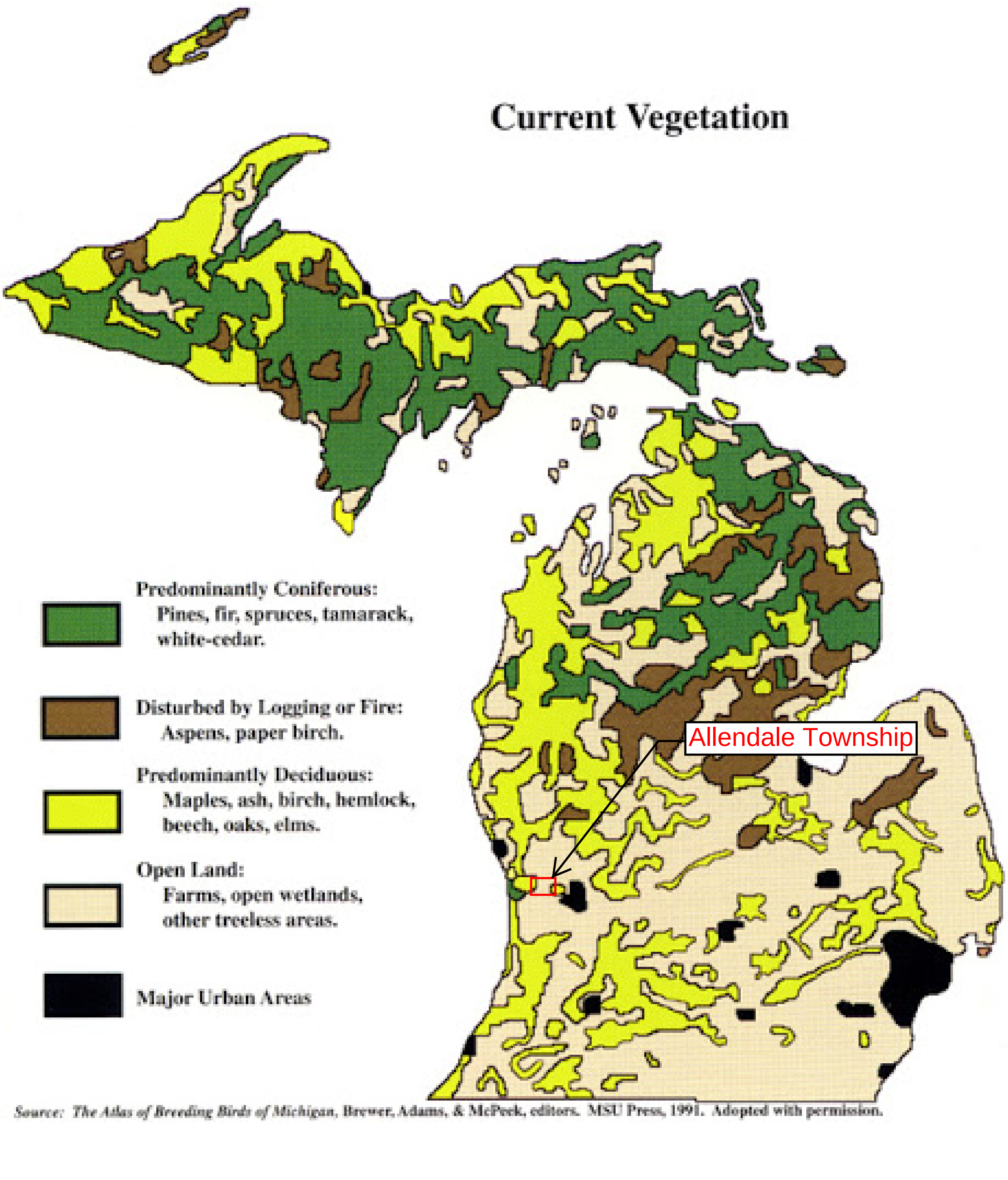


Exhibit H - Michigan Vegetation Map - 1991



Source: The Atlas of Breeding Birds of Michigan, Brewer, Adams, & McPeek, editors. MSU Press, 1991. Adopted with permission.

Exhibit I.1 - Agricultural Lands Map

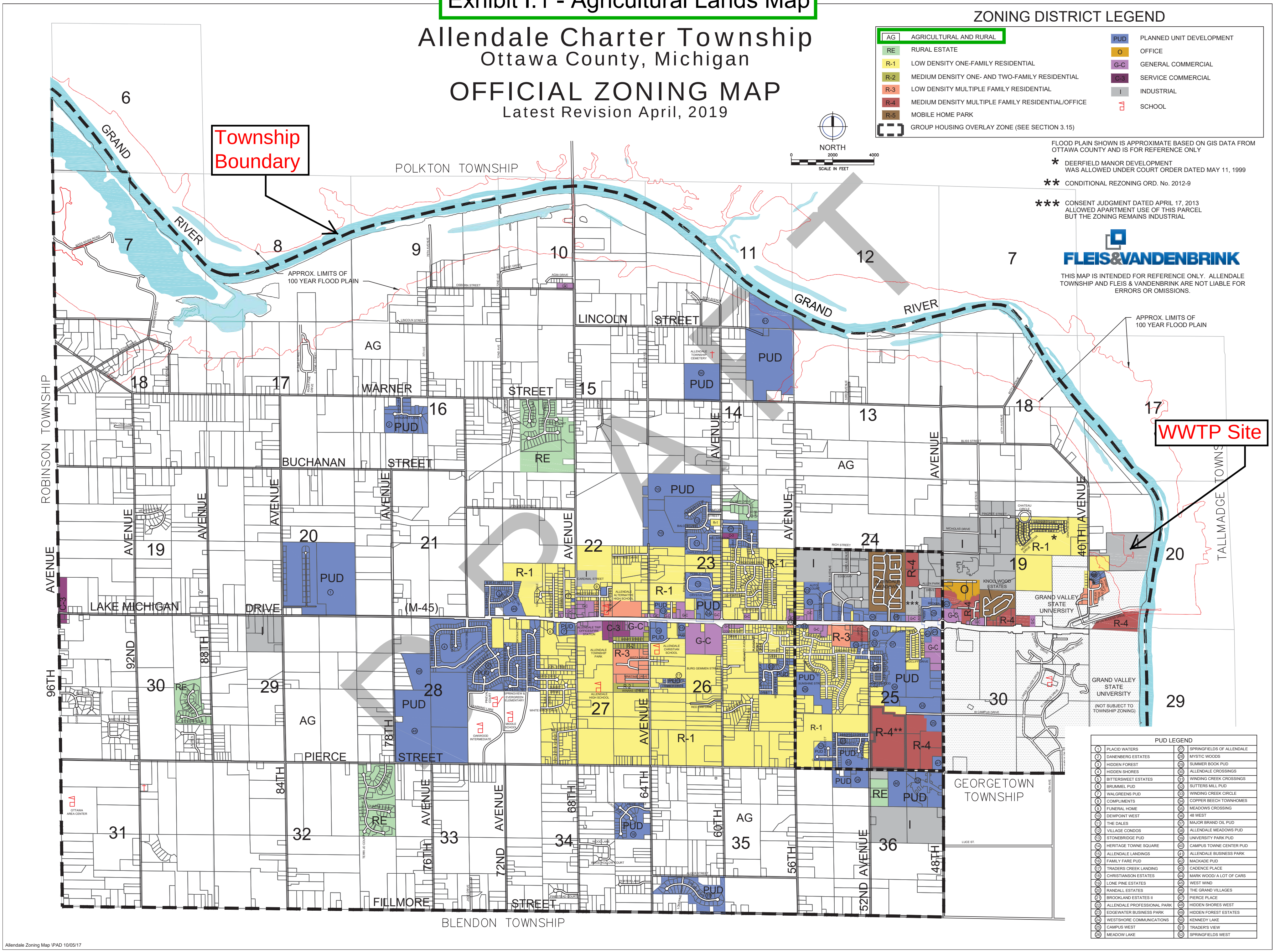


Exhibit J
Regional Facility Alternative Cost Estimate

Item #	*Description*	*Unit*	*Quantity*	*Unit Price*	*Amount*
1	Cross country force mains	lft	48000	$ 150.00	*$ 7,200,000.00*
2	Renovations to existing trunk sewers	lsum	1	$ 1,500,000.00	*$ 1,500,000.00*
3	Initial Lift Station	lsum	1	$ 3,500,000.00	*$ 3,500,000.00*
4	Intermediate Lift Station	lsum	1	$ 3,500,000.00	*$ 3,500,000.00*
5	Upgrades to Grandville CWP Headworks	lsum	1	$ 750,000.00	*$ 750,000.00*
6	Grandville CWP Primary treatment expansion	ea	4	$ 350,000.00	*$ 1,400,000.00*
7	Grandville CWP aeration treatment expansion	ea	6	$ 450,000.00	*$ 2,700,000.00*
8	Grandville CWP secondary clarifier expansion	ea	4	$ 350,000.00	*$ 1,400,000.00*
9	Grandville CWP UV expansion	ea	1	$ 700,000.00	*$ 700,000.00*
10	Grandville CWP solids thickening equipment	ea	1	$ 450,000.00	*$ 450,000.00*
11	Grandville CWP solids dewatering equipment	ea	1	$ 600,000.00	*$ 600,000.00*
12	Grandville CWP anaerobic digester modifcations	lsum	1	$ 1,000,000.00	*$ 1,000,000.00*
13	Miscellaneous pumping equipment	lsum	1	$ 250,000.00	*$ 250,000.00*
14	EGLE permit process to fill in existing pond at Grandville	lsum	1	$ 1,250,000.00	*$ 1,250,000.00*
15	Miscellaneous building upgrades	lsum	1	$ 1,500,000.00	*$ 1,500,000.00*
	Materials and Equipment Subtotal				*$ 27,700,000.00*
	General Contracting (OH&P, Bonding, Insurance, etc.)	%		20%	*$ 5,540,000.00*
	General Mechanical Contracting	%		10%	*$ 2,770,000.00*
	General Electrical Contracting	%		8%	*$ 2,216,000.00*
	General Instrumentation	%		2%	*$ 554,000.00*
	Construction Subtotal				$ 38,780,000.00
	Contingency	%		20%	*$ 7,756,000.00*
	Project Costs (engineering, survey, inspection)	%		15%	*$ 5,817,000.00*
	Total Cost				***$ 52,353,000.00***