MICHIGAN RCAP

Environmental Report

Ludington Water Plant Improvement Project: Mason County, Michigan

2/17/2016

Prepared by: Leo Dion, Michigan Rural Community Assistance Program. This report has been made possible as a result of funding as part of the RCAP/USDA Technitrain Program, an RCAP network project.

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1.0 Purpose and Need of Project

1.1 Project Description

Fishbeck, Thompson, Carr & Huber, Inc. (FTCH) was retained by the City of Ludington (City) to prepare preliminary (30%) design documents for improvements to the Ludington Water Treatment Plant (WTP). This document summarizes the preliminary engineering design for the improvements to the City's existing water plant. The project improvements will address specific deficiencies noted in an Administrative Consent Order executed by the City and the Michigan Department of Environmental Quality (MDEQ).

The City has requested that the project incorporate the following components based on the engineering evaluations and past studies:

1. Improve filter reliability by converting to high-rate sedimentation in one existing clarifier and adding two new filters in the remaining clarifier.
2. Repair cracked concrete in the existing filters.
3. Replace the existing fiberglass-reinforced plastic (FRP) tanks used for sodium hypochlorite storage.
4. Modify the fluoride system to align with current fluoride system design standards.
5. Replace bolts on the old plant high-service piping.
6. Install a redundant 24-inch diameter raw water line from the Low-Service Pump Station to the WTP.
7. Extend the 36-inch diameter filter backwash pipe from a new buried valve vault to a connection to the existing pipe.
8. Replace the standby generator with a new unit in an outdoor enclosure.
9. Repairs to existing masonry.
10. Repair/replace exterior aggregate wall surfacing.
11. Replace the roof on the existing WTP building.
12. Replace the existing HVAC units and hydronic piping.

The filter reliability improvements will require converting both existing upflow clarifiers to new uses. Flocculation and high-rate sedimentation will occur in two trains to be constructed in the east clarifier. Each train will include a flocculation tank with 30 minutes of detention time and a sedimentation tank with inclined plate settlers. Two new filters will be constructed in the existing west clarifier. They will include a similar underdrain system and media profile as the existing filters, and will be equipped with surface wash piping similar to the existing filters. Each filter will include filter effluent and associated piping and valves configured similar to the existing filters. The 16-inch filter effluent pipe from the

existing two filters to the reservoir was originally designed to handle flow up to 8 mgd, per the original rated design, and will continue to be used.

A 9 feet by 20 feet backwash valve vault for the new filters will be constructed outside the existing plant on the west side, adjacent to the new filters. The chamber will house the backwash discharge valves. Constructing the chamber outside the plant avoids the need to construct the backwash discharge piping beneath the floor within the existing plant. An at-grade accessible buried valve vault is planned for the chamber.

1.2 Purpose and Need of Project

As of the 2015 MDEQ Sanitary Survey issued January 30, 2015, the water plant was down-rated by the MDEQ from 6.4 mgd to 3.2 mgd. This was based on the firm capacity of the existing filters, specifically the capacity of one of the two existing filters. The previous plant rated capacity had been 6.4 mgd based on the combined capacity of the filters. Upon addition of two filters as proposed, the filter capacity will not be a limiting factor, so the plant rated capacity can be increased as part of the project.

The plant was originally designed and rated for 8 mgd. As part of the preliminary design phase, the City requested an evaluation of improvements required to restore the water plant capacity to its original design of 8 mgd. The specific components of the plant that were thought to be potentially impacted by this criteria include the intake, high service pumps, and electrical systems. The preliminary design concepts and costs for the preliminary design were developed based on achieving 8 mgd capacity.

2.0 Alternatives to the Proposed Action

One alternative was explored for this proposed project (Table 1).

Table 1. List of Alternatives

Alternative	Beneficial Environmental Impacts	Potential Adverse Environmental Impacts
Alternative 1: No Action Alternative	None	The City's 2015 MDEQ Sanitary Survey issued January 30, 2015 down-rated the water plant from 6.4 mgd to 3.2 mgd. The water plant would remain at this capacity.
Alternative 2: Proposed System	The project improvements will address specific deficiencies noted in an Administrative Consent Order executed by the City and the Michigan Department of Environmental Quality (MDEQ).	None

Alternative 1: No Action Alternative

No improvements would be implemented for this alternative. The "No Action" alternative would maintain the current system operations.

This alternative would NOT address any of the specific deficiencies noted in an Administrative Consent Order executed by the City and the Michigan Department of Environmental Quality (MDEQ).

The "No Action" alternative does not meet the project objectives and will not be evaluated further as a principle alternative.

Alternative 2: Proposed Water System and Waste Water System Improvements

Alternative 2 is the recommended alternative. The water plant upgrade is outlined in section 1.1. This alternative proposes to upgrade the filter system in the water treatment plant (WTP), install a redundant 24-inch diameter raw water line from the Low-Service Pump Station to the WTP, repair and replace parts of the existing WTP building, and replace existing HVAC and backup generator with the addition of a new structure to house thegenerator.

3.0 Affected Environment/Environmental Consequences

3.1 Land Use/Important Farmland/Formally Classified Lands

3.1.1 Affected Environment

The vicinity of the project area is largely rural residential, commercial with an adjacent public beach, and sand dunes. The construction will happen on public lands where an existing water treatment plant is located. There are three soil types as shown on the project maps in Section 6.0. There are no designations of "prime farmland," "farmland of local importance", "forests," or "rangelands". The project area is within public lands, or mowed rights-of-way. A summary of all soil types found in the project areas are shown in Table 1 below.

A soils map is included in Section 6 of this report. A summary of all soil types found in the project areas are:

Table 1 – Ludington Water Plant Improvement Project Area: Soil Types

Mason County, Michigan (MI105)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Classification**
1	Beaches	0.4	Not prime farmland
90B	Epworth fine sand, 0 to 6 percent slopes	0.4	Not prime farmland
97B	Urban land-Epworth complex, 0 to 8 percent slopes	3.0	Not prime farmland
Totals for Area of Interest		**3.8**	**100.0%**

3.1.2 Environmental Consequences

The proposed project for the water plant improvement will have a minor amount of excavation to install a 24 inch diameter redundancy pipe for raw water intake. This excavation will take place from the low service pump station to the WTP across mowed public land on the site of the existing treatment facility. The project will restore all lands to pre-construction conditions. No environmental consequences are anticipated as a direct result of this project.

3.1.3 Mitigation

No mitigation is necessary as no direct impact is anticipated with regard to prime and important soils, or farmland preservation with the proposed project.

3.2 Floodplains

3.2.1 Affected Environment

The project area has been mapped for the FEMA National Flood Insurance Program. See attached maps in section 6.0. The project does not appear to fall within the 100-year flood zone. Any excavations will be below ground and the ground returned to its original condition including restored topsoil, grass, and paving, etc.

3.2.2 Environmental Consequences

No long term environmental consequences associated with the floodplains are anticipated in association with the proposed project.

3.2.3 Mitigation

No mitigation is necessary as no direct impact is anticipated with regard to floodplains with the proposed project.

3.3 Wetlands

3.3.1 Affected Environment

The project does not pass through wetlands according to the MDEQ National Final Wetlands Inventory shown on the map in Section 6.0. Any excavations will be have the ground returned to its original condition including restored topsoil, grass, and paving, etc.

3.3.2 Environmental Consequences

No long term environmental consequences associated with the wetlands are anticipated in association with the proposed project.

3.3.3 Mitigation

No mitigation is necessary as no direct impact is anticipated with regard to wetlands with the proposed project.

3.4 Cultural Resources

3.4.1 Affected Environment

The land area in the vicinity of the project is residential, commercial, and public uses. There are no historic sites listed in the National Register or sites identified within the Area of Potential Effect (APE).

3.4.2 Environmental Consequences

The National Historic Preservation Act of 1966 requires a Section 106 review to determine any impacts upon historic properties. A Section 106 review was performed and found no historic properties effected. See State Historic Preservation Officer response in Section 5.0.

3.4.3 Mitigation

No mitigation required.

3.5 Biological Resources

3.5.1 Affected Environment

No environmental consequences are anticipated to occur as a result of the proposed project. The proposed project will be constructed within publicly owned property. The proposed project for the water plant improvement will have a minor amount of excavation to install a 24 inch diameter redundancy pipe for raw water intake. This excavation will take place from the low service pump station to the WTP across mowed public land on the site of the existing treatment facility. Within Mason

County, there are known endangered and threatened species including: Indiana bat, Northern long-eared bat, Piping plover, rufa red knot, Eastern massasauga, Karner Blue Butterfly, and pitcher's thistle. The mowed lawn around the existing WTP is not biological habitat. None of the habitats for known listed threatened or endangered species is present on the WTP property where construction will occur. There is beach and dune habitat adjacent to the property, but this will not be impacted by the proposed project. No known candidate, threatened or endangered species or critical habitat is in or near the proposed project area.

3.5.2 Environmental Consequences

USDA RD has checked the species listed by the U.S. Fish and Wildlife Service website and determined that the proposed project will have no effect with regard to candidate, threatened, or endangered species. See the attached correspondence in Section 5.0 of this report. Also, since the project is in developed areas and mowed public lands, the project will not likely affect state threatened and endangered species.

3.5.3 Mitigation

No mitigation will be required, as no impacts are anticipated with regard to biological resources for the proposed construction project.

3.6 Water Quality Issues

3.6.1 Affected Environment

The environment affected by the WTP improvement project is within publicly owned property.

3.6.2 Environmental Consequences

This project should not have any negative impact on surface or ground water quality in the area as a result of the proposed actions. The proposed project should have a water quality benefit to the City of Ludington. The proposed WTP upgrades will return the plant to its full capacity and address specific deficiencies noted in an Administrative Consent Order executed by the City and the Michigan Department of Environmental Quality (MDEQ) and the associated public health and environmental issues.

3.6.3 Mitigation

No mitigation measures are necessary with regard to water quality as no negative impacts are anticipated to result from the proposed project.

3.7 Coastal Resources

3.7.1 Affected Environment

The City of Ludington WTP Improvement project is located near the shore of Lake Michigan and the proposed project area is located within the Coastal Zone Management (CZM) Area.

3.7.2 Environmental Consequences

No environmental consequences are anticipated with respect to coastal resources associated with this project. The Michigan DNRE Land and Water Management Division, Great Lakes Shorelands Unit was

consulted regarding potential impacts of this project on the Coastal Management Zone. See the correspondence in Section 5.0.

3.7.3 Mitigation

No mitigation will be required, as there are no environmental impacts are anticipated with regard to coastal resources.

3.8 Socio-Economic/Environmental Justice Issues

3.8.1 Affected Environment

As of the census of 2010, there were 8076 people living in the City of Ludington, 3,549 households, and 2,004 families residing in the City. The racial makeup of the township was 92.2% White, 1.1% African American, 1.4% Native American, 0.6% Asian, 2.0% from other races, and 2.6% from two or more races. Hispanic or Latino of any race made up 6.3% of the population.

There were 3,549 households out of which 25.3% had children under the age of 18 living with them, 38.8% were married couples living together, 13.7% had a female householder with no husband present, and 43.5% were non-families. Of all households, 37.8% were made up of individuals and 32.9% had someone living alone who was 65 years of age or older. The average household size was 2.19 and the average family size was 2.87. The City has a population range that consists of 26.7% under the age of 18, and 32.9% who were 65 years of age or older. The median age was 46.1 years.

According to the American Community Survey 2014, the median income for a household in Ludington was $33,110, and the median family income was $43,165. The per capita income for Ludington was $22,955. Individuals and families below the poverty line made up 19.0% and 14.7%, of the population, respectively. Out of the total people living in poverty, 38.4% are under the age of 18 and 3.5% are 65 or older.

The water main and sewer lines for the City of Ludington will serve all of the residents within the district. The customers are to be charged fairly and equitably according to their usage of the system. The planned improvements in association with this project will benefit all residents within the district equally. The cost of the project will be distributed across all users, through user rates. No segment of the population will be treated differently than any other, and discrimination within the city is prohibited.

3.8.2 Environmental Consequences

No environmental consequences are anticipated with regard to socio- economic/environmental justice issues relating to this project. All residents and users of the system will be treated equally and all will share equally in the benefits and cost of the proposed project.

3.8.3 Mitigation

No mitigation measures are necessary as no socio-economic/environmental justice impacts are anticipated in relation to this project.

3.9 Miscellaneous Issues

3.9.1 Air Quality

1.1.1.1 *Affected Environment*

Air quality in the area of the City of Ludington is generally good. The proposed project is not anticipated to increase emissions.

2.1.1.1 *Environmental Consequences*

During construction, there could be short term air quality impacts from fugitive dust as is common with any construction project; however, with the use of best management practices during construction, such as dampening of the soil to limit dust and use of diesel powered equipment that will be fueled with low sulfur diesel oil the impacts are minimal. Additionally, contractors will be encouraged to limit idling time during operation of heavy equipment to reduce air quality impacts from exhaust.

3.1.1.1 *Mitigation*

No mitigation measures are necessary with regard to impacts to air quality as there will be no long lasting impacts to the air quality in the area resulting from this project.

3.9.2 Transportation

4.1.1.1 *Affected Environment*

The City of Ludington has US-10 (Ludington Ave) running through the heart of the city and providing East and West passage. Just west of Ludington US-31 provides a north and south route along the west coast of Michigan. The areas of construction in this project are not anticipated to impact the flow of traffic; however local transportation may be temporarily affected by construction employee and equipment traffic.

5.1.1.1 *Environmental Consequences*

The project will have a temporary effect on local transportation due to construction equipment using these roads to gain access to the constructions site. This project is not anticipated to have any lasting impacts on transportation patterns. If street closures or detours are necessary, these will be coordinated with the Michigan Department of Transportation, the local street department and/or the County Road Commission. These should be highly publicized and well-marked, if necessary during construction.

6.1.1.1 *Mitigation*

No mitigation measures are necessary in relation to the proposed project with regard to transportation, as no long term impacts are anticipated.

3.9.3 Noise

7.1.1.1 *Affected Environment*

The City of Ludington is a rural coastal community with a mix of commercial, residential and industrial along the roadways in the area of the proposed project. The major sources of noise are traffic related, and local commercial activities.

8.1.1.1 ***Environmental Consequences***

No new sound generating equipment is anticipated in the proposed project. However, during construction, noise levels will increase due to the construction activities and heavy equipment use. The use of best management practices should limit the unnecessary noise from construction by limiting idling time of heavy equipment, and unnecessary noise from construction workers during construction. Construction will be limited to normal daylight hours as well, which will limit the disruption of the normal quiet nature of the community.

9.1.1.1 ***Mitigation***

No mitigation measures are necessary in association with noise control related to this project as no long term impacts are anticipated.

3.9.4 Solid Waste Disposal

10.1.1.1 ***Affected Environment***

Solid waste disposal will not be impacted by this project. During construction, construction crews should be responsible for cleanup of debris on a daily basis, as well as at the end of the construction during the cleanup and restoration phases. There are no new permanent sources of solid waste materials associated with this project.

11.1.1.1 ***Environmental Consequences***

No environmental consequences are anticipated as a result of this project. Solid waste generated by the project will be managed in an appropriate manner as required in the construction agreements. The general contractor will be responsible for adequate and appropriate disposal of all wastes generated during construction. No long term impact on solid waste are anticipated, other than those that will be subject to permitting processes currently in place locally or statewide.

12.1.1.1 ***Mitigation***

No mitigation measures are necessary as no impacts are anticipated to result from the proposed project.

3.9.5 Existing or Potential Spills/Releases

13.1.1.1 ***Affected Environment***

MDEQ STD (Storage Tank Division) enforces state and federal laws regarding pollution from storage tank leaks or releases, and maintains a listing of all known releases of hazardous materials from any registered underground or above ground storage tanks. There are no known releases in the proposed construction area.

14.1.1.1 ***Environmental Consequences***

A search of the MDEQ/STD website showed no open or closed underground storage tank locations in the proposed construction site. See section 6.0 for a map and list of known active and closed storage tanks in the vicinity of the project.

Part 213 of the Natural Resources Environmental Protection Act (NREPA) prohibits any exacerbation of any polluted areas (e.g. through excavation and/or dewatering activities). The consultants and contractors will take all necessary precautions when working in potentially contaminated areas.

If, during construction, the contractor encounters any contaminated soil which appears to be the result of an unreported release of hazardous material, the contractor will immediately cease construction and notify the City, who in turn will notify the MDEQ STD of a suspected release. According to law, a discovery of a suspected release of hazardous materials must be reported to MDEQ STD within 24 hours. This begins a series of mitigation efforts and/or enforcement actions. These measures are designed to protect the public from any environmental consequences from hazardous spills.

15.1.1.1 *Mitigation*

No mitigation measures are necessary as no impacts are anticipated to result from the proposed project.

4.0 Summary of Mitigation

No mitigation measures are necessary in relation to this project as no long term negative impacts are anticipated to result from the proposed actions.

5.0 Correspondence

5.1 Fish and Wildlife Service Review

5.2 Section 7 Endangered Species Act Consultation

5.3 Coastal Zone Management

United States Department of Agriculture
Rural Development
Community Programs – Michigan State Office

January 8, 2016

Scott Hicks, Field Supervisor
United States Dept of the Interior
Fish and Wildlife Service
East Lansing Field Office
2651 Coolidge Road
East Lansing, MI 48823

RE: City of Ludington Water Treatment Plant Improvements
USDA Finding of No Effect

Dear Mr. Hicks:

The above-mentioned applicant has applied to USDA Rural Development for funding assistance to construct the referenced project to serve their residents in Mason County, Michigan.

USDA is making a finding of no effect for the above-mentioned project with respect to the threatened and endangered species identified. Our review of the endangered species list and summary of findings are attached, as well as a map of the project location.

Sincerely,

Andrew H. Granskog, PE
State Environmental Coordinator

3001 Coolidge Road • Suite 200 • East Lansing, MI 48823
Phone: (517) 324-5209 • Fax: (517) 324-5225 • TDD: (517) 324-5169 • Web: http://www.rurdev.usda.gov/mi

MEMORANDUM

TO: USDA Rural Development Environmental File

FROM: Andrew H. Granskog, PE; RD State Environmental Coordinator

DATE: January 8, 2016

RE: Section 7 Endangered Species Act Consultation – Ludington Water Treatment Improvements

Ludington is in the process of applying to USDA Rural Development for funding for construction of improvements to their existing water treatment plant and is completing a NEPA review for the project. The project construction schedule is yet to be determined. A project map and description are attached.

USDA Rural Development reviewed the US Fish and Wildlife technical assistance website on the above-mentioned date for federally listed threatened and endangered species. The species list is provided as a screen print attached to this memo. None of the habitats listed for the threatened or endangered species identified are present at the project location. The project location is the existing water treatment plant facility, and is not wildlife habitat for the species identified.

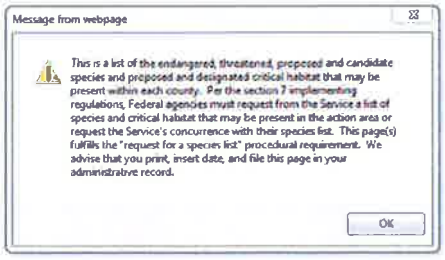
For these reasons, we conclude that the above-mentioned project will have "no effect" on listed species, their habitats, or proposed or designated critical habitat.

Screen prints, of the species list are attached.

Michigan Endangered Species List - By County

Will this list be used for a Section 7 project review?

YES NO



			MAY 1 - SEPTEMBER 30
Mason	Indiana bat (*Myotis sodalis*)	Endangered	Summer habitat includes small to medium river and stream corridors with well developed riparian woods; woodlots within 1 to 3 miles of small to medium rivers and streams; and upland forests. Caves and mines as hibernacula.
	Northern long-eared bat *Myotis septentrionalis*	Threatened	Hibernates in caves and mines - swarming in surrounding wooded areas in autumn. Roosts and forages in upland forests during spring and summer.
	Piping plover (*Charadrius melodus*)	Endangered	Beaches along shorelines of the Great Lakes
	Piping plover (*Charadrius melodus*)	Critical Habitat	
	Rufa Red knot *(Calidris canutus rufa)*	Threatened	Only actions that occur along coastal areas during the Red Knot migratory window of MAY 1 - SEPTEMBER 30
	Eastern massasauga (*Sistrurus catenatus*)	Proposed as Threatened	
	Karner blue butterfly (*Lycaeides melissa samuelis*)	Endangered	Pine barrens and oak savannas on sandy soils and containing wild lupines *(Lupinus perennis)*, the only known food plant of larvae.
	Pitcher's thistle (*Cirsium pitcheri*)	Threatened	Stabilized dunes and blowout areas
Mecosta	Northern long-eared bat *Myotis septentrionalis*	Threatened	Hibernates in caves and mines - swarming in

1.0 SUMMARY OF PROJECT

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reservoir was originally designed to handle flow up to 8 mgd, per the original rated design, and will continue to be used.

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As of the 2015 MDEQ Sanitary Survey issued January 30, 2015, the water plant was down-rated by the MDEQ from 6.4 mgd to 3.2 mgd. This was based on the firm capacity of the existing filters, specifically the capacity of one of the two existing filters. The previous plant rated capacity had been 6.4 mgd based on the combined capacity of the filters. Upon addition of two filters as proposed, the filter capacity will not be a limiting factor, so the plant rated capacity can be increased as part of the project.

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Topographic map for the Water Treatment Plant Improvement Project for the City of Ludington. Not to Scale.

Picture index map for the photos of the project area. Not to scale.

STATE OF MICHIGAN
DEPARTMENT OF ENVIRONMENTAL QUALITY
LANSING

RICK SNYDER
GOVERNOR

KEITH CREAGH
DIRECTOR

February 1, 2016

Leo Dion
Michigan RCAP
9815 Blue Moss Trail
Traverse City, Michigan 49685

Dear Mr. Dion:

Subject: Federal Consistency Determination, Proposed Water Treatment Facility Improvement Project, City of Ludington, Michigan

Staff of the Water Resources Division has reviewed this phase of the project for consistency with Michigan's Coastal Management Program (MCMP), as required by Section 307 of the Coastal Zone Management Act, PL 92-583, as amended (CZMA). Thank you for providing the opportunity to review this proposed activity.

Our review indicates that portions of this project are located within Michigan's coastal management boundary and are subject to consistency requirements.

A determination of consistency with MCMP requires evaluation of a project to determine if it will have an adverse impact on coastal land or water uses or coastal resources. Projects are evaluated using the permitting criteria contained in the regulatory statutes administered by the Department of Environmental Quality. These statutes constitute the enforceable policies of the Coastal Management Program.

Provided all permits are issued and complied with where required, no adverse impacts to coastal resources are anticipated from this phase of the project as described in the information you forwarded to our office. Issuance of all required permits will certify the activity for which the permits were issued as consistent with MCMP.

This consistency determination does not waive the need for permits that may be required under other federal, state or local statutes. Please call me if you have any questions regarding this review.

Sincerely,

Chris Antieau
Great Lakes Shorelands Unit
Water Resources Division
517-290-5732

5.4 State Historic Preservation Office

5.4.1 Application for Section 106 Review

STATE HISTORIC PRESERVATION OFFICE
Application for Section 106 Review

SHPO Use Only
☐ IN Received Date ____ / ____ / ____ Log In Date ____ / ____ / ____
☐ OUT Response Date ____ / ____ / ____ Log Out Date ____ / ____ / ____
Sent Date ____ / ____ / ____

Submit one copy for each project for which review is requested. This application is required. Please type. Applications must be complete for review to begin. Incomplete applications will be sent back to the applicant without comment. Send only the information and attachments requested on this application. Materials submitted for review cannot be returned. Due to limited resources we are unable to accept this application electronically.

I. GENERAL INFORMATION

☒ THIS IS A NEW SUBMITTAL ☐ THIS IS MORE INFORMATION RELATING TO ER#

a. Project Name: City of Ludington Water Treatment Plant Improvement Project
b. Project Address (if available):
c. Municipal Unit: City of Ludington County: Mason County
d. Federal Agency, Contact Name and Mailing Address (*If you do not know the federal agency involved in your project please contact the party requiring you to apply for Section 106 review, not the SHPO, for this information*.): Andrew H. Granskog, USDA Rural Development, 3001 Coolidge Rd, Suite 200, East Lansing, MI 48823 Phone: (517) 324-5209.
e. State Agency (if applicable), Contact Name and Mailing Address:
f. Consultant or Applicant Contact Information (if applicable) *including mailing address*: John A. Willemin, PE, Fishbeck, Thompson, Carr & Huber, Inc., (616) 464-3801; Leo Dion, RCAP Technical Assistance Provider, Michigan RCAP, P.O. Box 173, Lake Ann, MI 49650-0173, (231) 492-0324.

II. GROUND DISTURBING ACTIVITY (INCLUDING EXCAVATION, GRADING, TREE REMOVALS, UTILITY INSTALLATION, ETC.)

DOES THIS PROJECT INVOLVE GROUND-DISTURBING ACTIVITY? ☒ YES ☐ NO (If no, proceed to section III.)

Exact project location must be submitted on a USGS Quad map (portions, photocopies of portions, and electronic USGS maps are acceptable as long as the location is clearly marked).

a. USGS Quad Map Name: Ludington
b. Township: 18N Range: 18W Section: 9, 16
c. Description of width, length and depth of proposed ground disturbing activity: City of Ludington Water Treatment Plant Improvements Description of Ground Disturbing Activities: A concrete vault will be constructed on the west side of the existing water treatment plant for back wash water main isolation valves for the new filters. The vault will be approximately 9 feet x 20 feet in dimension and 17 feet below grade to the bottom of the excavation. The vault will be constructed of cast-in-place concrete. Sheet piling may be required for temporary earth retention to protect the excavation.Piping improvements will include the installation of a 24-inch diameter redundant raw water main between the Low Lift Pump Station and the south side of the Water Treatment Plant. A 36-inch diameter back wash water main will be constructed between the new back wash valve vault and the existing back wash water main that least to the wash water recovery tank. A foundation drain will installed around the new vault and connected into adjacent foundation drain piping for the water plant.Site restoration will include the replacement of approximately 6,000 square feet of existing pavement on the west side of the plant..
d. Previous land use and disturbances: Existing public land and water treatment facility.
e. Current land use and conditions: Existing public land and water treatment facility.
f. Does the landowner know of any archaeological resources found on the property? ☐ YES ☒ NO
Please describe:

III. PROJECT WORK DESCRIPTION AND AREA OF POTENTIAL EFFECTS (APE)

Note: Every project has an APE.

a. Provide a detailed written description of the project (plans, specifications, Environmental Impact Statements (EIS), Environmental Assessments (EA), etc. **cannot** be substituted for the written description): This is an improvement to an existing water treatment facility in the City of Ludington. See the attached project narrative for a detailed description of the project.
b. Provide a localized map indicating the location of the project; road names must be included and legible.
c. On the above-mentioned map, identify the APE.
d. Provide a written description of the APE (physical, visual, auditory, and sociocultural), the steps taken to identify the APE, and the justification for the boundaries chosen. The APE is the facility grounds where the existing water treatment facility stands.

IV. IDENTIFICATION OF HISTORIC PROPERTIES

a. List and date **all** properties 50 years of age or older located in the APE. If the property is located within a National Register eligible, listed or local district it is only necessary to identify the district: none
b. Describe the steps taken to identify whether or not any **historic** properties exist in the APE and include the level of effort made to carry out such steps: A search of the National Register of Historic Buildings.
c. Based on the information contained in "b", please choose one:
   - ☐ Historic Properties Present in the APE
   - ☒ No Historic Properties Present in the APE
d. Describe the condition, previous disturbance to, and history of any historic properties located in the APE:

V. PHOTOGRAPHS

Note: All photographs must be keyed to a localized map.

a. Provide photographs of the site itself.
b. Provide photographs of all properties 50 years of age or older located in the APE (faxed or photocopied photographs are not acceptable).

VI. DETERMINATION OF EFFECT

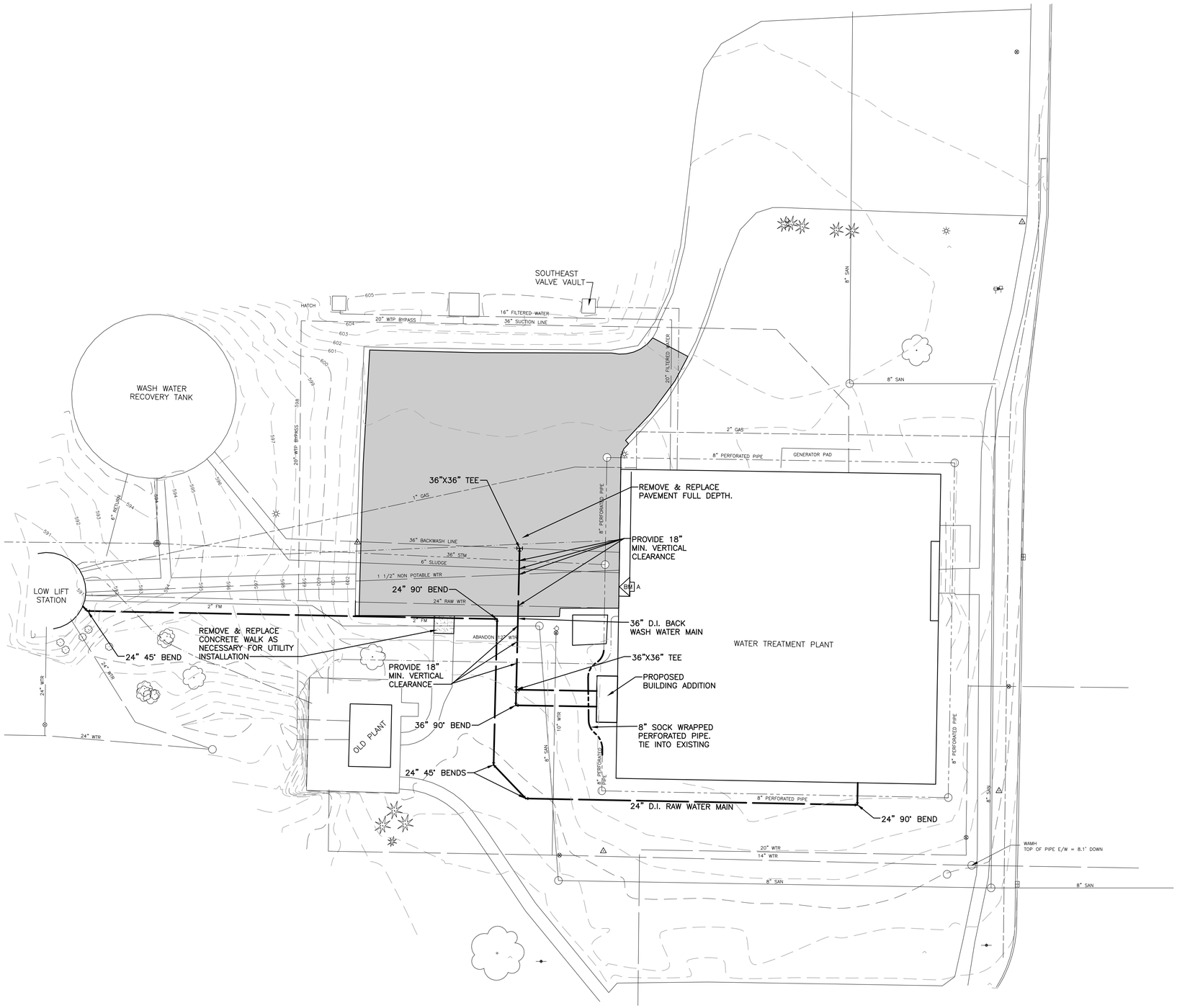
☒ No historic properties affected based on [36 CFR § 800.4(d)(1)], please provide the basis for this determination.

☐ No Adverse Effect [36 CFR § 800.5(b)] on historic properties, explain why the criteria of adverse effect, 36 CFR Part 800.5(a)(1), were found not applicable.

☐ Adverse Effect [36 CFR § 800.5(d)(2)] on historic properties, explain why the criteria of adverse effect, [36 CFR Part 800.5(a)(1)], were found applicable.

Please print and mail completed form and required information to:

State Historic Preservation Office, Environmental Review Office, Michigan Historical Center, 702 W. Kalamazoo Street, P.O. Box 30740, Lansing, MI 48909-8240



NORTH

SITE UTILITY PLAN

SCALE: 1" = 20'

0 10 20 40

BENCH MARK

BENCH MARK A ELEVATION: 603.89
SW CORNER OF 1ST CONCRETE STEP,
EAST ENTRANCE TO WATER TREATMENT PLANT

NOTES

1. EXISTING UTILITIES LOCATIONS SHOWN ARE APPROXIMATE.
2. VERIFY THE HORIZONTAL AND VERTICAL LOCATION OF EXISTING UTILITIES PRIOR TO EXCAVATION WHERE NECESSARY.
3. PROTECT AND MAINTAIN SERVICE OF OTHER UTILITIES AT CROSSINGS.
4. DO NOT CONNECT ROOF DRAINS, FOUNDATION DRAINS, AND OTHER CLEAN WATER SERVICES TO THE SANITARY SEWER.
5. WATER MAIN TO HAVE A MINIMUM OF 5.5 FEET OF COVER.
6. PROVIDE A MINIMUM OF EIGHTEEN (18) INCHES OF VERTICAL SEPARATION AND TEN (10) FEET OF HORIZONTAL SEPARATION BETWEEN THE WATER MAIN AND ALL SANITARY AND STORM SEWERS.
7. RESTIPE PARKING SPACES WITH 4" PAINT. MATCH EXISTING LAYOUT. HANDICAP SPACES AND HANDICAP SYMBOL TO BE BLUE PAINT. PARKING SPACES TO BE WHITE PAINT.

LEGEND

ASPHALT PAVEMENT (FULL DEPTH)

NEW WATER MAIN

fishbeck, thompson, carr & huber, inc.
engineers
scientists
architects
constructors
www.ftch.com

City of Ludington
Ludington, Michigan

Water Treatment Plant Improvements

10/06/2015 OWNER REVIEW

Drawn By	DRW
Designer	DRW
Reviewer	
Manager	JW

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

PROJECT NO.
G150169

SHEET NO.
C201

PLOT INFO: Z:\2015\150169\CAD\CIDI\C201150169PD.DWG LAYOUT: C201 DATE: 10/8/2015 TIME: 5:25:39 PM USER: BP

1.0 SUMMARY OF PROJECT

Fishbeck, Thompson, Carr & Huber, Inc. (FTCH) was retained by the City of Ludington (City) to prepare preliminary (30%) design documents for improvements to the Ludington Water Treatment Plant (WTP). This document summarizes the preliminary engineering design for the improvements to the City's existing water plant. The project improvements will address specific deficiencies noted in an Administrative Consent Order executed by the City and the Michigan Department of Environmental Quality (MDEQ).

The City has requested that the project incorporate the following components based on the engineering evaluations and past studies:

1. Improve filter reliability by converting to high-rate sedimentation in one existing clarifier and adding two new filters in the remaining clarifier.
2. Repair cracked concrete in the existing filters.
3. Replace the existing fiberglass-reinforced plastic (FRP) tanks used for sodium hypochlorite storage.
4. Modify the fluoride system to align with current fluoride system design standards.
5. Replace bolts on the old plant high-service piping.
6. Install a redundant 24-inch diameter raw water line from the Low-Service Pump Station to the WTP.
7. Extend the 36-inch diameter filter backwash pipe from a new buried valve vault to a connection to the existing pipe.
8. Replace the standby generator with a new unit in an outdoor enclosure.
9. Repairs to existing masonry.
10. Repair/replace exterior aggregate wall surfacing.
11. Replace the roof on the existing WTP building.
12. Replace the existing HVAC units and hydronic piping.

The filter reliability improvements will require converting both existing upflow clarifiers to new uses. Flocculation and high-rate sedimentation will occur in two trains to be constructed in the east clarifier. Each train will include a flocculation tank with 30 minutes of detention time and a sedimentation tank with inclined plate settlers. Two new filters will be constructed in the existing west clarifier. They will include a similar underdrain system and media profile as the existing filters, and will be equipped with surface wash piping similar to the existing filters. Each filter will include filter effluent and associated piping and valves configured similar to the existing filters. The 16-inch filter effluent pipe from the existing two filters to the

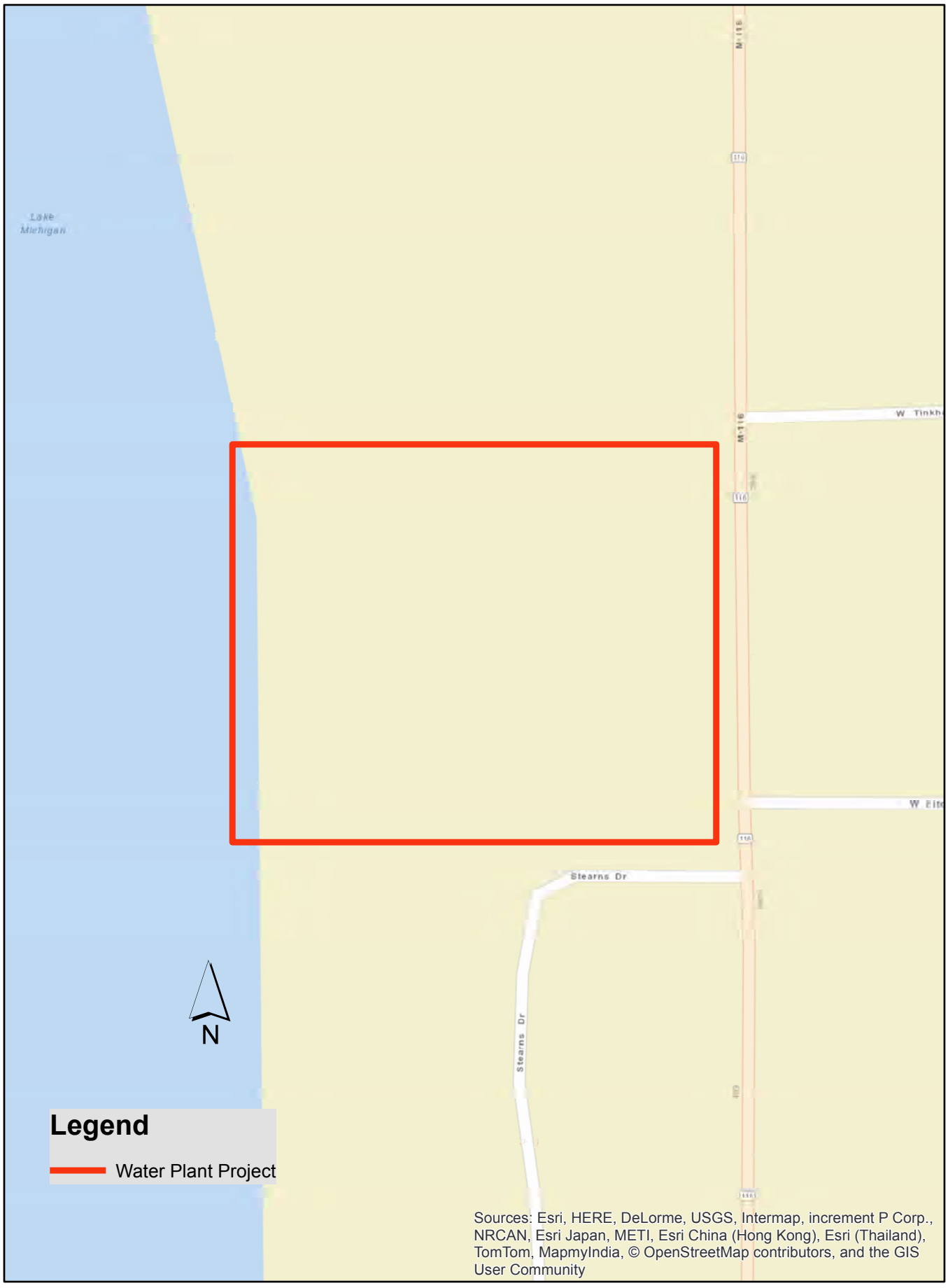
reservoir was originally designed to handle flow up to 8 mgd, per the original rated design, and will continue to be used.

A 9 feet by 20 feet backwash valve vault for the new filters will be constructed outside the existing plant on the west side, adjacent to the new filters. The chamber will house the backwash discharge valves. Constructing the chamber outside the plant avoids the need to construct the backwash discharge piping beneath the floor within the existing plant. An at-grade accessible buried valve vault is planned for the chamber.

As of the 2015 MDEQ Sanitary Survey issued January 30, 2015, the water plant was down-rated by the MDEQ from 6.4 mgd to 3.2 mgd. This was based on the firm capacity of the existing filters, specifically the capacity of one of the two existing filters. The previous plant rated capacity had been 6.4 mgd based on the combined capacity of the filters. Upon addition of two filters as proposed, the filter capacity will not be a limiting factor, so the plant rated capacity can be increased as part of the project.

The plant was originally designed and rated for 8 mgd. As part of the preliminary design phase, the City requested an evaluation of improvements required to restore the water plant capacity to its original design of 8 mgd. The specific components of the plant that were thought to be potentially impacted by this criteria include the intake, high service pumps, and electrical systems. The preliminary design concepts and costs for the preliminary design were developed based on achieving 8 mgd capacity.

Topographic map for the Water Treatment Plant Improvement Project for the City of Ludington. Not to Scale.



Street map for the Water Treatment Plant Improvement Project for the City of Ludington. Not to Scale.

Picture index map for the photos of the project area. Not to scale.

Facing west towards the pump house the water treatment facility in Ludington.

Facing southeast on the grounds of the water treatment facility in Ludington.

Facing east towards the treatment plant near the west side parking lot.

Facing northeast along the south side of the treatment facility in Ludington.

5.5 State Historic Preservation Officer Response

STATE OF MICHIGAN

RICK SNYDER
GOVERNOR

MICHIGAN STATE HOUSING DEVELOPMENT AUTHORITY
STATE HISTORIC PRESERVATION OFFICE

KEVIN ELSENHEIMER
EXECUTIVE DIRECTOR

February 4, 2016

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

RE: ER06-204 City of Ludington Water Treatment Plant Improvements, Sec. 9 & 16, Ludington, Mason County (USDA/RD)

Dear Mr. Granskog:

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

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

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

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

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

Sincerely,

Brian G. Grennell
Cultural Resource Management Specialist

for Brian D. Conway
State Historic Preservation Officer

SAT:BGG

6.0 Exhibits/Maps

6.1 Project Narrative

1.0 SUMMARY OF PROJECT

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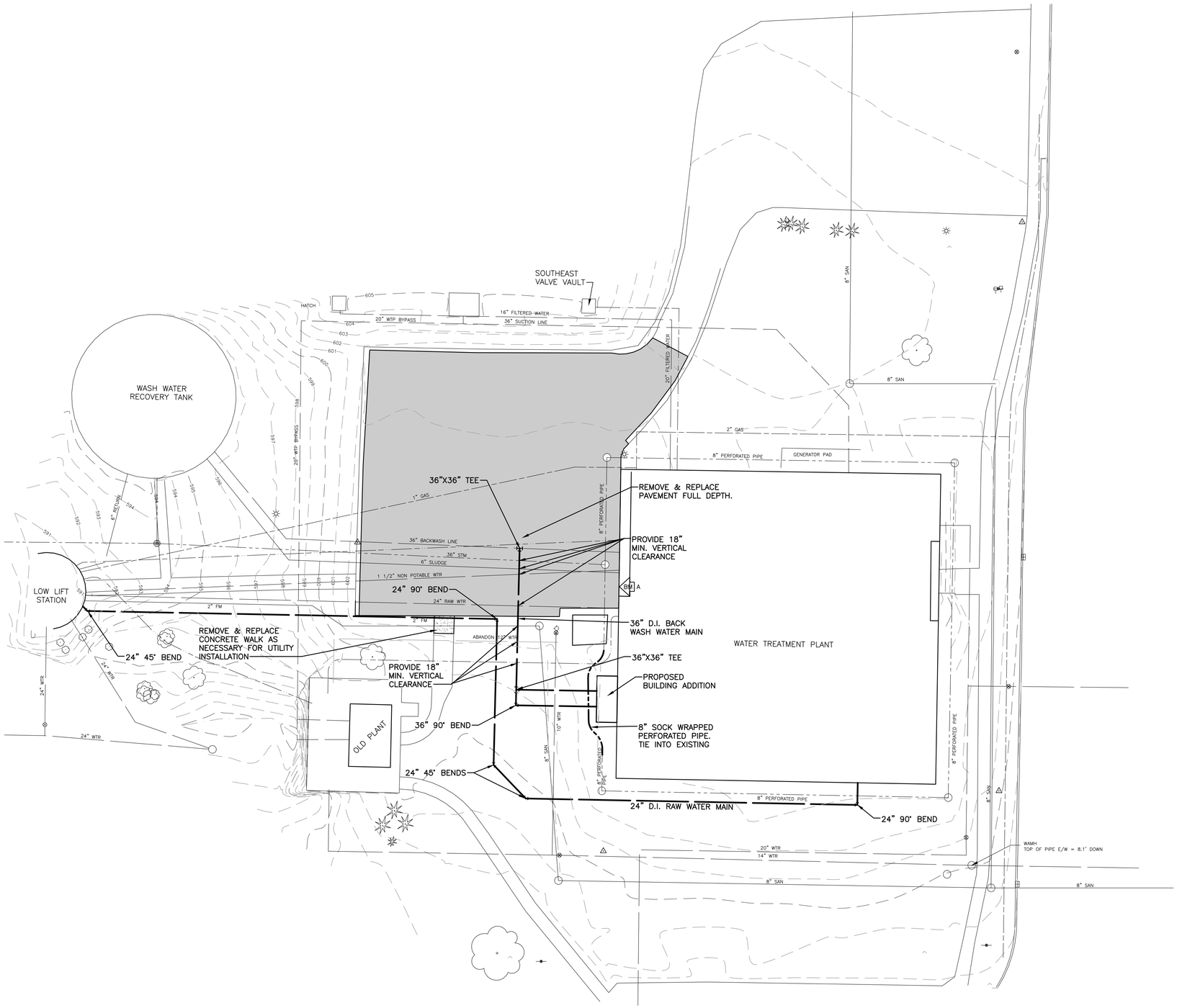

NORTH

SITE UTILITY PLAN

SCALE: 1" = 20'

0 10 20 40

BENCH MARK

BENCH MARK A ELEVATION: 603.89
SW CORNER OF 1ST CONCRETE STEP,
EAST ENTRANCE TO WATER TREATMENT PLANT

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LEGEND

ASPHALT PAVEMENT (FULL DEPTH)

NEW WATER MAIN

fishbeck, thompson, carr & huber, inc.
engineers
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City of Ludington
Ludington, Michigan

Water Treatment Plant Improvements

10/06/2015 OWNER REVIEW

Drawn By	DRW
Designer	DRW
Reviewer	
Manager	JW

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

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C201

PLOT INFO: Z:\2015\150169\CAD\CIDI\C201150169PD.DWG LAYOUT: C201 DATE: 10/8/2015 TIME: 5:25:39 PM USER: BP

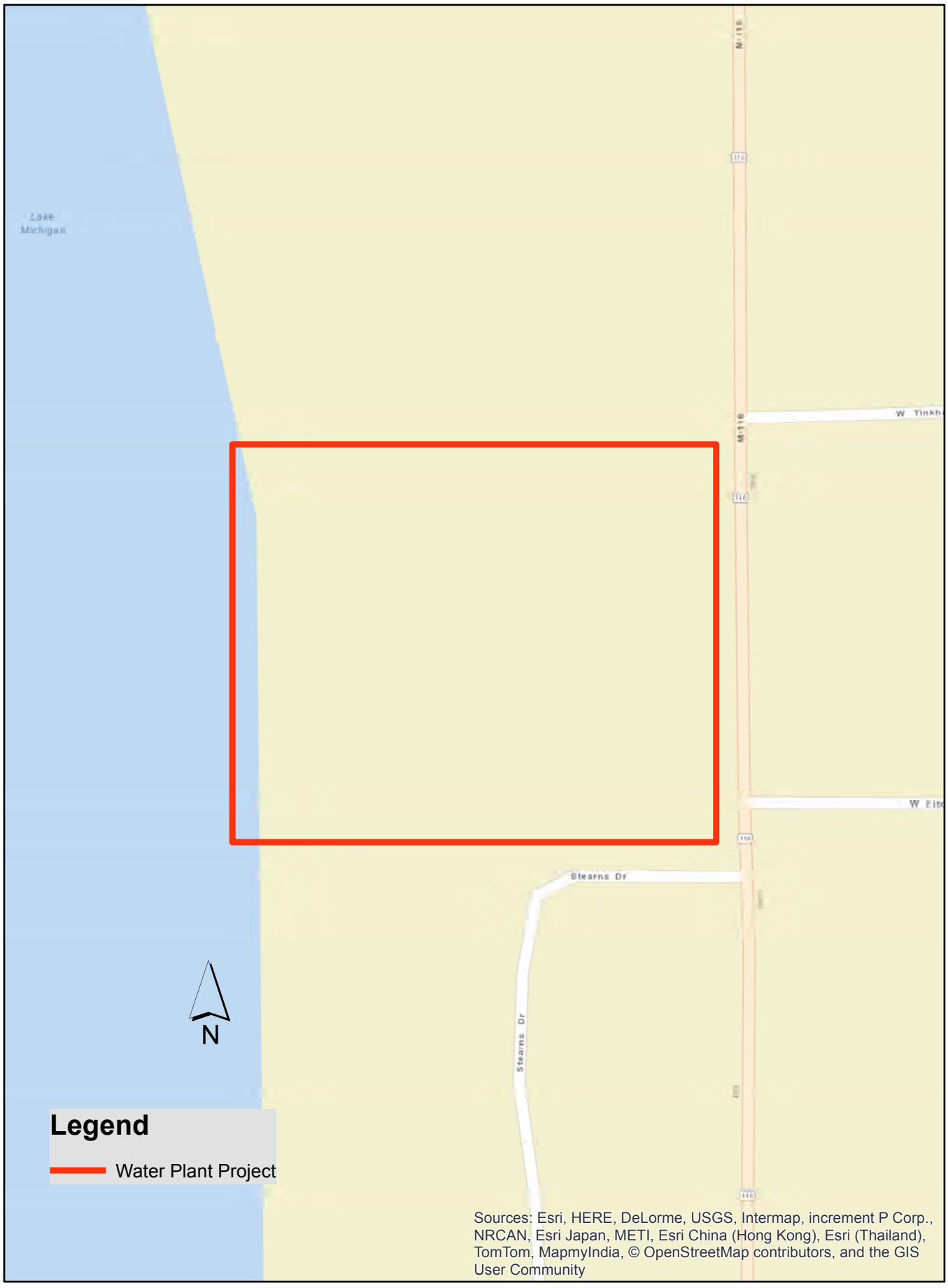
6.2 Street Map with Project Locations

6.3 Topographical Map

6.4 Aerial Map

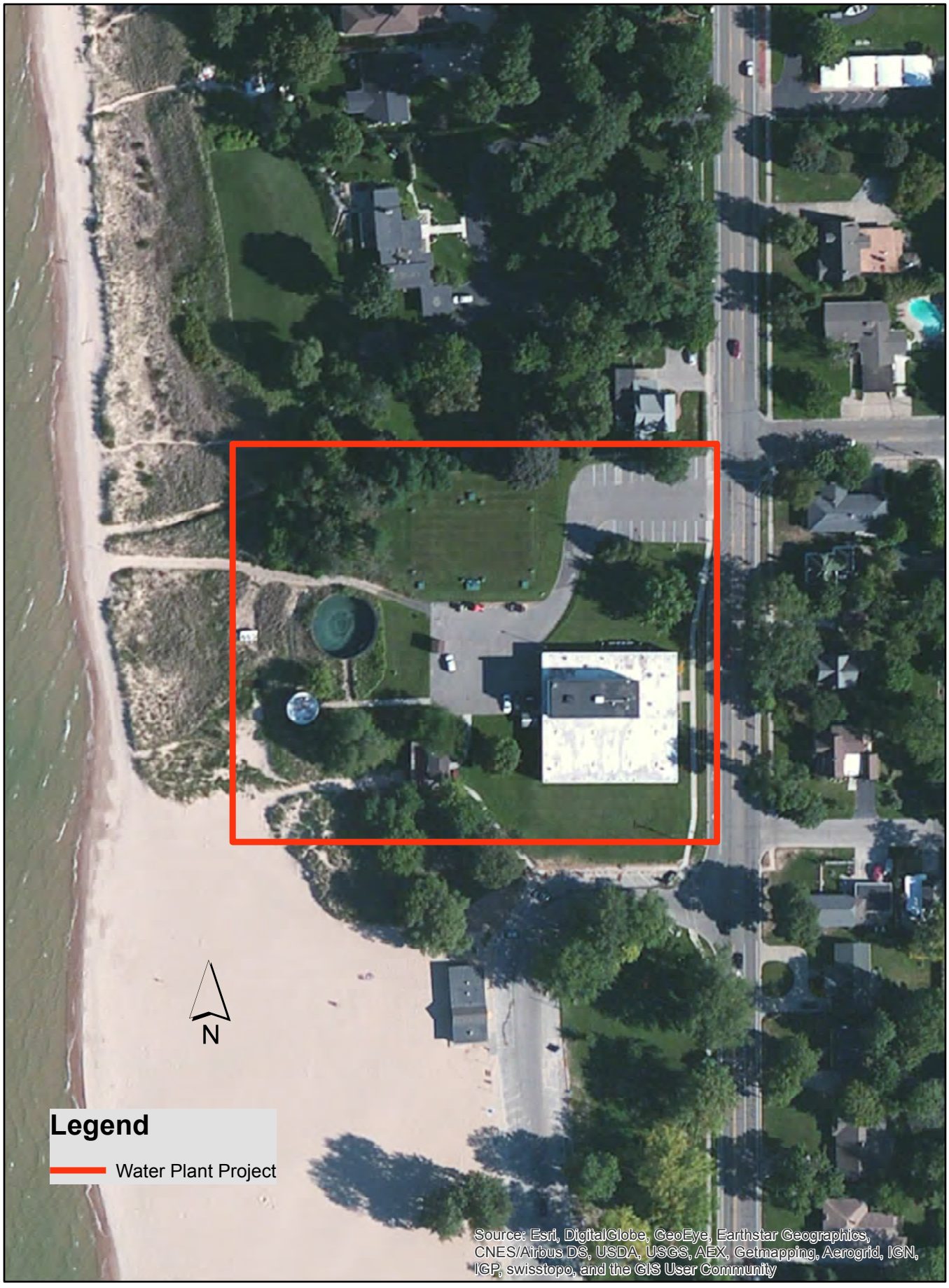
6.5 Flood Insurance Rate Map

6.6 Wetlands Map



Street map for the Water Treatment Plant Improvement Project for the City of Ludington. Not to Scale.

Topographic map for the Water Treatment Plant Improvement Project for the City of Ludington. Not to Scale.



Aerial map for the Water Treatment Plant Improvement Project for the City of Ludington. Not to Scale.

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The **community map repository** should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) Report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS Report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Coastal Base Flood Elevations shown on this map apply only landward of 0.0' North American Vertical Datum of 1988 (NAVD 88). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations table in the Flood Insurance Study Report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations table should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study Report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study Report for information on flood control structures for this jurisdiction.

The **projection** used in the preparation of this map was Universal Transverse Mercator (UTM) zone 16. The **horizontal datum** was NAD 83, GRS 1980 spheroid. Differences in datum, spheroid, projection or UTM zones used in the production of FIRMs for **adjacent** jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the North American Vertical Datum of 1988. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum**. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at http://www.ngs.noaa.gov or contact the National Geodetic Survey at the following address:

NGS Information Services
NOAA, N/NGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, Maryland 20910-3282
(301) 713-3242

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at **(301) 713-3242**, or visit its website at http://www.ngs.noaa.gov.

Base map information shown on this FIRM was provided in digital format by the USDA FSA Aerial Photography Field Office. This information was photogrammetrically compiled at a scale of 1:12,000 from aerial photography dated 2010.

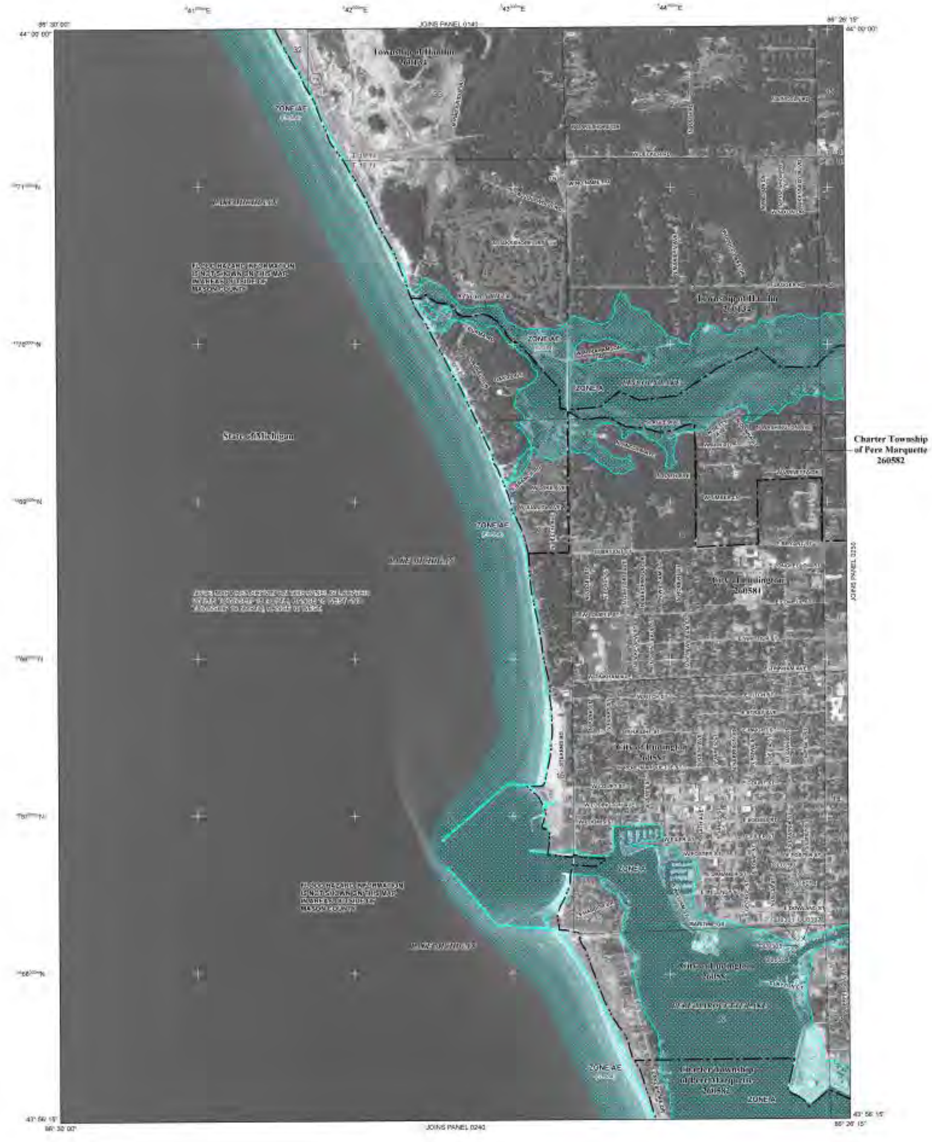
The **profile baselines** depicted on this map represent the hydraulic modeling baselines that match the flood profiles in the FIS report. As a result of improved topographic data, the **profile baseline**, in some cases, may deviate significantly from the channel centerline or appear outside the SFHA.

Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

For information on available products associated with this FIRM visit the **Map Service Center (MSC)** website at http://msc.fema.gov. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. Many of these products can be ordered or obtained directly from the MSC website.

If you have **questions about this map**, how to order products, or the National Flood Insurance Program in general, please call the **FEMA Map Information eXchange (FMIX)** at **1-877-FEMA-MAP** (1-877-336-2627) or visit the FEMA website at http://www.fema.gov/business/nfip.



LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A	No Base Flood Elevations determined.
ZONE AE	Base Flood Elevations determined.
ZONE AH	Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
ZONE AO	Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE AR	Special Flood Hazard Areas formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
ZONE A99	Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
ZONE V	Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE	Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X	Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X	Areas determined to be outside the 0.2% annual chance floodplain.
ZONE D	Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

- 1% Annual Chance Floodplain Boundary
- 0.2% Annual Chance Floodplain Boundary
- Floodway boundary
- Zone D boundary
- CBRS and OPA boundary
- Boundary dividing Special Flood Hazard Area Zones and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths, or flood velocities.
- ~~~ 513 ~~~ Base Flood Elevation line and value; elevation in feet*
- (EL 987) Base Flood Elevation value where uniform within zone; elevation in feet*

*Referenced to the North American Vertical Datum of 1988

- A —— A Cross section line
- 23 - - - - 23 Transect line
- Geographic coordinates referenced to the North American Datum of 1983 (NAD 83) Western Hemisphere
- 1000-meter Universal Transverse Mercator grid values, zone 16
- Bench mark (see explanation in Notes to Users section of this FIRM panel)
- M1.5 River Mile

MAP REPOSITORIES
Refer to Map Repositories list on Map Index

EFFECTIVE DATE OF COUNTYWIDE
FLOOD INSURANCE RATE MAP
July 16, 2014

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 1000'

NFIP — NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0230C

FIRM
FLOOD INSURANCE RATE MAP
MASON COUNTY, MICHIGAN (ALL JURISDICTIONS)

PANEL 230 OF 425
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

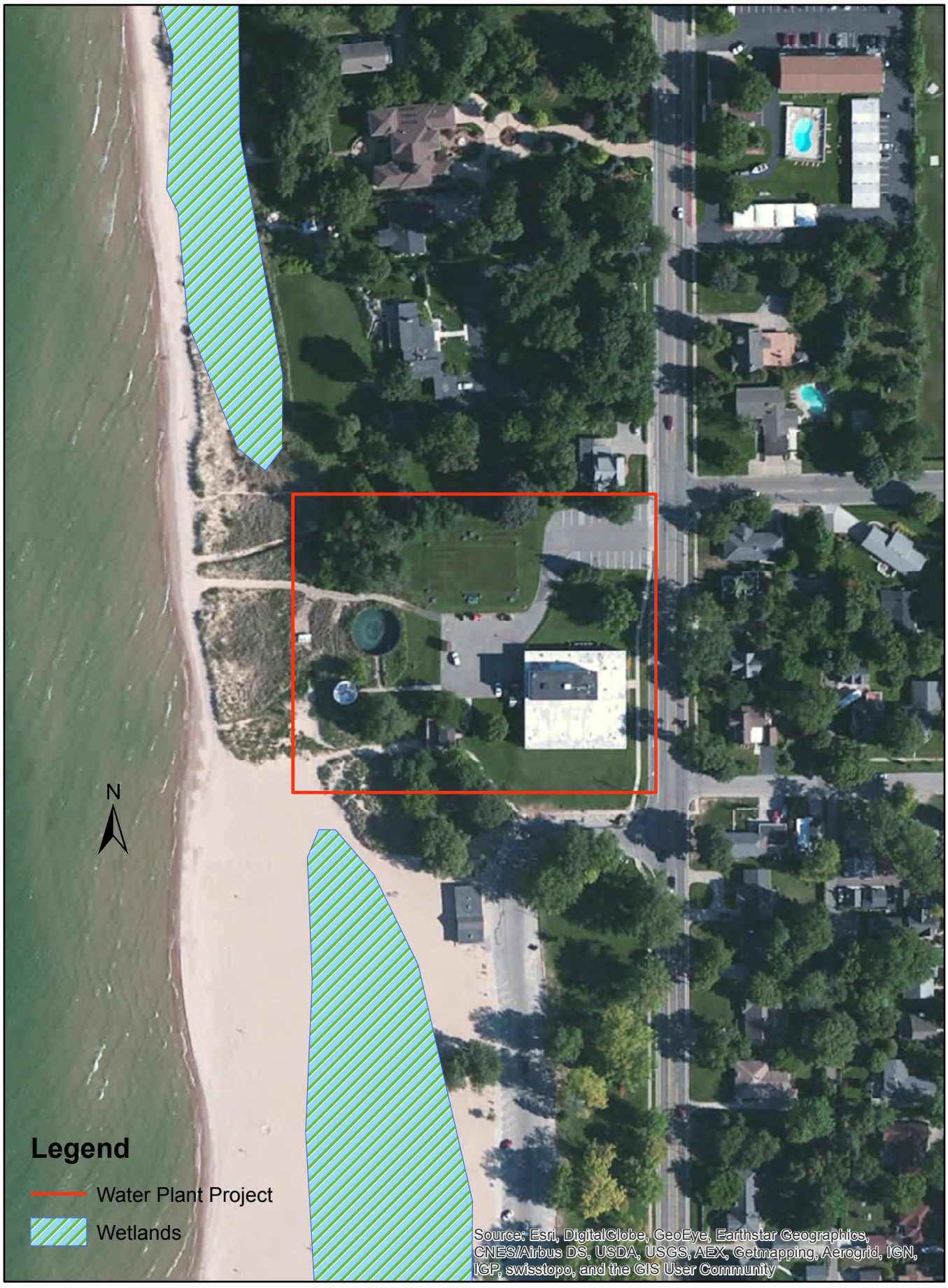
COMMUNITY	NUMBER	PANEL	SUFFIX
HAMLIN, TOWNSHIP OF	[illegible]	0230	C
LUDINGTON, CITY OF	260581	0230	C
PERE MARQUETTE, CHARTER TOWNSHIP OF	260582	0230	C

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER 26105C0230C

EFFECTIVE DATE JULY 16, 2014

Federal Emergency Management Agency



National Wetlands Inventory Map for the Ludington Water Plant Improvement Project. Not to scale.

6.7 Soils Map

6.8 Prime and Other Important Farmlands

United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Mason County, Michigan

Ludington Water Plant Improvement

February 16, 2016

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (http://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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Contents

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the

individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map

Map Scale: 1:960 if printed on A landscape (11" x 8.5") sheet.

N

Meters
0 10 20 40 60

Feet
0 45 90 180 270

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 16N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:15,800.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Mason County, Michigan
Survey Area Data: Version 11, Sep 18, 2015

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Aug 19, 2011—Aug 28, 2011

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Mason County, Michigan (MI105)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
1	Beaches	0.4	11.3%
90B	Epworth fine sand, 0 to 6 percent slopes	0.4	10.1%
97B	Urban land-Epworth complex, 0 to 8 percent slopes	3.0	78.6%
Totals for Area of Interest		**3.8**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If

intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Mason County, Michigan

1—Beaches

Map Unit Composition

Beaches and similar soils: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Beaches

Setting

Landform: Beaches

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None

90B—Epworth fine sand, 0 to 6 percent slopes

Map Unit Setting

National map unit symbol: 6gfb
Elevation: 600 to 1,000 feet
Mean annual precipitation: 28 to 36 inches
Mean annual air temperature: 45 to 50 degrees F
Frost-free period: 120 to 160 days
Farmland classification: Not prime farmland

Map Unit Composition

Epworth and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Epworth

Setting

Landform: Lake plains, moraines, beach ridges, outwash plains
Landform position (three-dimensional): Rise
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Fine sandy glaciofluvial deposits

Typical profile

H1 - 0 to 6 inches: fine sand
H2 - 6 to 30 inches: fine sand
H3 - 30 to 60 inches: fine sand

Properties and qualities

Slope: 0 to 6 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained

Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 19.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 3.9 inches)

Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3s
Hydrologic Soil Group: A

Minor Components

Fern
Percent of map unit: 5 percent
Landform: Beach ridges, outwash plains, lake plains, moraines
Landform position (three-dimensional): Rise
Down-slope shape: Linear
Across-slope shape: Linear

Pipestone
Percent of map unit: 5 percent
Landform: Beach ridges, outwash plains, lake plains, moraines
Landform position (three-dimensional): Rise
Down-slope shape: Linear
Across-slope shape: Linear

97B—Urban land-Epworth complex, 0 to 8 percent slopes

Map Unit Setting
National map unit symbol: 6gfm
Elevation: 600 to 1,000 feet
Mean annual precipitation: 28 to 36 inches
Mean annual air temperature: 39 to 50 degrees F
Frost-free period: 100 to 180 days
Farmland classification: Not prime farmland

Map Unit Composition
Urban land: 55 percent
Epworth and similar soils: 35 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Urban Land

Setting
Landform: Lake plains

Typical profile

H1 - 0 to 60 inches: variable

Description of Epworth

Setting

Landform: Lake plains
Landform position (three-dimensional): Rise
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Fine sandy glaciofluvial deposits

Typical profile

H1 - 0 to 6 inches: fine sand
H2 - 6 to 30 inches: fine sand
H3 - 30 to 60 inches: fine sand

Properties and qualities

Slope: 0 to 8 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 19.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 3.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3s
Hydrologic Soil Group: A

Minor Components

Pipestone

Percent of map unit: 10 percent
Landform: Lake plains
Landform position (three-dimensional): Rise
Down-slope shape: Linear
Across-slope shape: Linear

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6.9 Underground Storage Tanks

6.9.1 Underground Storage Tank Map

6.9.2 Active and Closed Listing

Leaking Underground Storage Tanks Map for the Ludington Water Plant Improvement Project. Not to scale.

Leaking_Underground_Storage_Tanks__Part

OWNE	FACNAM	ADDRESS	CITY	CNTYNA	LATIT	LONG	HDA	ACCU	ACC	OPEN	CLOSI	ACTV	CLOSS
3571	Mason County Sheriff Dept.	302 N Delia St	Ludington	Mason	43.95794	-86.8344444	NAD	100	FEET	0	0	0	1
6945	Star Port Marina	846 S LAKESHORE DR	LUDINGTON	Mason	43.940095	-86.8345276 2	NAD	100	FEET	0	1	0	1
15973	Whitehall Industries,inc	801 S Madison St	Ludington	Mason	43.948609	-86.8343626 7	NAD	100	FEET	0	0	0	1
9359	Ludington Radio Shop	129 2nd St	Ludington	Mason	43.945586	-86.8343892 2	NAD	100	FEET	0	0	0	1
24480	Hackerts Standard Service	202 E Ludington Ave	Ludington	Mason	43.955391	-86.8344619 8	NAD	100	FEET	0	1	0	1
15103	United Parcel Service	5565 6TH ST	LUDINGTON	Mason	43.941966	-86.8342119 7	NAD	100	FEET	0	1	0	1
2945	City of Ludington / Dept of Public Works	975 First St	Ludington	Mason	43.94748	-86.8342158 5	NAD	15	METERS	0	0	1	0
1546	Parkview Marathon	319 W LUDINGTON AVE	LUDINGTON	Mason	43.955355	-86.8345099	NAD	100	FEET	0	0	0	1
1807	Brody Scrap Corp	428 E DOWLAND ST	LUDINGTON	Mason	43.949327	-86.8344129 4	NAD	100	FEET	0	0	0	1
1546	Ludingto	5985	Ludingto	Mason	43.	-	NAD	40	FEE	1	0	1	0

OWNE	FACNAM	ADDRESS	CITY	CNTYNA	LATIT	LONG	HDA	ACCU	ACC	OPEN	CLOSI	ACTV	CLOSS
	n EZ Mart	West US-10	n		95581 7	86. 83 42906 8			T				
29374	One Ludingto n Place LLC	201 S William St	Ludingto n	Mason	43. 95366	- 86. 83 45124 5	NAD	10	MET ERS	0	1	0	1
31233	Eagle Express Trucking	925 E Melendy St	Ludingto n	Mason	43. 95079 7	- 86. 83 43136 3	NAD	100	FEE T	0	0	0	1
10794	Murphy USA #6652	4888 West US Hwy 10	Ludingto n	Mason	43. 9558	- 86. 83 40111 3	NAD	40	FEE T	0	0	1	0
23674	Memorial Medical Center	1 N Atkinson Dr	Ludingto n	Mason	43. 95917 1	- 86. 83 42943 1	NAD	15	MET ERS	0	0	0	1
15166	Urka Auto Center Inc	3736 W Us Highway 10	Ludingto n	Mason	43. 95617	- 86. 83 37077 4	NAD	100	FEE T	0	0	0	1
24558	Auto Svc Ctr Of Ludingto n Inc	EAST LUDING TON AVENUE	LUDING TON	Mason	43. 96071 8	- 86. 83 41956 1	NAD	15	MET ERS	0	0	0	1
9360	Ludingto n Yacht Club	PO Box 132	Ludingto n	Mason	43. 94816 9	- 86. 83 44366 7	NAD	15	MET ERS	0	0	0	1
13637	Royce's Ave Shell	301 E Ludingto n Ave	Ludingto n	Mason	43. 95567 6	- 86. 83 44485 2	NAD	10	MET ERS	0	1	0	1
32201	Helen Abraham son	5457 W US 10	LUDING TON	Mason	43. 95607 4	- 86. 83 41627 8	NAD	100	FEE T	1	0	0	1
18949	Pierre Marquett	SIXTH ST &	LUDING TON	Mason	43. 94216	- 86. 83	NAD	10	MET ERS	1	0	0	1

OWNE	FACNAM	ADDRESS	CITY	CNTYNAI	LATIT	LONG	HDA	ACCU	ACC	OPEN	CLOSI	ACTV	CLOSS
	e Charter Twp	OLD US 31			8	41695							
191	Lakeshore Lumber Co	920 E Tinkham Ave	Ludington	Mason	43.96306 8	-86.83 43311 7	NAD	100	FEET	0	1	0	1
9354	Bus Garage	809 E Tinkham Ave	Ludington	Mason	43.96423 3	-86.83 43510 8	NAD	40	FEET	0	1	0	1
12744	Roehrigs Service	929 S Washington Ave	Ludington	Mason	43.94614	-86.83 43911	NAD	100	FEET	0	0	0	1
22854	Lake Michigan Carferry Serv. Inc	SOUTH WILLIAM	LUDINGTON	Mason	43.94740 3	-86.83 45012 3	NAD	100	FEET	1	0	0	1
4502	Dorrell Funeral Home	605 N Washington Ave	Ludington	Mason	43.96190 5	-86.83 43945 1	NAD	100	FEET	0	0	1	0
25408	Ludington Concrete Products	280 S PERE MAARQUETTE RD	LUDINGTON	Mason	43.95234 5	-86.83 41353 3	NAD	10	METERS	1	0	0	1
85	Abrahamsons Marina	800 S WASHINGTON	LUDINGTON	Mason	43.94702 9	-86.83 43951 4	NAD	100	FEET	0	0	0	1
24558	East Gate Rental	5866 WEST US 10	LUDINGTON	Mason	43.95632 3	-86.83 42560 2	NAD	100	FEET	1	0	0	1
19116	House of Flavors	402 W Ludington Ave	Ludington	Mason	43.95561 9	-86.83 45221	NAD	100	FEET	1	0	0	1
27980	Pere Marquette Charter Township	787 S Pere Marquette Hwy	Ludington	Mason	43.94205 2	-86.83 41690 2	NAD	10	METERS	0	0	0	1

OWNE	FACNAM	ADDRESS	CITY	CNTYNAI	LATIT	LONG	HDA	ACCU	ACC	OPEN	CLOSI	ACTV	CLOSS
	DPW												
24322	Wesco #23	5685 E Ludington	Ludington	Mason	43.955757	-86.842142	NAD 83	10	METERS	1	0	1	0
17384	Tire It Wholesale	5734 W Us Highway 10	Ludington	Mason	43.956398	-86.842461	NAD 83	100	FEET	0	1	0	1
24322	Wesco #25	301 W Ludington Ave	Ludington	Mason	43.955087	-86.845073	NAD 83	40	FEET	0	1	1	0
1546	Freeway EZ Mart	4528 West US Hwy-10	Ludington	Mason	43.956347	-86.839745	NAD 83	40	FEET	0	0	1	0
16453	Ludington Mass Transportation	410 E Dowland St	Ludington	Mason	43.949327	-86.841397	NAD 83	100	FEET	0	1	0	1
23907	Foliage Co Building	US 10 AND 31 AT MEYERS RD	LUDINGTON	Mason	43.955492	-86.839201	NAD 83	100	FEET	0	1	0	1
50651	Former Phillips 66 (aka Former Kent Optical)	5784 West US-10	Ludington	Mason	43.956571	-86.842389	NAD 83	10	FEET	1	0	0	1
8963	Latocha & Co Inc	950 E Melendy St	Ludington	Mason	43.95054	-86.830743	NAD 83	100	FEET	0	0	0	1
23096	Floracraft Corp	1 LONGFELLOW PLACE	LUDINGTON	Mason	43.96903	-86.844523	NAD 83	100	FEET	1	0	0	1
5987	Gte	317 N	LUDING	Mason	43.		NAD	100	FEE	0	0	0	1

OWNE	FACNAM	ADDRESS	CITY	CNTYNAI	LATIT	LONG	HDA	ACCU	ACCI	OPENI	CLOSI	ACTVS	CLOSS
	North Inc	ROWE	TON		95803 7	86. 83 44525 5		T					
9950	Gas Station #193	3960 W Us Highway 10	Ludingto n	Mason	43. 95656 2	- 86. 83 37884 7	NAD	40	FEE T	0	0	1	0
30000	Ludingto n Service Center	5825 W Us Highway 10	Ludingto n	Mason	43. 95606 9	- 86. 83 42481 6	NAD	100	FEE T	0	0	0	1
27941	Ackers Car Care	201 W Ludingto n Ave	Ludingto n	Mason	43. 95536 9	- 86. 83 44943 9	NAD	100	FEE T	0	0	0	1
18949	Former Zephyr Service Station	5605 W Us Highway 10	Ludingto n	Mason	43. 95610 7	- 86. 83 41991 5	NAD	100	FEE T	1	0	0	1
9647	Marek Auto Parts	3473 W Us Highway 10	Ludingto n	Mason	43. 95585 7	- 86. 83 36612 5	NAD	100	FEE T	0	0	0	1
22925	Ludingto n Mobil	50 PERE MARQU ETTE	LUDING TON	Mason	43. 95525 8	- 86. 83 41485 2	NAD	10	MET ERS	1	0	0	1
5016	Epworth Assembly	1161 N LAKE SHORE DR	LUDING TON	Mason	43. 97632 5	- 86. 83 45959 1	NAD	100	FEE T	0	1	0	1
14445	The Dow Chemical Co	SOUTH MADISO N ST	LUDING TON	Mason	43. 94075	- 86. 83 43672	NAD	15	MET ERS	0	1	0	1
15171	US Fish & Wildlife Service	229 S Jebavy Dr	Ludingto n	Mason	43. 95258 3	- 86. 83 41901 2	NAD	100	FEE T	0	0	0	1
29893	Longfello w Towers	301 E COURT ST	LUDING TON	Mason	43. 95674	- 86. 83 44486	NAD	100	FEE T	0	0	0	1

OWNE	FACNAM	ADDRESS	CITY	CNTYNA	LATIT	LONG	HDA	ACCU	ACC	OPEN	CLOSI	ACTV	CLOSS
						9							
6450	Great Lakes Casting Corp	800 N Washington Ave	Ludington	Mason	43.965871	-86.439091	NAD83	100	FEET	0	0	0	1
60062	Northside Market Inc	6388 Bryant Rd	Ludington	Mason	43.9709	-86.438842	NAD83	10	METERS	0	0	1	0
34105	Express Mart LLC	5587 West US Hwy-10	Ludington	Mason	43.955998	-86.418558	NAD83	40	FEET	1	0	1	0
6705	Hardman Construction, Inc	242 S Brye Rd	Ludington	Mason	43.952587	-86.378676	NAD83	100	FEET	0	0	0	1
6209	Glc Metal Fabricators, Inc	5765 E LUDINGTON AVE	LUDINGTON	Mason	43.956107	-86.423173	NAD83	100	FEET	0	0	0	1
13641	Slaggert Oil Co Inc	5851 W Us Highway 10	Ludington	Mason	43.956055	-86.425296	NAD83	100	FEET	0	0	0	1
1661	Boonstra Oil Co Inc	52 S JEBAVY DR	LUDINGTON	Mason	43.956157	-86.419233	NAD83	100	FEET	0	0	0	1
18631	Pandrol Jackson	200 S Jackson Rd	Ludington	Mason	43.952649	-86.429589	NAD83	100	FEET	1	0	0	1
14114	Straits Steel & Wire Co	902 N ROWE ST	LUDINGTON	Mason	43.967105	-86.44495	NAD83	100	FEET	0	1	0	1
32622	Harbor View Llc	400 S Rath Ave	Ludington	Mason	43.952303	-86.449365	NAD83	100	FEET	0	0	1	0
62551	Speedway	3755	Ludington	Mason	43.	-	NAD	100	FEE	0	1	0	1

OWNE	FACNAM	ADDRESS	CITY	CNTYNA	LATIT	LONG	HDA	ACCU	ACC	OPEN	CLOSI	ACTV	CLOSS
	#7240	West US-10	n		95615 3	86. 83 36994 4			T				
15169	Uscg Station	101 S Lakeshor e Dr	Ludingto n	Mason	43. 95529	- 86. 83 45939 4	NAD	100	FEE T	0	0	0	1
2945	Rath Avenue Lift Station	110 W DOWLA ND	LUDING TON	Mason	43. 94925 6	- 86. 83 44874 9	NAD	100	FEE T	0	1	0	1
4277	Dick Boyd Ford, Lincoln & Mercur	3632 WEST US 10-31	LUDING TON	Mason	43. 95614 3	- 86. 83 36866 9	NAD	100	FEE T	0	0	0	1
13637	Ludingto n Beverage Co Inc	816 N Washingt on Ave	Ludingto n	Mason	43. 96599 2	- 86. 83 43909 1	NAD	100	FEE T	0	0	0	1
26205	Tamarac Sport Fishing Docks	105 Water St	Ludingto n	Mason	43. 94732	- 86. 83 43751 2	NAD	100	FEE T	0	1	0	1
8617	Kmart #9130	5532 W US 10	LUDING TON	Mason	43. 95640 8	- 86. 83 41763 7	NAD	100	FEE T	0	0	0	1
11342	Larson Moving	65 S Jebavy Dr	Ludingto n	Mason	43. 95500 7	- 86. 83 41901 2	NAD	100	FEE T	0	0	0	1
17303	Dore Enterpris es	801 N Rowe St	Ludingto n	Mason	43. 96501 3	- 86. 83 44530 1	NAD	100	FEE T	0	0	0	1
16241	Wolohan Lumber Company	3351 W Us Highway 10	Ludingto n	Mason	43. 95584 1	- 86. 83 36220 9	NAD	100	FEE T	0	0	1	0
23674	Memorial	1 N	Ludingto	Mason	43.	-	NAD	15	MET	0	0	0	1

OWNE	FACNAM	ADDRESS	CITY	CNTYNA	LATIT	LONG	HDA	ACCU	ACC	OPEN	CLOSI	ACTV	CLOSS
	Medical Center	Atkinson Dr	n		95893 8	86. 83 43011 9			ERS				
27651	Mason County Airport	5300 W Us Highway 10	Ludingto n	Mason	43. 95623 6	- 86. 83 41375 7	NAD	100	FEE T	0	0	0	1
12267	Rays Auto Marine	801 S Washingt on Ave	Ludingto n	Mason	43. 94703 4	- 86. 83 43913 3	NAD	100	FEE T	0	1	0	1
9497	Maclean Construct ion Co	PO Box 190	Ludingto n	Mason	43. 95579 7	- 86. 83 41022 6	NAD	100	FEE T	1	0	0	1
10502	Mitchell Corp. Ludingto n Div.	185 N JEBAVY DR	LUDING TON	Mason	43. 95820 2	- 86. 83 41923 8	NAD	100	FEE T	0	1	0	1
15091	United Parcel Service	915 First St	Ludingto n	Mason	43. 94755 5	- 86. 83 42232	NAD	10	MET ERS	0	0	1	0
28823	Austin Marine & Jc Marine	516 S RATH AVE	LUDING TON	Mason	43. 95118 7	- 86. 83 44933 6	NAD	100	FEE T	0	0	0	1
1546	Parkview Service Cemter	302 W Ludingto n Ave	Ludingto n	Mason	43. 95597 7	- 86. 83 45072 3	NAD	10	MET ERS	0	0	0	1
16408	Old Kent Bank	115 S RATH AVENUE	LUDING TON	Mason	43. 95526 2	- 86. 83 44905 3	NAD	100	FEE T	0	0	0	1
2945	Ludingto n Municipa l Marina	400 W Filer	Ludingto n	Mason	43. 95296 8	- 86. 83 45532 7	NAD	10	MET ERS	0	0	1	0
5617	Frank Ezdebski	410 4th St	Ludingto n	Mason	43. 94340 3	- 86. 83 43464	NAD	100	FEE T	0	0	0	1

OWNE	FACNAM	ADDRESS	CITY	CNTYNA	LATIT	LONG	HDA	ACCU	ACC	OPEN	CLOSI	ACTV	CLOSS
						5							
33347	Quick Lube	5929 W Us Highway 10	Ludingto n	Mason	43. 95600 5	- 86. 42745 4	NAD 83	100	FEE T	1	0	0	1
13703	Soules Landscap ing & Garden Ctr	1009 N James St	Ludingto n	Mason	43. 96962 9	- 86. 44820 6	NAD 83	100	FEE T	0	0	0	1
33927	409 West Ludingto n Ave	409 W Ludingto n Ave	Ludingto n	Mason	43. 95580 8	- 86. 45232 7	NAD 83	15	MET ERS	1	0	0	1
717	Anr Freight Systems	3785 W Us Highway 10	Ludingto n	Mason	43. 95586 8	- 86. 36892 9	NAD 83	100	FEE T	0	1	0	1
3225	Clark Service Station #820	224 LUDING TON	LUDING TON	Mason	43. 95587 5	- 86. 45066	NAD 83	10	MET ERS	1	0	0	1
18949	Thompso n Marina	510 1/2 E LAKE	LUDING TON	Mason	43. 94836 2	- 86. 44061 8	NAD 83	100	FEE T	1	0	0	1
9354	Nordhous e School	RT #2	LUDING TON	Mason	43. 95601 5	- 86. 42429	NAD 83	15	MET ERS	0	0	0	1
10794	Murphy Oil USA	4854 West US Hwy 10	Ludingto n	Mason	43. 95536 9	- 86. 39984	NAD 83	15	MET ERS	0	0	0	1
14848	Tri-county Dairy Distribut ors	609 1st St	Ludingto n	Mason	43. 94818	- 86. 43171	NAD 83	100	FEE T	0	1	0	1
2945	Star Watch Case Property	302 S RATH	LUDING TON	Mason	43. 95314 6	- 86. 44938	NAD 83	100	FEE T	1	0	1	0

OWNE	FACNAM	ADDRESS	CITY	CNTYNAI	LATIT	LONG	HDA	ACCU	ACC	OPEN	CLOSI	ACTV	CLOS
25152	Olive Ferris	703 6th St	Ludington	Mason	43.941744	-86.430095	NAD 83	100	FEE T	1	0	0	1
1546	Airport EZ Mart	5445 W US Highway 10	Ludington	Mason	43.95572	-86.414192	NAD 83	40	FEE T	1	0	1	0