City of Holland

Ottawa County, MI

Drinking Water State Revolving Fund Loan

Project Plan for Drinking Water System Improvements

April 2023

Holland
MICHIGAN

Holland Board of Public Works

625 Hastings Ave

Holland, MI 49423

Contents

I. Background 1
1. Study and Service Areas 1
A. Delineation of Study Area 1
B. Delineation of Service Area 1
C. Land Use 2
D. Economic Characteristics 3
2. Population 4
3. Existing Environmental Evaluation 5
A. Cultural and Historic Resources 5
B. Air Quality 5
C. Wetlands 6
D. Great Lakes Shorelands, Coastal Zones, and Coastal Management Areas 6
E. Floodplains 6
F. Natural or Wild and Scenic Rivers – Not Applicable 6
G. Major Surface Waters 6
H. Topography 8
I. Geology 8
J. Soil Types 8
K. Agricultural Resources 8
L. Fauna and Flora 8
4. Existing Facilities 11
A. Source Facilities 11
B. Water Treatment 12
C. Storage Tanks and Pump Stations 15
D. Service Lines 18
E. Distribution and Transmission Systems 19
F. Residuals Handling and Disposal 20
G. Condition of Water Meters 20
H. Operation and Maintenance 20
I. Design Capacity of Waterworks System 21
J. Climate Resiliency 21
5. Need for Project 21

A. Compliance with Act 399 Drinking Water Standards 21
B. Orders or Enforcement Actions 22
C. Drinking Water Quality Problems 22
6. Projected Future Needs 22
II. New Water Supply Well Procedures 23
III. Analysis of Alternatives 24
1. Alternatives for Lead Service Line Replacements 24
A. Alternative 1 – Trenchless Installation of New Services 24
B. Alternative 2 – Conventionally Constructing (Excavating) New Services 24
C. Alternative 3– No Action 24
D. Alternative 4 – Optimum Performance of Existing System 24
E. Alternative 5 – Regionalization 24
F. Monetary Evaluation 25
G. Environmental Evaluation 25
H. Technical and Other Considerations 30
2. Alternatives for Chemical Storage Improvements 30
A. Alternative 1 – Replace Existing Chemical Storage Tanks in Same Location 31
B. Alternative 2 – Construct new Chemical Storage Building on WTP Site 31
C. Alternative 3 – Expand and Modify Existing Filter Building for Chemical Storage 31
D. Alternative 4– No Action 31
E. Alternative 5 – Optimum Performance of Existing System 31
F. Alternative 6 – Regionalization 32
G. Monetary Evaluation 32
H. Environmental Evaluation 33
I. Technical and Other Considerations 35
IV. Selected Alternative 36
1. Chemical Storage Design Parameters 36
2. Useful Life 37
3. Water and Energy Efficiency 37
4. Schedule for Design and Construction 37
5. Cost Summary 38
6. Implementability 39
V. Environmental and Public Health Impacts 40

1. General 40
2. Direct Impacts 40
A. Construction Impacts 40
B. Operational Impacts 40
C. Social Impacts 41
D. Cumulative Impacts 41
VI. Mitigation 42
1. Short-Term Construction Related Mitigation 42
2. Mitigation of Long-Term Impacts 42
A. Permits 42
B. Siting Decisions 42
C. Operational Impacts 42
3. Mitigation of Indirect Impacts 43
A. Impacts on Growth and Development 43
VII. Public Participation 44
1. Public Meeting 44
2. Public Meeting Advertisement 44
3. Public Meeting Summary 44
4. Adoption of Project Plan 44

Appendices

Appendix A **Study Area Map**

Appendix B **Service Area Maps**

Water System Overview Map

Retail Water Service Area Delineations

Appendix C **Planning Information**

City of Holland Development Patterns Map

City of Holland Strategic Land Development Areas Map

City of Holland Future Land Use Map

Holland Master Plan – Public Utilities Excerpt

Park Township Existing Land Use Map

Park Township Future Land Use Map

Holland Township Existing Land Use Map

Holland Township Future Land Use Map

Laketown Township Future Land Use Map

Appendix D **Archeological and Historic Resources Review**

State Historic Preservation Office – Correspondence

Tribal Historic Preservation Office – Correspondence

Appendix E **Environmental Resources Review**

Allegan County Wetlands Inventory Map

Ottawa County Wetlands Inventory Map

Allegan County Coastal Zone Management Area (CZMA) Map

Ottawa County CZMA Map

EGLE Water Resources Division – CZMA Correspondence

FEMA Flood Insurance Maps

Michigan Natural Rivers List

Holland East, Mich. USGS Topographic Map

Holland West, Mich. USGS Topographic Map

Michigan Natural Features Inventory – Correspondence

Appendix F **Soils and Geology/Hydrology**

Ottawa County Geology Summary from EGLE Groundwater Modeling Project

Bedrock Geology of Michigan Map

Holland Water Treatment Plant Soils and Prime Farmland Report

Holland BPW Service Area Soils and Prime Farmland Report

Appendix G **Lead Service Line Replacement Maps**
Distribution of Private Side Only Lead Service Lines
Private Side Only Lead Service Lines and 100-Year Floodplain

Appendix H **Project Need Documentation**
Distribution System Excerpt from 1/23/23 State of Water Utility Presentation
Current 5-Year Capital Improvement Plan (CIP) for Water Distribution
Current 5-Year CIP for Water Treatment Plant
CIP from 2019 Reliability Study (showing proposed improvements)
Transmittal Letter from 2019 Sanitary Survey
Excerpts from Water Treatment Plant Master Plan
2015 Bulk Chemical Storage Evaluation Study

Appendix I **Cost Data**
Opinions of Probable Project Costs
Present Worth Analysis
User Cost Calculations
Project Useful Life

Appendix J **Public Participation Documents**
Screenshot of Notice of Public Meeting from Holland BPW Website
Screenshots of Notice of Public Meeting from Social Media

I. Background

This Project Plan is prepared by the Holland Board of Public Works (HBPW), City of Holland, Allegan and Ottawa Counties, Michigan, for the purpose of obtaining a Drinking Water State Revolving Fund (DWRF) loan from the State of Michigan for the construction of improvements to the regional Holland Water Treatment Plant (WTP). The applicant is the City of Holland acting by and through its Holland Board of Public Works (Holland).

The City of Holland is the largest city in Ottawa County, which is located at the western edge of Michigan. The City occupies approximately 9.1 square miles in Ottawa County and 8.1 in Allegan County. It is situated on Lake Macatawa which is fed by the Macatawa River. The City has a population of approximately 34,024 as of 2021, with an Urbanized Area population of approximately 101,064 as of 2021.

The communities of Park Township, Holland Township, Laketown Township, and Fillmore Township are also within the retail water service area of the Holland Board of Public Works. Demographics for these communities are as follows:

- Park Township occupies approximately 19.2 square miles in Ottawa County. It has a population of approximately 18,770 as of 2021.
- Holland Township occupies approximately 27 square miles in Ottawa County. It has a population of approximately 39,450 as of 2021.
- Laketown Township occupies approximately 21.6 square miles in Allegan County. It has a population of approximately 6,046 as of 2021.
- Fillmore Township occupies approximately 28.3 square miles in Allegan County. It has a population of approximately 2,774 as of 2021.

The purpose of this report is to present a comprehensive plan and evaluation of alternatives for improving the existing Water Treatment Plant (WTP) and water distribution system. The evaluation includes an analysis of cost, technical feasibility, and environmental impacts for projects that are needed over the next 20 years.

1. Study and Service Areas

A. Delineation of Study Area

The study area for this project plan is the City of Holland's WTP, transmission infrastructure and distribution system serving retail customers. Holland's retail service area includes the City of Holland and portions of Park Township, Holland Charter Township, Laketown Township, and Fillmore Township. Appendix A contains a map of the study area.

B. Delineation of Service Area

In addition to the retail customers, Holland's service area also includes wholesale water service to the City of Zeeland and by extension Zeeland Charter Township. These wholesale service areas have been excluded from the study area but do have an impact on overall system demands. As a result, discussion relative to these customers in this Project Plan is largely limited to projections of population and water generated from those communities. Appendix B contains a map of

Holland's service area (retail and wholesale) and Table I provides a breakdown of the service area by customer type, service connections, and estimated population served.

Table 1: Holland Water System Customers

COMMUNITY	CUSTOMER TYPE	SERVICE CONNECTIONS	ESTIMATED POPULATION SERVED
City of Holland	Retail	10,618	34,242
Park Township	Retail	4,446	12,004
Holland Township	Retail	626	1,815
Laketown Township	Retail	1,221	3,053
Fillmore Township	Retail	4	10
Zeeland (City & Township)	Wholesale	2,980	8,100
Totals		**19,895**	**59,224**

C. Land Use

This section summarizes ongoing planning activities related to land use and water system development in the following order: 1) City of Holland; 2) Park Township; and 3) Holland Charter Township; 4) Laketown Township; and 5) Fillmore Township.

City of Holland

The City of Holland prepared a Master Plan between 2015 and 2017 to guide how the City should approach development and growth. The document is divided into five chapters providing an arc from the history of the area to the snapshot of the current local data to overarching goals and finally specific development patterns for the city to use to achieve the goals.

The 2017 Master Plan builds on the 1999 Master Plan which was written in a manner to address the needs of different "Policy Areas" independently. Policy Areas identified separate sections of the City with different characteristics and as such different development goals. Specific Master Plans for several of the "Policy Areas" were prepared in the years since the 1999 Master Plan was adopted. Updated Master Plans were created for the "Policy Areas" known as Holland Heights in 2007, Central Neighborhoods in 2002, and the Southern Holland area annexed from Fillmore Township in December of 1999. Maps of existing land use, strategic land development, and future land use from the 2017 Master Plan are included in Appendix C for reference.

The 2017 Holland Master Plan includes a section on public utilities that has also been included in Appendix C for reference.

Park Township

Park Township adopted a new Master Plan in 2017, which introduces its updated community agenda and outlines an implementation plan for future land use goals. Among several goals, the Master Plan seeks to focus commercial development within appropriate Township locations and to promote redevelopment where infrastructure already exists in the community. The Master Plan focuses on seven subareas of the community: Southside, North Beach, Bayviews, Lakeshore, Park Central, Perry Reserve, and Uplands. Maps of existing and future land use from the 2017 Master Plan are included in Appendix C for reference.

Holland Charter Township

Holland Charter Township adopted a new Master Plan in 2020, which focuses on creating a unified vision to guide policy and placemaking through 2040. Among many highlights, the plan calls for: targeted future development and land use patterns to minimize sprawl and preserve existing amenities; identification of priority redevelopment opportunities; reimagination of the Township's various neighborhoods and unique areas; and various Zoning Ordinance updates. Maps of existing and future land use from the 2020 Master Plan are included in Appendix C for reference.

Laketown Township

Laketown Township adopted a new Master Plan in 2020, which focuses on four core values: to preserve and maintain rural character, open space, and sand dunes; to protect farmland from development; to provide pedestrian connectivity; and to provide for a high quality of commercial and industrial buildings and site design. The Master Plan includes strategies for protecting these values in key areas such as residential, agricultural, and along commercial districts including the Blue Star Highway corridor. The future land use from the 2020 Master Plan is included in Appendix C for reference.

Fillmore Township

No master plan was received from Fillmore Township as part of the project planning efforts. The Township is currently undergoing a revision of their Land Use Plan. However, only a small portion of the Township is served by the Holland system as demonstrated by the number of services (4) and estimated population served (10) in Table 1. As such, planning activities within Fillmore Township are expected to have negligible impact on Holland's system demands and capital needs.

D. Economic Characteristics

The greater Holland area is home to diverse mix of manufacturing and industrial companies. Major employer sectors in the area include education (Holland Public Schools, West Ottawa Public Schools, Hope College, etc.), office furniture manufacturing (MillerKnoll, Haworth, etc.), pharmaceuticals (Perrigo), automotive components (Gentex, Magna, Yanfeng, etc.), food processing (Request Foods, Kraft Heinz, Hudsonville Ice Cream, etc.), and advanced energy storage (LG Energy Solutions, Clarios, etc.).

The median household income in the City of Holland is $63,853 (in 2021 dollars) according to the United States Census Bureau. Holland's median income is only slightly higher than Michigan's as a whole, which is $63,202 (in 2021 dollars) according to the United States Census Bureau.

According to Lakeshore Advantage, the local economic development group, in 2022 there were 33 successful major expansions by Ottawa and Allegan County companies that leveraged $436 million dollars in private investment, resulting in more than 627 new jobs. Further, 60% of surveyed executives in Ottawa and Allegan counties reported that their companies are expanding within the next three years. Of these expansions, several were in the area served by the Holland Area Wastewater System. Investments like these indicate a growing local economy. However, since much of the local economy is dependent on manufacturing and other industries it is also susceptible to population decline during economic downturns. Current factors indicate that the area will continue to exhibit moderate growth or at the least remain steady as it did between 2010 and 2020. System capacity will need to be continuously evaluated as industry in the area grows or contracts.

2. Population

Historical population and future population projection data from the West Michigan Regional Planning Commission (WMRPC) was obtained for all of the communities served by the Holland Water System and is summarized in Table 2.

Table 2: WMRPC Population Projections

COMMUNITY	HISTORICAL DATA			WMRPC PROJECTIONS		Projected Annual % Change
	2000	**2010**	**2020**	**2030**	**2040**	
City of Holland (Allegan County)	7,202	7,016	7,728	8,463	9,196	0.87%
City of Holland (Ottawa County)	27,846	26,035	26,514	27,130	27,612	0.20%
Laketown Township	5,561	5,505	5,948	6,299	6,670	0.57%
Holland Township	28,911	35,636	38,446	45,975	53,675	1.68%
Park Township	17,579	17,802	18,692	20,198	21,770	0.77%
City of Zeeland	5,805	5,504	5,718	5,855	5,990	0.23%
Zeeland Township	7,613	9,971	12,049	15,533	19,057	2.32%
Totals	**100,517**	**107,469**	**115,095**	**129,453**	**143,970**	**1.13%**

Since the Holland Water System only supplies water to portions of several of the serviced communities, the WMRPC projections were interpolated to calculate the projected average annual percent change (Table 2). The percent change was then applied to the current population served estimates included in Table 1 to provide population projections for the service area over the next 20 years. This information is included in Table 3.

Table 3: Holland Water System Population Projections

COMMUNITY	CURRENT SERVICE AREA POPULATION	SERVICE AREA PROJECTED POPULATION			
	2023	**2028**	**2033**	**2038**	**2043**
City of Holland	34,242	34,855	35,487	36,138	36,808

Park Township	12,004	12,470	12,954	13,457	13,980
Laketown Township	1,815	1,868	1,922	1,978	2,035
Holland Township	3,053	3,319	3,608	3,922	4,263
Fillmore Township	10	10	10	10	10
City of Zeeland and Zeeland Township	8,100	8,195	8,291	8,388	8,486
Totals	**59,224**	**60,717**	**62,272**	**63,893**	**65,582**

3. Existing Environmental Evaluation

This section is a synopsis of the existing environmental setting of the study area.

A. Cultural and Historic Resources

The greater Holland area was originally inhabited primarily by Ottawa Indians who had lived along Black Lake (now Lake Macatawa) for hundreds of years. Dutch Calvinist separatists settled into the area in 1847 under the leadership of Dr. Albertus Van Raalte. The Dutch settlers choose the land due to its proximity to the Macatawa River, then referred to as the Black River, where it streamed to Black Lake which, in turn, led to Lake Michigan. In 1867, Holland was incorporated as a city.

Due to the ground-disturbing activity involved in the proposed project, the State Historic Preservation Office requires a Section 106 Review to be completed by an archaeologist meeting the qualifications as outlined in the Code of Federal Regulations, 36 CFR Part 61. Requests for quotations for this work have been sent to all qualified Michigan-based archaeologists listed with the State Historic Preservation Office. Copies of all correspondence with SHPO and prospective archaeological consultants are included in Appendix D.

Additionally, requests for reviews were sent to the applicable Tribal Historic Preservation Officers (THPO) requesting information on any Tribal historic properties. Copies of all correspondence are included in Appendix D. Based on information received to date, there is no reason to believe that there are any tribal historical or archaeological sites in the project area.

B. Air Quality

The Clean Air Act, which was last amended in 1990, requires the Environmental Protection Agency (EPA) to set National Ambient Air Quality Standards for pollutants that can harm public health and the environment. The EPA has established National Ambient Air Quality Standards for six pollutants, called "criteria" pollutants. These include carbon monoxide, lead, nitrogen dioxide, ozone, particle pollution (PM2.5 and PM10), and sulfur dioxide.

Two pollutants are particularly important for West Michigan: ozone and PM2.5. When either pollutant is expected to reach levels where sensitive groups might start to experience symptoms, meteorologists from the Michigan Department of Environment, Great Lakes, & Energy (EGLE) declare a Clean Air Action Day. On these days, the public is asked to participate in voluntary emission reduction activities to protect public health, the environment, and maintain attainment status of both pollutants.

All areas in Michigan are currently designated as attainment for the Environmental Protection Agency's (EPA's) 2008 8-hour ozone standard of 75 ppb.

On October 26, 2015, EPA adopted new, more protective National Ambient Air Quality Standards for ground-level ozone set at 70 ppb, based on extensive scientific evidence about ozone's effects on public health.

On August 3, 2018, the EPA designated part of Muskegon County, part of Allegan County, and all of Berrien County as nonattainment for the strengthened 2015 ozone NAAQS standard. All other areas in west Michigan are currently designated as attainment under this new standard.

All counties in Michigan must meet an annual and daily standard for PM2.5. All of West Michigan is currently in attainment for the 2006 daily standard of 35 µg/m3. EPA issued final designations for the 2012 annual fine particulate standard of 12 µg/m3 on December 18, 2014. All of Michigan has been designated as "unclassifiable/attainment" for the annual standard.

The project is not anticipated to contribute or detract from the long-term air quality of the area.

C. Wetlands

The Allegan County and Ottawa County Final Wetland Inventory maps as compiled by the Michigan Department of Environment, Great Lakes, and Energy (EGLE) have been used to identify wetlands in the study area (See Appendix E). The wetland inventory maps show potential and approximate locations of wetlands and wetland conditions.

D. Great Lakes Shorelands, Coastal Zones, and Coastal Management Areas

Based on review of the U.S. Department of the Interior's Coastal Barrier Resources System there are no federally listed coastal barrier zones in the study area.

While the study area does not include any federally listed coastal barrier zones, parts of the study area are within the Michigan Coastal Zone Management Area (see map in Appendix E). A letter was submitted to the EGLE Water Resources Division Field Operations Support Section Coastal Mangement Program Unit requesting review for consistency with the approved state coastal zone management plan (Appendix E).

E. Floodplains

The FEMA floodplain maps for the study area are provided in Appendix E. Areas of 100-year floodplains are evident in the study area around Lake Macatawa.

F. Natural or Wild and Scenic Rivers – Not Applicable

A list from the Michigan Department of Natural Resources of Michigan's natural rivers is included in Appendix E. There are no Natural or Wild and Scenic Rivers within the study area according to a review of that list.

G. Major Surface Waters

Lake Michigan, Lake Macatawa, and the Macatawa River are the most significant surface water bodies within the study area.

Lake Michigan, the second largest Great Lake (by volume) and fifth largest lake in the world (by surface area), is a globally significant ecosystem. Stretching over 300 miles, it is the only Great

Lake located entirely within the United States. Its shoreline boasts a variety of coastal habitats, including unique coastal wetlands, drowned river mouths, hundreds of smaller tributaries and more than 700 islands. Nearly half of the state of Michigan's land area drains to Lake Michigan and a third of its population resides within the watershed. Lake Michigan serves as the source water for twenty public water supplies in Michigan, and of those communities it serves the 4th largest number of customers (behind Grand Rapids, Wyoming, and Muskegon).

The 1996 amendments to the federal Safe Drinking Water Act (SDWA) require an assessment of each source of drinking water in community public water supplies and determine the susceptibility to contamination. To meet this requirement, the USGS completed a Source Water Assessment (SWA) report for the City of Holland in 2003. The report rated Holland's source water area based on its sensitivity and susceptibility to contamination based on WTP operating data, soils maps, historical raw water quality data, and other published reports.

Sensitivity is defined by the USGS as "the natural ability of a source water area to provide protection against contamination of the water supply intake, and includes physical attributes of lakes, rivers, and soils." The SWA characterized Holland's intake as having "moderate sensitivity" to contamination due to the impacts of winds, lake currents, and the influence of nearby rivers.

The SWA found that under normal conditions, lake currents generally move from the south-southwest as they pass over the WTP intake. Approximately 2 miles south of the intake is the outlet of the Macatawa River (Lake Macatawa), which flows north from its mouth and can influence the water quality at the intake. The Kalamazoo River is approximately 9 miles to the south and also flows north. Sustained winds from the northwest through northeast can occasionally cause the flow of the Pigeon River (7 miles north) and the Grand River (18 miles north) to pass over the intake. The influence of the Macatawa River on water quality at the intake is most pronounced during large storm events or thermal inversions when the sediment levels are highest coming out of Lake Macatawa.

Susceptibility is "the relative potential for contamination to reach the public water supply intake used for drinking water purposes." The SWA considered existing facilities and land uses within the source water area to determine which factors may pose a risk to the water supply. The source water area for the Holland intake was deemed to have a "moderately high susceptibility" to potential contamination based on the number of potential contaminant sources and urban and agricultural runoff in the watershed.

Lake Macatawa is approximately 1,780 acres in overall area. The average depth of the lake is variable but generally less than 10 feet, excluding a navigation channel of fixed depth that crosses the lake to allow deep draft ships to access the dock at the City of Holland. The Macatawa River flows through the lake emptying directly into Lake Michigan. For this reason, Lake Macatawa is considered to be a drowned river mouth lake. Both bodies of water provide many recreational opportunities including boating, fishing, and kayaking.

A major water quality problem in Lake Macatawa is phosphorus loading as identified in the document titled "Total Maximum Daily Load for Phosphorus in Lake Macatawa" (TMDL document) published January 20, 1999, by the Michigan Department of Environmental Quality (now EGLE). Neither Lake Macatawa, nor the Macatawa River serve as drinking water supplies.

H. Topography

Elevations within the greater Holland area vary generally about 100 feet within the service area of the Holland water system. The highest point in the service area is Mt. Pisgah at 730 feet. Other general areas of highest elevation, around 700 feet, are located in the southeast portion of the service area. Topographical maps of the area are included in Appendix E.

I. Geology

A complete description of the geology of Ottawa County was obtained from EGLE's Groundwater Mapping Project and can be found in Appendix F along with excerpts from a 1958 report titled "Summary of Ground-Water Investigations in the Holland Area, Michigan."

Based on well records recorded in the area, approximately 62% of the wells in Ottawa County are completed in glacial deposits, and 31% in the bedrock units. There is insufficient information to make a distinction for the remaining 7% of wells in the County.

The glacial deposits in Ottawa County are from the last glacial period, the Wisconsin period, which occurred around 8,000 to 12,000 years ago. Glacial deposits generally range from 100 to 400 feet thick in parts of the County.

The bedrock underlying the greater Holland area varies from Marshall Sandstone to the northeast to Coldwater Shale to the southwest, as shown on the Bedrock Map of Michigan, found in Appendix F.

J. Soil Types

Soils reports were generated using the United States Department of Agriculture (USDA) National Resource Conservation Service's (NRCS) web soil survey for the areas of the principal alternatives described below. Copies of the soils reports are included in Appendix F.

K. Agricultural Resources

The soils reports included in Appendix F also include maps and brief discussions of the prime, unique, and locally important farmland in the vicinity of the proposed improvements described below.

L. Fauna and Flora

The study area can be divided into two areas: drinking water distribution service area; and Water Treatment Plant (WTP) site. The proposed work in the drinking water distribution service area is limited to water service replacements. This work would be completed in residential and commercial areas primarily consisting of pavement and managed turfgrass. The proposed work at the WTP site would include some removal of brush and trees which could potentially provide habitat for fauna of special concern.

Review of the Federally Listed Threatened, Endangered, Proposed, and Candidate Species in Michigan (as documented by the U.S. Fish & Wildlife Service's (USF&W) webpage) shows eleven potential species in Allegan and Ottawa Counties. Table 4 provides information on the species and their respective status and habitats.

Table 4. Federally Listed Threatened, Endangered, Proposed, and Candidate Species

SPECIES	STATUS	HABITAT

Whooping crane (*Grus americanus*)	**Non-essential experimental population	Open wetlands and lakeshores
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.
Tricolored Bat (*perimyotis subflavus*)	Proposed Endangered	During the spring, summer, and fall, found in forested habitats roosting in trees, primarily among leaves of live or recently dead deciduous hardwood trees, but may also be found in pine trees and occasionally human structures.
Piping Plover (*Charadrius melodus*)	Endangered	Nest on shoreline and island sandy beaches with sparse vegetation and the presence of small stones (greater than 1 cm (0.4 in.)) called cobble.
Rufa red knot *(Calidris canutus rufa)*	Threatened	Coastal areas during the migratory window of MAY 1 - SEPTEMBER 30
Eastern Massasauga (*Sistrurus catenatus*)	Threatened	Wet areas including wet prairies, marshes, fens, sedge meadows, peatlands, and low areas along rivers and lakes. Use adjacent uplands (shrubland, open woodlands, prairie) during part of the year.
Snuffbox mussel (*Epioblasma triquetra*)	Endangered	Inhabits sand, gravel, or cobble substrates in swift small and medium-sized rivers.
Karner Blue Butterfly (*Lycaeides melissa samuelis*)	Endangered	Karner blue caterpillars feed only on the leaves of the wild lupine plant. Adults visit a wide variety of flowering plants for nectar. Wild lupine occurs in pine barrens and oak savannas.
Monarch Butterfly (*Danaus plexippus*)	Candidate	Lays eggs on Milkweed plants which are caterpillar's sole source of food.
Pitcher's thistle (*Cirsium pitcheri*)	Threatened	Stabilized dunes and blowout areas

The Michigan Natural Features Inventory (MNFI) was contacted via email on April 11, 2023, for a Rare Species Review Request to ascertain whether any species of fauna or flora listed or proposed to be listed in the MNFI as endangered, threatened, or special concern, or the critical habitat of such species, is found in the vicinity of the proposed project. In response to the Rare Species Review Request, a letter from Mr. Michael Sanders of the MNFI staff summarizing its findings was received on April 19, 2019. Table 5 provides information on the species identified in Mr. Sanders' letter and their respective status and habitats. A copy of the correspondence with the MNFI is included in Appendix D.

Table 5. Listed Threatened, Endangered, Proposed, and Candidate Species

SPECIES	STATUS	HABITAT
Ginseng (*Panax quinquefolius*)	Threatened	Found in rich hardwoods, often on slopes or ravines, ranging even into swampy portions. It also occurs in wooded dune hollows and leeward slopes along the Lake Michigan shoreline.
Round lake floater (*Pyganodon subgibbosa*)	Threatened	Natural river impoundments more than 3 feet deep with mud or mud-sand substrates.
King Rail (*Rallus elegans*)	Endangered	Coastal wetlands in the Great Lakes region. Associated with permanent marsh habitats along upland-wetland edges largely dominated by tussock-forming sedges.
Wild rice (*Zizania aquatic*)	Threatened	Rivers, streams, lakes, and ponds, generally in larger water bodies. Favors areas with a slow current flowing over a mucky or silty bottom with little competition from other plants.
Merlin (*Falco columbarius*)	Threatened	Has known to nest at Tunnel Park. Nests are frequently near lakeshores or other semi-open areas where prey (small to medium birds) may be captured. Merlins will rarely nest in cavities or on cliffs.
Gentian-leaved St. John's-wort (*Hypericum gentianoides*)	Special Concern	Marshy to often sandy ground, particularly within and near areas that experience seasonal water table fluctuations.
Whorled mountain mint (*Pycnanthemum verticillatum*)	Special concern	Moist sandy shores, fields, roadsides, and borrow pits.
Northern appressed clubmoss (*Lycopodiella subappressa*)	Special concern	Moist to wet floors of sandy borrow pits, moist, sandy lake and pond shores, sunny, moist to wet, sandy depressions.
Campeloma spire snail (*Cincinnatia cincinnatiensis*)	Special concern	Widely distributed and found in a variety of aquatic habitats including small creeks, large streams, springs and lakes.
Pink heelsplitter (Potamilus alatus)	Special concern	Various types of substrate, and in slower moving waters.
Rusty-patched bumble bee (*Bombus affinis*)	Special concern	Dunes, marshes, forests, farmland and urban areas.

4. Existing Facilities

An overview of the existing water system is provided below. A map of the water system is provided in Appendix B.

A. Source Facilities

Holland's water is supplied via an intake that extends approximately 4,450 feet into Lake Michigan where it joins a steel fabricated intake crib. The intake consists of a 42-inch diameter reinforced concrete pipe with rubber gasket steel joints that was installed as part of the original Water Treatment Plant Construction in 1955-57. The intake crib is submerged approximately 45 feet depending on lake level. The design involves siphon action where the intake pipe connects into an airtight manhole in the low lift pumping station. A vacuum priming system is connected to the airtight manhole to aid the siphon action.

In 1990, a 2-inch chemical feed line was installed from the pump station within the 42-inch pipe for the purpose of adding chlorine to prevent the growth of zebra mussels. The chemical feed line displaces some of the volume of the intake pipe and reduces its capacity by approximately 4%. Several tests have been conducted over the years to establish the hydraulic capacity of the intake system. In 1996, engineering consultant Fishbeck Thompson Carr & Huber (FTC&H) conducted tests and analyzed the intake's capacity. They concluded that the intake capacity is 38.5 million gallons per day (mgd) at the average lake level of 580.03. Their analysis also concluded that for every 1 foot of variance in lake level, the intake capacity is affected by 1 mgd. Based on historical variations in lake level, the capacity of the intake ranges from 34.5 mgd at minimum lake level to 42.0 mgd at maximum lake level.

An 8-inch valve is installed on the top of an emergency access riser on the intake line. The valve is located near the midpoint of the pipe, approximately 2,250 feet into Lake Michigan. The valve has been sized so that when open under minimum lake level, an additional 4.5 mgd capacity is available. When water levels necessitate, the valve is left open during summer months to assure a capacity of 38.5 mgd for the peak pumping season.

The intake crib and pipe are inspected annually to evaluate the condition and growth of zebra mussels. Zebra mussels are removed from the crib at least biannually. The most recent intake inspection revealed the intake to be in good condition. However, based on age and criticality of the intake, Holland does plan to begin planning for a new intake in the near future. Installation of this new intake is anticipated in the 20-year planning period.

Low Service Pumps (Raw Water)

The low service pumps are used to move water from the intake wet well in the low service building to the Water Treatment Plant. The facility is equipped with five vertical turbine pumps as outlined in Table 6. Firm Pump capacity is 38.9 MGD as shown in Table 6.

Table 6. Low Service Pumps

PUMP ID	YEAR INSTALLED	TYPE	CAPACITY (MGD)	TDH (FEET)	STATUS
1	1990	VT	9.2	68	In Service
2	1997	VT-VS	11.8	68	In Service

3	1997	VT-VS	11.8	68	In Service
4	1997	VT	11.8	68	In Service
5	1957	VT	10.0	54	Standby
		Firm Pump Capacity	**38.9**		

Low Service Pump 5 can be driven electrically or by a natural gas engine. The pump is available via the natural gas engine in the event of a catastrophic power outage impacting the facility. In order to ensure proper operation when needed, the engine is started on a weekly basis and the pump is engaged with the engine once per month. Due to the age of this pump and limitations of relying on a single pump in a power outage, it is planned for replacement in the 20-year planning period. A diesel-powered generator will be installed at the low service building that has the ability to run more than one of the pumps for increased reliability. Pump 5 will be replaced after that time with a unit similar to Pumps 2-4.

B. Water Treatment

Rapid Mix

The first step in the treatment is rapid mix of chemicals into the water pumped from the low service station. Primary chemical mixing is accomplished via Parshall flumes. The flumes serve as inline static mixers and provide the energy necessary for mixing of the chemicals (alum, fluoride and sodium hypochlorite) via a hydraulic jump. There are two flumes available for mixing, each with an estimated volume of 3,230 gallons. The corresponding velocity gradient (G) of the flumes is 340-440 per second according to a 1996 study performed by engineering consultant Fishbeck Thompson Carr & Huber (FTC&H).

Secondary chemical mixing is accomplished via rapid mix chambers equipped with mechanical mixers. The secondary rapid mix chambers are each approximately 7,480 gallons in volume and are equipped with polymer and sodium hypochlorite feeds. The corresponding velocity gradient (G) of the secondary chambers is also 340-440 per second according to the 1996 study performed by FTC&H. The units are not currently in use but are in operable condition and included in the preventative maintenance program at the WTP.

Flocculation Basins

The Water Treatment Plant is equipped with four treatment trains, each with 2 stages per train. Three of the trains are sized at 220,000 gallons and the newest train (constructed in 1997) is 254,000 gallons. The total basin volume is 914,000 gallons.

Detention time at the WTP's rated capacity of 38.5 mgd is 33 minutes for each of the smaller basins and 38 minutes for the largest basin. Recommended Standards for Water Works by the Great Lakes – Upper Mississippi River Board of State and Provincial Public Health and Environmental Managers (commonly referred to as the Ten State Standards) recommend a minimum of 30 minutes.

Settling Basins

The Water Treatment Plant is equipped with four settling tanks. Three of the tanks are sized at 992,000 gallons and the newest train (constructed in 1997) is 1,008,000 gallons. The total basin volume is 3,984,000 gallons.

Detention time at the WTP's rated capacity of 38.5 mgd is 148 minutes for each of the smaller basins and 151 minutes for the largest basin. Ten State Standards suggests a minimum detention time of 240 minutes. While the detention time is significantly lower than the time recommended by the Ten State guidelines, finished water turbidities remain well below the 0.3 NTU requirement.

Filtration

The Water Treatment Plant is equipped with ten constant rate, rising head filters. Each of the filters is 840 square feet in area with filter rates of 3.2 gpm per square foot with all filters in service and 3.53 gpm per square foot with one filter out of service.

Clearwell

Following filtration finished water flows to a 0.463 million gallon concrete clearwell located directly below the filters. The volume is comprised of approximately 46,300 gallons per filter.

Transfer Pumps

Transfer pumps are used to move water from the clearwell to the ground storage tanks located at the Water Treatment Plant site. The facility is equipped with four vertical turbine pumps as outlined in Table 7. Additionally, the "Climax" high service pump can take suction directly from the filter clear wells without the water first being transferred to the plant storage reservoirs. Usage of the Climax pump in this manner increases the high service pumping capability in a "transfer pump limited" condition.

Table 7: Transfer Pumps

PUMP ID	YEAR INSTALLED	TYPE	CAPACITY (MGD)	TDH	STATUS
1	1997	VT-VS	10	64	In Service
2	1997	VT	10	64	In Service
3	1989	VT	10	55	In Service
4	1975	VT	10	60	In Service
5	2012	VT	10	64.9	In Service
"Climax"	1957	HC	10.08	168	Standby
		Firm Pump Capacity	**40**		

Plant Treated Water Storage

Treated water at the plant is stored in two ground storage tanks located at the WTP site. Table 8 outlines the tanks and their associated details. The redundancy of these two reservoirs allows for normal system operations during average day conditions when one tank is out of service.

Table 8: Plant Treated Water Storage

	NORTH TANK	SOUTH TANK
Volume (mg)	3.0	1.5
Tank Type	Ground Storage	Ground Storage
Material	Concrete	Steel
Overflow El.	653.5	653.0

The 1.5 million gallon tank was inspected in April of 2022 and implementation of associated recommendations are planned to be implemented in Holland's Fiscal Year 2024. Improvements include but are not limited to high pressure cleaning and recoating of the tank exterior, addition of mixing to the tank, and miscellaneous smaller repairs and improvements.

High Service Pumps

The high service pumps are used to move water from the filtration plant to the distribution system. The facility is equipped with five high service pumps as outlined in Table 9.

Table 9: High Service Pumps

PUMP ID	YEAR INSTALLED	TYPE	CAPACITY (MGD)	TDH	STATUS
1	2022	HC-VS	18.0	185	In Service
2	1997	HC-VS	10.0	185	In Service
3	1997	HC-VS	10.0	185	In Service
4	2022	HC-VS	18.0	185	In Service
"Climax"	1957	HC	8.6	185	Standby
		Firm Pump Capacity	**46.6**		

The Climax high service pump runs on natural gas. The pump is available via the natural gas engine in the event of a catastrophic power outage impacting the facility. Additionally, the pump can take suction directly from the filter clear wells without the water first being transferred to the plant storage reservoirs. Usage of the Climax pump in this manner allows the WTP staff to pump limited quantities of treated water to the distribution system in a major power outage.

Due to the age of the Climax high service pump plans are being made for its ultimate retirement. High service pumps 1 and 4 were designed in coordination with recent transmission improvements to the Holland system in order to eliminate the need for the Climax pump to allow for firm high service pumping capacity aligning with WTP capacity. Holland is currently installing emergency power generators at the site that will also eliminate the need for the Climax pump in the event of a power outage.

Standby Power

The WTP has electrical feeds from two independent substations which meets the requirements of the Safe Drinking Water Act.

Holland is also in the process of installing two 500 kilowatt (kW) natural gas generators at the WTP site that will provide emergency power for two of the high service pumps and two of the transfer pumps. A 30 KVA generator is available for running lights, chemical feeders and SCADA computer controls.

In addition to the generators, Holland currently has the natural gas fired low service and high service pumps previously mentioned. Both pumps are planned for retirement within the planning period but will be replaced by emergency generators providing more flexibility and capacity during events where standby power is needed.

C. Storage Tanks and Pump Stations

In order to serve customers at various elevations throughout the service area, the Holland Water System is divided into pressure districts. Each pressure district consists of pumping stations to feed the associated service area and storage tanks to normalize pressures and provide water during peak flow demands. The following sections evaluate these major system components.

Storage Tanks

The Holland water distribution system currently has four tanks providing storage volume for the water system. Table 10 highlights the storage tanks and provides general information relative to the structures.

Table 10: Distribution System Water Storage

	Waverly	**Southside**	**48th Street**	**M-40**
Volume (mg)	5.0	5.0	0.5	1.0
Tank Type	Ground Storage	Ground Storage	Elevated	Elevated
Material	Steel	Concrete	Steel	Steel
Overflow El.	741.0	741.0	828.0	828.0
Date Constructed	1964	1986	1968	2002

In addition to the storage in the distribution system, the two ground storage tanks at the Water Treatment Plant (See Water Treatment Section) provide an additional 4.5 million gallons of storage. The Holland Water System also pumps into two storage reservoirs owned by the City of Zeeland with total capacity of 2.5 million gallons from which Zeeland draws its water. Total water storage available for meeting peak hourly demands and daily demand fluctuations is 18.5 million gallons.

EGLE recommends that the community maintain a storage capacity of at least 33% of the maximum day demand. For the Holland system demands in 2022, 33% of the maximum day demand of 30.35 mgd is 10 million gallons. Existing storage is well above recommended volumes for current and projected demands.

Pressure Districts

The Holland Water System is generally comprised of two large pressure districts with associated pump stations and water storage. Pressure district boundaries are defined by topographical elevations within the service area. This section is intended to provide an overview and evaluation of the individual pressure districts.

Low Pressure District

The low-pressure district generally includes portions of the distribution system below USGS elevation 650 and water is supplied to the district through the high service pumps located at the Water Treatment Plant.

Water storage in the low-pressure district is provided by two 5.0 million gallon ground storage tanks in the distribution system and the two finished water storage tanks (4.5 million gallons total) at the Water Treatment Plant. The high service pumps draw water from the finished water storage tanks at the treatment plant and pump to the Waverly and Southside ground storage tanks in the distribution system. The two ground storage tanks float on the low-pressure district hydraulic grade, normalizing pressure and providing water to the district during peak flow demands. The redundancy of the operation of these two reservoirs also allows for normal system operations during average day conditions when one is out of service.

In addition to the Holland Water System's storage in the low-pressure district, the City of Zeeland has two 1.25 million gallon reservoirs that provide storage for Zeeland to re-pump into their system.

High Pressure District

The high-pressure district generally includes portions of the distribution system above USGS elevation 650 and below elevation 700. Water is supplied to the district through pumping stations located at the site of the Waverly and Southside storage tanks. These pump stations pump to the two elevated storage tanks in the district.

Water storage in the high-pressure district is provided by a one million gallon elevated storage tank on M-40 and a five hundred thousand gallon elevated storage tank on 48th Street. The two elevated tanks float on the high-pressure district hydraulic grade, normalizing pressure and providing water to the district during peak flow demands. The redundancy of the operation of these two reservoirs also allows for normal system operations during average day conditions when one is out of service.

Waverly Pumping Station

The Waverly Pumping Station was constructed in 1967-68 and draws its water from the 5 million gallon ground storage reservoir located on the same site. Two pumps were replaced in 2002 and the remaining two pumps were replaced in 2017 to increase capacity as recommended by consulting engineer FTC&H. The pump station has four pumps with a firm capacity of 5.83 mgd.

Pumps #3 or #4 at the Waverly Pump Station have the capability to be run by the permanent backup generator located on-site installed in 2018. This is the basis of the auxiliary power capacity

Table 11: Waverly Pumping Station

PUMP ID	YEAR INSTALLED	TYPE	CAPACITY (GPM)	TDH (FEET)	HP
1	2002	VT	1,200	104	40
2	2002	VT	2,300	108	100
3	2017	VT	2,300	108	100
4	2017	VT	2,300	108	100
Total Pump Capacity			5,270		
Firm Pump Capacity			4,050		
Auxiliary Power Capacity			4,050		

Southside Pumping Station

The Southside Pumping Station was constructed in 1983-84 and draws its water from the 5 million gallon ground storage reservoir located on the same site (Meadowlane Dr. and Cumberland Ave.). One pump was replaced in 2002 to increase capacity as recommended by consulting engineer FTC&H. The pump station has four pumps with a firm capacity of 4.87 mgd.

Table 12: Southside Pumping Station

PUMP ID	YEAR INSTALLED	TYPE	CAPACITY (GPM)	TDH (FEET)	HP
1	2002	HC	2,350	120	40
2	1983	HC	1,350	135	100
3	1983	HC	1,350	135	100
4	1983	HC	1,750	175	75
Estimated Total Pump Capacity			4,900		
Firm Pump Capacity			2,430		
Auxiliary Power Capacity			2,430		

The Southside Pump Station is served by dual electrical feeds from separate substations. This is the basis of the auxiliary power capacity listed in Table 12. The station is wired such that Pumps #1 and #2 are on one circuit and Pumps #3 and #4 are on another circuit. Phase monitors on the electrical services determine the power capabilities of the station. The monitors send a signal to the programmable logic controller (PLC) which in turn sends a message through the Supervisory Control and Data Acquisition (SCADA) system to the Water Treatment Plant letting the operators know if one circuit has lost power. The operators can relay this information to the distribution system operators who in turn can manually adjust the power inside the station to be on whichever circuit is live.

The distribution system also includes four smaller booster pump stations that serve individual neighborhoods. This includes the Scenic Shores Pump Station (450 gpm capacity), Spyglass Pump Station (450 gpm capacity), Sunset Bluff Pump Station (200 gpm capacity), and the Castle Park Pump Station (60 gpm capacity).

D. Service Lines

There are 17,107 service connections to the water distribution system with a total connected water service length of 322 miles. HBPW owns these water services up to the edge of the right of way. Beyond the right-of-way the services are privately owned. The most common materials for service lines are copper pipe followed by galvanized pipe and then plastic pipe materials. The high rate of failure of older galvanized services and polybutylene services over the past few decades has resulted in an elevated replacement rate of these service lines. As a result, approximately 80% of services are less than 50 years old and should be in generally good condition (with the exception of the remaining polybutylene services prone to early failure). Only 2% of service lines are over 100 years old.

Table 13: Service Lines by Material Type

Service Material	Miles	Percent
Copper	172	53.4%
Galvanized	36	11.2%
Polybutylene	31	9.6%
Polyethylene	26	8.1%
Ductile Iron	12	3.7%
HDPE	6	1.9%
Cast Iron	5	1.6%
PVC	1	0.3%
No Material Information Available	33	10.2%
Total	**322**	

Table 14: Service Lines by Installation Date

Decade Installed	Miles	Percent	Groupings
Pre 1910	5	1.6%	2% of services over 100 yrs old
1910s	2	0.6%	
1920s	4	1.2%	11% of services 50-100 years old
1930s	1	0.3%	
1940s	4	1.2%	
1950s	6	1.9%	
1960s	20	6.2%	
1970s	31	9.6%	83 % of services less than ~50 yrs old
1980s	62	19.3%	
1990s	71	22.0%	
2000s	53	16.5%	
2010s	34	10.6%	
2020s to date	16	5.0%	
No Install Date Available	13	4.0%	
Total	**322.0**		

Of the 17,107 service connections there are 3,500 water services containing galvanized pipe. Of these services 1,783 are galvanized services still connected to the main via a lead gooseneck, and the remaining 1,717 services are private-side only galvanized services where the lead gooseneck and galvanized pipe have already been replaced with copper pipe in the right-of-way. The majority of these services are concentrated within the City of Holland in areas that were developed prior to the 1970s. An overview map showing the location of these service lines is included as Appendix G.

E. Distribution and Transmission Systems

The Holland distribution system includes transmission mains with adequate capacity to supply system demands. The sizes of the transmission mains range from 24" to 36".

The distribution system serving Holland and its retail customer communities consists of water mains ranging in diameter from 6" to 36". Including the transmission mains, the total length of water mains currently operated and maintained by the Holland BPW is approximately 310.3 miles. Table 13 lists the length of each diameter pipe in the distribution system and the percent of the total system that the length represents.

Table 15: Distribution Piping

PIPE DIAMETER (INCHES)	LENGTH (MILES)	PERCENT
6	95.5	30.8 %
8	101.5	32.7 %
10	1.6	0.5 %
12	65.3	21.0 %
16	10.9	3.5 %
20	9.8	3.2 %
24	5.8	1.9 %
30	10.5	3.4 %
36	9.3	3.0 %
Total:	**310.3**	

Approximately 93% of the water mains in the Holland Water System are either ductile or cast-iron pipe, however, PVC pipe is beginning to replace ductile iron as the replacement pipe of choice for distribution mains. Table 14 lists the known pipe materials and estimated percentages utilized in the water system.

Table 16: Piping Materials

PIPE DIAMETER (INCHES)	PERCENT
Ductile Iron	69.6 %
Cast Iron	23.6 %
Prestressed Concrete	4.3 %
PVC	1.1 %

HDPE	0.9 %
Steel	0.4 %
Asbestos Cement	0.1 %

F. Residuals Handling and Disposal

Sludge from the sedimentation basins at the Water Treatment Plant is drained by gravity to a reclaim basin that is 45 feet in diameter and has a capacity of approximately 251,600 gallons. Sludge from the reclaim well is then pumped to the settling lagoons located at the treatment plant site via two pumps within the well. The Holland Water Plant is equipped with two sludge settling lagoons. Each lagoon has a capacity of 1.2 million gallons for a total capacity of 2.4 million gallons. The lagoons are emptied of residuals as necessary. The residuals are then allowed to dry prior to ultimate disposal at a local landfill.

G. Condition of Water Meters

The distribution system provides service to 17,584 metered service connections. HBPW has standardized on the Neptune T10 water meter platform for most water services, with some variation on meter make and model for larger diameter meters. Most of the meters were installed in the early 2000s and are nearing end of life. However, approximately 4,000 meters were installed in 2021 when a portion of Park Township transitioned from a wholesale supply area to HBPW retail area.

H. Operation and Maintenance

Water mains throughout the Holland water system are identified for replacement based on an evaluation of condition, criticality, hydraulic capacities/fire flows, and increasing operation and maintenance requirements. A primary driver of replacement is the frequency and density of water main breaks, as well as certain vintages of pipe that are known to have a poor overall life expectancy. An excerpt from a January 23, 2023 presentation to the Holland BPW Board of Directors is included in Appendix H that outlines many of these issues and priorities for improvements. Also included in Appendix H is a copy of the current 5-year capital improvements plan (CIP) for the Holland distribution system.

Similar to the water mains in the Holland Water System, improvements at the Water Treatment Plant are typically identified based on increased demands and/or asset renewal/replacement in alignment with Holland's asset management program. A copy of the current 5-Year Capital Improvement Plan for the Holland WTP is also included in Appendix H.

One operational issue at the Water Treatment Plant that is not directly related to increased demands or asset management is a lack of sufficient space for operations and maintenance staff. The current staff size of eleven is four more than what the plant was designed for when last renovated in the late 1990s. As the staff size has grown, it has been a challenge to find appropriate workspaces for everyone. This issue is proposed to be addressed as part of the scope of work for the proposed DWRF project. As a result of relocating the bulk chemical storage to a new building addition as indicated in the proposed DWRF project scope, the WTP will create more workspace for staff.

I. Design Capacity of Waterworks System

Holland's Water Treatment Plant has a rated capacity of 38.5 million gallons per day (MGD). Calendar year 2022 average day demand for the Holland system was 15.0 MGD and maximum day demand was 30.4 MGD.

J. Climate Resiliency

As mentioned previously, the WTP is currently installing two natural gas generators to be used as emergency power during a prolonged power outage. Future plans include adding low service emergency power generation as well. These backup power sources are in addition to having two separate electric feeds to the WTP. All of these power sources allow the WTP to continue facility operations and to withstand and respond to changes resulting from climatic factors including storms and other factors outside of the system's control.

The distribution system also includes interconnections with neighboring water systems to allow for the transfer of water between systems in the event that climate or water quality events disrupt the ability of either system to supply water.

5. Need for Project

A. Compliance with Act 399 Drinking Water Standards

a) Acute Violations of a Maximum Contaminant Level or Treatment Technique

Not Applicable - Holland has no acute violations of a MCL or Treatment Technique.

b) Non-Acute Violations of a Maximum Contaminant Level or Treatment Technique

Not Applicable - Holland has no non-acute violations of a MCL or Treatment Technique.

c) EGLE Evaluation of Existing System

The proposed project addresses two issues identified by EGLE:

- Lead Service Line Replacement – The proposed project addresses a large portion of the identified Lead Service Lines in Holland's system, including the private side portion of service lines, in compliance with Michigan's Lead and Copper Rule (LCR).
- Chemical Storage Improvements – This work will address a recommendation made as part of EGLE's most recent Sanitary Survey of the Holland system (see Appendix H).
    - o "Bulk chemical storage should be moved from upper floor of WTP, tanks will need replacement"

d) Waterborne Diseases

Not Applicable - Holland has no incidents of waterborne disease.

e) Reliability Study / Master Plan

The Holland BPW Water System completed a reliability study in 2019 that details the historical water demand, projected water demands along with an evaluation of the existing system assets and the associated improvements that will be needed to maintain the system and provide adequate supply for projected future water uses. Additionally, the WTP completed a master plan in 2016. While some of the projects identified in this master plan have been completed and therefore timelines have been updated, the overall goals and direction remain the same. Both of these documents provide the direction for Holland's water system and excerpts specifically related to the proposed project scope are included in Appendix H.

B. Orders or Enforcement Actions

Not Applicable - Holland is not subject to any orders or enforcement actions.

C. Drinking Water Quality Problems

The primary water quality concern for the distribution system has been some isolated areas that experience lower residuals due to increased water age. One of these areas includes the dead-end transmission main and storage in the M-40 elevated storage tank. This main and tank were constructed in anticipation of growth in the area that has been slower to develop than expected. A mixing system for the tank is scheduled for spring of 2023, and adjustment of operational set points for the tank in 2022 have increased turnover in the main and tank. Looping other dead end distribution mains is also being pursued via a biennially repeating water main looping Capital project. Routine flushing of the distribution system is also performed on a weekly basis.

6. Projected Future Needs

The Holland BPW strives to plan well for a strong future while being good stewards of the assets that we have. To that end, the detailed 5-year capital improvement plans as well as 20-year CIP documents prepared as part of the most recent reliability study (2019) outline anticipated needs during those timeframes. Reference the 5-year and 20-year CIP documents for more detail about the projects that are currently planned for the WTP as well as the Distribution System in Appendix H.

II. New Water Supply Well Procedures

Holland utilizes surface water from Lake Michigan as the source water for the system. There are no existing or planned wells for water supply.

III. Analysis of Alternatives

As a result of analysis of the existing facilities included above, problems and goals were identified for the Holland Water System.

1. Alternatives for Lead Service Line Replacements

One of the primary objectives of the proposed DWRF project is to replace private side galvanized Lead Service Lines (LSLs) where the public side, including the former lead goosenecks, have previously been replaced. This includes all such known services within the Holland distribution system. These are being targeted as part of a consolidated project due to the ability to handle them all without removing and restoring roadways. Replacement of LSLs where the galvanized services and lead goosenecks still exist on the public side of the service will generally be done in coordination with street improvements. Alternatives for the private side galvanized LSL replacements include the following:

A. Alternative 1 – Trenchless Installation of New Services

Trenchless installation of services is the most common and most likely means of construction. This includes directional drilling of new services or splitting and pulling in a new service through the old one. Trenchless installations minimize, effort, cost, and impact of the service replacement work compared to conventional construction.

B. Alternative 2 – Conventionally Constructing (Excavating) New Services

Conventional construction of a new water service includes excavating the full alignment of the service and placing the new water service in the resulting trench. This requires significant excavation in landscaped areas, near or under driveways, and across sidewalks. Due to the additional effort required, this approach is typically only used where trenchless installations are not possible.

C. Alternative 3– No Action

This is not a viable solution for LSL replacement. Failure to replace the LSLs would result in non-compliance with Michigan's Lead and Copper Rule. No action was not selected as a Principal Alternative for further analysis.

D. Alternative 4 – Optimum Performance of Existing System

This is not a viable solution for LSL replacement as it is essentially another form of No Action with regards to the underlying regulatory issue. Failure to replace the LSLs would result in non-compliance with Michigan's Lead and Copper Rule. Optimum Performance of Existing System was not selected as a Principal Alternative for further analysis.

E. Alternative 5 – Regionalization

The Holland system is already a regional water system. Additionally, regionalization is primarily a solution for water supply. Regardless of water supply source, LSL lines need to be replaced in accordance with the requirements of Michigan's Lead and Copper Rule. Failure to do so would result in non-compliance. Regionalization was not selected as a Principal Alternative for further analysis.

F. Monetary Evaluation

a) Sunk Costs

Holland has been replacing galvanized services and lead goosenecks in the right of way proactively when water mains are replaced, or roads are reconstructed. The remaining private side service lines were not replaced since they were the responsibility of the homeowner. Because of this there is no significant sunk cost so far for the private side replacement effort.

b) Present Worth

The lead service lines being replaced are isolated to the privately owned portions of the water services. Because of this, HBPW would not have any ongoing operation and maintenance costs associated with the services since the services would remain the responsibility of the customer after the work is completed. HBPW is also not entitled to any remaining salvage value after 20 years since the services are not an HBPW asset. Since HBPW has no O&M costs and is not entitled to any salvage value, a net present worth analysis is not applicable. Instead, Table 12 provides just the present-day construction costs for the alternatives.

Table 17: LSL Replacement Alternatives Present Cost

Alternative	Capital Cost
1 – Trenchless Installation	$ 6,000,000
2 – Conventional Construction	$10,000,000

c) Salvage Value

The water service lines to be replaced under this work are the property of the customer and will remain so after completion of the work. HBPW is not entitled to the salvage value of the service lines.

d) Escalation

Neither principal alternative is expected to require additional energy or land versus operations today. As such, there are no related costs to escalate in the present worth analysis.

e) Interest During Construction

No significant difference in construction timeline is anticipated between the two principal alternatives. As such, interest during construction is assumed to apply equally to both alternatives and has thus been excluded from the present worth analysis.

f) User Costs

Additional user cost calculations have been included in Appendix I and show a user cost of $0.05/ccf for alternative 1 and $0.09/ccf for alternative 2.

g) Project Delivery Method

Neither principal alternative is proposing to utilize an alternative delivery method.

G. Environmental Evaluation

This section is an analysis of the potential environmental and public health impacts of the Principal Alternatives.

a) Cultural and Historic Resources

The proposed project area has been submitted for review by the State Historic Preservation Office for the presence of known historical and/or archaeological sites. Copies of all correspondence with SHPO are included in Appendix D. Regardless of the outcome of that review, Alternative 1 is more protective of the existing structures and landscaping due to the minimal disturbance created by the directional drilling technology.

b) Air Quality

Neither principal alternative conflicts with the State Implementation Plan for Air Quality. During construction, dust suppression will be applied if determined to be necessary to avoid any dusting of the site and surrounding area. There are no foreseen indirect emissions that will result from the construction or operation of either principal alternative.

c) Wetlands

The Ottawa County Final Wetland Inventory as compiled by EGLE has been used to identify wetlands in the study area (see Appendix E). Based on review of the Wetland Inventory Map, it does not appear as though either principal alternative will impact wetland areas.

d) Great Lakes Shorelands, Coastal Zones, and Coastal Management Areas

The project area does not include any federally listed coastal barrier zones, but the project area is within the Michigan Coastal Zone Management Area (see map in Appendix E). A letter was sent to EGLE Water Resources Division Field Operations Support Section for review of the proposed project for consistency with Michigan's Coastal Management Program (MCMP). In a response dated March 28, 2023, Matt Smar, Environmental Quality Specialist, reported that "provided all required permits are issued and complied with, no adverse impacts to coastal resources are anticipated from this project as described in the information forwarded to the WRD. Issuance of all required permits will certify the activity for which the permits were issued as consistent with the MCMP. If no permits are required, this project shall be considered consistent as of the date of this letter." The full response letter is included in Appendix E.

As a result, the design of either principal alternative shall be consistent with the approved state coastal zone management plan and shall incorporate any permitting measures that may be required by EGLE WRD to achieve this purpose.

e) Floodplains

Based on a comparison of FEMA floodplain maps for the area, none of the service lines to be replaced fall within the 100-year flood plain (see Appendix F).

f) Natural or Wild and Scenic Rivers

There are no Natural Rivers within the study area according to the list of these rivers produced by the Michigan Department of Natural Resources, so this factor is not applicable to either principal alternative

g) Major Surface Waters

Lake Michigan, Lake Macatawa, and the Macatawa River are the most significant surface water bodies within the study area. Neither of the principal alternatives should impact these water bodies. The principal alternatives do not involve construction which will adversely impact the ground water or surface water.

h) Topography

No impact is anticipated on the area topography as a result of either principal alternative as all disturbed areas will be restored to existing grade following construction. However, Alternative 1 (Directional Drilling of New Services) has less temporary impact as it involves minimal disturbance to existing topography during construction.

i) Geology

No difference in impact is expected between the principal alternatives with respect to local geological structures and formations.

j) Soils

Neither principal alternative is anticipated to notably impact soils in the area. However, Alternative 2 (Conventional Construction) could have minor impact due to replacement of soils found in utility trenches that are determined to be unsuitable as backfill.

k) Agricultural Resources

The Lead Service Lines are serving existing customers so neither option involves any construction in the area of prime, unique, or locally important farmland.

l) Fauna and Flora

As described in the Background section, review of the Federally Listed Threatened, Endangered, Proposed, and Candidate Species in Michigan shows eleven potential species in Allegan and Ottawa Counties (See Table 4).

A nonessential experimental population of the whooping crane is designated in a 20-state area of the eastern United States. This species is considered a proposed species which means any disturbance of nesting cranes on private property that is incidental to an otherwise lawful activity, such as construction is not considered an illegal activity under the Endangered Species Act. Whooping crane habitat includes open wetlands and lakeshores. No work is anticipated to be completed in wetlands or lakeshore. As a result, it is believed that none of the considered alternatives are likely to adversely affect the whooping crane species or critical habitat.

To date the presence of the Indiana bat has been documented in 12 southern counties in Michigan. While Ottawa County is not among these counties, it has been concluded that the Indiana bat is likely a widespread resident of southern Lower Michigan (Kurta *et al.* 2002). For this reason, it is believed that the Indiana bat may be present in the project area.

While the likelihood of roosting Indiana bats in the project area does exist, design and construction will be performed in a manner to avoid disturbance to existing trees during the roosting season (April 1 through September 30). As a result, it is believed that the project is not likely to adversely affect the Indiana Bat species or critical habitat.

In 2000, the presence of northern long eared bats was last documented in Allegan County. Northern long-eared bats roost in the summer underneath bark, in cavities or in crevices of both live trees and dead trees. While the likelihood of roosting northern long-eared bats in the project area does exist, design and construction will be performed in a manner to avoid disturbance to existing trees during the roosting season (April 1 through September 30). As a result, it is believed that the project is not likely to adversely affect the northern long-eared bat species or critical habitat.

As of 2004, the presence of Tricolored bats has been documented in Ottawa County. In summer, it forages over the open water of streams and ponds, as well as forest edges. Summer roosts are usually within 30 miles of hibernacula and may include buildings, tree hollows, and bridges. Tricolored bats can be found in open woods near the edges of water, as well as over water. They are not usually found in open fields, deep forests, or buildings. While the likelihood of roosting tricolored bats in the project area does exist, design and construction will be performed in a manner to avoid disturbance to existing trees during the roosting season (April 1 through September 30). As a result, it is believed that the project is not likely to adversely affect the tricolored bat species or critical habitat.

Piping Plovers are migratory shorebirds that nests and feeds along coastal sand and gravel beaches in North America. No improvements are proposed on the Lake Michigan shoreline or any associated coastal habitat. Based on this information, it is believed that the Piping Plover species and critical habitat will not be impacted by this project.

The Snuffbox mussel inhabits rivers and streams with cobble, gravel, or sand bottoms in swift currents and usually is deeply buried in the substrate. The snuffbox mussel is sensitive to river impoundment, siltation and disturbance, due to its requirement for clean, swift current and relative immobility as an adult. To maintain the current populations in Michigan, rivers need to be protected to reduce silt loading and run-off. Soil erosion and sedimentation control measures will be incorporated in the design and construction of any of the proposed alternatives thereby protecting bodies of water from silt and run-off. As a result, it is believed that the none of the alternatives are likely to adversely affect the Snuffbox mussel species or critical habitat.

Rufa Red Knots are migratory shorebirds that travel from the central Canadian Artic to Tierra del Fuego annually. According to the USF&W, as the knot makes its journey through the United States and other countries, it depends on safe beach habitat for resting and feeding without disturbance. The knot occurs primarily along the ocean coasts, but data sets also contain records of knots away from the ocean coast. Most records in the interior states, like Michigan, show small numbers (fewer than 10) of knots.

No improvements are proposed along the Lake Michigan shoreline or any associated costal habitat. Based on this information it is believed that the Rufa Red Knot species and critical habitat will not be impacted by this project.

The Eastern Massasauga is a small to medium-sized, thick-bodied, gray, gray-brown or brown snake; its tail has alternating dark and light bands and a segmented rattle at the end. Eastern Massasaugas have been found in a variety of wetland habitats. Some populations of Eastern Massasaugas also utilize open uplands and/or forest openings for foraging, basking, gestation and giving birth.

None of the proposed work will occur in wetlands or adjacent upland habitats. Based on this information it is believed that the Eastern Massasauga species and critical habitat will not be impacted by this project.

Karner blue butterflies usually is associated with landscapes composed of sandy soils, which supported oak or oak-pine savanna or barrens prior to European settlement. Since their historical habitat suffers from fire suppression efforts, the butterfly often occurs in openings, old fields, and right-of-ways surrounded by close-canopied oak forest. Karner blue larvae feed exclusively on wild lupine (Lupinus perennis). Adults visit a wide variety of flowering plants for nectar.

The proposed project alternatives will occur in areas of managed turfgrass which is not a suitable habitat for the Karner blue butterfly. As a result, it is believed that the Karner blue butterfly species and critical habitat will not be impacted by this project.

The Monarch butterfly is a candidate species and not yet listed or proposed for listing. The US Fish & Wildlife Service encourages agencies to take advantage of any opportunity they may have to conserve the species but are not required to consult under the Endangered Species Act.

According to the USF&W species information sheet for Pitcher’s Thistle, the species grows on the open sand dunes and low open beach ridges of the Great Lakes’ shores. It is most often found in near-shore plant communities, but it can grow in all non-forested areas of a dune system.

No improvements are proposed along the Lake Michigan shoreline or any associated dune systems. Additionally, the USF&W *Recovery Plan for the Pitcher’s Thistle* lists the only known distributions of Pitcher’s Thistle in Ottawa County as Hoffmaster Natural Area, Kitchel Dunes, and Rosy Mound, which are well north of the proposed project. Based on this information it is believed that the Pitcher’s Thistle species and critical habitat are not present in the project area.

The Michigan Natural Features Inventory (MNFI) was contacted to ascertain whether any species of fauna or flora listed or proposed to be listed in the MNFI as endangered, threatened, or special concern, or the critical habitat of such species, is found in the vicinity of the proposed project. A letter from Mr. Sanders of MNFI identified eleven potential species within 1.5 miles of the project site (See Table 4).

The letter indicated that there were no concerns for ten of the eleven species identified in the MNFI because records were historic or far removed from the project site. The one species that has been observed in close proximity to the project site is the Merlin falcon.

The Merlin's habitat in Michigan is not seriously threatened and there are no known factors that are critically limiting its present population in the state. In some portions of the country dying or over harvesting of preferred nesting trees in woodlots and shelterbelts is suspected to have impacted Merlin numbers. As such, nesting trees should be protected and human activity within a buffer around nests should be limited. Due to plans to avoid disturbance through conscientious design and construction methods, it is believed that the project is not likely to adversely affect the listed species.

m) Environmental Evaluation Summary

The principal alternatives listed are evaluated in the following tables for environmental and cultural impacts.

Table 18: LSL Replacement Environmental and Cultural Impacts

Resource	Alt. 1 – Directionally Drilling	Alt. 2 – Conventionally Constructing
Cultural Resources	No cultural resources in project area identified at this time	Same as Alt. 1
Air Quality	Negligible impact anticipated	May be temporary impact from dust, no long-term air emissions
Wetlands	No Impact	Same as Alt. 1
Costal Zones / Great Lakes Shoreline	Project within the Michigan Coastal Zone Management Area. Design of the project would need to be consistent with approved state coastal zone management plan and incorporate any mitigative measures recommended by the EGLE WRD.	Same as Alt. 1
Floodplains	No impact	Same as Alt. 1
Natural Rivers	-NA- None in project area	Same as Alt. 1
Surface Waters	No impact	Same as Alt. 1
Topography	Minimal disturbance and all disturbed areas restored to existing grades	All disturbed areas restored to existing grades
Geology	No impact	Same as Alt. 1
Soils	No impact	Same as Alt. 1
Agricultural Resources	-N/A- None in project area	-NA- None in project area
Fauna and Flora	No direct or indirect adverse impacts to state or federally listed wildlife are anticipated.	Same as Alt. 1

H. Technical and Other Considerations

Both alternatives are intended to comply with the requirements of Act 399 and would be designed in accordance with the guidelines in the “Recommended Standards for Waterworks” as published by the Great Lakes and Upper Mississippi Board of State Sanitary Engineers.

2. Alternatives for Chemical Storage Improvements

The other primary objectives of the proposed DWRF project are to replace the existing bulk chemical storage tanks and appurtenant equipment at Holland’s Water Treatment Plant. In alignment with a recommendation in Holland’s most recent Sanitary Survey, a secondary goal of these improvements is to relocate the tanks currently located on the third floor of the WTP's Filtration Building to address safety concerns and to allow that space to be repurposed for other facility needs. Alternatives for the chemical storage improvements include the following:

A. Alternative 1 – Replace Existing Chemical Storage Tanks in Same Location

Alternative 1 would replace the existing FRP tanks with new tanks of the same capacity. It is assumed that the existing steel, rubber-lined Alum tanks will remain in service in the current location. The new bulk tanks will provide adequate chemical storage capacity for the treatment plant capacity of 38.5 million gallons per day (mgd). While this alternative is considered the least expensive from a capital cost perspective, it does not solve the issues identified by the project proposal. Alternative 1 does not create more working space for the additional staff at the WTP. More importantly, it does not alleviate safety concerns with bulk chemical storage located above the occupied operational floor. It also does not allow for easy tank replacement in the future.

B. Alternative 2 – Construct new Chemical Storage Building on WTP Site

Alternative 2 would move bulk chemical storage from the existing plant to a new building. A conceptual layout has been developed for a new chemical storage building. Based on the evaluation of this alternative, the large capital cost makes this a less desirable alternative.

C. Alternative 3 – Expand and Modify Existing Filter Building for Chemical Storage

Although the upfront capital costs of a new building addition are higher than in-situ replacement the added benefits of risk reduction and added efficiency described below make the separate storage option the recommended alternative when considered over the life cycle of the new tanks (15-20 years). We receive polymer in totes rather than bulk storage tanks. This alternative includes relocating two chemicals to the new building addition (Sodium Hypochlorite and Alum), renewing the fluoride bulk tank room, and moving the polymer tanks from the 3rd floor to a newly created space at the existing loading dock. The freight elevator is currently used to lift polymer to the 3rd floor from the loading dock and it is at the end of its useful life. The freight elevator will be removed, and a space created for the polymer to be placed at the dock level. To accommodate access to the 3rd floor, the passenger elevator will be extended to serve the 3rd floor.

D. Alternative 4– No Action

This is not a viable solution for chemical storage. The existing storage tanks are at the end of their useful life and require replacement. Failure to do so could create a situation where the chemical tanks fail catastrophically and can no longer be used. This in turn could create a public safety issue if sufficient chemical cannot be stored on site to allow for proper treatment of drinking water. The No Action option also does not address safety concerns with the location of the current tanks that led to the recommendation in Holland's most recent Sanitary Survey to move the bulk chemicals from the upper floor of the Filter Building. No action was not selected as a Principal Alternative for further analysis

E. Alternative 5 – Optimum Performance of Existing System

This option has already been implemented by Holland. Existing tanks were retrofitted several years ago with liners to extend their useful life. However, these liners were not intended as a permanent solution. The also do not address the Sanitary Survey recommendation to move the bulk chemicals from the upper floor of the Filter Building. As such, this option creates similar risks to those identified under the No Action alternative. Optimum Performance of Existing System was not selected as a Principal Alternative for further analysis

F. Alternative 6 – Regionalization

The Holland system is already a regional water system. Additionally, regionalization is primarily a solution for water supply and not really applicable to a project to replace/relocate chemical storage. Regionalization was not selected as a Principal Alternative for further analysis

G. Monetary Evaluation

a) Sunk Costs

Sunk costs to date include significant internal project planning as well as planning from architecture and engineering firms as well as the existing facilities and land.

b) Present Worth

A net present worth analysis has been completed for the principal alternatives. A 20-year period was used for the analysis. The following capital depreciation breakdown and escalation rates were used for analysis:

Table 19: Depreciation Breakdown

Capital Project Area	Depreciation Period	% of Capital Project
Structures, Buried Piping, etc.	50 years	50%
Electric Infrastructure	30 years	15%
Mechanical Equipment	20 years	25%
Instrumentation & Controls	10 years	10%

Table 20: Present Worth Evaluation Rates

Description	Annual Escalation Rate
Real Discount Rate from OMB Circular No. A-94	2.0%

The results of the net present worth analysis are provided in Table 21. Alternative 3 has a capital cost that is about one third of the capital cost of Alternative 2; the difference in annual operating costs is considered negligible and has not been included in the results. Detailed breakdowns of the opinion of probable costs, O&M costs, and present worth analysis for the principal alternatives are included in Appendix I.

Table 21: Chemical Storage Present Worth Analysis Results

Alternative	Capital Cost	Net Present Worth
2 – Construct New Chemical Storage Building on WTP Site	6,300,000	6,264,868

3 – Expand and Modify Existing Filter Building for Chemical Storage	4,000,000	3,977,694

c) Salvage Value

Due to the various components in this project, the weighted useful life of the project is 31.8 years for alternative 3. Items that fall under the planning period include instrumentation and controls. We have shown replacing this equipment at the 10-year mark and have included this as part of the useful life analysis.

d) Escalation

Neither principal alternative is expected to require additional energy or land compared to the existing operations today. As such, there are no related costs to escalate in the present worth analysis.

e) Interest During Construction

No significant difference in construction timeline is anticipated between the two principal alternatives. As such, interest during construction is assumed to apply equally to both alternatives and has thus been excluded from the present worth analysis.

f) User Costs

Additional user cost calculations have been included in Appendix I and show an average of $0.06/ccf for alternative 2 and $0.04/ccf for alternative 3.

g) Project Delivery Method

Neither principal alternative is proposing to utilize an alternative delivery method.

H. Environmental Evaluation

This section is an analysis of the potential environmental and public health impacts of the Principal Alternatives.

a) Cultural and Historic Resources

As discussed in the project background section, based on information received to date, there is no reason to believe there are any historic, tribal historical or archaeological sites in the project area.

b) Air Quality

Neither of the proposed principal alternatives conflicts with the State Implementation Plan for Air Quality. During construction, dust suppression will be applied if determined to be necessary to avoid any dusting of the site and surrounding area. There are no foreseen indirect emissions that will result from the construction or operation of either principal alternative.

c) Wetlands

The Ottawa County Final Wetland Inventory as compiled by EGLE has been used to identify wetlands in the study area (see Appendix E). Based on review of the Wetland Inventory Map it does not appear as though either principal alternative will impact any wetland areas.

d) Great Lakes Shorelands, Coastal Zones, and Coastal Management Areas

The project area does not include any federally listed coastal barrier zones, but the project area is within the Michigan Coastal Zone Management Area (see map in Appendix E). As a result, the design of either principal alternative shall be consistent with the approved state coastal zone management plan by complying with all required permits per the response letter provided by Matt Smar of the Field Operations Support Section of the Water Resourced Division of EGLE.

e) Floodplains

Based on evaluation of the FEMA floodplain map for the study area (see Appendix E), neither of the principal alternatives are in the area of a 100-year floodplain.

f) Natural or Wild and Scenic Rivers

There are no Natural Rivers within the study area according to the list of these rivers produced by the Michigan Department of Natural Resources, so this factor is not applicable to either principal alternative

g) Major Surface Waters

Lake Michigan, Lake Macatawa, and the Macatawa River are the most significant surface water bodies within the study area. Neither of the principal alternatives should impact these water bodies. The principal alternatives do not involve construction which will adversely impact the ground water or surface water.

h) Topography

No notable impact is anticipated on the area topography. For both principal alternatives, disturbed areas will be restored with grading similar to pre-construction. Primary changes are simply to facilitate proper drainage and storm water controls on site.

i) Geology

No difference in impact is expected between the principal alternatives with respect to local geological structures and formations.

j) Soils

Generally, the soils at the Holland Water Treatment Plant, site of the water supply improvement alternatives are classified as Rubicon Sand with 0 - 6% slopes. Neither principal alternative will impact soils in the area.

k) Agricultural Resources

There are no prime, unique, or locally important farmlands in the vicinity of the WTP. Neither principal alternative will impact agricultural resources in the area.

l) Fauna and Flora

The Fauna and Flora discussion above describes the lack of potential impacts for both the proposed service line replacement and WTP work.

m) Cultural and Environmental Evaluation Summary

The principal alternatives listed are evaluated in the following tables for environmental and cultural impacts.

Table 22: Chemical Storage Environmental and Cultural Impacts

Resource	Alt. 2 – New Chemical Storage Building	Alt. 3 – Expand and Modify Existing Building
Cultural Resources	No Cultural Resources in project area	Same as Alt. 1
Air Quality	May be temporary impact from dust, no long-term air emissions	May be temporary impact from dust, no long-term air emissions
Wetlands	No Impact	Same as Alt. 1
Costal Zones / Great Lakes Shoreline	Project within the Michigan Coastal Zone Management Area. Design of the project would need to be consistent with approved state coastal zone management plan and incorporate any mitigative measures recommended by the EGLE WRD	Same as Alt. 1
Floodplains	No impact	Same as Alt. 1
Natural Rivers	-N/A- None in project area	Same as Alt. 1
Surface Waters	No impact	Same as Alt. 1
Topography	All disturbed areas restored with minimal change to existing grades. Changes primarily are anticipated to facilitate proper drainage and storm water controls	Same as Alt. 1
Geology	No impact	Same as Alt. 1
Soils	No impact	Same as Alt. 1
Agricultural Resources	-N/A- None in project area	-N/A- None in project area
Fauna and Flora	No direct or indirect adverse impacts to state or federally listed wildlife are anticipated.	Same as Alt. 1

I. Technical and Other Considerations

All alternatives are intended to comply with the requirements of Act 399 and would be designed in accordance with the guidelines in the “Recommended Standards for Waterworks” as published by the Great Lakes and Upper Mississippi Board of State Sanitary Engineers.

IV. Selected Alternative

The selected alternative for the LSL replacements is Alternative 1 – Trenchless Installation of New Services. This alternative was selected because it is the most cost effective and also creates the least impact on environmental and cultural factors. Additionally, the disturbance to customers during construction is minimized. A map of the location of the water services to be replaced using this alternative is included as Appendix G.

The selected alternative for Chemical Storage is Alternative 3 – Expand and Modify Existing Filter Building for Chemical Storage. The alternative was selected because it is the most cost-effective solution to address the desired relocation of chemical storage at the Water Treatment Plant site. This alternative makes the best use of existing space while providing good access for future chemical storage tank replacements with minimal new structure addition as opposed to a new stand-alone building. Other benefits include the increased safety of moving the chemical storage area away from occupied workspaces, better traffic flow for chemical deliveries, increased workspaces for WTP staff, and new chemical storage solutions that allow for robust and continuous WTP operations.

1. Design Parameters

The design of all improvements is being done in accordance with the *Recommended Standards for Water Works* published by the Great Lakes – Upper Mississippi River Board of State and Provincial Public Health and Environmental Managers (more commonly referred to as Ten State Standards).

Design of private side lead service line replacement work shall be to replace existing galvanized services with new copper services of the same size.

In general, the design of new bulk chemical storage tanks is being done to provide the minimum 30 days of storage required by the Ten States Standards. As part of the preliminary design, engineers from Prein & Newhof conducted an analysis of storage volume needs. Table 23 highlights the recommended volumes and number of tanks for each:

Table 23: Preliminary Sizing of Bulk Chemical Storage Tanks

Chemical	Recommended Storage Volume (gallons)	Number of Tanks	Volume per Tank (gallons)	Recommended Storage Volume (gallons)
Sodium Hypochlorite	17,880	2	9,000	18,000
Alum	11,514	2	12,000	12,000
Fluoride	5,100	2	2,550	5,100
Polymer	Not recommended for bulk storage due to shelf life and cost			

Tank materials were also evaluated by Prein and Newhof with materials compared based upon ability to meet project parameters and priorities (sloped bottoms, height limitations, tolerance of heat for alum deliveries, etc.). The analysis looked at the ability of materials to meet project parameters and priorities as well as a life cycle comparison of alternatives. To ensure the project goals identified by HBPW are met, it was recommended the HBPW install FRP chemical storage tanks for all bulk chemical storage. The recommendation of FRP tanks ensures excellent material properties including high tensile strength, low coefficient of expansion, and good resistance to higher temperatures. It also provides serviceability through a full drain and good access for maintenance. These features and life cycle cost supported the FRP selection.

A construction permit is required under the Michigan Safe Drinking Water Act, 1976 PA 399, as amended (Act 399).

2. Useful Life

The proposed project is composed of a variety of components and equipment with varying useful life estimates. A weighted average of the expected useful life for the project was computed. The following methodology was used to calculate the weighted average of the expected useful life:

$$Project\ Weighted\ Useful\ Life = \frac{\sum(Asset\ Value \times Estimated\ Useful\ Life)}{Project\ Cost\ for\ All\ Assets}$$

The weighted average of the expected useful life for the project is 31.8 years. The 20-year loan term that is being sought for this project is less than the expected useful life of the project. Useful life documentation, including the calculations for the expected useful life of the project, is included in Appendix I.

Of note to the useful life calculation is that the private side service replacements were not included in the analysis. They were excluded because these assets are ultimately the property of the associated customers rather than Holland BPW. However, if included in the analysis they would have extended the useful life even further than the value already calculated.

3. Water and Energy Efficiency

The chemical storage addition does not affect our water or energy efficiency from an operational standpoint. Efficiencies are gained for replacing equipment such as chemical storage tanks and pumps in the future.

Replacement of lead service lines will result in removal of some leaking services. This will result in water conservation and reduced energy utilization through decreased pumpage. The exact quantity of water conserved is not known but can be estimated from system data once the work is complete.

4. Schedule for Design and Construction

The major activities and project milestones are shown in the chart below. This schedule takes into account the time required for design, financing, bidding, lead time on ordering and receiving materials, processing of permits and seasonal restrictions on construction. The schedule is tentative and assumes State Fiscal Year 3rd quarter 2024 loan closing.

Task Name	Start	Finish
Public Meeting and Final Project Plan Submitted	5/8/2023	6/1/2023
EGLE Review & Publication of Priority List	6/1/2023	9/30/2023

Design of Project & Permitting	8/9/2022	2/28/2024
Parts I and II of Financial Application Submitted	1/2/2024	2/14/2024
All Project Clearances Obtained & Plans Approved	2/14/2024	3/7/2024
Project Bid and Contractor Selection	3/1/2024	4/15/2024
Part III of Financial Application Submitted	4/1/2024	4/15/2024
Final Loan Closing	4/16/2024	6/5/2024
Construction of Project	6/10/2024	12/13/2025

5. Cost Summary

The following table outlines all costs, including planning, design, construction, and operation and maintenance of the selected alternatives. Detailed opinions of probable costs are provided in Appendix I.

Selected Alternatives	Construction	Engineering	Total (Includes contingencies)
Directionally Drill New Service Lines	$5,200,000	$200,000	$6,000,000
Expand and Modify Existing Filter Building for Chemical Storage	$2,900,000	$600,000	$4,000,000

The current user charge system for the Holland Board of Public Works retail customers includes both a readiness to serve and commodity charge. Below is a summary of the current user charges for retail customers:

Readiness to Serve Charge: $11.99 per month for 5/8” meter

Commodity Charge: $1.74 per 100 cubic feet (ccf)

Average residential usage in the Holland water system is approximately 10 ccf per month. Based on the current rate structure, the average monthly bill for a residential customer is $29.39.

Total impact of the proposed improvements is approximately $0.09 per ccf. This equates to approximately $0.90 per month or an increase of approximately 3.1%.

During annual budgeting, Holland BPW reviews rates and makes recommendations for any adjustments needed to assure sufficient revenue to meet reserves policy requirements and the anticipated operating expenses and debt retirement. Rate adjustments are then brought annually to Board and Council for approval with the budget.

In addition to seeking approval of the necessary rate increase for the next fiscal year, the HBPW also identifies the necessary rate track for the next five years and presents this information to Board and

Council for planning purposes. The target rate track developed for Holland BPW's water utility in the Fiscal Year 2024 budget outlined rate increases of 5% in FY24, 4% in FY25, 4% in FY26, 3.5% in FY27, and 3.5% in FY28. These increases account for increasing chemical and power costs impacting the water utility's operating budget and the five-year capital improvement plan which includes the work proposed herein. HBPW has proactively worked to address the replacement of the utility owned portion of LSLs during water main replacement projects, which are typically also timed with other utility and street work to experience efficiencies in construction costs, as well as eliminate as much as possible the need for future street work associated with unplanned utility upgrades. The requirement for the utility to address the private side portion of the LSL that wasn't replaced when the utility side was addressed, is an added expense, contributing partially to the planned rate increases noted above.

6. Implementability

The City of Holland and the Holland Board of Public Works are familiar with the legal, technical, financial and managerial aspects necessary to complete municipal utility improvements. The City and Board have overseen the preparation of engineering plans, solicited bids, and supervised construction for many public improvement projects in recent years. Additionally, the City and Board have the staff and resources to manage all aspects of the proposed project.

V. Environmental and Public Health Impacts

1. General

This section summarizes the environmental impacts of the final selected alternatives. The detailed descriptions of all the environmental factors affecting the study area are covered in Section I.3. See that section for a complete discussion.

Environmental impacts in the guidance for Project Plan preparation are defined to include cultural, social, and economic impacts characterized as follows:

Beneficial Impacts: Those impacts that have a positive effect on the environment and the community.

Adverse Impacts: Those impacts that have a negative effect on the environment and the community.

2. Direct Impacts

Direct Impacts are the social and environmental impacts that are directly attributable to the construction and operation of the project. This section summarizes the anticipated direct impacts as a result of the proposed improvements.

A. Construction Impacts

Impacts associated with the construction of the project are by nature temporary and include the following:

a) Beneficial Impacts

No beneficial impacts were identified relative to project construction.

b) Adverse Impacts

Noise

The construction of the project will result in noise at times that could be disruptive to residents or businesses in the area of the construction.

Dust

Some project activities (excavation and grading) may create opportunities for dust that could impact area residents or businesses.

Soil Erosion and Sedimentation

Excavation and grading activities may also create opportunities for soil erosion and sedimentation control.

Pedestrian Path Closures

While no roadway detours are anticipated as part of the LSL replacement work, it is very possible that sidewalks and other pedestrian paths may be temporarily impacted by the work.

B. Operational Impacts

Impacts associated with the operation of the project are by nature more long-term and include the following:

a) *Beneficial Impacts*

Mitigation of Public Health Risk

While Holland does not have any history of elevated lead concentrations in its distribution system, elimination of a large number of LSLs will still provide reduced public health risk.

Improved Water Pressure

Customers receiving new copper services in lieu of existing aged galvanized LSLs are expected to see noticeable improvement in water pressure.

Reliability

Customers receiving new copper services in lieu of existing galvanized LSLs are expected to have more reliable service. Existing galvanized lines tend to be heavily corroded and are more subject to failures.

Reduced Water Loss

Due to the corrosion of galvanized services, they are more likely to have leaks than copper services. Replacement of these services thus should result in less unaccounted for water losses in the distribution system.

Improved Safety

Relocation of chemical storage tanks from the third floor at the Water Treatment Plant will mitigate safety risks for plant staff and guests.

b) *Adverse Impacts*

No adverse impacts were identified relative to project operations.

C. Social Impacts

Lead water services have received substantial local and national attention in recent years. This is a subject of importance to individuals across the country due to news stories from communities that have experienced challenges around this issue. While Holland's test results for lead remain very low, expediting replacement of LSLs in the Holland system is still expected to be received well by the community and thus will have a beneficial social impact.

D. Cumulative Impacts

There are no other related infrastructure improvements from the proposed project that would result in a cumulative impact to the environment or public health.

VI. Mitigation

1. Short-Term Construction Related Mitigation

The project contracts will dictate methods designed to minimize construction related impacts. These are briefly outlined as follows:

- **Safety**
  The contractor will be required by the contract documents to comply with the HBPW Contractor Safety Program and follow all MIOSHA safety regulations.

- **Dust control**
  The contract documents will require that the contractor employ dust control measures as needed and monitored by the on-site inspector. Dust control measures include the use of approved dust control chemicals, the use of water, and cleanup to minimize dust generation.

- **Noise control**
  The construction times will be limited to those allowed by the City of Holland's noise control ordinance. The noise from construction will not be excessive with the normal construction equipment used for the construction of buildings and process equipment.

- **Soil erosion and sedimentation control**
  Soil erosion and sedimentation control measures will be required for all construction. All necessary permits will be obtained and necessary Best Management Practices in place prior to commencement of construction.

2. Mitigation of Long-Term Impacts

Prudent design measures will avoid long-term or irreversible adverse impacts. Where it is not feasible to completely avoid impacts, mitigation will be completed to ensure that sensitive features do not suffer permanent or irreversible adverse environmental impacts.

A. Permits

All Part 399 construction permits will be obtained prior to construction. Similarly, any Soil Erosion and Sedimentation Control permits and building permits related to the planned work at the Water Treatment Plant will be obtained prior to construction.

B. Siting Decisions

The Water Treatment Plant Chemical Storage improvements identified herein are all to be located on public lands which already contain existing water infrastructure. Private Side LSL replacements will require agreements to facilitate the work being performed on private property. Holland BPW staff has worked with customers in the past to obtain these agreements and will work with homeowners to receive the necessary approvals for this project as well.

C. Operational Impacts

Impacts occurring as a result of facility operation, including noise and operational accidents, will be mitigated during design of the improvements. Material and energy costs will be considered during design and minimized to the extent possible during design. Negative impacts occurring during use of the completed facilities will be mitigated through the use of HBPW standard operating procedures.

3. Mitigation of Indirect Impacts

A. Impacts on Growth and Development

The growth rate, density and type of development are not expected to change as a result of this project. Any growth that does occur in the project area is expected to be in accordance with the City of Holland's Master Plan or in accordance with Fillmore, Holland Charter, Laketown, and Park Townships respective master plans. No changes are anticipated to the plans as a result of this project.

VII. Public Participation

1. Public Meeting

A public meeting describing the draft project plan will be held at 4:00 PM on Monday, May 8, 2023 at the Holland Board of Public Works' Service Center as part of a regular HBPW Board of Directors Meeting.

2. Public Meeting Advertisement

A notice of the public meeting was posted on the Holland BPW website and via the BPW's social media accounts on Friday, April 28, 2023, ten days prior to the public hearing.

3. Public Meeting Summary

Section to be completed following meeting.

4. Adoption of Project Plan

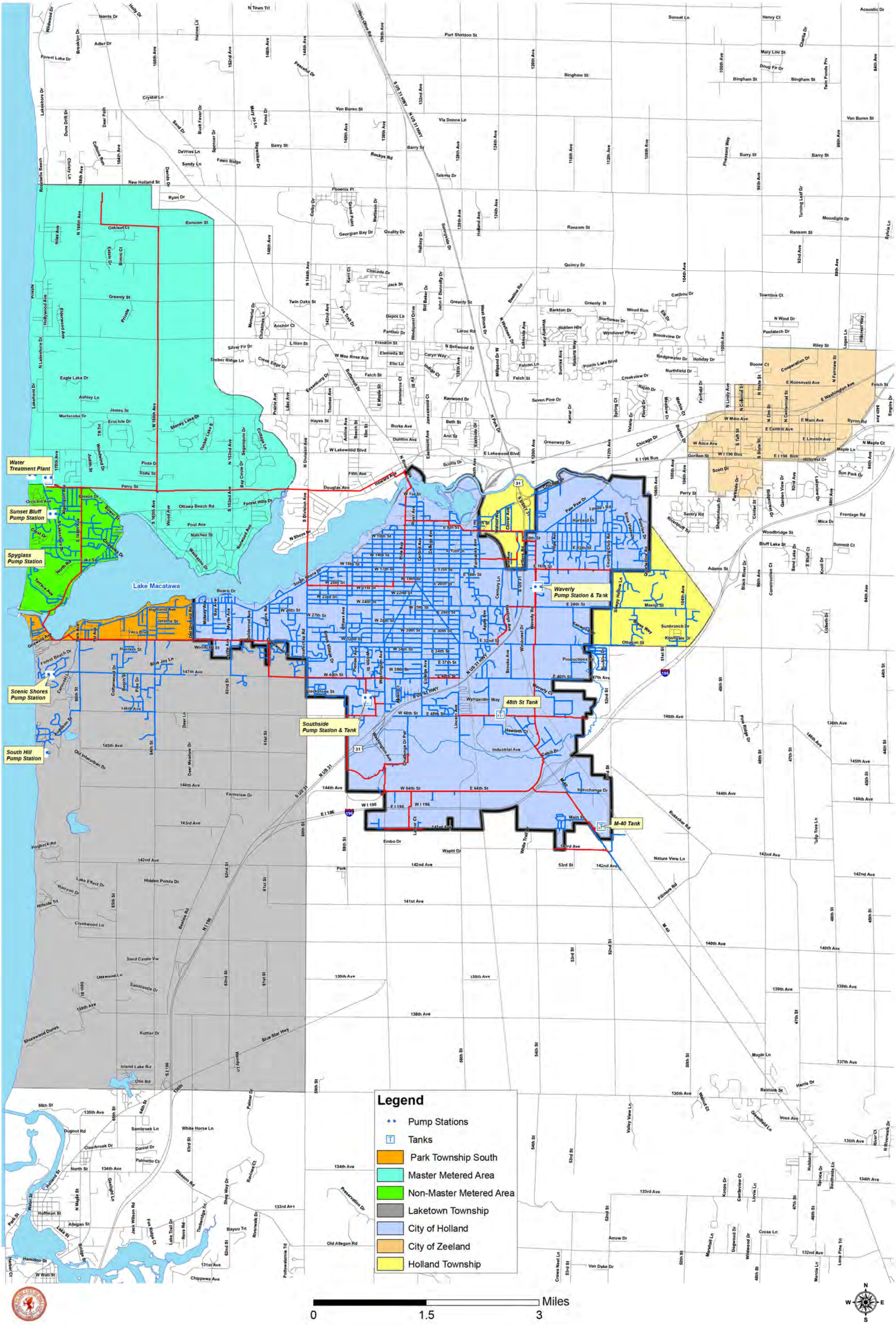
Section to be completed following meeting.

Appendix A

Study Area Map

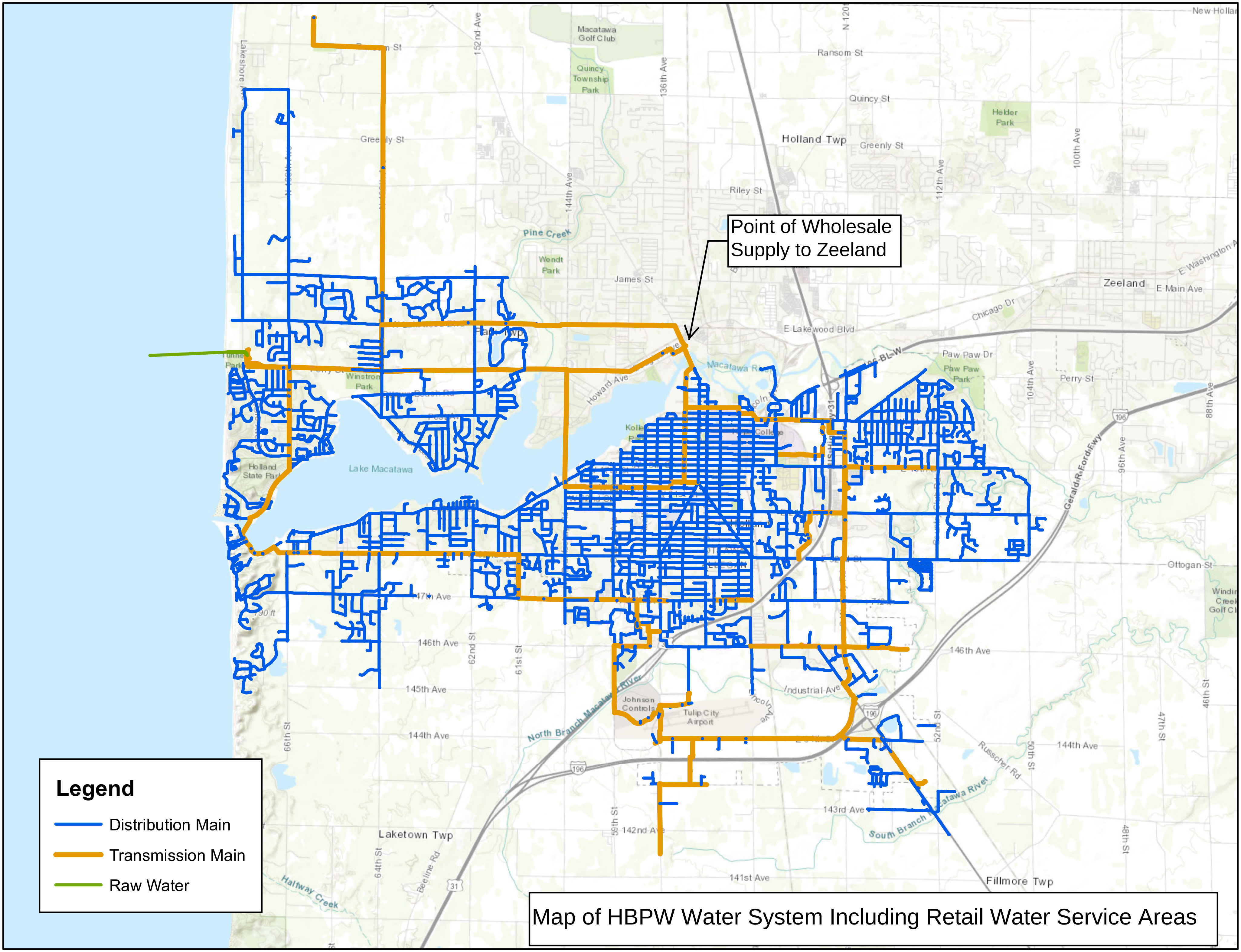
Figure A-1

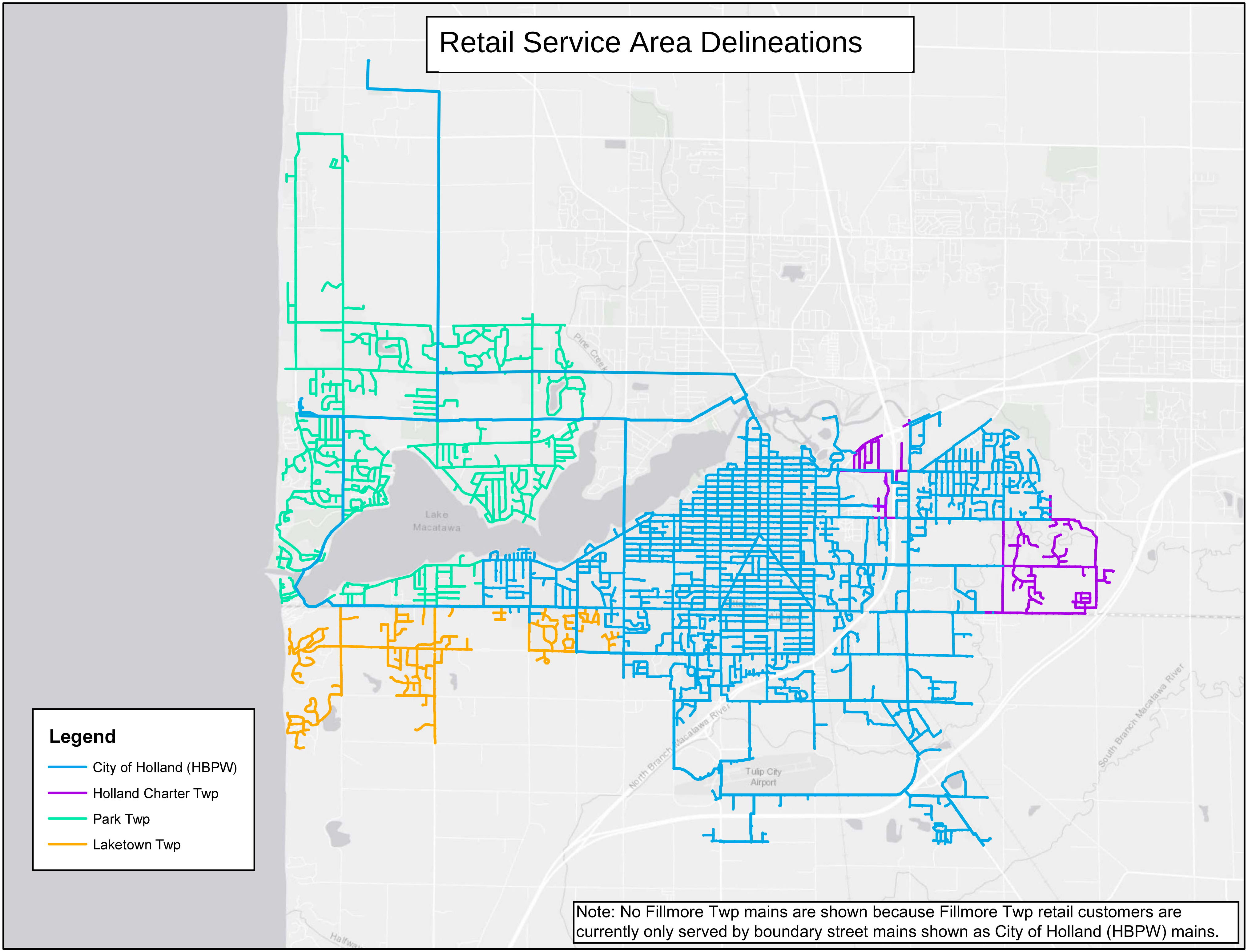
Holland Board of Public Works
Water Service Area by Contract



Appendix B

Service Area Map

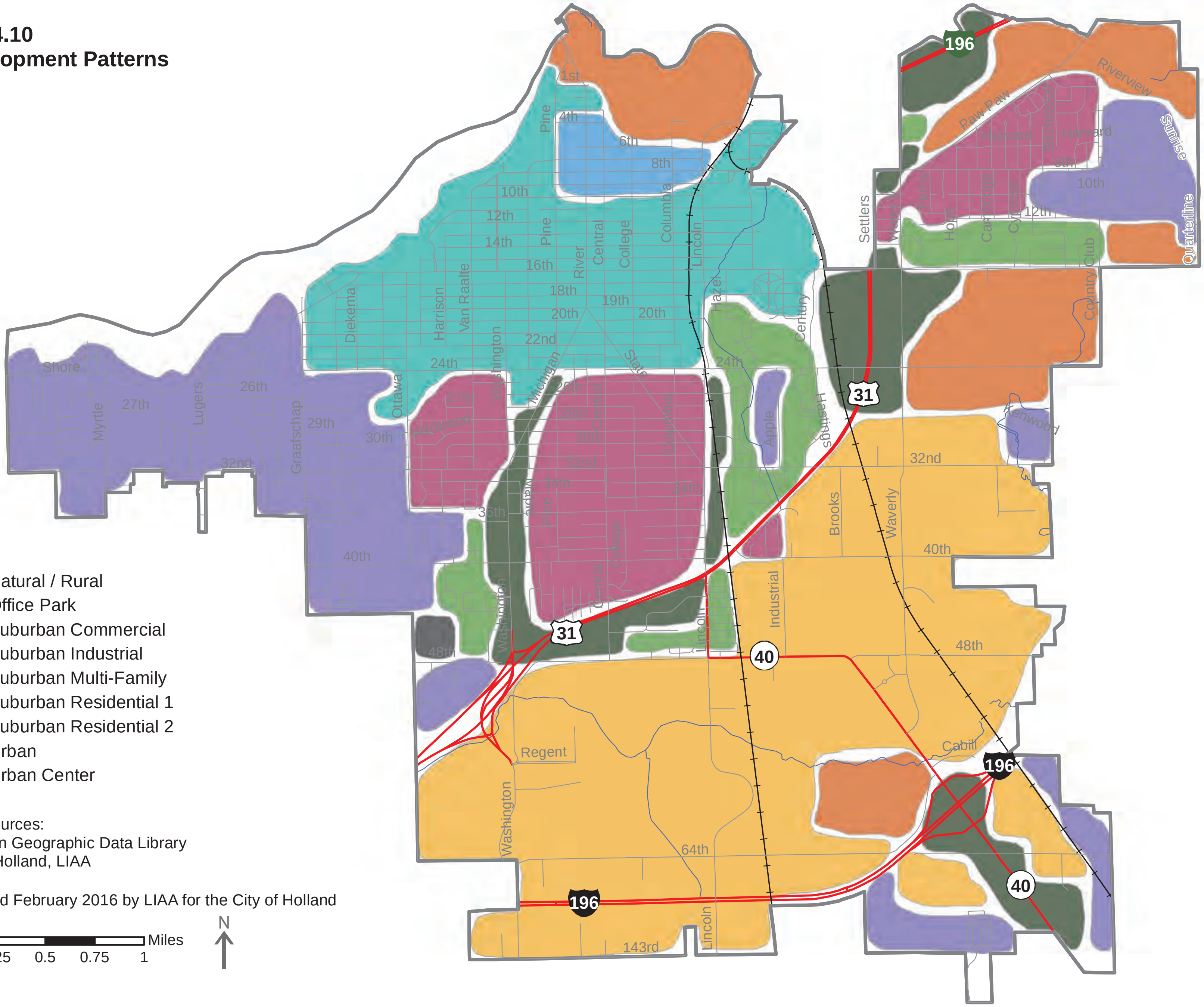

Map of HBPW Water System Including Retail Water Service Areas
Point of Wholesale Supply to Zeeland
Legend
Distribution Main
Transmission Main
Raw Water
Macatawa Golf Club
Quincy Township Park
Ransom St
Quincy St
Holland Twp
Greenly St
Helder Park
Riley St
Pine Creek
Wendt Park
James St
Zeeland
E Main Ave
E Washington Ave
Chicago Dr
E Lakewood Blvd
Paw Paw Dr
Paw Paw Park
Perry St
Macatawa River
Lake Macatawa
Holland State Park
Winstrom Park
Howard Ave
Ottogan St
146th Ave
145th Ave
144th Ave
143rd Ave
142nd Ave
141st Ave
Industrial Ave
Tulip City Airport
Johnson Controls
North Branch Macatawa River
South Branch Macatawa River
Laketown Twp
Fillmore Twp
Halfway Creek
Beeline Rd
Russcher Rd
Gerald R Ford Fwy
66th St
64th St
62nd St
61st St
59th St
52nd St
50th St
48th St
47th St
46th St
152nd Ave
144th Ave
136th Ave
112th Ave
104th Ave
100th Ave
96th Ave
88th Ave
Lakeshore Ave


Retail Service Area Delineations
Legend
City of Holland (HBPW)
Holland Charter Twp
Park Twp
Laketown Twp
Note: No Fillmore Twp mains are shown because Fillmore Twp retail customers are currently only served by boundary street mains shown as City of Holland (HBPW) mains.
Lake Macatawa
Pine Creek
North Branch Macatawa River
Tulip City Airport
South Branch Macatawa River

Appendix C

Planning Information

Map 4.10
Development Patterns



Natural / Rural
Office Park
Suburban Commercial
Suburban Industrial
Suburban Multi-Family
Suburban Residential 1
Suburban Residential 2
Urban
Urban Center

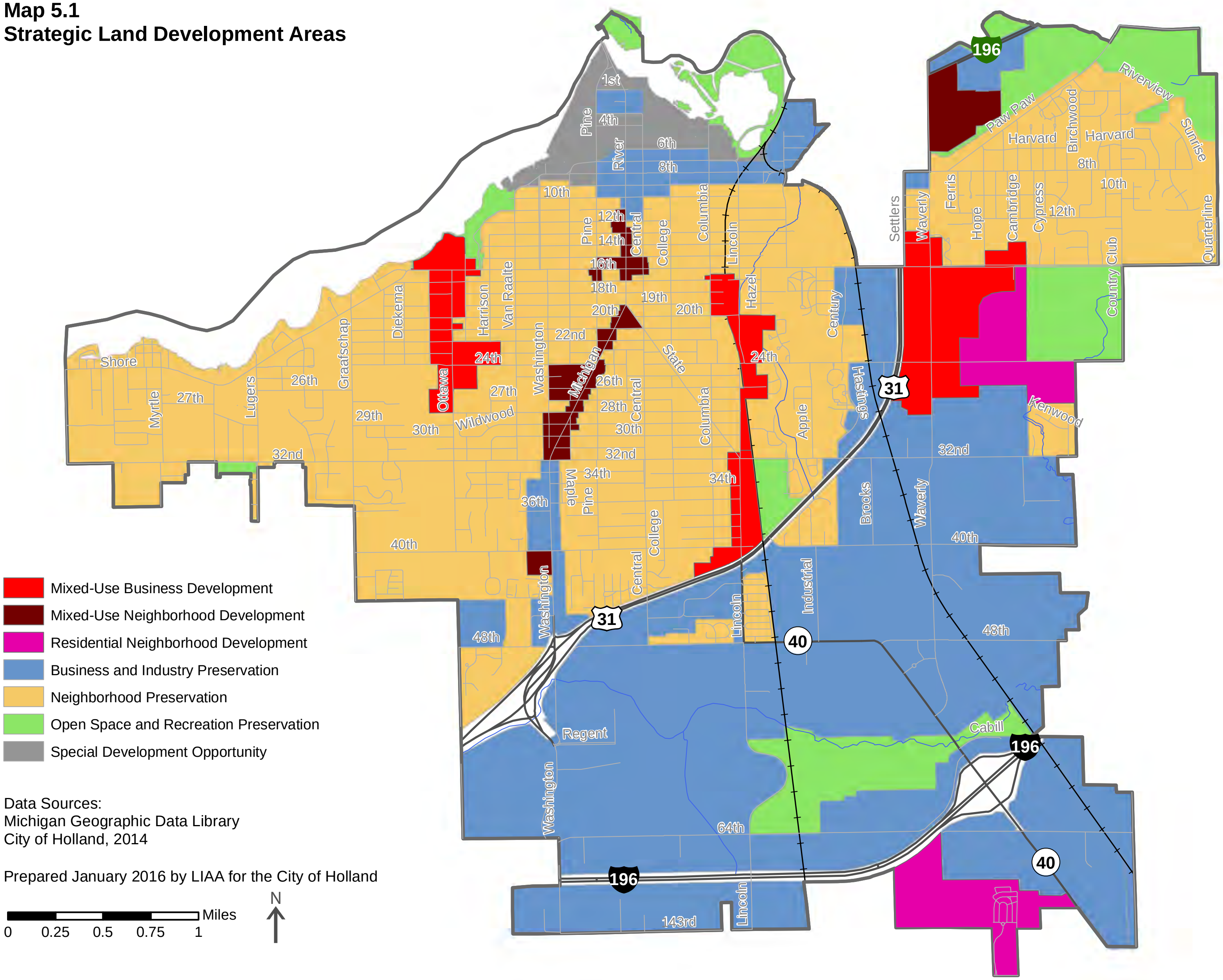
Data Sources:
Michigan Geographic Data Library
City of Holland, LIAA

Prepared February 2016 by LIAA for the City of Holland

Miles
0 0.25 0.5 0.75 1

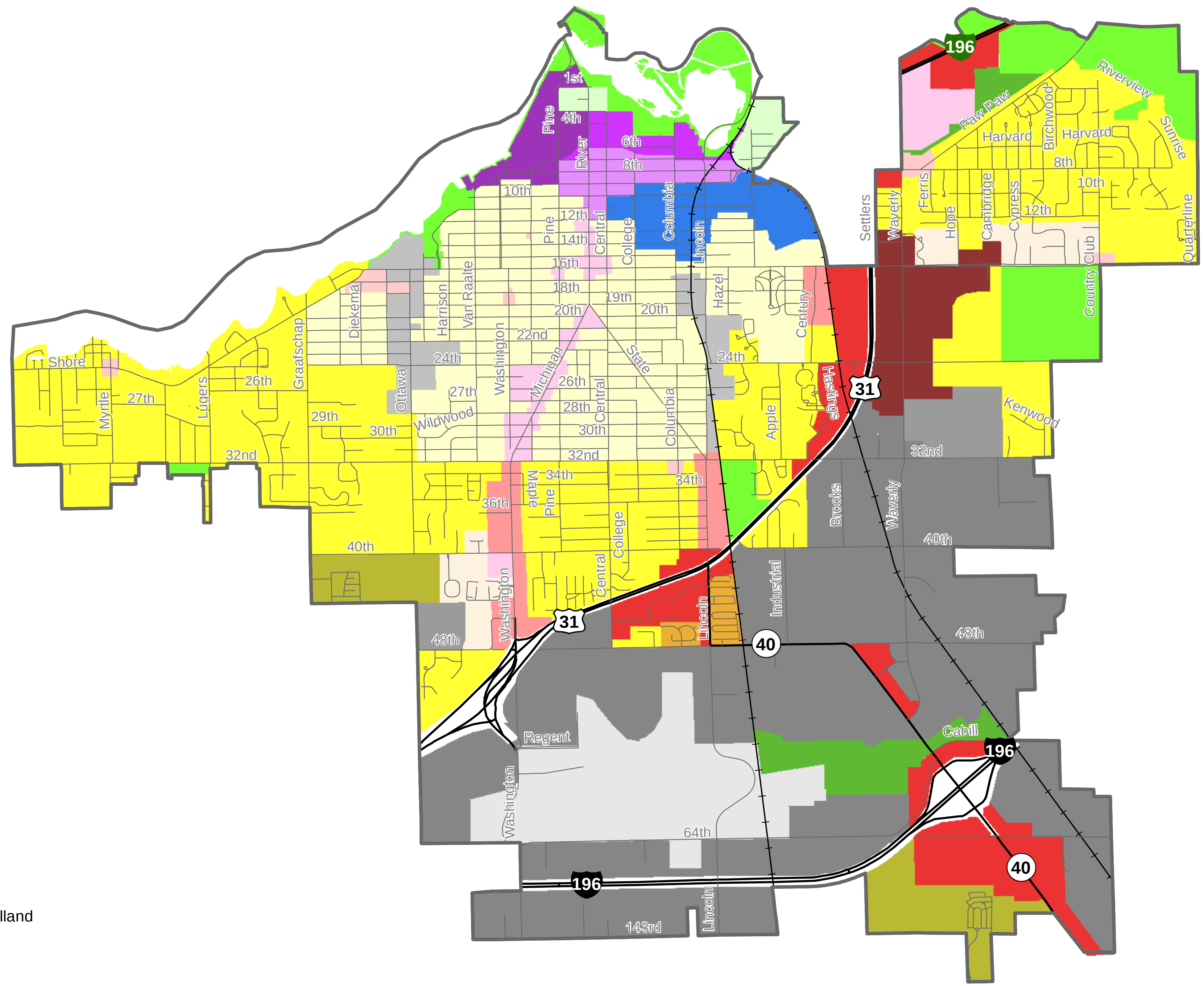
N

Map 5.1
Strategic Land Development Areas



Map 5.2
Future Land Use

- Airport Business District
- Business Development Area
- Research and Development
- Industrial
- Neighborhood Commercial
- Arterial Commercial
- Highway Commercial
- Marketplace Commercial
- Mixed-Use Village
- Central Downtown
- Northern Downtown
- Waterfront Downtown
- Urban Residential
- Suburban Residential
- Neo-Traditional Residential
- Apartment Residential
- Mobile Home Residential
- Essential Service Area
- Regional Park
- Environmentally Sensitive Areas
- College Campus District



Data Sources:
Michigan Geographic Data Library
City of Holland

Prepared January 2016 by LIAA for the City of Holland

Miles
0 0.25 0.5 0.75 1
N

PUBLIC SAFETY

The Public Safety department provides full-time fire fighting, police, and emergency medical services within the City of Holland. Fire fighting services are provided from three stations located on Waverly Road, Kollen Park Drive, and a joint City of Holland and Park Township facility located on 160th Avenue in Park Township. The Holland Department of Public Safety Police Operations is located at 89 West 8th Street.

UTILITIES

The Holland Board of Public Works (HBPW), a community-owned utility, provides electric, water, and wastewater treatment services within the City. Additionally, the HBPW provides fiber optic communications service to residents and businesses. The HBPW seeks to provide reliable, cost-effective utility services while maintaining environmental responsibility.[37]

Holland's water distribution system includes a water treatment plant on Lake Michigan, four water storage tanks, five pump stations, and 240 miles of water main lines. The water treatment plant has the capacity to treat 38.5 million gallons of water per day. Water service is provided to the City of Holland and some portions of Park, Laketown, and Holland Charter Townships, as well as to the City of Zeeland. The HBPW also provides wastewater treatment for the City of Holland and parts of Park, Laketown, Fillmore, Zeeland and Holland Charter Townships. The sanitary sewer system is completely separated from the storm sewer system and contains nearly 190 miles of sanitary sewer pipe. Wastewater is treated at the Water Reclamation Facility on S. River Avenue and is ultimately released into Lake Macatawa.

The HBPW generates, transmits, and distributes electricity to customers in Holland and portions of the surrounding townships. Currently, electricity is generated at local facilities and the HBPW has ownership and purchased power agreements outside of the system for generation using coal, natural gas, wind and landfill gas. Supplemental power is also purchased on the open market. The HBPW is currently constructing a new natural gas combined-cycle power plant that is projected to be completed in 2017. Fiber optic communications service is also available through the HBPW owned and operated fiber optic network.

In 2011, the City of Holland adopted the Holland Community Energy Efficiency and Conservation Strategy (Community Energy Plan) to help Holland meet a variety of economic, environmental, and energy supply reliability goals.[38] The Community Energy Plan makes a variety of recommendations to improve energy efficiency, reduce pollution, and strengthen local energy production over the next 40 years. This Master Plan supports the recommendations of the Community Energy Plan as they can help improve quality of life for Holland residents and greatly improve the community's resilience. The City should continue to work closely with the HBPW to educate citizens on ways to improve energy efficiency and offer assistance through programs like the Holland Home Energy Retrofit Program.

37 For more information, see HBPW's website at: www.hollandbpw.com/about-us
38 See the Community Energy Planning Information page on the City's website for current updates.

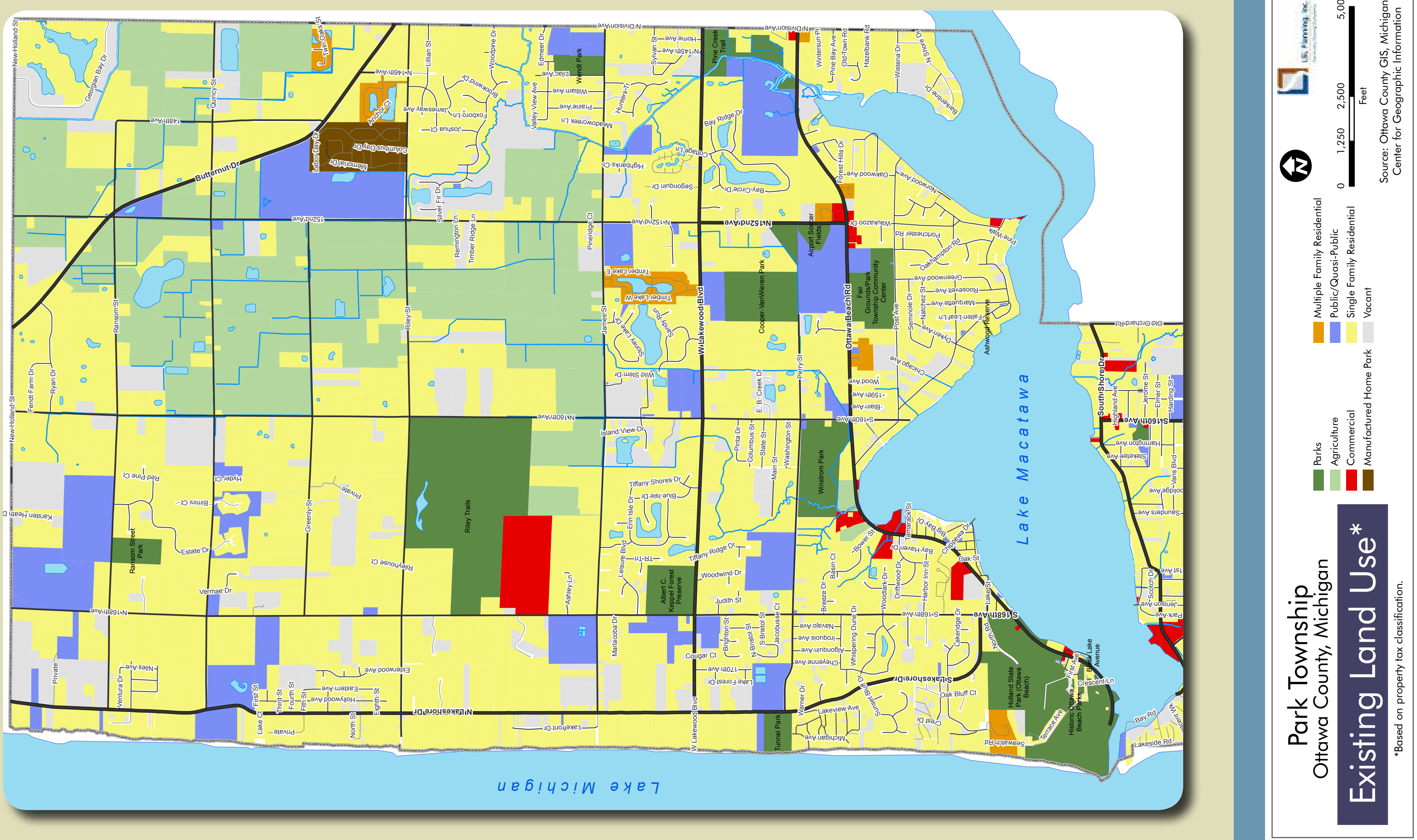
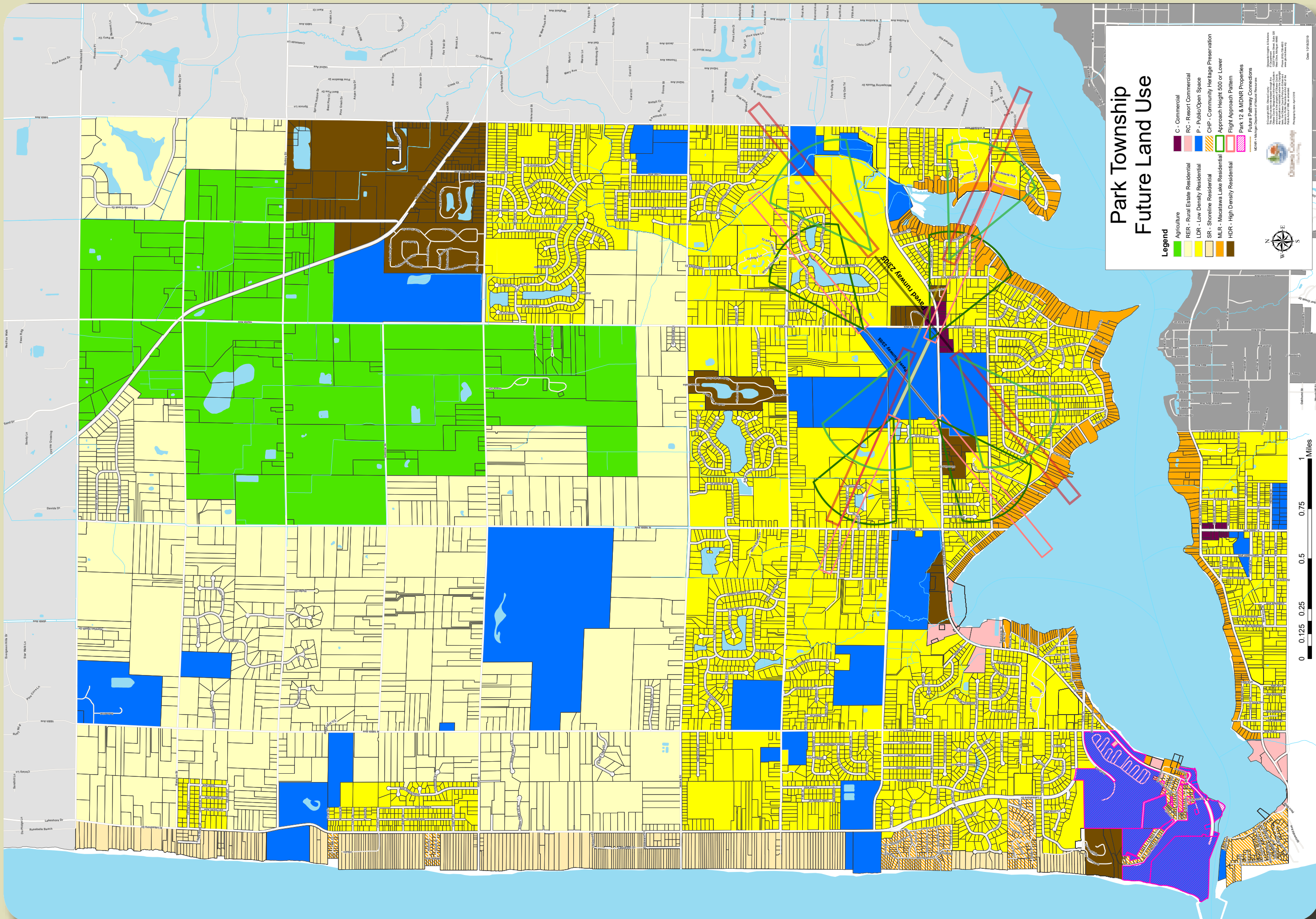

Park Township
Ottawa County, Michigan
Existing Land Use*
*Based on property tax classification.
Parks
Agriculture
Commercial
Manufactured Home Park
Multiple Family Residential
Public/Quasi-Public
Single Family Residential
Vacant
0 1,250 2,500 5,000
Feet
Source: Ottawa County GIS, Michigan Center for Geographic Information
Lake Michigan
Lake Macatawa
Riley Trails
Winstrom Park
Cooper-VanWieren Park
Airport Soccer Fields
Fair Grounds/Park Township Community Center
Holland State Park (Ottawa Beach)
Tunnel Park
Ransom Street Park
Albert C. Keppel Forest Preserve
Wendt Park
Pine Creek Trail
Ashwood Reserve
Historic Ottawa Beach Parks
N Lakeshore Dr
S Lakeshore Dr
Butternut Dr
W Lakewood Blvd
Ottawa Beach Rd
N 152nd Ave
N 160th Ave
N 168th Ave
N 148th Ave
S 160th Ave
S 168th Ave
South Shore Dr
N Division Ave
Riley St
James St
Greenly St
Ransom St
Quincy St
New Holland St

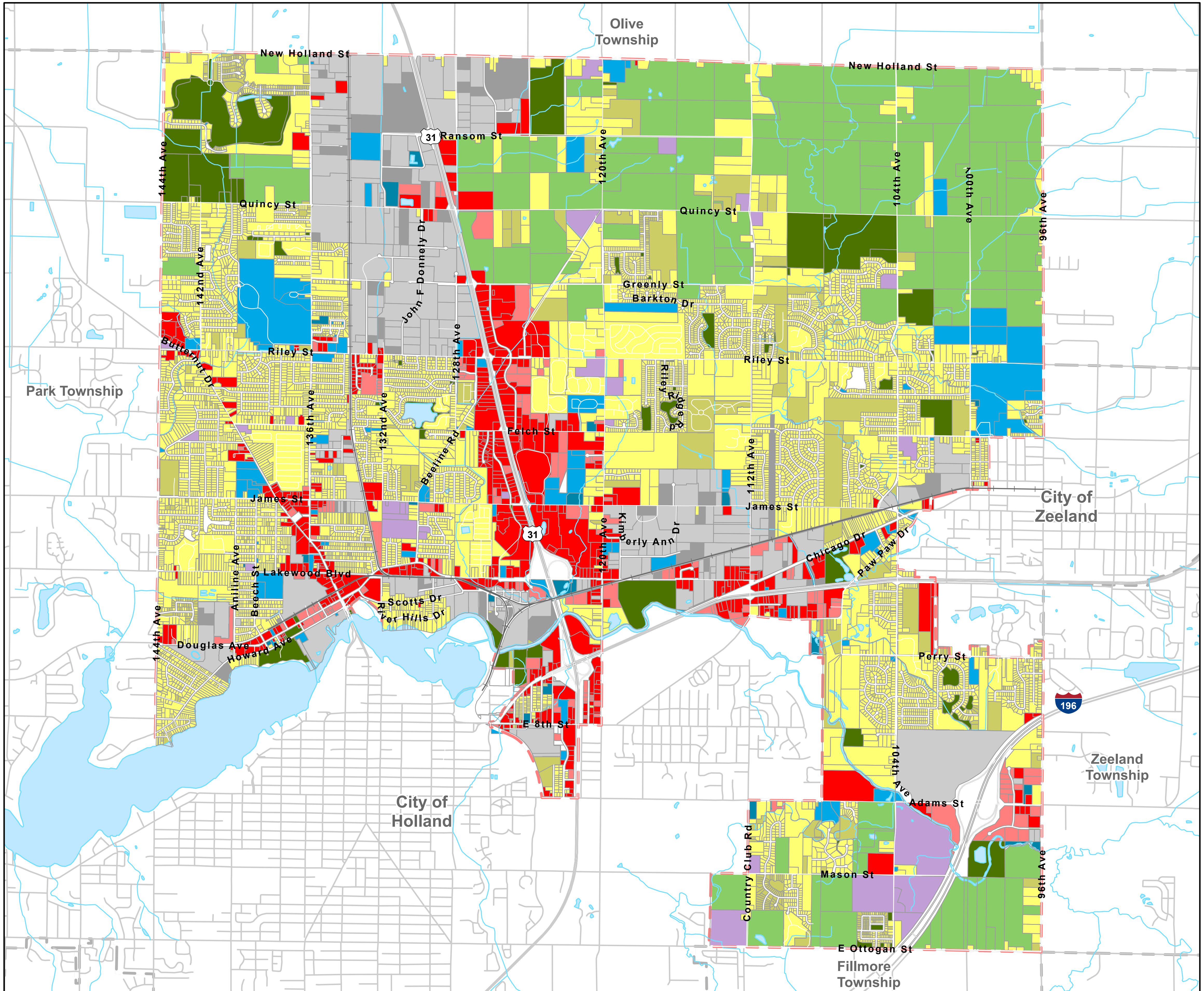
Figure 30 - Future Land Use Map



Existing Land Use

Charter Township of Holland, Ottawa County, MI

May 5, 2020



LEGEND

- Holland Charter Township Boundary
- Agricultural
- Residential
- Residential - Vacant
- Commercial
- Commercial - Vacant
- Industrial
- Industrial - Vacant
- Educational
- Public - Federal, State, or Local
- Religious
- Parks/Cemeteries/Open Space
- Railroads
- Rivers, Lakes, Streams, Drains
- Other Municipal Boundaries

0 500 1,000
Feet

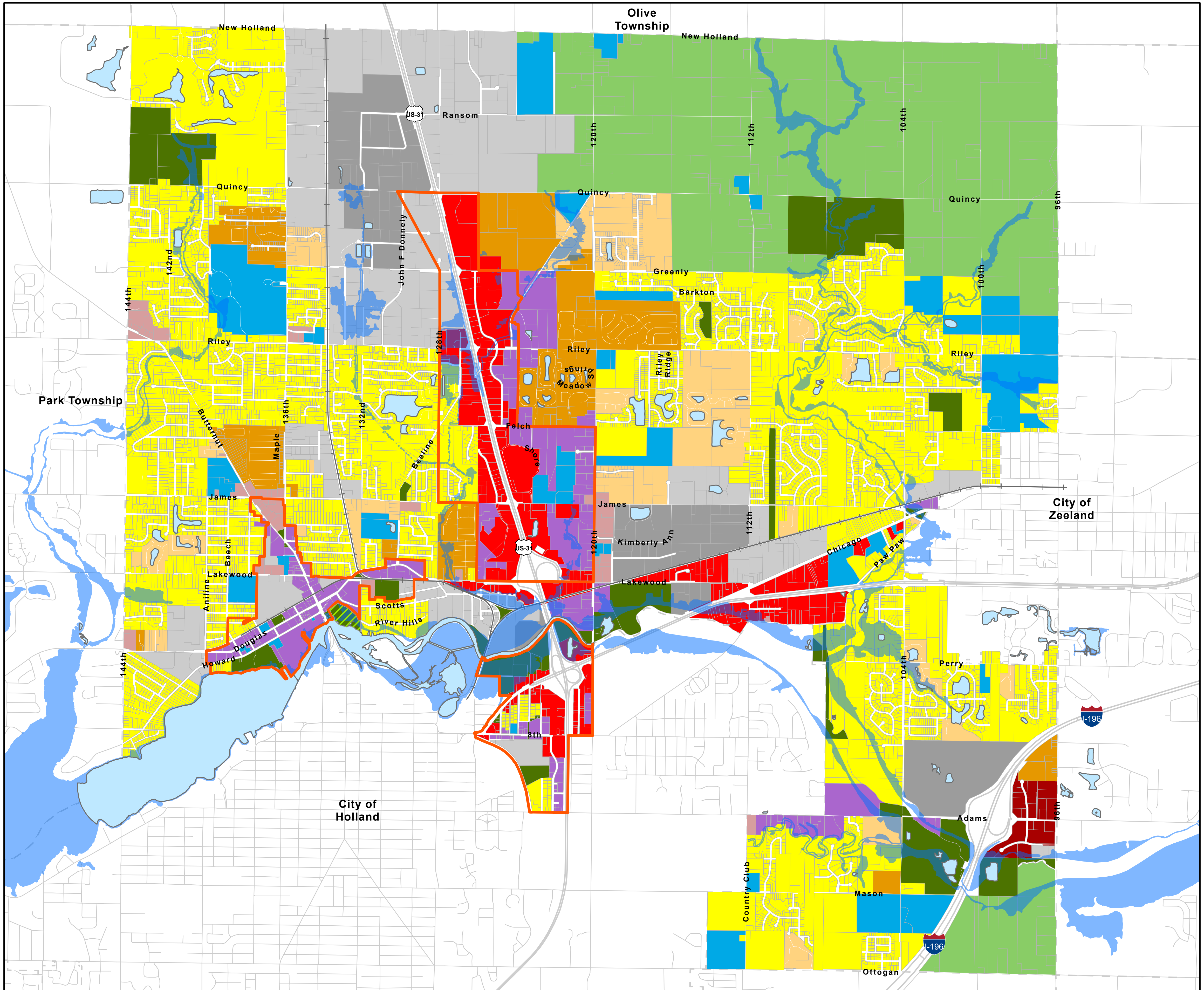
Basemap Source: Michigan Center for Geographic Information, Version 17a.
Data Source: Holland Charter Township 2020. McKenna 2020.

MCKENNA

Future Land Use

Charter Township of Holland, Ottawa County, MI

October 8, 2020



LEGEND

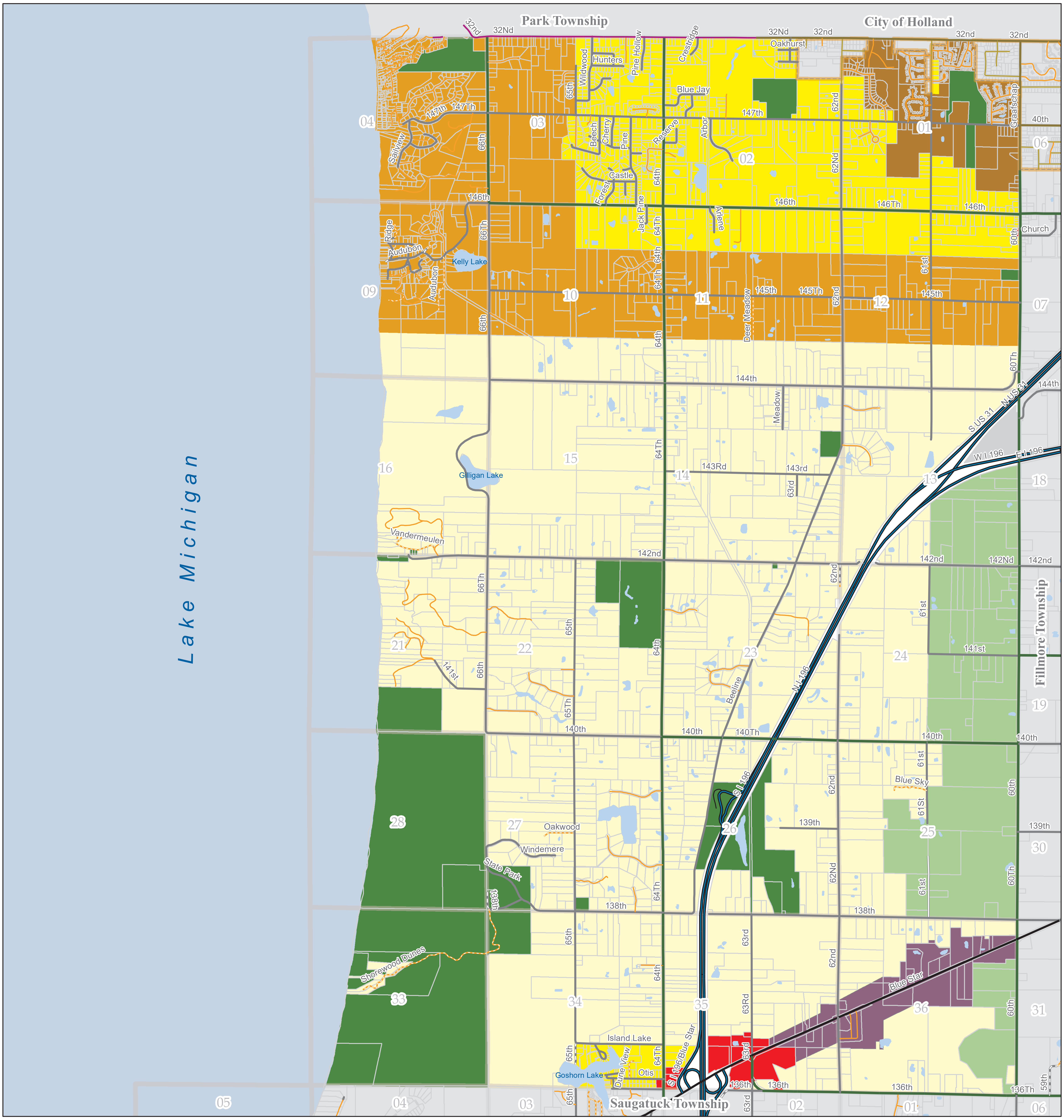
- Subarea Boundary
- Agricultural Preservation
- Low Density Residential
- Medium Density Residential
- High Density Residential
- Neighborhood Commercial
- Community Commercial
- Highway Commercial
- Light Industrial
- General Industrial
- Mixed Use
- Public/Quasi Public
- Park/Open Space
- FEMA 100 Year Floodplain
- City of Holland parcel planned for Park/Open Space in partnership with the City

0 500 1,000

Feet

Basemap Source: Michigan Center for Geographic Information, Version 17a.
Data Source: Holland Charter Township 2020. McKenna 2020.

MCKENNA



Master Plan Map

Laketown Township

Allegan County, Michigan

Date: 12/17/2020

- AG, AGRICULTURE
- RE, RURAL ESTATE
- VLDR, VERY LOW DENSITY RESIDENTIAL
- LDR, LOW DENSITY RESIDENTIAL
- MDR, MEDIUM DENSITY RESIDENTIAL
- MU, MIXED USE
- C, COMMERCIAL
- I, LIGHT INDUSTRIAL
- P, PUBLIC / SEMI-PUBLIC
- ROW, RIGHT OF WAY
- W, WATER

N W E S

0 0.5 1 1.5 2 Miles

Allegan County GIS Services

Appendix D

Archaeological and Historic Resources Review

Connie Locker

From:	Connie Locker
Sent:	Friday, April 7, 2023 10:07 AM
To:	Slagor, Scott (LEO)
Subject:	Re: Lead Service Line Replacement Project in Holland

Thanks Scott! This is helpful. I've forwarded it on to the BPW team and will reach out if we have any additional questions.

Connie

Connie Locker
Grant Manager | City of Holland
Direct: 616-355-1371
c.locker@cityofholland.com

Holland
MICHIGAN

From: Slagor, Scott (LEO) <SlagorS2@michigan.gov>
Sent: Tuesday, April 4, 2023 11:03 AM
To: Connie Locker <c.locker@cityofholland.com>
Subject: RE: Lead Service Line Replacement Project in Holland

This sender is trusted.

Hi Connie,

Nice to hear from you- hope you're doing well as well!

You are correct that SHPO requires that the identification portion of the application be completed by qualified professionals, particularly for archaeology as archaeological site data is protected in Michigan and we can only share the data with qualified archaeologists.

When the project comes in, please be sure that the EPA is listed as the federal agency. We get a lot of EGLE projects where the federal nexus is unclear. Although our correspondence may ultimately be with EGLE, for our database we need to know which federal agency is ultimately responsible.

Thank you!

MICHIGAN SHPO STATE HISTORIC PRESERVATION OFFICE

Scott Slagor (he/him)
Cultural Resource Protection Manager
State Historic Preservation Office
300 N. Washington Square
Lansing, MI 48913
Office: 517.335.9840 Direct: 517.285.5120
michigan.gov/shpo

Get the latest news with the SHPO and MEDC Community Development newsletters!

From: Connie Locker <c.locker@cityofholland.com>
Sent: Tuesday, April 4, 2023 10:28 AM
To: Slagor, Scott (LEO) <SlagorS2@michigan.gov>
Subject: Lead Service Line Replacement Project in Holland

CAUTION: This is an External email. Please send suspicious emails to abuse@michigan.gov

Hi Scott,

I'm working with the Holland Board of Public Works on a Drinking Water State Revolving Fund application through EGLE that will involve ground-disturbing activity replacing lead service lines in front of approximately 200 historic homes in Holland. EGLE notes that SHPO review of the DWSRF projects is required, and HBPW has done a Section 106 for DWSRF applications in the past. In looking at the Section 106 form, I noticed it's been updated from the the older form that HBPW used previously for their last DWSRF request. I wanted to reach out and confirm that SHPO requires a 35CFR Part 61 Qualified Archaeologist to complete the Section 106 review for this work. Can you advise?

Thanks very much, and I hope all is well with you and that you're enjoying working for SHPO!

Connie

Connie Locker
Grant Manager | City of Holland
Direct: 616-355-1371
[c.locker@cityofholland.com]c.locker@cityofholland.com

Holland
MICHIGAN

Connie Locker

From:	Connie Locker
Sent:	Thursday, April 27, 2023 3:43 PM
To:	andrew.smith@rescom.org
Cc:	eric.sanchez@rescom.org
Subject:	RE: Section 106 Review for Holland Board of Public Works
Attachments:	Area Maps - Section 106 DWSRF.pdf; Project Information - Section 106 DWSRF.pdf; SHPO Addresses.xlsx

Hi Andrew,

Thank you for your interest in this project. As requested, I've attached several documents to this email:

- Project Information document
- Area Maps
- List of Affected Addresses

Please let me know if any additional information is needed.

Thanks,

Connie

Connie Locker
Grant Manager | City of Holland
Direct: 616-355-1371
c.locker@cityofholland.com

Holland
MICHIGAN

From: andrew.smith@rescom.org <andrew.smith@rescom.org>
Sent: Wednesday, April 19, 2023 8:48 AM
To: Connie Locker <c.locker@cityofholland.com>
Cc: eric.sanchez@rescom.org
Subject: RE: Section 106 Review for Holland Board of Public Works

Connie,

Thanks for reaching out. We are interested in this project. What we would need up front is any drawings you have for the project along with a detailed description of all of the work including a list of all of the properties that are having lead lines replaced so that we make sure we have all of the details in our state application for the SHPO to review.

I can get you a cost based on the size of the project, the footprint etc. since I need to see that to know if any archaeology is going to be required on this.

Thanks,
Andrew Smith
260-385-6999

RESCOM

From: Connie Locker <c.locker@cityofholland.com>
Sent: Wednesday, April 19, 2023 8:42 AM
To: andrew.smith@rescom.org
Subject: Section 106 Review for Holland Board of Public Works

Hi Andrew,

The Holland Board of Public Works is submitting a Drinking Water State Revolving Fund application through EGLE this spring. The project will involve ground-disturbing activity replacing lead service lines in front of approximately 200 historic homes in Holland. A Section 106 review of this project by a qualified archaeologist is required.

To perform the Section 106 assessment, HBPW is reaching out to Michigan-based consultants listed with the State Historic Preservation Office. We received Rescom Environmental's name and your contact information from this list.

Is this Section 106 review a project you would be interested in taking on? If so, what would you need from us to complete the review? What would your estimated fee for this work be, and what is your availability?

Thank you and looking forward to discussing this soon,

Connie

Connie Locker
Grant Manager | City of Holland
Direct: 616-355-1371
c.locker@cityofholland.com

Holland
MICHIGAN

Connie Locker

From: Connie Locker
Sent: Thursday, April 27, 2023 3:48 PM
To: Ethan Epstein
Subject: RE: Section 106 Review for Holland Board of Public Works
Attachments: Area Maps - Section 106 DWSRF.pdf; Project Information - Section 106 DWSRF.pdf; SHPO Addresses.xlsx

Hi Ethan,

Thank you for your interest in this project, and your patience as I've gathered this information. To answer your questions:

- See attached for project information, area maps, and a list of addresses.
- No, no water mains will be replaced as part of this project.
- Service lines will be installed from edge of right-of-way (near sidewalk) through the foundation and into the home. No work in the road.
- The default for service line installation will be boring/drilling/pulling. Conventional trenching will only be used in unique circumstances.

Please let me know if any additional information is needed.

Connie

Connie Locker
Grant Manager | City of Holland
Direct: 616-355-1371
c.locker@cityofholland.com

Holland
MICHIGAN

From: Ethan Epstein <ethan.epstein@chg-inc.com>
Sent: Wednesday, April 19, 2023 9:56 AM
To: Connie Locker <c.locker@cityofholland.com>
Subject: FW: Section 106 Review for Holland Board of Public Works

Caution! This message was sent from outside your organization.

Hi Connie,

Sounds like a great project!

We are definitely interested in providing the services you'll need for a Section 106 review. Over the past several years we have completed numerous DWRF projects – and are very familiar with what Michigan's SHPO will be looking for in terms or reporting and the S-106 application.

To provide you with a proposal and cost estimate, we need a bit more information.

Do you have a map (or shapefiles/.kmz would be even better) showing the addresses where service lines are planned to be replaced? Will any watermains be replaced in conjunction with the project? Is it correct that the service lines will be installed from road curb to residential foundation or will the connection to the watermain be under roadway? (typically there's a mix of this). Will the service lines be installed by trenching or boring, or both?

Once we have the additional information, you can expect a proposal from Commonwealth within two to three business days.

Thanks,
Ethan

CHRONICLE™
HERITAGE

Ethan A. Epstein | Office Principal
Chronicle Heritage
C: 715.482.0273
O: 517.788.3550
ChronicleHeritage.com

Michigan Office
3215 Central Street
Dexter, MI 48130

Chronicle Heritage: Breaking new ground
(Formerly PaleoWest/Commonwealth)

From: Brandon Gabler <bgabler@chg-inc.com>
Sent: Wednesday, April 19, 2023 8:54 AM
To: Connie Locker <c.locker@cityofholland.com>; Ethan Epstein <ethan.epstein@chg-inc.com>
Cc: Hunter Davis <hdavis@paleowest.com>; Natalie Gomez <ngomez@paleowest.com>
Subject: RE: Section 106 Review for Holland Board of Public Works

Hi Connie,
Thanks for reaching out; I'm copying Ethan Epstein, our Michigan Office Principal, and he'll be able to help you out. I'll let him answer your questions below.

Cheers,
Brandon

PALEOWEST COMMONWEALTH HERITAGE GROUP

Brandon M. Gabler, PhD, RPA
Senior Vice President
PaleoWest / Commonwealth Heritage Group
3215 Central Street, Dexter, MI 48130

c: (571) 488-5912
e: bgabler@chg-inc.com
www.commonwealthheritagegroup.com

Click here to learn more about the Section 106 process!

From: Connie Locker <c.locker@cityofholland.com>
Sent: Wednesday, April 19, 2023 8:31 AM
To: Brandon Gabler <bgabler@chg-inc.com>
Subject: Section 106 Review for Holland Board of Public Works

External sender - Think before you click

Hi Brandon,

The Holland Board of Public Works is submitting a Drinking Water State Revolving Fund application through EGLE this spring. The project will involve ground-disturbing activity replacing lead service lines in front of approximately 200 historic homes in Holland. A Section 106 review of this project by a qualified archaeologist is required.

To perform the Section 106 assessment, HBPW is reaching out to Michigan-based consultants listed with the State Historic Preservation Office. We received Commonwealth Heritage Group's name and your contact information from this list.

Is this Section 106 review a project you would be interested in taking on? If so, what would you need from us to complete the review? What would your estimated fee for this work be, and what is your availability?

Thank you and looking forward to discussing this soon,

Connie

Connie Locker
Grant Manager | City of Holland
Direct: 616-355-1371
c.locker@cityofholland.com

Holland
MICHIGAN

Connie Locker

From: Connie Locker
Sent: Thursday, April 27, 2023 3:51 PM
To: Monte Lawton
Subject: RE: Section 106 Review for Holland Board of Public Works
Attachments: Area Maps - Section 106 DWSRF.pdf; Project Information - Section 106 DWSRF.pdf; SHPO Addresses.xlsx

Hi Monte,

Thank you for your interest in this project. Per your request, I've attached additional information about the project to this email. I can also confirm that this project is a replacement only project. Excavations will be limited to areas around existing service line shutoff valves where the ground has been excavated previously during the original service line install.

Please let me know if you need any additional information, and thank you!

Connie

Connie Locker
Grant Manager | City of Holland
Direct: 616-355-1371
c.locker@cityofholland.com

Holland
MICHIGAN

From: Monte Lawton <mlawton@heartsongarchaeology.com>
Sent: Wednesday, April 19, 2023 10:11 AM
To: Connie Locker <c.locker@cityofholland.com>
Subject: Re: Section 106 Review for Holland Board of Public Works

Caution! This message was sent from outside your organization.

Hello,
I would be happy to prov ide you with a scope and proposal. I will just need any general locational maps and plans you have especially those which indicate whether this will be purely replacement or if there will be new ground disturbance. When replacing these lines there is occasionally a need to expand the ground disturbance involved and that would affect whether we need to consider archaeological survey or not.

Feel free to contact me with any questions you might have for me!

Monte Lawton, RPA# 17021
Principal Investigator
Heartsong Archaeology LLC
e: mlawton@heartsongarchaeology.com
p: (989) 323.1239

web: http://heartsongarchaeology.godaddysites.com/

From: Connie Locker <c.locker@cityofholland.com>
Sent: Wednesday, April 19, 2023 8:36 AM
To: Monte Lawton <mlawton@heartsongarchaeology.com>
Subject: Section 106 Review for Holland Board of Public Works

Hi Patrick,

The Holland Board of Public Works is submitting a Drinking Water State Revolving Fund application through EGLE this spring. The project will involve ground-disturbing activity replacing lead service lines in front of approximately 200 historic homes in Holland. A Section 106 review of this project by a qualified archaeologist is required.

To perform the Section 106 assessment, HBPW is reaching out to Michigan-based consultants listed with the State Historic Preservation Office. We received Heartsong Archaeology's name and your contact information from this list.

Is this Section 106 review a project you would be interested in taking on? If so, what would you need from us to complete the review? What would your estimated fee for this work be, and what is your availability?

Thank you and looking forward to discussing this soon,

Connie

Connie Locker
Grant Manager | City of Holland
Direct: 616-355-1371
c.locker@cityofholland.com

Holland
MICHIGAN

Connie Locker

From: Connie Locker
Sent: Thursday, April 27, 2023 3:59 PM
To: mjackson arbrecroche.com
Subject: RE: Section 106 Review for Holland Board of Public Works
Attachments: Area Maps - Section 106 DWSRF.pdf; Project Information - Section 106 DWSRF.pdf; SHPO Addresses.xlsx

Hi Misty,

Thank you so much for your interest in this project, and apologies for the delay in getting this information to you. I've attached a few documents to help answer your questions: a project information sheet, a file with several area maps, and a list of affected addresses.

Please let me know if any additional information is needed, and thank you again!

Connie

Connie Locker
Grant Manager | City of Holland
Direct: 616-355-1371
c.locker@cityofholland.com

Holland
MICHIGAN

From: mjackson arbrecroche.com <mjackson@arbrecroche.com>
Sent: Wednesday, April 19, 2023 10:03 AM
To: Connie Locker <c.locker@cityofholland.com>
Subject: Re: Section 106 Review for Holland Board of Public Works

Caution! This message was sent from outside your organization.

Hello Connie,

This is something we would be happy to help you with. We need a map outlining the area in which this work would be conducted. Another other information you have on hand in regard to the historic homes would be help, as well.

Once we have this information we can pull you together a quote. If you were to accept the proposal, we complete the work within 30 to 45 days of acceptance of proposal.

Thanks for contacting me.

Misty

Misty Jackson, Ph.D., RPA 16457
Arbre Croche Cultural Resources LLC
214 S Main Street
Leslie, Michigan 49251
517-525-3060
mjackson@arbrecroche.com
arbrecroche.com
Center for Maritime and Underwater Resource Management
cmurm.org

On Apr 19, 2023, at 8:28 AM, Connie Locker <c.locker@cityofholland.com> wrote:

Hi Misty,

The Holland Board of Public Works is submitting a Drinking Water State Revolving Fund application through EGLE this spring. The project will involve ground-disturbing activity replacing lead service lines in front of approximately 200 historic homes in Holland. A Section 106 review of this project by a qualified archaeologist is required.

To perform the Section 106 assessment, HBPW is reaching out to Michigan-based consultants listed with the State Historic Preservation Office. We received Arbre Croche Cultural Resources's name and your contact information from this list.

Is this Section 106 review a project you would be interested in taking on? If so, what would you need from us to complete the review? What would your estimated fee for this work be, and what is your availability?

Thank you and looking forward to discussing this soon,

Connie

Connie Locker
Grant Manager | City of Holland
Direct: 616-355-1371
[c.locker@cityofholland.com]c.locker@cityofholland.com
<Outlook-Logo, comp.jpeg>

Connie Locker

From:	Connie Locker
Sent:	Thursday, April 27, 2023 4:02 PM
To:	Robert Chidester
Subject:	RE: Section 106 Review for Holland Board of Public Works
Attachments:	Area Maps - Section 106 DWSRF.pdf; Project Information - Section 106 DWSRF.pdf; SHPO Addresses.xlsx

Hi Bob,

Thank you for your interest in this project. I've attached a few documents to this email that will give you a better sense of the project: a project information sheet, a file with several area maps, and a list of affected addresses.

Please let me know if any additional information is needed, and thank you again!

Connie

Connie Locker
Grant Manager | City of Holland
Direct: 616-355-1371
c.locker@cityofholland.com

Holland
MICHIGAN

From: Robert Chidester <RChidester@manniksmithgroup.com>
Sent: Wednesday, April 19, 2023 11:27 AM
To: Connie Locker <c.locker@cityofholland.com>
Subject: RE: Section 106 Review for Holland Board of Public Works

Caution! This message was sent from outside your organization.

Hi Connie,

Thank you for reaching out. Yes, we are certainly interested in submitting a cost proposal for this project, as we do this type of work frequently. Could you send me a map of the affected properties? That will help me to fine-tune our fee for this effort.

We will send a form along with our cost proposal that you can fill out with the information we will need – generally, agency contact information, a narrative project description, and information about efforts to reach out to consulting parties (Tribes, historical societies, etc.) and opportunities for the general public to comment on the project.

We can start work immediately upon contract authorization. Generally, for a project of this size we can complete the work and send you a draft of the Section 106 Application within 5-6 weeks.

Thanks,
Bob

Dr. Robert C. Chidester, RPA 1066050
Pronouns: He/Him/His
Cultural Resources Group Manager
The Mannik & Smith Group, Inc.
607 Shelby St., Suite 300
Detroit, MI 48226
Ph: 313-961-9500 x 2062
Fax: 313-961-9509
rchidester@manniksmithgroup.com

From: Connie Locker <c.locker@cityofholland.com>
Sent: Wednesday, April 19, 2023 8:40 AM
To: Robert Chidester <RChidester@manniksmithgroup.com>
Subject: Section 106 Review for Holland Board of Public Works

EXTERNAL EMAIL: Open with EXTREME caution!

Hi Robert,

The Holland Board of Public Works is submitting a Drinking Water State Revolving Fund application through EGLE this spring. The project will involve ground-disturbing activity replacing lead service lines in front of approximately 200 historic homes in Holland. A Section 106 review of this project by a qualified archaeologist is required.

To perform the Section 106 assessment, HBPW is reaching out to Michigan-based consultants listed with the State Historic Preservation Office. We received Mannik & Smith Group's name and your contact information from this list.

Is this Section 106 review a project you would be interested in taking on? If so, what would you need from us to complete the review? What would your estimated fee for this work be, and what is your availability?

Thank you and looking forward to discussing this soon,

Connie

Connie Locker

Grant Manager | City of Holland
Direct: 616-355-1371
c.locker@cityofholland.com

Holland
MICHIGAN

CONFIDENTIALITY NOTICE

Connie Locker

From:	Connie Locker
Sent:	Thursday, April 27, 2023 4:07 PM
To:	David Brose
Subject:	RE: Section 106 Review for Holland Board of Public Works

Hi David,

Thank you for your quote for this project. The HBPW is still gathering quotes from contractors. We will be in touch with additional information soon.

Thank you again,

Connie

Connie Locker
Grant Manager | City of Holland
Direct: 616-355-1371
c.locker@cityofholland.com

Holland
MICHIGAN

From: David Brose <david_brose@sbcglobal.net>
Sent: Monday, April 24, 2023 11:55 AM
To: Connie Locker <c.locker@cityofholland.com>
Cc: David Brose <dbrose@umich.edu>
Subject: Re: Section 106 Review for Holland Board of Public Works

Hi, Connie.

I'm interested in working with you to coordinate a 106 review plan that will satisfy the Michigan SHPO and the Federal Agency.
The standard MISHPO plan is largely designed to identify prehistoric archaeological resources which would be unhelpful in this case, affecting several hundred individual properties already developed for historic housing. In my professional judgement, an urban archaeological approach is called for.

First, I can prepare a Phase 1 document research plan for the various historic houses that will indicate whether the waterline replacement is likely to affect any historic resources eligible for listing on the National Register of Historic Places. Secondly, because waterline R/W are seldom alterable, I can provide a Phase 2 matrix for mitigative fieldwork actions and schedules for any such resources predicted or encountered in the project as it is implemented.

I am available to develop the Phase 1 document research plan as soon as the SHPO agrees that such a somewhat unusual approach is acceptable.
I can be available to prepare and schedule the Phase 2 mitigative action as needed during the construction project.

My rates are $107.50 per hour. I estimate the Phase 1 work will take between 15 and 20 hours to complete.

Imprints From The Past's fieldwork rates (detailed below), such as would be appropriate for Phase 2 mitigation should such be needed, are approximately $950 per day: the number of days will depend on the results of Phase 1 research and the unavoidable possibility of construction encountering previously unknown buried deposits.

Imprints from the Past's rates are $35.00/hour for trained Archaeological Fieldworkers; $60.00/hour for qualified Laboratory Technicians and Collections Managers; and $107.50/hour for RPA Certified Project Manager/Principal Investigator: Itemized facilities, equipment, essential travel expenses, and publication charges, will be pre-authorized. Any necessary agency-approved curation/storage fees will be billed separately.

David S. Brose, Ph.D., President of *Imprints from the Past, LLC,* a research and appraisal division of *Brose and Brose Consulting, Inc.*

dbrose@umich.edu

On Apr 19, 2023, at 08:38, Connie Locker <c.locker@cityofholland.com> wrote:

Hi David,

The Holland Board of Public Works is submitting a Drinking Water State Revolving Fund application through EGLE this spring. The project will involve ground-disturbing activity replacing lead service lines in front of approximately 200 historic homes in Holland. A Section 106 review of this project by a qualified archaeologist is required.

To perform the Section 106 assessment, HBPW is reaching out to Michigan-based consultants listed with the State Historic Preservation Office. We received Imprints from the Past's name and your contact information from this list.

Is this Section 106 review a project you would be interested in taking on? If so, what would you need from us to complete the review? What would your estimated fee for this work be, and what is your availability?

Thank you and looking forward to discussing this soon,

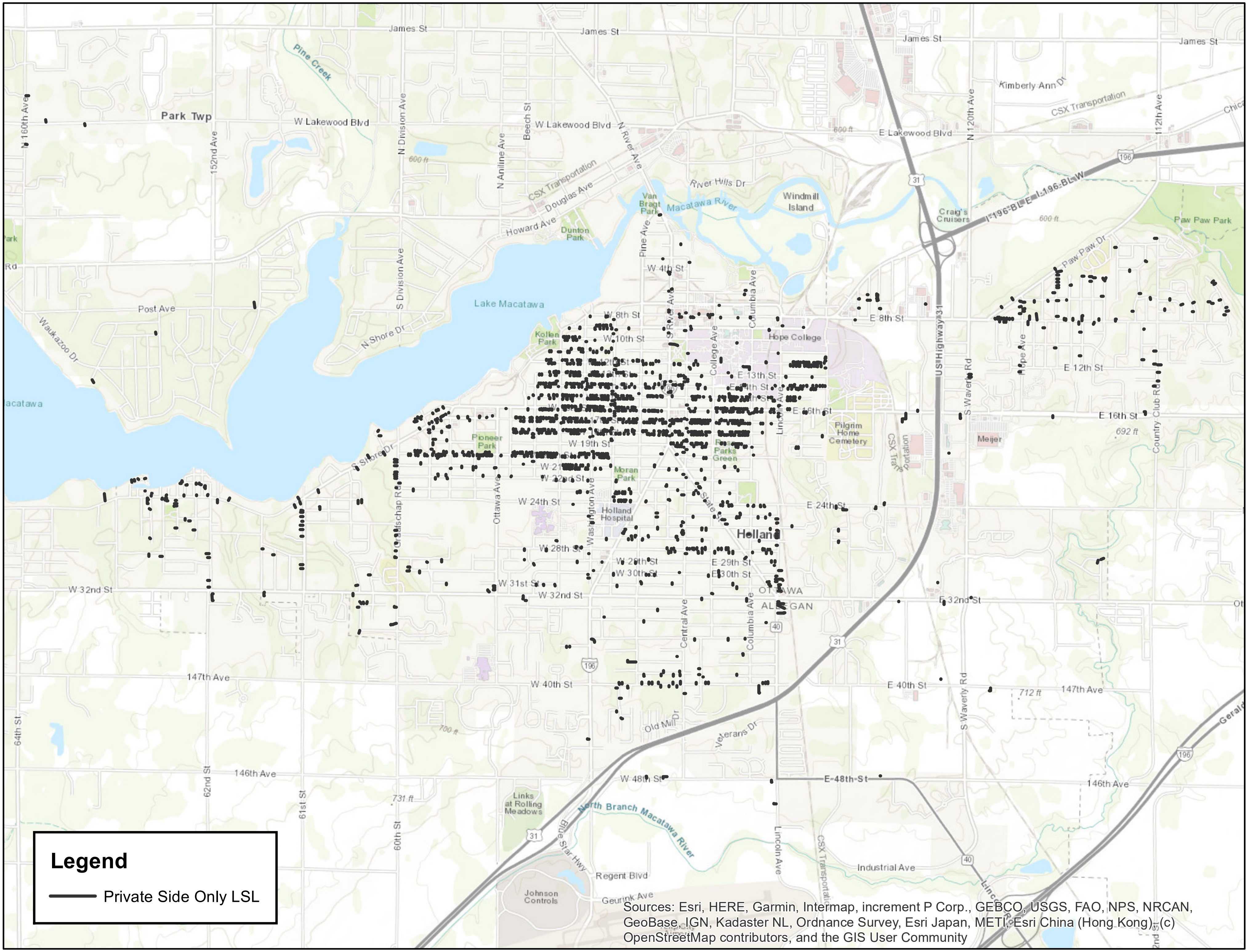
Connie

Connie Locker
Grant Manager | City of Holland
Direct: 616-355-1371
c.locker@cityofholland.com

HOLLAND BOARD OF PUBLIC WORKS
DWRF APPLICATION – WATER SYSTEM IMPROVEMENTS
Project Information

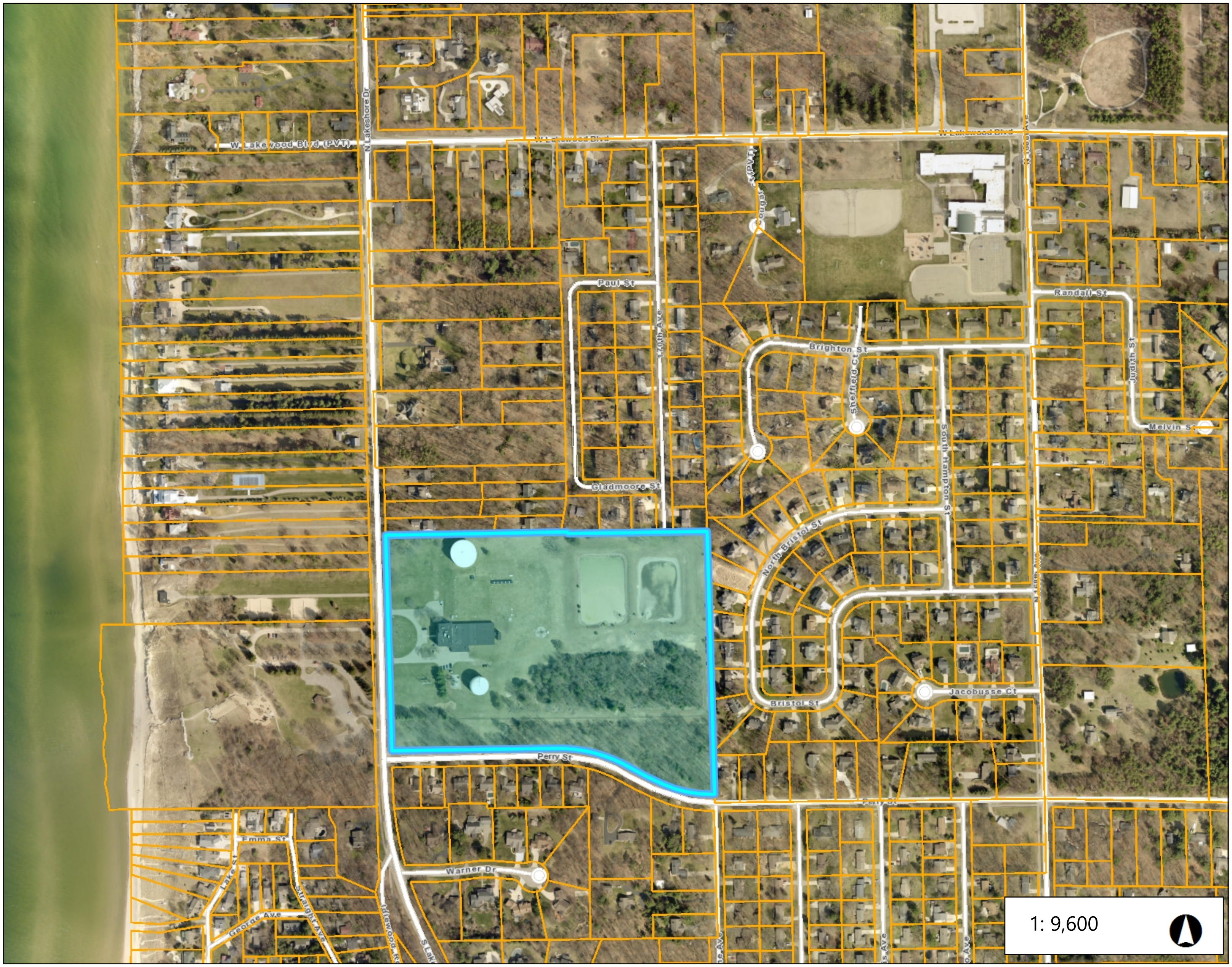
Project Name:	Holland Board of Public Works Water System Improvements
Project Address:	46 North Lakeshore Drive, Holland, MI 49424
Federal Agency and Contact:	Dan Beauchamp Water Infrastructure Funding and Financing Section Department of Environment, Great Lakes, and Energy P.O. Box 30457 Lansing, MI 48909-7957 Phone: 517-388-3380
State Agency and Contact:	Sara Brown Water Infrastructure Funding and Financing Section Department of Environment, Great Lakes, and Energy P.O. Box 30457 Lansing, MI 48909-7957 Phone: 517-231-8916
Applicant Contact:	Connie Locker Holland Board of Public Works 625 Hastings Avenue Holland, MI 49423 Phone: 616-355-1371
Map of Project Location:	Attached
USGS Quad Maps:	Holland West Holland East
PLSS Town, Range, Sections:	T4N, R15W, Sec 3-6, 9 T4N, R16W, Sec 1-2 T5N, R16W, Sec 21, 23, 25-26, 35-36 T5N, R15W, Sec 20, 26-35

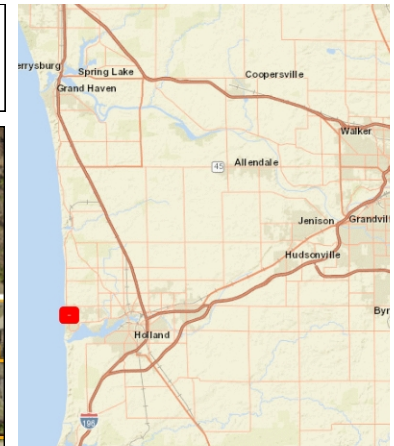
Project Description:
The Holland Board of Public Works is proposing improvements to its existing drinking water system to improve system reliability and maintain compliance with requirements for lead service lines that were previously connected to lead goosenecks. This work would be completed using directional drilling in lawns and driveways. The other component of the proposed project is replacing existing chemical storage facilities at the Water Treatment Plant (WTP) from the third floor with new facilities at ground level. A new service drive for chemical deliveries would be constructed as well as a stormwater retention feature.


Legend
Private Side Only LSL
Park Twp
Lake Macatawa
Holland
Hope College
Windmill Island
Holland Hospital
Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community

Ottawa County
Geospatial Insights & Solutions

Project Location Map - WTP





Legend

Parcels_

Notes

1,600.0 | 0 | 800.00 | 1,600.0 | Feet

WGS_1984_Web_Mercator_Auxiliary_Sphere

This map is a user generated static output from an Internet mapping site and is for reference only. Data layers that appear on this map may or may not be accurate, current, or otherwise reliable.

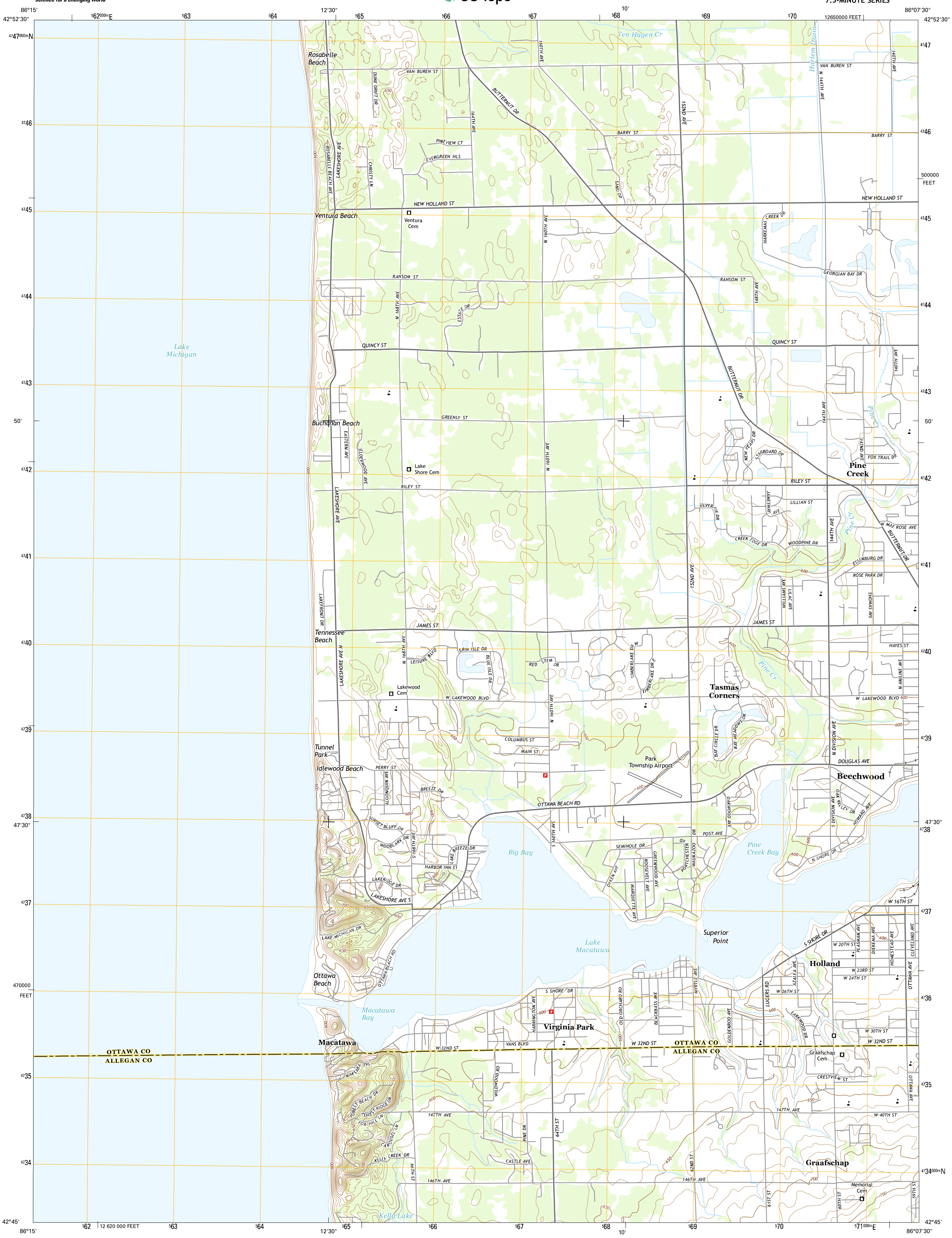
THIS MAP IS NOT TO BE USED FOR NAVIGATION

USGS science for a changing world

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

The National Map US Topo

HOLLAND WEST QUADRANGLE
MICHIGAN
7.5-MINUTE SERIES



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
10 000-foot ticks: Michigan Coordinate System of 1983 (south zone)

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, June 2012
Roads....................HERE, ©2013
Names....................GNIS, 2013
Hydrography..........National Hydrography Dataset, 2012
Contours..........National Elevation Dataset, 1999
Boundaries..........Multiple sources; see metadata file 1972 - 2013
Public Land Survey System..........BLM, 2011

MN
GN
5° 8′
91 MILS
0° 33′
10 MILS

UTM GRID AND 2014 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

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

SCALE 1:24 000

KILOMETERS: 1 0.5 0 1 2
METERS: 1000 500 0 1000 2000
MILES: 1 0.5 0 1
FEET: 1000 0 1000 2000 3000 4000 5000 6000 7000 8000 9000 10000

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 0.6.16

MICHIGAN
QUADRANGLE LOCATION

1	2	3
4		5
6	7	8

ADJOINING QUADRANGLES

1
2 Port Sheldon
3 Borculo
4
5 Holland East
6
7 Saugatuck
8 Hamilton West

ROAD CLASSIFICATION

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

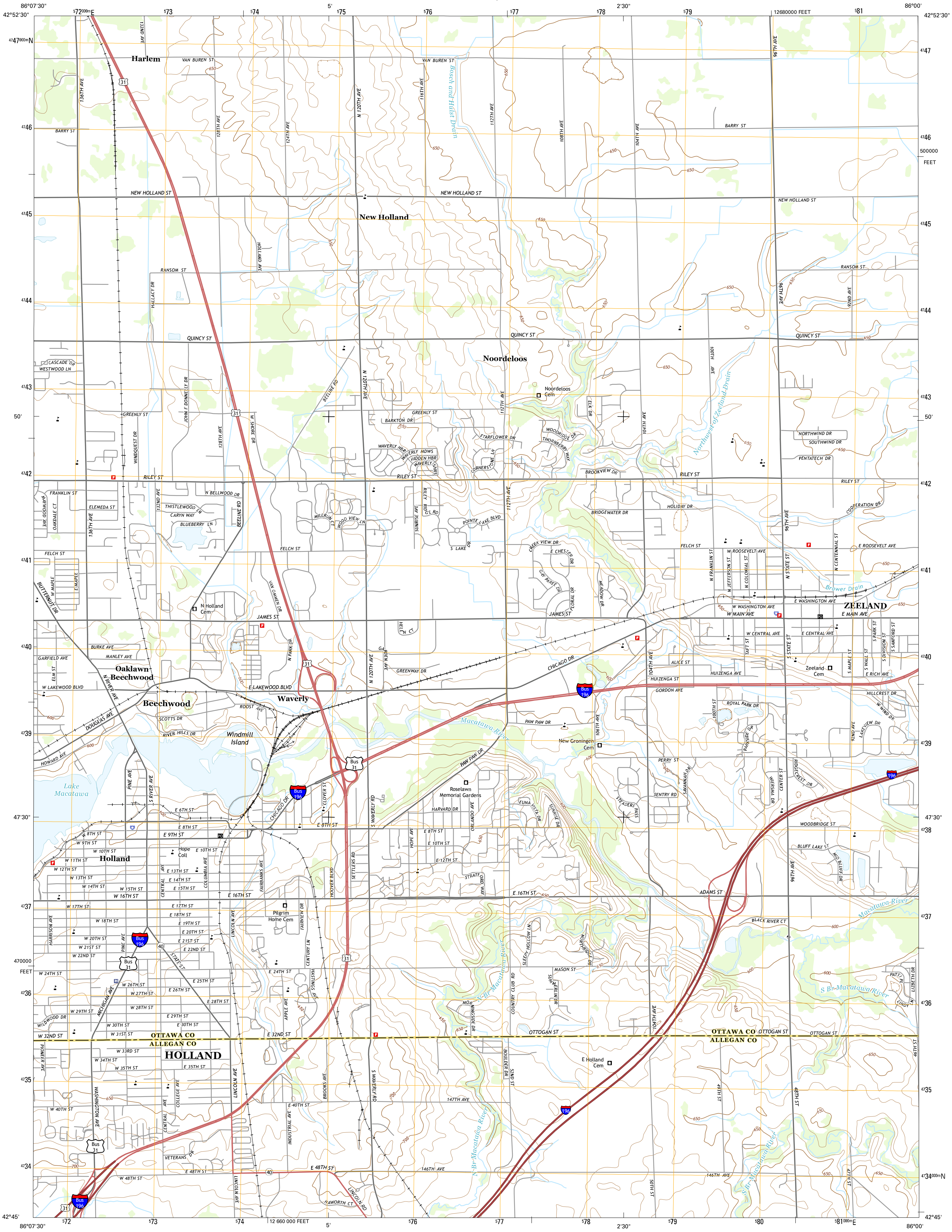
HOLLAND WEST, MI
2014

NSN. 7643016371154
NGA REF NO. USGSX24K20728

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

The National Map
US Topo

HOLLAND EAST QUADRANGLE
MICHIGAN
7.5-MINUTE SERIES



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
10 000-foot ticks: Michigan Coordinate System of 1983 (south zone)

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, June 2012
Roads....................HERE, ©2013
Names....................GNIS, 2013
Hydrography....................National Hydrography Dataset, 2012
Contours....................National Elevation Dataset, 1999
Boundaries............Multiple sources; see metadata file 1972 - 2013
Public Land Survey System....................BLM, 2011

MN
GN
5° 14′
93 MILS
0° 38′
11 MILS
UTM GRID AND 2014 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

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

SCALE 1:24 000

KILOMETERS 1 0.5 0 1 2
METERS 1000 500 0 1000 2000
MILES 1 0.5 0 1
FEET 1000 0 1000 2000 3000 4000 5000 6000 7000 8000 9000 10000

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 0.6.16

MICHIGAN
QUADRANGLE LOCATION

1	2	3
4		5
6	7	8

ADJOINING QUADRANGLES

1 Port Sheldon
2 Borculo
3 Allendale
4 Holland West
5 Hudsonville West
6 Saugatuck
7 Hamilton West
8 Hamilton East

ROAD CLASSIFICATION

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

HOLLAND EAST, MI
2014

NSN. 7643016371153
NGA REF NO. USGSX24K20723

Historic Sites in Ottawa County, Holland, MI Area
https://www.miplace.org/historic-preservation/programs-and-services/national-register-of-historic-places/researching-the-national-register-in-michigan/

Title:	National Register Information System ID:	Location	Near APE?	
Cappon, Isaac, House	84001478	228 W. 9th St.	No work at this address (204 W 9th St is nearest galvanized private side)	
De Zwaan Windmill	100002333	Windmill Island Gardens, 1 Lincoln Avenue	No	
Gold, Egbert H., Estate	84000548	1116 Marigold Ave.	No	
Holland Downtown Historic District	90001534	Roughly, Eighth St. from just E of College Ave. to River Ave. and River Ave. from Ninth St. to just N of Eighth St.	See below for galvanized, private owner services in this area	
		55 E 8th St		
		54 E 8th St		
		49 E 8th St		
		25 E 8th St		
		12 E 8th St		
		20 E 8th St (serviced from 12 E 8th St)		
		8 E 8th St		
		1 W 8th St		
		12 W 8th St		
		14 W 8th St		
		19 W 8th St		
		260 River Ave		
Holland Harbor Lighthouse	78001509	South Pier, Holland Harbor	No	
Holland Historic District	83000889	11th, 12th, 13th Sts., and Washington, Maple, and Pine Aves	See below for galvanized, private owner services in this area	
		11th, 12th, and 13th Streets between Washington Boulevard and Pine Avenue		
		225 W 11th St		
		222 W 11th St		
		221 W 11th St		
		220 W 11th St		
		216 W 11th St		
		217 W 11th St		
		206 W 11th St		
		204 W 11th St		
		198 W 11th St		
		191 W 11th St		
		188 W 11th St		
		182 W 11th St		
		178 W 11th St		
		268 Maple Ave		
		221 W 12th St		
		215 W 12th St		
		210 W 12th St		
		209 W 12th St		
		204 W 12th St		
		200 W 12th St		
		192 W 12th St		
		162 W 12th St		
		161 W 12th St		
		156 W 12th St		
		155 W 12th St		
		147 W 12th St		
		109 W 12th St		
		105 W 12th St		
		224 W 13th St		
		220 W 13th St		
		215 W 13th St		
		211 W 13th St		
		208 W 13th St		
		206 W 13th St		
		204 W 13th St		
		201 W 13th St		
		198 W 13th St		
		194 W 13th St		
		176 W 13th St		
		170 W 13th St		
		309 Maple Ave		
		155 W 13th St		
		151 W 13th St		
		143 W 13th St		
		140 W 13th St		
		124 W 13th St		
		120 W 13th St		
		116 W 13th St		
		110 W 13th St		
		303 Maple Ave		
		100 W 11th St (abandoned)		
		97 W 12th St		
		65 W 12th St		
		61 W 1th St		
		82 W 12th St		

		94 W 12th St		
		93 W 13th St		
		79 W 13th St		
		75 W 13th St		
		71 W 13th St		
		56 W 13th St		
Holland Historic District (Boundary Increase)	90001234	Roughly bounded by River Ave., Pine Ave., 16th St., 14th St., Columbia Ave., 13th St., Central Ave., and 10th St.	See below for galvanized, private owner services in this area	
		267 Central Ave		
		26 E 12th St		
		18 E 12th St		
		8 E 12th St		
		12 W 12th St		
		18 W 12th St		
		22 W 12th St		
		28 W 12th St		
		93 W 14th St		
		69 W 14th St		
		55 W 14th St		
		90 W 14th St		
		84 W 14th St		
		80 W 14th St		
		70 W 14th St		
		50 W 14th St		
		51 W 15th St		
		55 W 15th St		
		61 W 15th St		
		65 W 15th St		
		71 W 15th St		
		75 W 15th St		
		79 W 15th St		
		83 W 15th St		
Holland Old City Hall and Fire Station	85000063	108 E. 8th St.	Service is Copper, Next door is galvanized	
Holland Reformed Protestant Dutch Church	90001243	57 E. 10th St.	No	
Morrissey, Thomas and Anna, House	99000337	190 W. 9th St.	Service is Copper, Next door both sides are galvanized	
Ottawa Beach Historic District	95000451	Ottawa Beach Rd., Park Township	No	
Third Reformed Church of Holland	71000418	110 W. 12th St.	Service is Copper, across the street are multiple galvanized	
Van Raalte, Benjamin, House	89000790	1076 16th St.	No, but there is a galvanized across the street	
National Archives has scanned and made available on its website all National Register property files in Michigan held by the National Park Service up to 2013.				
	Local Historic District	Keppel's Village Historic District (est. 2010 per CoH web map)	See below for galvanized, private owner services in this area	
		11 W 14th St		
		334 Central Ave		
		330 Central Ave		
		324 Central Ave		
		318 Central Ave		
		6 W 13th St		
		12 W 13th St		
	Local Historic District	Washington Boulevard Historic District (est. 2001 per CoH web map)	See below for galvanized, private owner services in this area	
		228 W 16th St		
		229 W 16th St		

		230 W 15th St		
		382 Washington Blvd		
		378 Washington Blvd		
		358 Washington Blvd		
		352 Washington Blvd		
		347 Washington Blvd		
		343 Washington Blvd		
		344 Washington Blvd		
		339 Washington Blvd		
		338 Washington Blvd		
		333 Washington Blvd		
		329 Washington Blvd		
		334 Washington Blvd		
		332 Washington Blvd		
		325 Washington Blvd		
		224 W 13th St		
		220 W 13th St		
		208 W 13th St		
		206 W 13th St		
		204 W 13th St		
		198 W 13th St		
		194 W 13th St		
		176 W 13th St		
		170 W 13th St		
		201 W 13th St		
		211 W 13th St		
		215 W 13th St		
		304 Washington Blvd		
		240 W 12th St		
		244 W 12th St		
		256 W 12th St		
		239 W 12th St		
		243 W 12th St		
		247 W 12th St		
		259 W 12th St		
		273 W 12th St		
		277 W 12th St		
		283 W 12th St		
		275 Van Raalte Ave		
		270 W 11th St		
		268 W 11th St		
		258 W 11th St (noncontributing per WBSC)		
		250 W 11th St		
		246 W 11th St (behind 244 W 11th St)		
		240 W 11th St		
		234 W 11th St		
		237 W 11th St		
		241 W 11th St		
		243 W 11th St		
		251 W 11th St		
		253 W 11th St		
		257 W 11th St		
		261 W 11th St		
		265 W 11th St		
		269 W 11th St		
		261 Can Raalte Ave		
		284 W 10th St		
		278 W 10th St		
		274 W 10th St		
		256 W 10th St		
		252 W 10th St		
		248 W 10th St		
		237 Van Raalte Ave		
		277 W 10th St		
		273 W 10th St		
		271 W 10th St		
		259 W 10th St		
		255 W 10th St		
		253 W 10th St		
		243 W 10th St		
		272 W 9th St		
		231 W 9th St		
		255 W 9th St		
		219 W 9th St		
		205 W 9th St		
		199 W 9th St		
		187 W 9th St		
		181 W 9th St		
		182 W 9th St		
		198 W 9th St		
		237 Washington Blvd		
		232 W 10th St		
		168 W 10th St		
	State Listed	1 Graves Place	No	
		550 Grove Drive	No	
		236 W 9th St	No	
		555 Michigan Ave	two galvanized services, but don't appear to be connected to historical bldg	
		77 W 11th St	No	
		57 E 10th St	No	
		5298 147th Ave	No	
		110 W 12th St	No	
		190 W 9th St	No	
		31 W 10th St	No	
		116 E 10th St	No	
		195 W 8th St	No	
		86 E 12th St	No	

April 24, 2023

Molly Meshigaud, Cory Sagataw, and Michael Schuster
Hannahville Indian Community
N14911 Hannahville B-1 Rd.
Wilson, MI 49896

RE: Drinking Water System Improvements – Drinking Water State Revolving Fund Application
Holland Board of Public Works, Ottawa County

Dear Ms. Meshigaud, Mr. Sagataw, and Mr. Schuster:

The Holland Board of Public Works (HBPW) in Holland, Michigan requests a historical review by your Tribal Historic Preservation Office for activities related to a planned drinking water system improvement project. The HBPW is currently proposing improvements to the regional Holland Water Treatment Plant, as well as the replacement of lead service lines in front of approximately 200 historic homes in Holland.

The City of Holland, acting by and through its Board of Public Works, is seeking to finance this project through loans from the Drinking Water State Revolving Fund (DWSRF) program. Due to the project's potential impact on archaeological, historical, and cultural resources, the Michigan Department of Environment, Great Lakes, and Energy (EGLE) recommends reaching out to regional Tribal Historic Preservation Offices to assess any potential effects.

A project information sheet and supplemental information detailing the impacted properties are enclosed for your review. Response by May 22, 2023 would be appreciated so we can include your assessment in our Project Planning Document for EGLE.

Thank you for your assistance as we work toward implementing this project. If any additional information is needed, please feel free to contact me at 616-355-1371 or c.locker@cityofholland.com.

Sincerely,

Connie Locker
Grant Manager

Attachments: Project Information
Project Area Maps

April 24, 2023

Jay Sam and Frank Beaver
Little River Band of Ottawa Indians
2608 Government Center Dr.
Manistee, MI 49660

RE: Drinking Water System Improvements – Drinking Water State Revolving Fund Application
Holland Board of Public Works, Ottawa County

Dear Mr. Sam and Mr. Beaver:

The Holland Board of Public Works (HBPW) in Holland, Michigan requests a historical review by your Tribal Historic Preservation Office for activities related to a planned drinking water system improvement project. The HBPW is currently proposing improvements to the regional Holland Water Treatment Plant, as well as the replacement of lead service lines in front of approximately 200 historic homes in Holland.

The City of Holland, acting by and through its Board of Public Works, is seeking to finance this project through loans from the Drinking Water State Revolving Fund (DWSRF) program. Due to the project's potential impact on archaeological, historical, and cultural resources, the Michigan Department of Environment, Great Lakes, and Energy (EGLE) recommends reaching out to regional Tribal Historic Preservation Offices to assess any potential effects.

A project information sheet and supplemental information detailing the impacted properties are enclosed for your review. Response by May 22, 2023 would be appreciated so we can include your assessment in our Project Planning Document for EGLE.

Thank you for your assistance as we work toward implementing this project. If any additional information is needed, please feel free to contact me at 616-355-1371 or c.locker@cityofholland.com.

Sincerely,

Connie Locker
Grant Manager

Attachments: Project Information
Project Area Maps

April 24, 2023

Lakota Pochedley, Kaila Akina, and Shawn Mckenney
Match-E-Be-Nash-She-Wish Band of Pottawatomi Indians
2872 Mission Dr.
Shelbyville, MI 49344

RE: Drinking Water System Improvements – Drinking Water State Revolving Fund Application
Holland Board of Public Works, Ottawa County

Dear Ms. Pochedley, Ms. Akina, and Mr. Mckenney:

The Holland Board of Public Works (HBPW) in Holland, Michigan requests a historical review by your Tribal Historic Preservation Office for activities related to a planned drinking water system improvement project. The HBPW is currently proposing improvements to the regional Holland Water Treatment Plant, as well as the replacement of lead service lines in front of approximately 200 historic homes in Holland.

The City of Holland, acting by and through its Board of Public Works, is seeking to finance this project through loans from the Drinking Water State Revolving Fund (DWSRF) program. Due to the project's potential impact on archaeological, historical, and cultural resources, the Michigan Department of Environment, Great Lakes, and Energy (EGLE) recommends reaching out to regional Tribal Historic Preservation Offices to assess any potential effects.

A project information sheet and supplemental information detailing the impacted properties are enclosed for your review. Response by May 22, 2023 would be appreciated so we can include your assessment in our Project Planning Document for EGLE.

Thank you for your assistance as we work toward implementing this project. If any additional information is needed, please feel free to contact me at 616-355-1371 or c.locker@cityofholland.com.

Sincerely,

Connie Locker
Grant Manager

Attachments: Project Information
Project Area Maps

April 24, 2023

Douglas Taylor and John Rodwan
Nottawaseppi Huron Band of the Potawatomi
311 State St.
Grand Rapids, MI 49503

RE: Drinking Water System Improvements – Drinking Water State Revolving Fund Application
Holland Board of Public Works, Ottawa County

Dear Mr. Taylor and Mr. Rodwan:

The Holland Board of Public Works (HBPW) in Holland, Michigan requests a historical review by your Tribal Historic Preservation Office for activities related to a planned drinking water system improvement project. The HBPW is currently proposing improvements to the regional Holland Water Treatment Plant, as well as the replacement of lead service lines in front of approximately 200 historic homes in Holland.

The City of Holland, acting by and through its Board of Public Works, is seeking to finance this project through loans from the Drinking Water State Revolving Fund (DWSRF) program. Due to the project's potential impact on archaeological, historical, and cultural resources, the Michigan Department of Environment, Great Lakes, and Energy (EGLE) recommends reaching out to regional Tribal Historic Preservation Offices to assess any potential effects.

A project information sheet and supplemental information detailing the impacted properties are enclosed for your review. Response by May 22, 2023 would be appreciated so we can include your assessment in our Project Planning Document for EGLE.

Thank you for your assistance as we work toward implementing this project. If any additional information is needed, please feel free to contact me at 616-355-1371 or c.locker@cityofholland.com.

Sincerely,

Connie Locker
Grant Manager

Attachments: Project Information
Project Area Maps

April 24, 2023

Matthew Bussler and Jennifer Kanine
Pokagon Band of Potawatomi
58620 Sink Rd.
Dowagiac, MI 49047

RE: Drinking Water System Improvements – Drinking Water State Revolving Fund Application
Holland Board of Public Works, Ottawa County

Dear Mr. Bussler and Ms. Kanine:

The Holland Board of Public Works (HBPW) in Holland, Michigan requests a historical review by your Tribal Historic Preservation Office for activities related to a planned drinking water system improvement project. The HBPW is currently proposing improvements to the regional Holland Water Treatment Plant, as well as the replacement of lead service lines in front of approximately 200 historic homes in Holland.

The City of Holland, acting by and through its Board of Public Works, is seeking to finance this project through loans from the Drinking Water State Revolving Fund (DWSRF) program. Due to the project's potential impact on archaeological, historical, and cultural resources, the Michigan Department of Environment, Great Lakes, and Energy (EGLE) recommends reaching out to regional Tribal Historic Preservation Offices to assess any potential effects.

A project information sheet and supplemental information detailing the impacted properties are enclosed for your review. Response by May 22, 2023 would be appreciated so we can include your assessment in our Project Planning Document for EGLE.

Thank you for your assistance as we work toward implementing this project. If any additional information is needed, please feel free to contact me at 616-355-1371 or c.locker@cityofholland.com.

Sincerely,

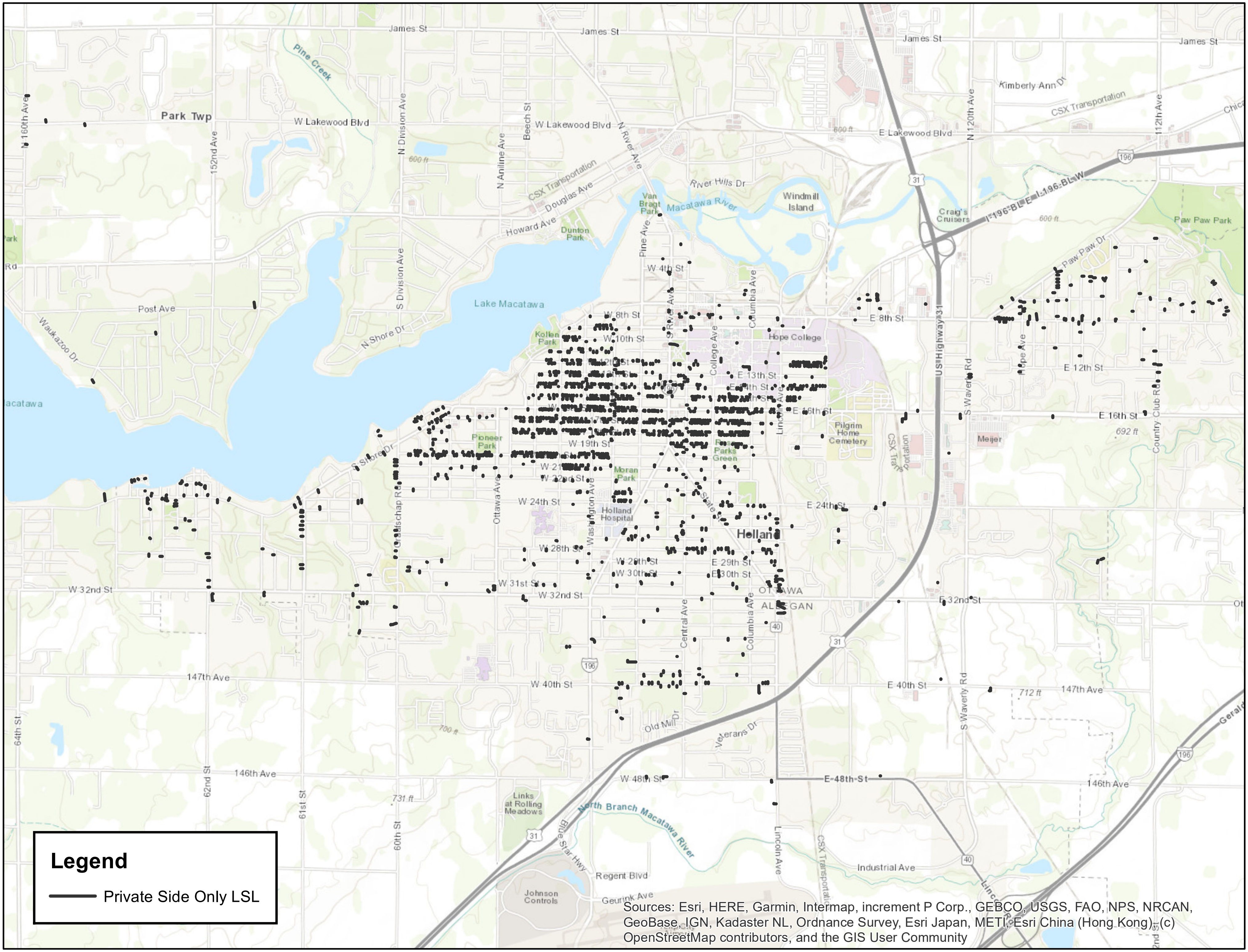
Connie Locker
Grant Manager

Attachments: Project Information
Project Area Maps

HOLLAND BOARD OF PUBLIC WORKS
DWRF APPLICATION – WATER SYSTEM IMPROVEMENTS
Project Information

Project Name:	Holland Board of Public Works Water System Improvements
Project Address:	46 North Lakeshore Drive, Holland, MI 49424
Federal Agency and Contact:	Dan Beauchamp Water Infrastructure Funding and Financing Section Department of Environment, Great Lakes, and Energy P.O. Box 30457 Lansing, MI 48909-7957 Phone: 517-388-3380
State Agency and Contact:	Sara Brown Water Infrastructure Funding and Financing Section Department of Environment, Great Lakes, and Energy P.O. Box 30457 Lansing, MI 48909-7957 Phone: 517-231-8916
Applicant Contact:	Connie Locker Holland Board of Public Works 625 Hastings Avenue Holland, MI 49423 Phone: 616-355-1371
Map of Project Location:	Attached
USGS Quad Maps:	Holland West Holland East
PLSS Town, Range, Sections:	T4N, R15W, Sec 3-6, 9 T4N, R16W, Sec 1-2 T5N, R16W, Sec 21, 23, 25-26, 35-36 T5N, R15W, Sec 20, 26-35

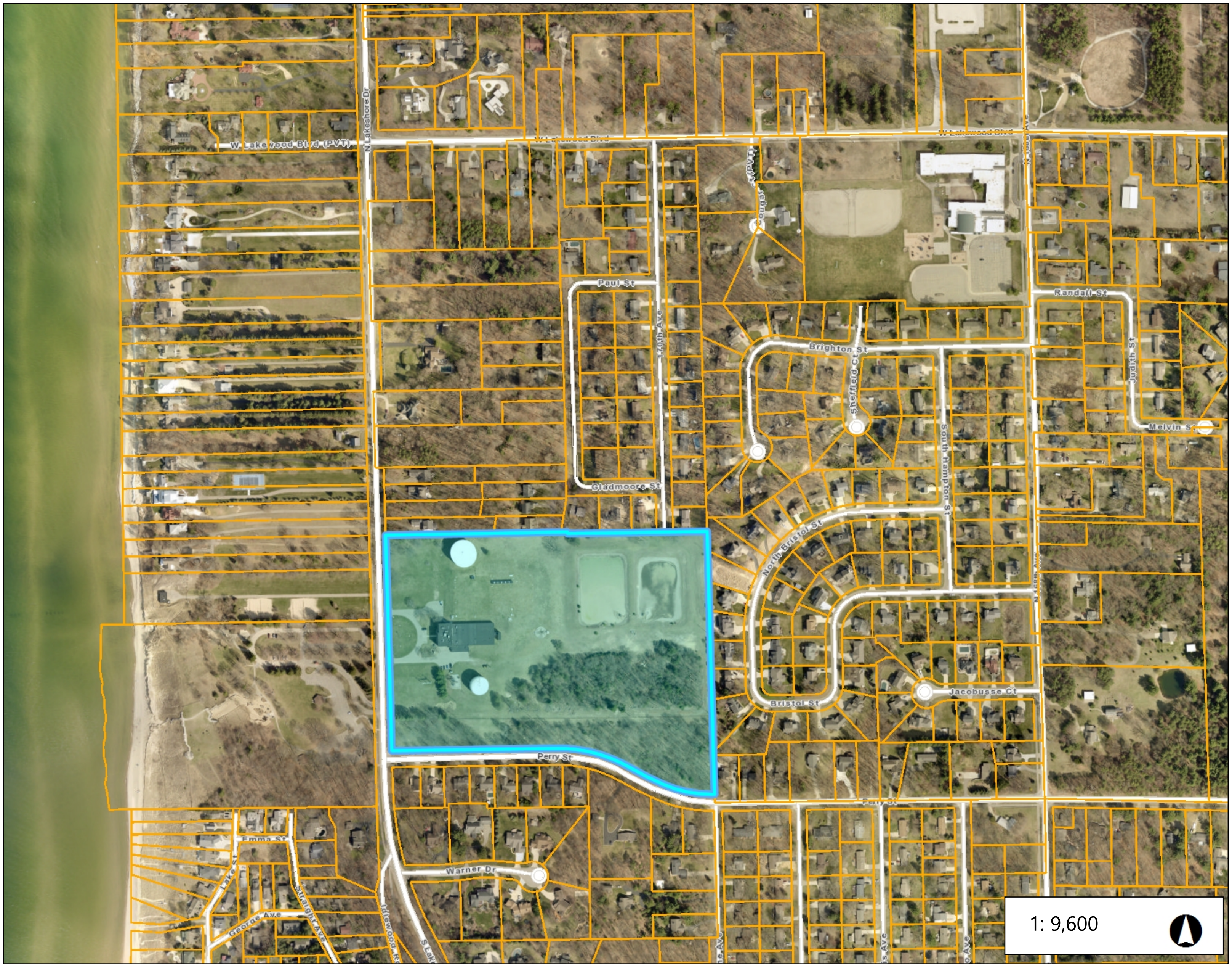
Project Description:
The Holland Board of Public Works is proposing improvements to its existing drinking water system to improve system reliability and maintain compliance with requirements for lead service lines that were previously connected to lead goosenecks. This work would be completed using directional drilling in lawns and driveways. The other component of the proposed project is replacing existing chemical storage facilities at the Water Treatment Plant (WTP) from the third floor with new facilities at ground level. A new service drive for chemical deliveries would be constructed as well as a stormwater retention feature.

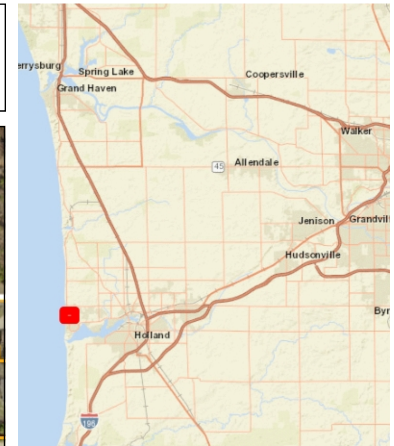


James St
Park Twp
W Lakewood Blvd
E Lakewood Blvd
Lake Macatawa
Macatawa River
Windmill Island
Hope College
Holland
Holland Hospital
W 8th St
E 8th St
W 10th St
E 12th St
E 13th St
E 16th St
W 19th St
W 24th St
E 24th St
W 28th St
W 32nd St
E 32nd St
W 40th St
E 40th St
W 48th St
E-48th-St
147th Ave
146th Ave
US Highway 31
Meijer
Pilgrim Home Cemetery
North Branch Macatawa River
Industrial Ave
Johnson Controls
Links at Rolling Meadows
OTTAWA
ALLEGAN
Legend
Private Side Only LSL
Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community

Ottawa County
Geospatial Insights & Solutions

Project Location Map - WTP





Legend

Parcels_

Notes

1,600.0 | 0 | 800.00 | 1,600.0 Feet

WGS_1984_Web_Mercator_Auxiliary_Sphere

This map is a user generated static output from an Internet mapping site and is for reference only. Data layers that appear on this map may or may not be accurate, current, or otherwise reliable.

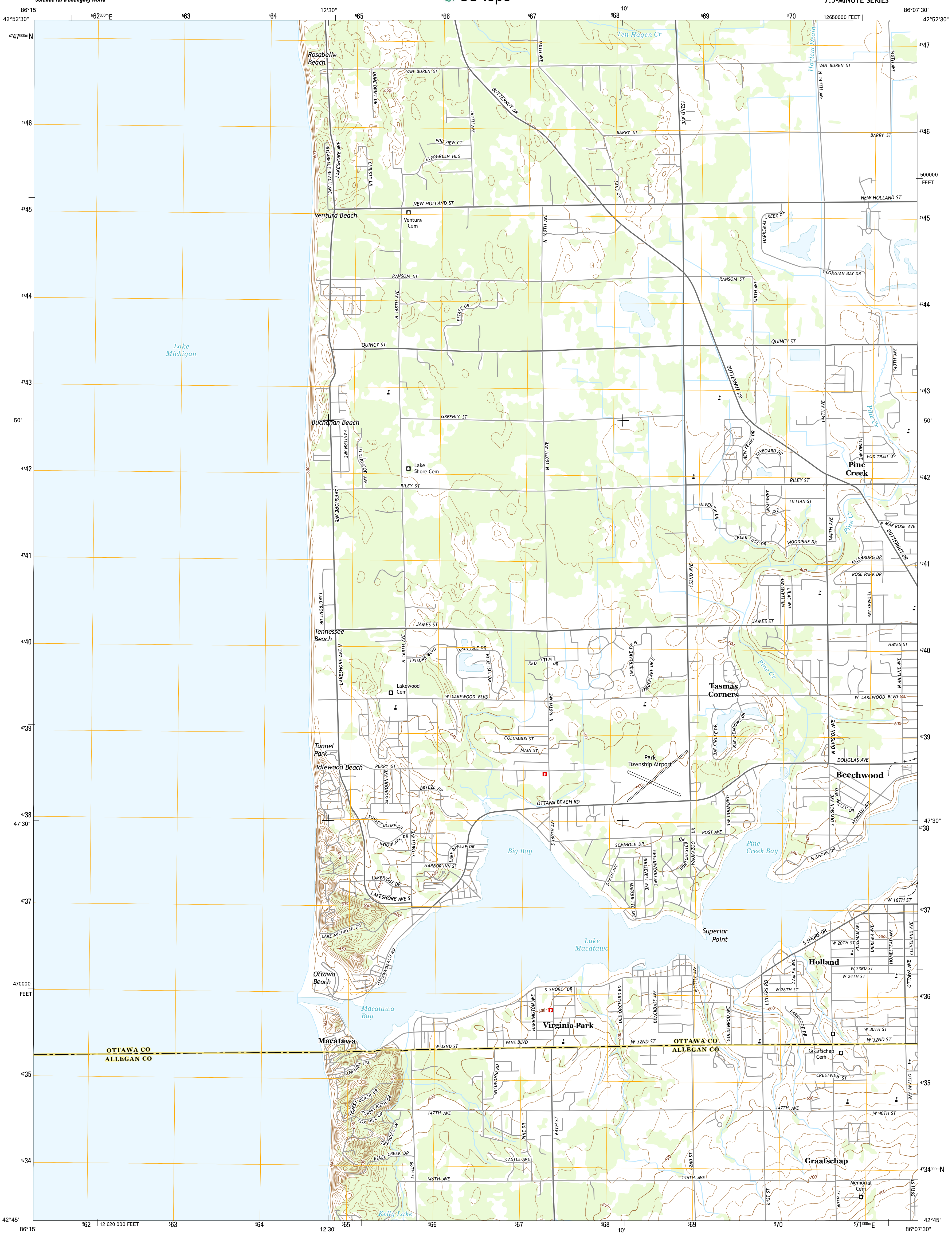
THIS MAP IS NOT TO BE USED FOR NAVIGATION

USGS science for a changing world

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

The National Map
US Topo

HOLLAND WEST QUADRANGLE
MICHIGAN
7.5-MINUTE SERIES



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
10 000-foot ticks: Michigan Coordinate System of 1983 (south zone)

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, June 2012
Roads.....HERE, ©2013
Names.....GNIS, 2013
Hydrography.....National Hydrography Dataset, 2012
Contours.....National Elevation Dataset, 1999
Boundaries.....Multiple sources; see metadata file 1972 - 2013
Public Land Survey System.....BLM, 2011

MN
GN
5° 8′
91 MILS
0° 33′
10 MILS

UTM GRID AND 2014 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

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

SCALE 1:24 000

KILOMETERS 1 0.5 0 1 2
METERS 1000 500 0 1000 2000
MILES 1 0.5 0 1
FEET 1000 0 1000 2000 3000 4000 5000 6000 7000 8000 9000 10000

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 0.6.16

MICHIGAN
QUADRANGLE LOCATION

1	2	3
4		5
6	7	8

1
2 Port Sheldon
3 Borculo
4
5 Holland East
6
7 Saugatuck
8 Hamilton West

ADJOINING QUADRANGLES

ROAD CLASSIFICATION

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

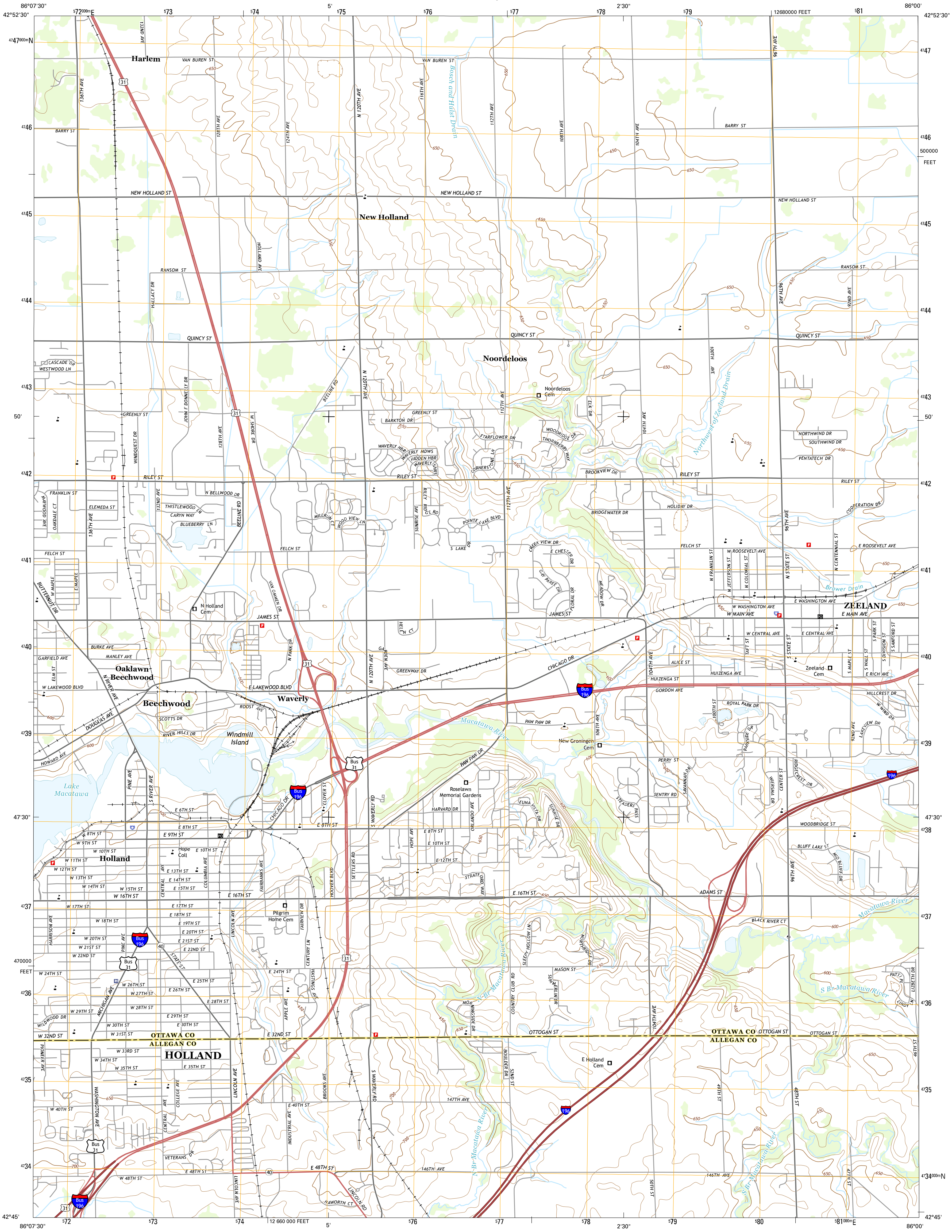
HOLLAND WEST, MI
2014

NSN. 7643016371154
NGA REF NO. USGSX24K20728

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

The National Map
US Topo

HOLLAND EAST QUADRANGLE
MICHIGAN
7.5-MINUTE SERIES



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
10 000-foot ticks: Michigan Coordinate System of 1983 (south zone)

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, June 2012
Roads.... HERE, ©2013
Names....GNIS, 2013
Hydrography....National Hydrography Dataset, 2012
Contours....National Elevation Dataset, 1999
Boundaries....Multiple sources; see metadata file 1972 - 2013
Public Land Survey System....BLM, 2011

MN
GN
5° 14´
93 MILS
0° 38´
11 MILS
UTM GRID AND 2014 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

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

SCALE 1:24 000

KILOMETERS 1 0.5 0 1 2
METERS 1000 500 0 1000 2000
MILES 1 0.5 0 1
FEET 1000 0 1000 2000 3000 4000 5000 6000 7000 8000 9000 10000

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 0.6.16

MICHIGAN
QUADRANGLE LOCATION

1	2	3
4		5
6	7	8

ADJOINING QUADRANGLES

1 Port Sheldon
2 Borculo
3 Allendale
4 Holland West
5 Hudsonville West
6 Saugatuck
7 Hamilton West
8 Hamilton East

ROAD CLASSIFICATION

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

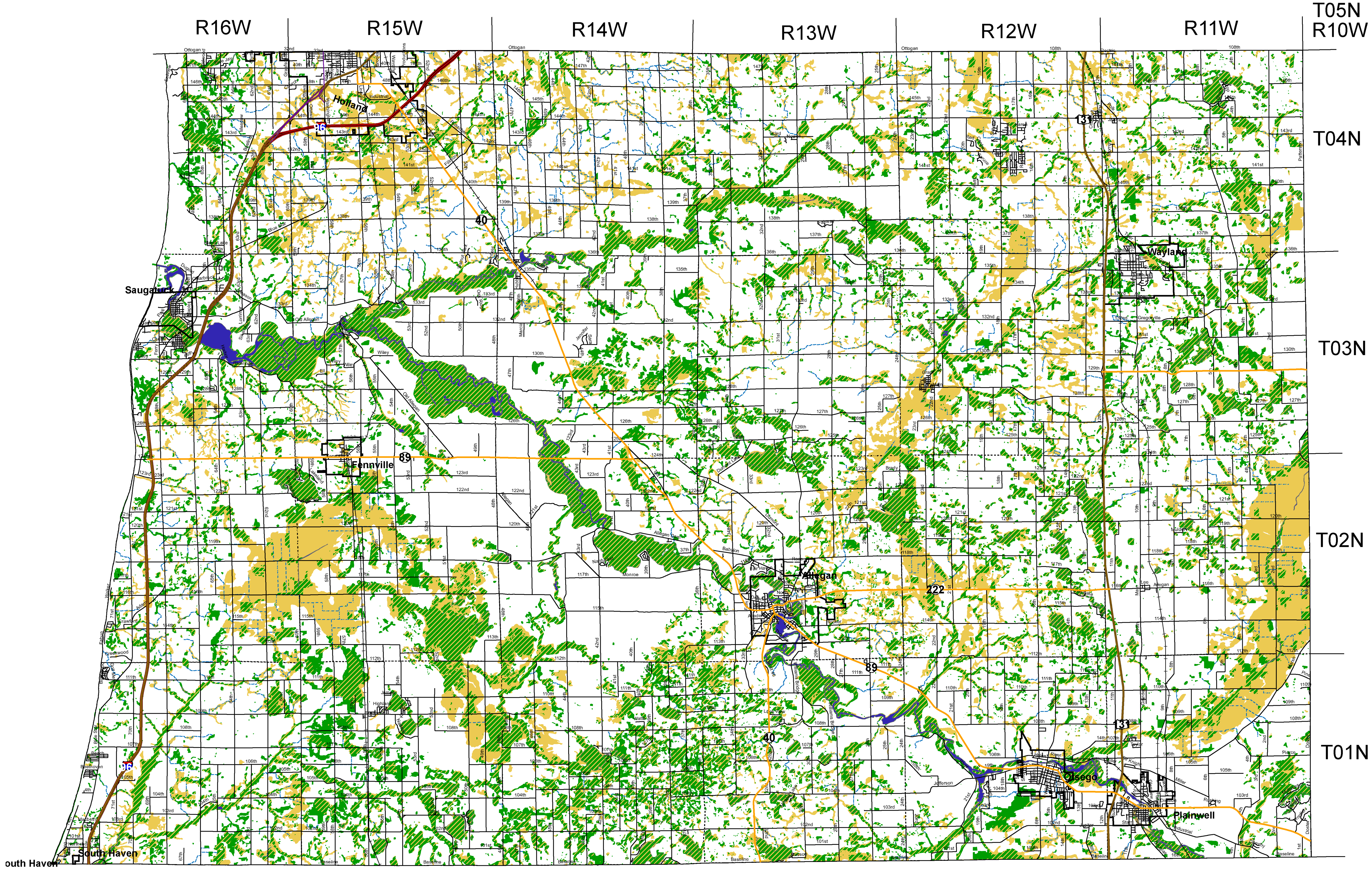
HOLLAND EAST, MI
2014

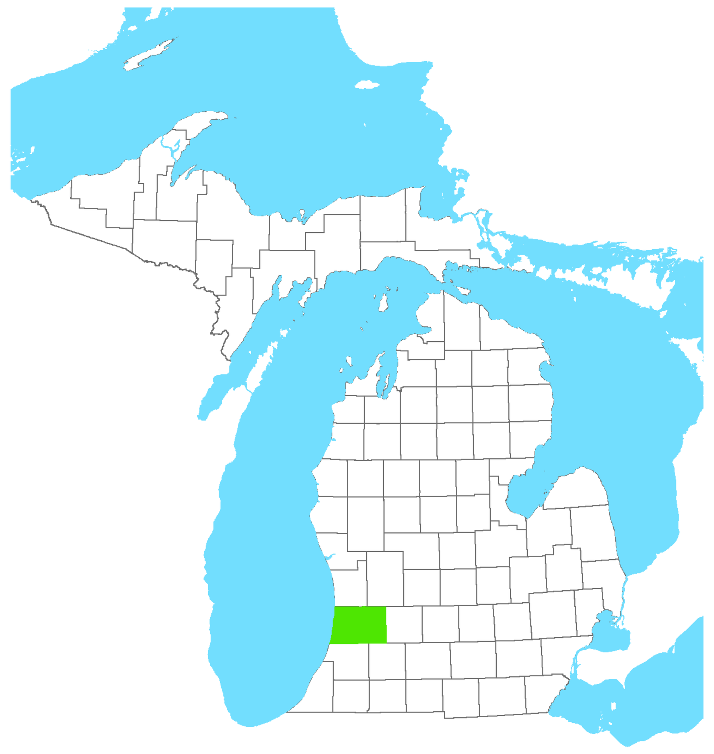
NSN. 7643016371153
NGA REF NO. USGSX24K20723

Appendix E

Environmental Resources Review

Allegan County Final Wetland Inventory





Allegan County

Final Wetland Inventory

This Michigan Department of Environmental Quality (MDEQ) Wetland Inventory Map is intended to be used as one tool to assist in identifying wetlands and provides only potential and approximate location of wetlands and wetland conditions. The MDEQ produced this map from the following data obtained from other agencies or organizations:

1. The National Wetland Inventory (NWI) conducted by the United States Fish and Wildlife Service through interpretation of aerial photos and topographic data.
2. Land Cover as mapped by the Michigan Resource Inventory System (MIRIS), Michigan Department of Natural Resources, through interpretation of aerial photographs.
3. Soils as mapped by the United States Department of Agriculture, Natural Resource Conservation Service (NRCS).

This map is not intended to be used to determine the specific locations and jurisdictional boundaries of wetland areas subject to regulation under Part 303, Wetlands Protection, of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended. Only an on-site evaluation performed by the MDEQ in accordance with Part 303 shall be used for jurisdictional determinations. A permit is required from the MDEQ to conduct certain activities in wetlands regulated under Part 303.

More information regarding this map, including how to obtain a copy can be accessed at www.michigan.gov/deqwetlands.

Miles
0 0.5 1 2 3 4

Legend

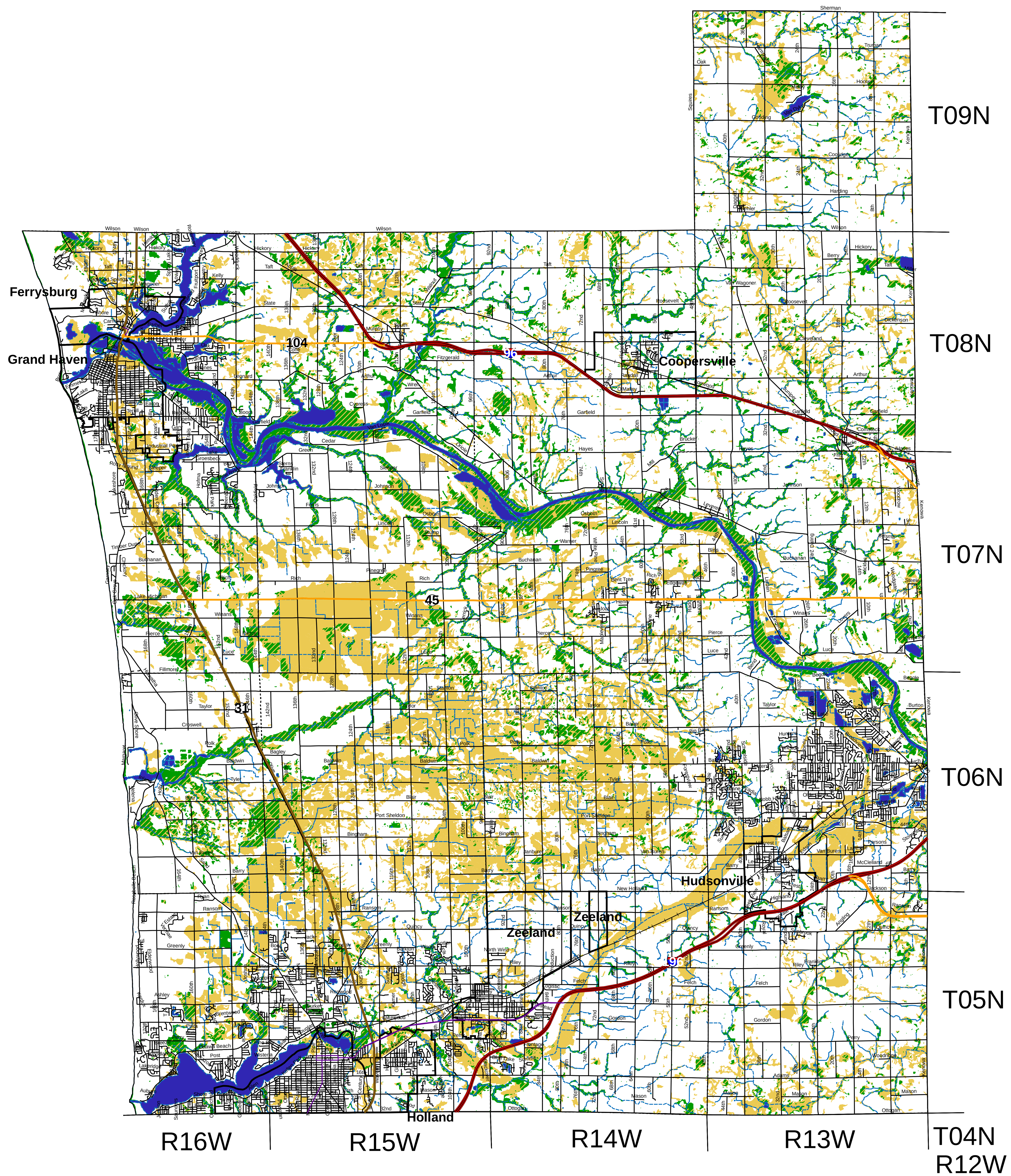
N
W E
S

- Interstate Highways
- US Highways
- State Highways
- Railways
- Open Water
- Rivers
- Drains
- Wetlands as identified on NWI and MIRIS maps
- Soil areas which include wetland soils
- Wetlands as identified on NWI and MIRIS maps and soil areas which include wetland soils
- County Boundary

Areas shown as wetlands, wetland soils, or open water on the map are potential wetlands and deserve further site investigation to verify if wetlands are actually present.
This map may not identify all potential wetlands in a county (it may show wetlands that are not actually present and it may not show wetlands which are actually present).
This map represents existing information that suggests the probability that a wetland may or may not exist in a given area and cannot be used to identify regulatory jurisdiction.

Compiled by MDEQ, December 18, 2006.

Ottawa County Final Wetland Inventory



Ottawa County

Final Wetland Inventory

This Michigan Department of Environmental Quality (MDEQ) Wetland Inventory Map is intended to be used as one tool to assist in identifying wetlands and provides only potential and approximate location of wetlands and wetland conditions. The MDEQ produced this map from the following data obtained from other agencies or organizations:

1. The National Wetland Inventory (NWI) conducted by the United States Fish and Wildlife Service through interpretation of aerial photos and topographic data.
2. Land Cover as mapped by the Michigan Resource Inventory System (MIRIS), Michigan Department of Natural Resources, through interpretation of aerial photographs.
3. Soils as mapped by the United States Department of Agriculture, Natural Resource Conservation Service (NRCS).

This map is not intended to be used to determine the specific locations and jurisdictional boundaries of wetland areas subject to regulation under Part 303, Wetlands Protection, of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended. Only an on-site evaluation performed by the MDEQ in accordance with Part 303 shall be used for jurisdictional determinations. A permit is required from the MDEQ to conduct certain activities in wetlands regulated under Part 303.

More information regarding this map, including how to obtain a copy can be accessed at www.michigan.gov/deqwetlands.

Miles
0 0.5 1 2 3 4

Legend

- Interstate Highways
- US Highways
- State Highways
- Railways
- Open Water
- Rivers
- Drains
- Wetlands as identified on NWI and MIRIS maps
- Soil areas which include wetland soils
- Wetlands as identified on NWI and MIRIS maps and soil areas which include wetland soils
- County Boundary

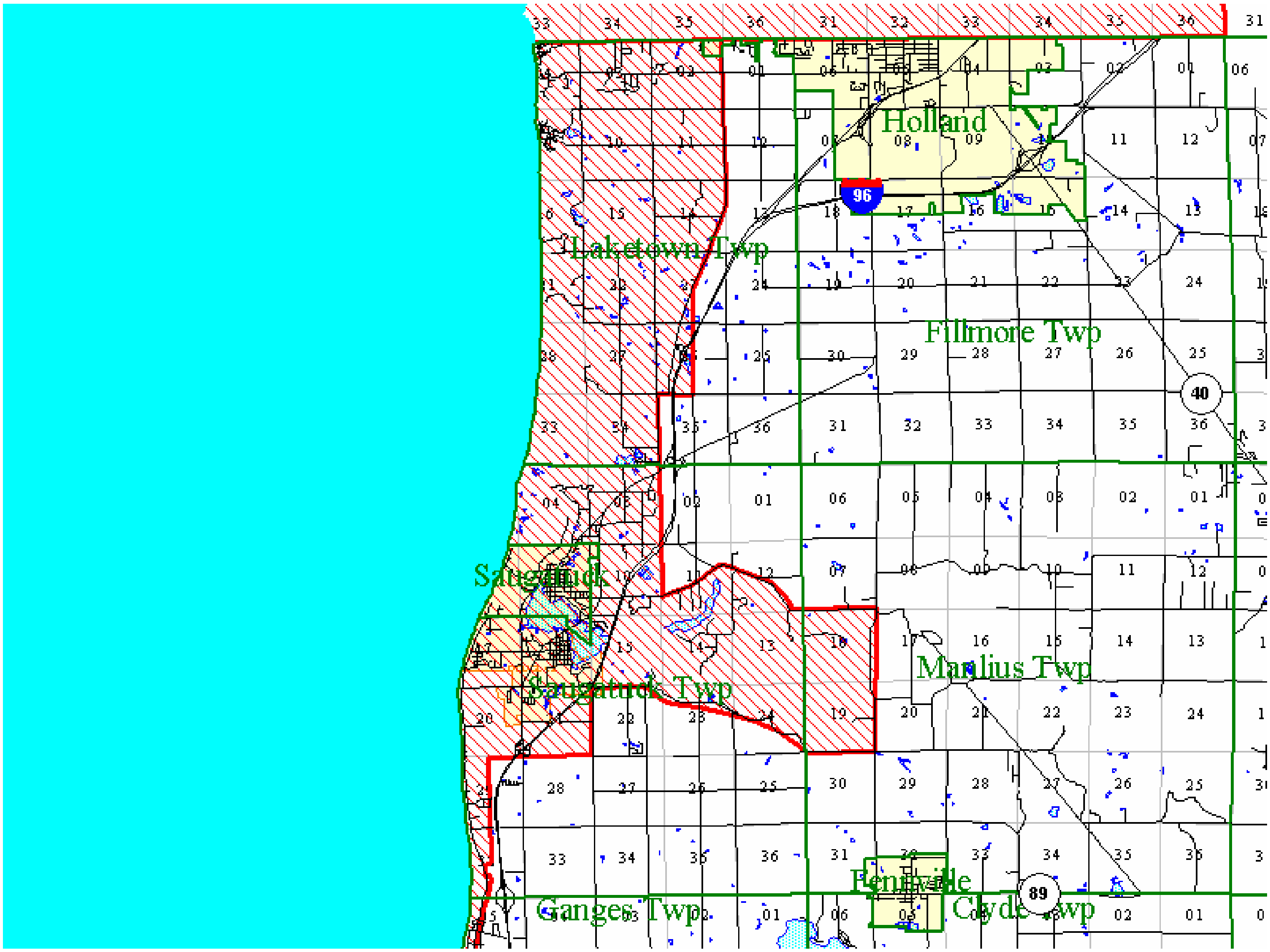
N
W E
S

Areas shown as wetlands, wetland soils, or open water on the map are potential wetlands and deserve further site investigation to verify if wetlands are actually present.
This map may not identify all potential wetlands in a county (it may show wetlands that are not actually present and it may not show wetlands which are actually present).
This map represents existing information that suggests the probability that a wetland may or may not exist in a given area and cannot be used to identify regulatory jurisdiction.

Compiled by MDEQ, December 18, 2006.

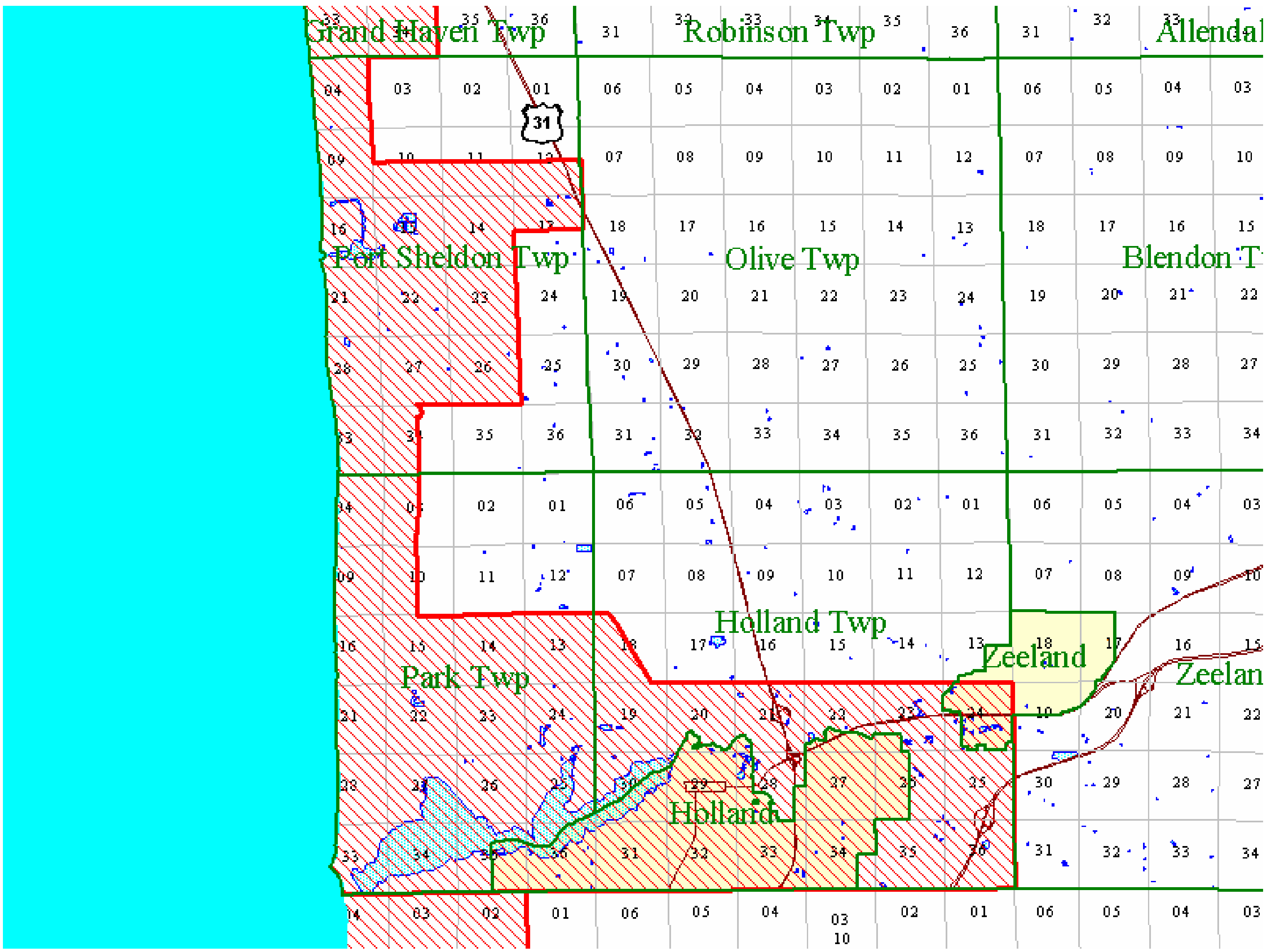
Allegan County
Laketown Township, T4N R16W
South Haven, T3N R 16W
Saugatuck Township, T3N R16W
Manlius Township T3N R15W

The heavy red line is the ***Coastal Zone Management Boundary***
The red hatched area is the ***Coastal Zone Management Area***



Ottawa County
Port Sheldon Township, T6N R16W
Park Township, T5N R16W
Holland Township T5N R15W
Holland, T5N R15W
Zeeland, T5N R15W

The heavy red line is the ***Coastal Zone Management Boundary***
The red hatched area is the ***Coastal Zone Management Area***



March 27, 2023

Attn: Ronda Wuycheck
EGLE-WRD
Field Operations Support Section
Coastal Management Program Unit
P.O. Box 30458
Lansing, MI 48909-7958

RE: Drinking Water System Improvements - Drinking Water SRF Application
Holland Board of Public Works, Allegan and Ottawa County

Dear Ronda Wuycheck:

The Holland Board of Public Works (BPW) requests a review of proposed water system improvements for potential impacts to State Coastal Zone Management Areas. The BPW is currently proposing improvements to the existing drinking water system that include replacement of privately owned galvanized service lines that were previously connected to lead goosenecks and replacement of existing chemical storage facilities at the Holland Water Treatement Plant. The proposed improvements will occur within Park Township, Ottawa County, and the City of Holland in Allegan and Ottawa Counties.

The City of Holland acting by and through its Board of Public Works is seeking to finance this project through loans from the Drinking Water State Revolving Fund (DWRF) Program. In order to proceed with the application process, the Michigan Department of Environment, Great Lakes, and Energy (EGLE) requires a review of the project for consistency with Michigan's coastal management program.

We request a review of the attached information and would appreciate any expedience with your response so that we may meet the SRF program submittal deadlines. We appreciate your assistance in this matter. If you need any additional information, please feel free to contact me at (616) 355-1251.

Thank you,

Samuel R Bender

Samuel Bender
Water & Wastewater Process Engineer

Attachments: Project Information
Project Area Maps
USGS Maps
Costal Zone Maps

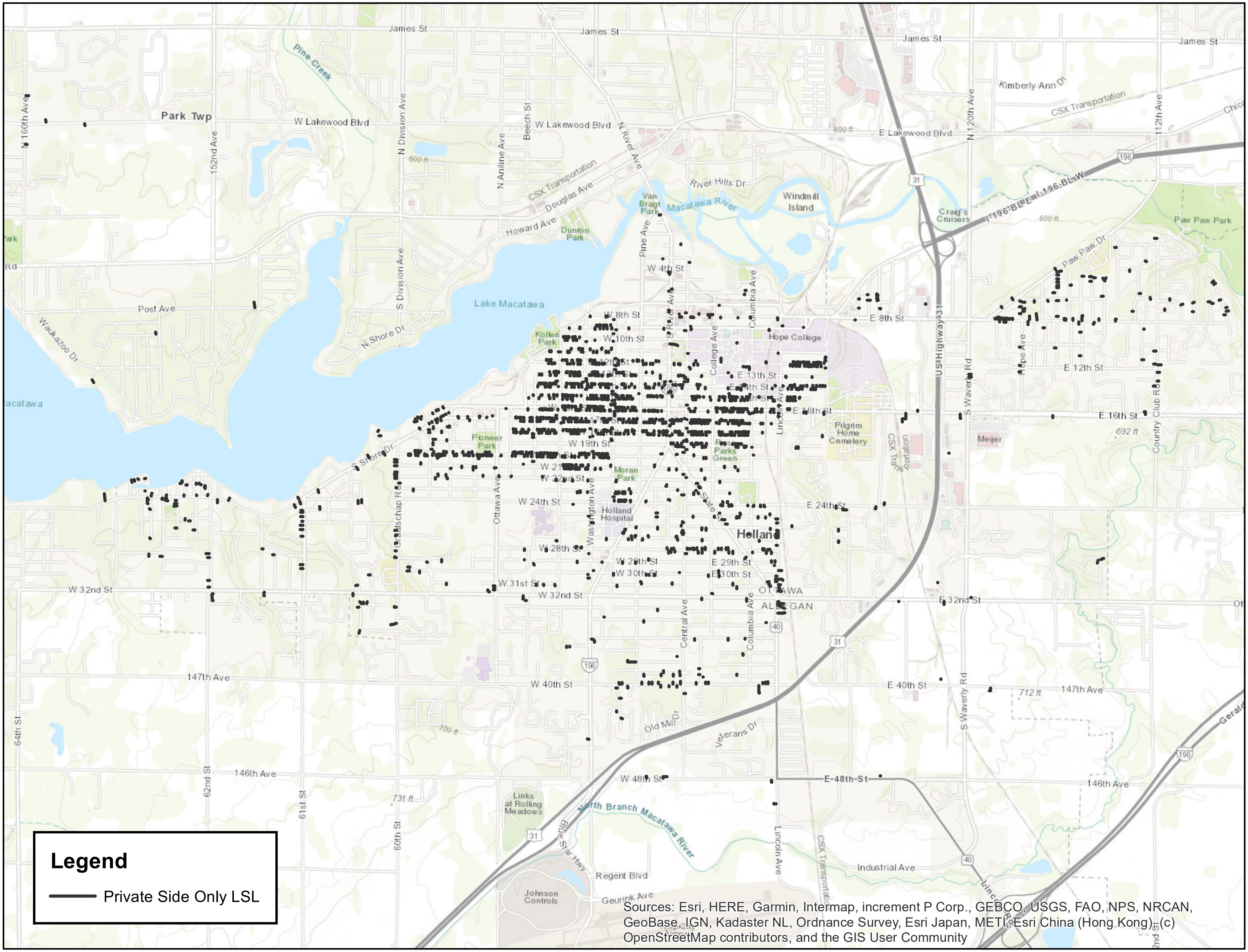
HOLLAND BOARD OF PUBLIC WORKS
DWRF APPLICATION – WATER SYSTEM IMPROVEMENTS
Project Information

Project Name:	Holland Board of Public Works Water System Improvements
Project Address:	46 North Lakeshore Drive, Holland, MI 49424
Federal Agency and Contact:	Dan Beauchamp Water Infrastructure Funding and Financing Section, Department of Environment, Great Lakes, and Energy P.O. Box 30457 Lansing, MI 48909-7957 Phone: 517-388-3380
State Agency and Contact:	Sara Brown Water Infrastructure Funding and Financing Section, Department of Environment, Great Lakes, and Energy P.O. Box 30457 Lansing, MI 48909-7957 Phone: (517) 231-8916
Applicant Contact:	Samuel Bender Holland Board of Public Works 625 Hastings Avenue Holland, MI 49423 Phone: (616) 355-1251
Map of Project Location:	Attached
USGS Quad Maps:	Holland West Holland East
PLSS Town, Range, Sections:	T4N, R15W, Sec 3-6, 9 T4N, R16W, Sec 1-2 T5N, R16W, Sec 21, 23, 25-26, 35-36 T5N, R15W, Sec 20, 26-35

Project Description:
The Holland Board of Public Works is proposing improvements to its existing drinking water system to improve system reliability and maintain compliance with requirements for lead service line replacement. The proposed project would replace privately owned galvanized service lines that were previously connected to lead goosenecks. This work would be completed using directional drilling in lawns and driveways. The other component of the proposed project is replacing existing chemical storage facilities at the Water Treatment Plant (WTP) from the third floor with new facilities at ground level. A new service drive for chemical deliveries would be constructed as well as a stormwater retention feature.

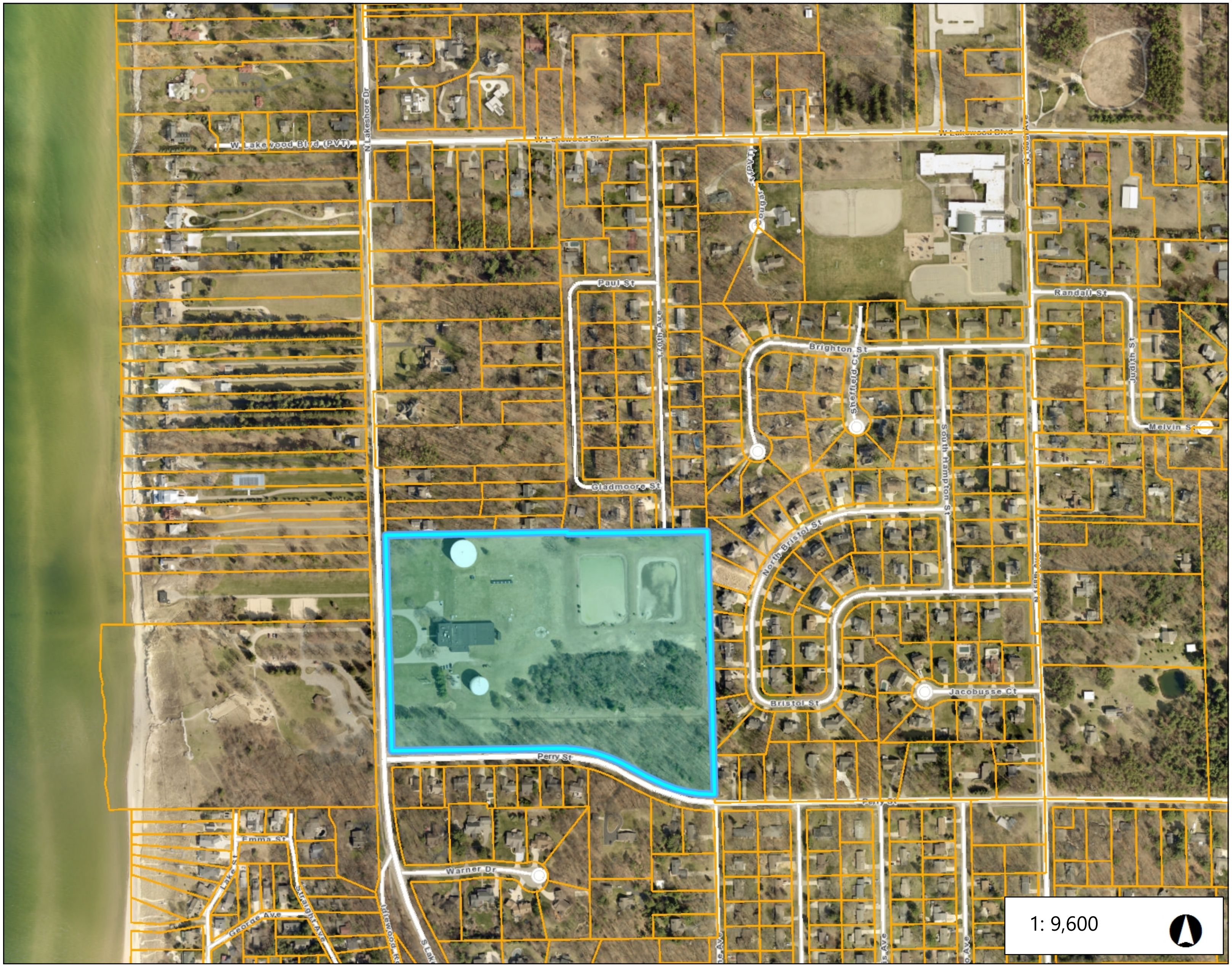
Costal Zones/Great Lakes Shoreline:
Based on review of the U.S. Department of the Interior's Coastal Barrier Resources System there are no federally listed coastal barrier zones in the project area.

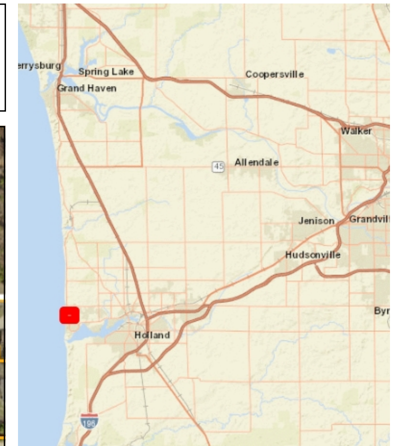
While the project does not include construction in any federally listed coastal barrier zones, the project would take place within the Michigan Coastal Zone Management Area (see map). As a result, the design of the project shall be consistent with the approved state coastal zone management plan and shall incorporate any mitigative measures that may be recommended by the EGLE Land/Water Interface Permitting to achieve this purpose.


Legend
Private Side Only LSL
Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community
James St
Park Twp
W Lakewood Blvd
E Lakewood Blvd
Lake Macatawa
Macatawa River
Windmill Island
Hope College
Holland
Holland Hospital
Pilgrim Home Cemetery
Meijer
Paw Paw Park
US Highway 31
E 8th St
E 16th St
E 24th St
E 32nd St
W 32nd St
W 40th St
E 40th St
W 48th St
E 48th St
147th Ave
146th Ave
Post Ave
Country Club Rd
OTTAWA
ALLEGAN
North Branch Macatawa River
Links at Rolling Meadows
Johnson Controls
Industrial Ave
Regent Blvd
Geurink Ave

Ottawa County
Geospatial Insights & Solutions

Project Location Map - WTP





Legend

Parcels_

Notes

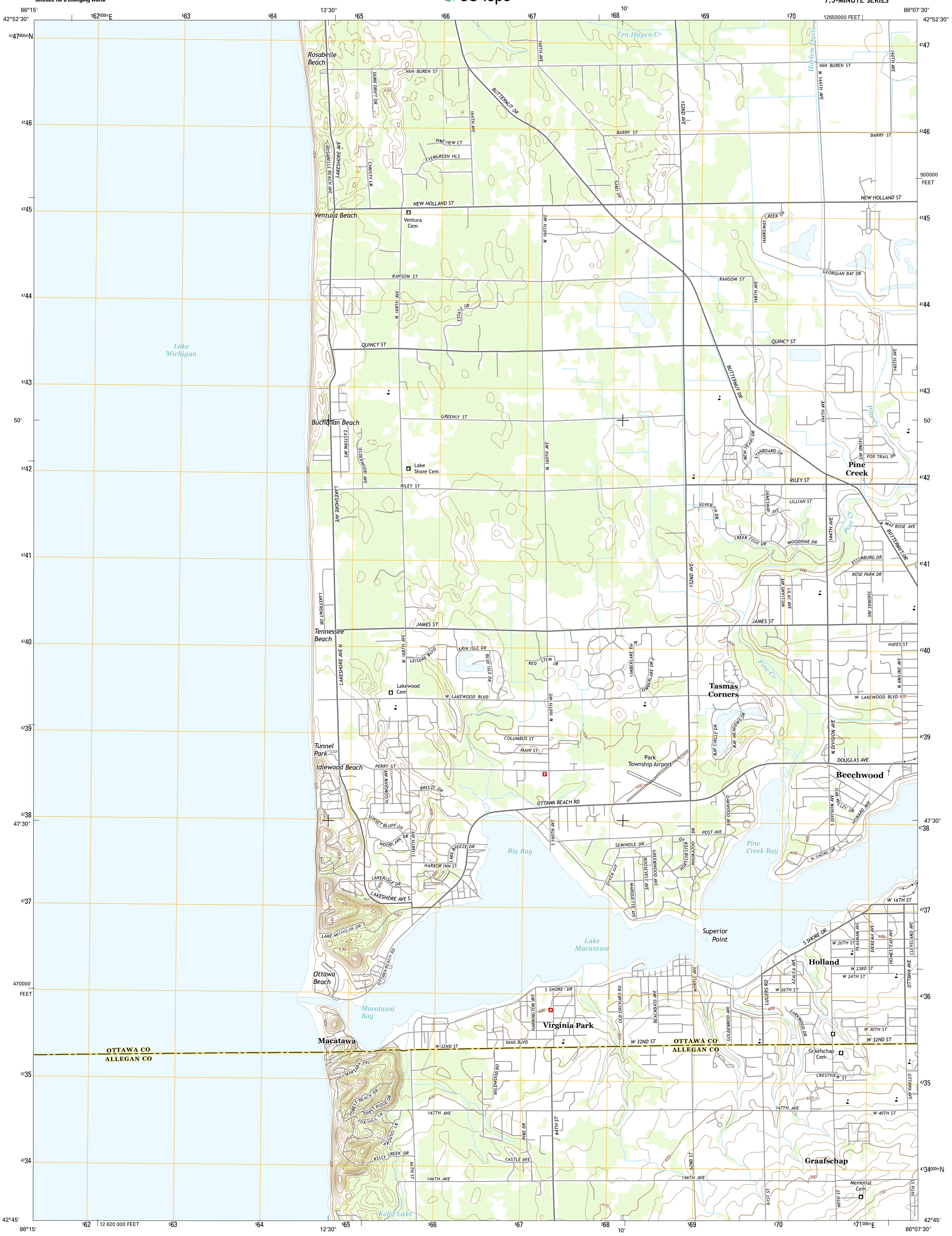
1,600.0 0 800.00 1,600.0 Feet

WGS_1984_Web_Mercator_Auxiliary_Sphere

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

The National Map
US Topo

HOLLAND WEST QUADRANGLE
MICHIGAN
7.5-MINUTE SERIES



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
10 000-foot ticks: Michigan Coordinate System of 1983 (south zone)

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, June 2012
Roads....................HERE, ©2013
Names....................GNIS, 2013
Hydrography..........National Hydrography Dataset, 2012
Contours..........National Elevation Dataset, 1999
Boundaries..........Multiple sources; see metadata file 1972 - 2013
Public Land Survey System..........BLM, 2011

MN
GN
5° 8´
91 MILS
0° 33´
10 MILS
UTM GRID AND 2014 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

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

SCALE 1:24 000

KILOMETERS 1 0.5 0 1 2
METERS 1000 500 0 1000 2000
MILES 1 0.5 0 1
FEET 1000 0 1000 2000 3000 4000 5000 6000 7000 8000 9000 10000

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 0.6.16

MICHIGAN
QUADRANGLE LOCATION

ROAD CLASSIFICATION

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

1	2	3
4		5
6	7	8

1
2 Port Sheldon
3 Borculo
4
5 Holland East
6
7 Saugatuck
8 Hamilton West

ADJOINING QUADRANGLES

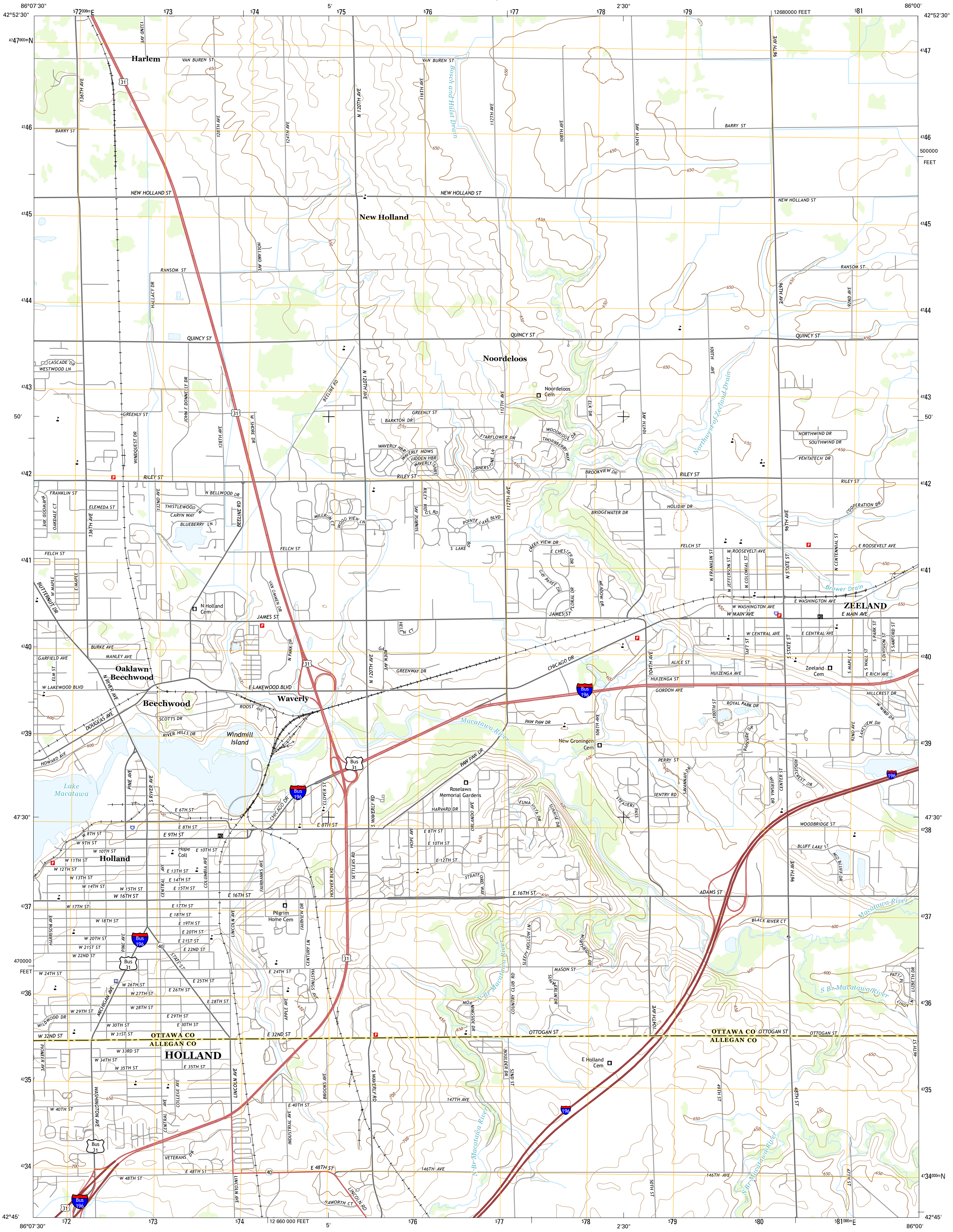
HOLLAND WEST, MI
2014

NSN. 7643016371154
NGA REF NO. USGSX24K20728

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

The National Map
US Topo

HOLLAND EAST QUADRANGLE
MICHIGAN
7.5-MINUTE SERIES



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
10 000-foot ticks: Michigan Coordinate System of 1983 (south zone)

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, June 2012
Roads....................HERE, ©2013
Names....................GNIS, 2013
Hydrography..........National Hydrography Dataset, 2012
Contours..........National Elevation Dataset, 1999
Boundaries..........Multiple sources; see metadata file 1972 - 2013
Public Land Survey System..........BLM, 2011

MN
GN
5° 14´
93 MILS
0° 38´
11 MILS
UTM GRID AND 2014 MAGNETIC NORTH
DECLINATION AT CENTER OF SHEET

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

SCALE 1:24 000

KILOMETERS 1 0.5 0 1 2
METERS 1000 500 0 1000 2000
MILES 1 0.5 0 1
FEET 1000 0 1000 2000 3000 4000 5000 6000 7000 8000 9000 10000

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 0.6.16

MICHIGAN
QUADRANGLE LOCATION

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

1	2	3
4		5
6	7	8

ADJOINING QUADRANGLES
1 Port Sheldon
2 Borculo
3 Allendale
4 Holland West
5 Hudsonville West
6 Saugatuck
7 Hamilton West
8 Hamilton East

HOLLAND EAST, MI
2014

NSN. 7643016371153
NGA REF NO. USGSX24K20723

STATE OF MICHIGAN
DEPARTMENT OF
ENVIRONMENT, GREAT LAKES, AND ENERGY
LANSING

EGLE

GRETCHEN WHITMER
GOVERNOR

DANIEL EICHINGER
ACTING DIRECTOR

March 28, 2023

VIA E-MAIL

Samuel Bender, PE
Holland Board of Public Works
625 Hastings Avenue
Holland, Michigan 49423
SBender@hollandbpw.com

Dear Samuel Bender:

Subject: Federal Consistency Certification, Proposed Water Service Line Replacements and Water Treatment Plant Improvements, City of Holland, Ottawa County, Michigan

The Department of Environment, Great Lakes, and Energy (EGLE), Water Resources Division (WRD), 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. Thank you for providing the opportunity to review this proposed activity.

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

Certification of consistency with the 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 EGLE. These statutes constitute the enforceable policies of the MCMP.

Provided all required permits are issued and complied with, no adverse impacts to coastal resources are anticipated from this project as described in the information forwarded to the WRD. Issuance of all required permits will certify the activity for which the permits were issued as consistent with the MCMP. If no permits are required, this project shall be considered consistent as of the date of this letter.

This consistency certification does not waive the need for permits that may be required under other federal, state, or local statutes. If you have any questions regarding this review, please contact me at 517-230-7849 or SmarM@Michigan.gov.

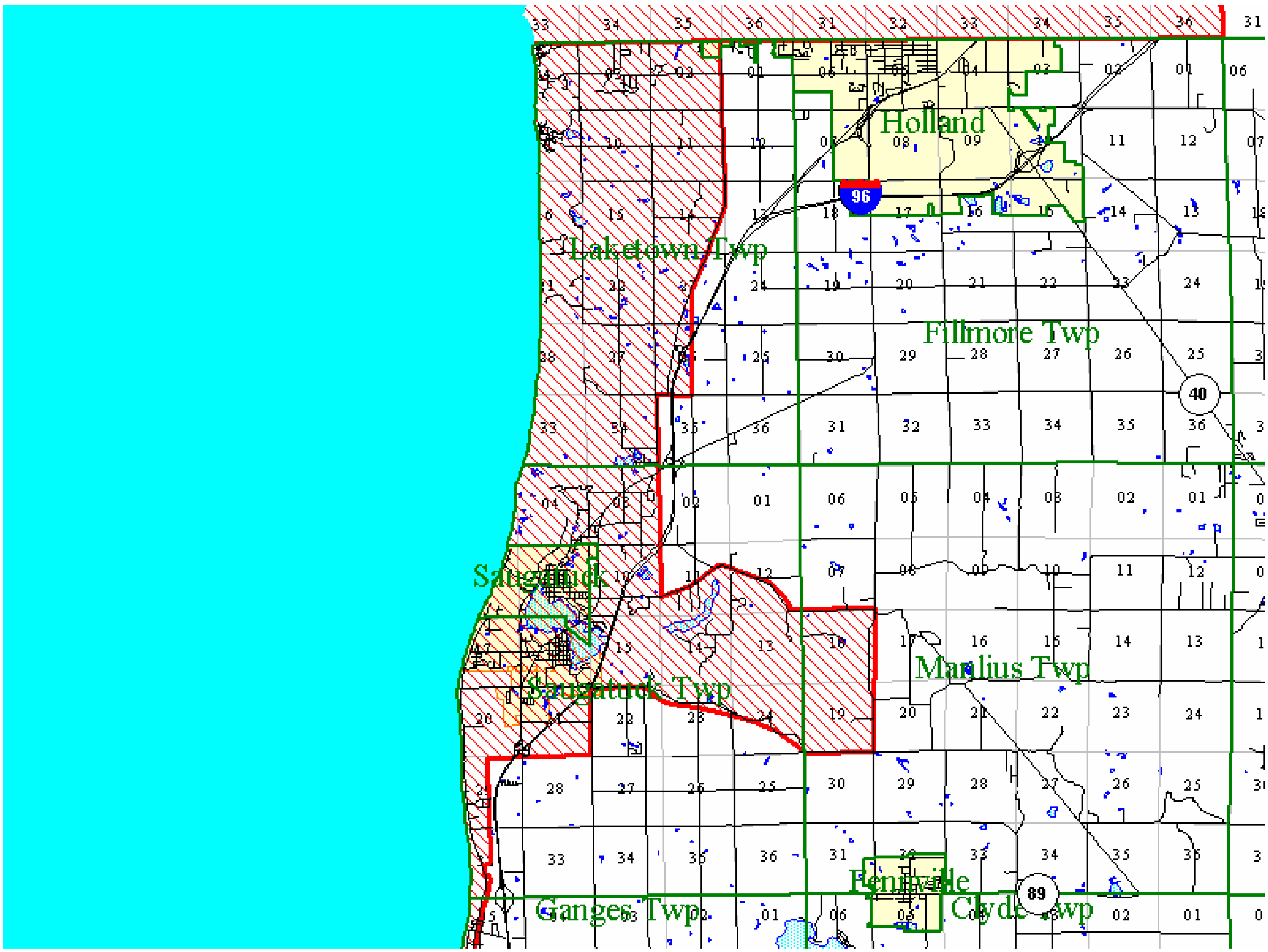
Sincerely,

Matt Smar

Matt Smar, Environmental Quality Specialist
Field Operations Support Section
Water Resources Division

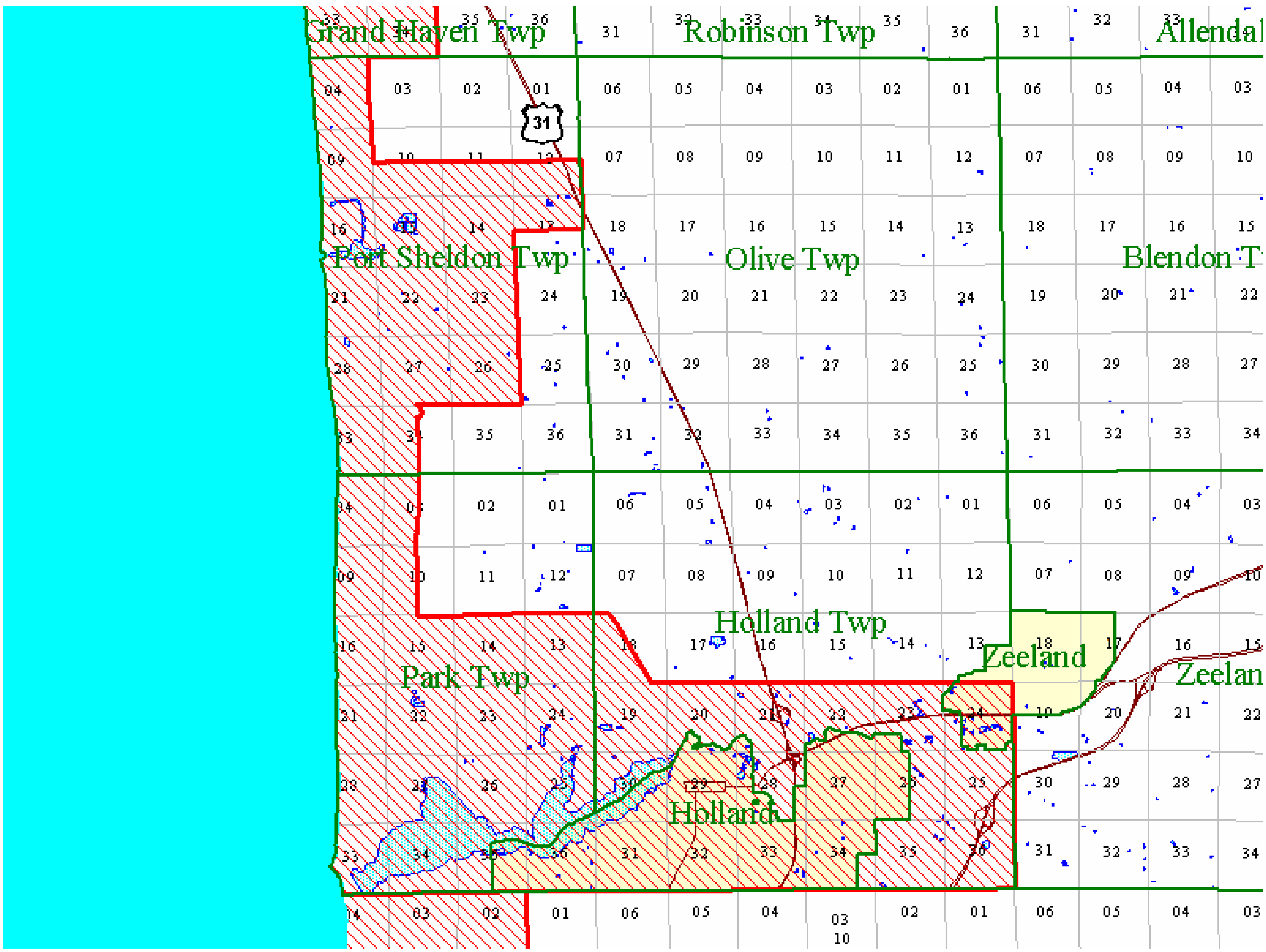
Allegan County
Laketown Township, T4N R16W
South Haven, T3N R 16W
Saugatuck Township, T3N R16W
Manlius Township T3N R15W

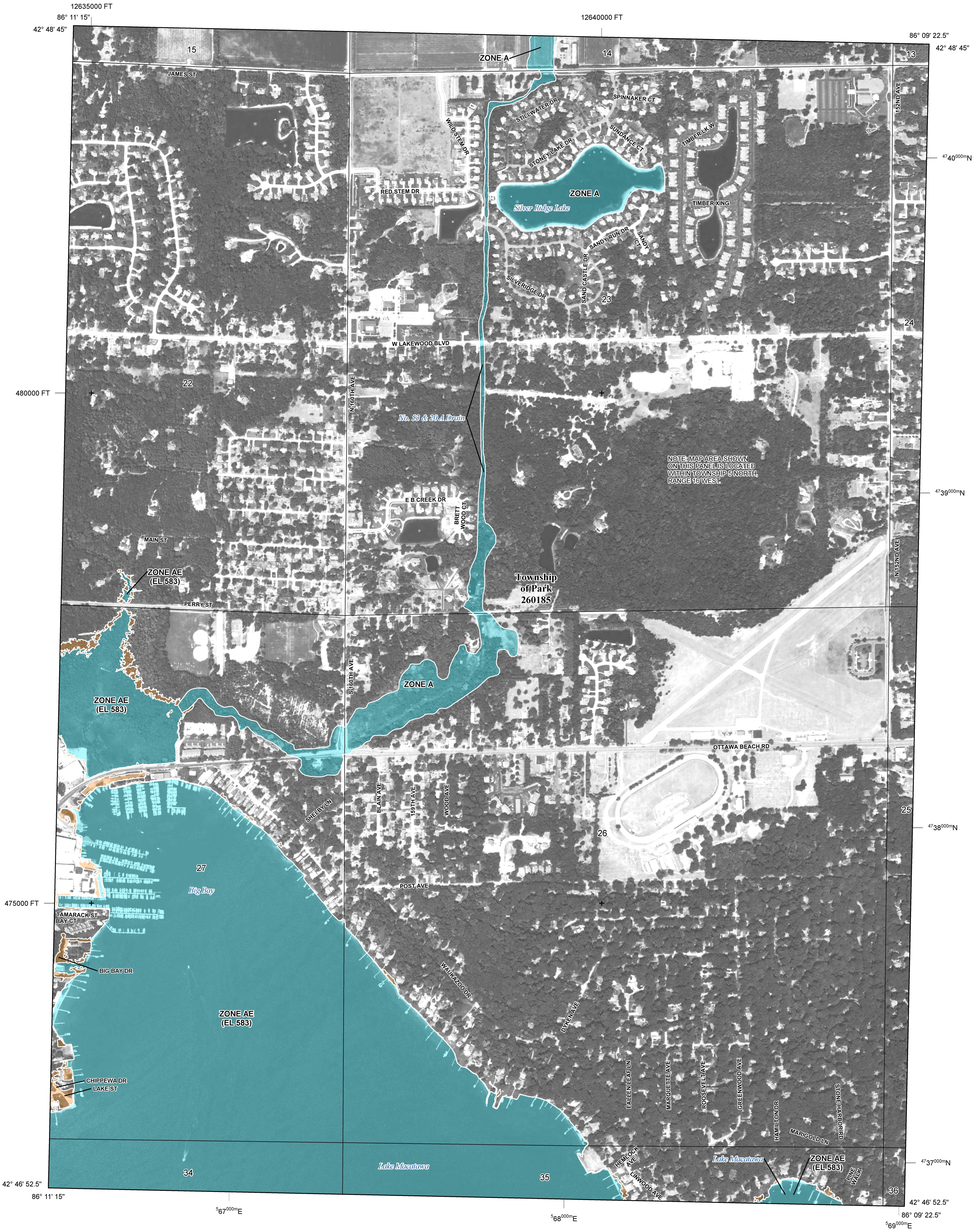
The heavy red line is the ***Coastal Zone Management Boundary***
The red hatched area is the ***Coastal Zone Management Area***



Ottawa County
Port Sheldon Township, T6N R16W
Park Township, T5N R16W
Holland Township T5N R15W
Holland, T5N R15W
Zeeland, T5N R15W

The heavy red line is the ***Coastal Zone Management Boundary***
The red hatched area is the ***Coastal Zone Management Area***





FLOOD HAZARD INFORMATION

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

THE INFORMATION DEPICTED ON THIS MAP AND SUPPORTING DOCUMENTATION ARE ALSO AVAILABLE IN DIGITAL FORMAT AT

HTTPS://MSC.FEMA.GOV

SPECIAL FLOOD HAZARD AREAS	Without Base Flood Elevation (BFE) *Zone A,V, A99*
	With BFE or Depth *Zone AE, AO, AH, VE, AR*
	Regulatory Floodway
OTHER AREAS OF FLOOD HAZARD	0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
	Future Conditions 1% Annual Chance Flood Hazard *Zone X*
	Area with Reduced Flood Risk due to Levee See Notes. *Zone X*
	Area with Flood Risk due to Levee *Zone D*
OTHER AREAS	NO SCREEN Area of Minimal Flood Hazard *Zone X*
	Area of Undetermined Flood Hazard *Zone D*
GENERAL STRUCTURES	Channel, Culvert, or Storm Sewer
	Levee, Dike, or Floodwall
OTHER FEATURES	E 18.2 17.5 Cross Sections with 1% Annual Chance Water Surface Elevation
	8 Coastal Transect
	Coastal Transect Baseline
	Profile Baseline
	Hydrographic Feature
	513 Base Flood Elevation Line (BFE)
	Limit of Study
	Jurisdiction Boundary

NOTES TO USERS

For information and questions about this Flood Insurance Rate Map (FIRM), available products associated with this FIRM, including historic versions, the current map date for each FIRM panel, how to order products, or the National Flood Insurance Program (NFIP) in general, please call the FEMA Map Information eXchange at 1-877-FEMA-MAP (1-877-336-2627) or visit the FEMA Flood Map Service Center website at https://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 website.

Communities annexing land on adjacent FIRM panels must obtain a current copy of the adjacent panel as well as the current FIRM Index. These may be ordered directly from the Flood Map Service Center at the number listed above.

For community and countywide map dates refer to 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.

Base map information shown on this FIRM was derived from MCGI public land survey system data, dated 2003, Ottawa County's GIS department municipal boundary data, dated 2013, and digital imagery provided by the National Agriculture Imagery Program, dated 2016.

SCALE

N

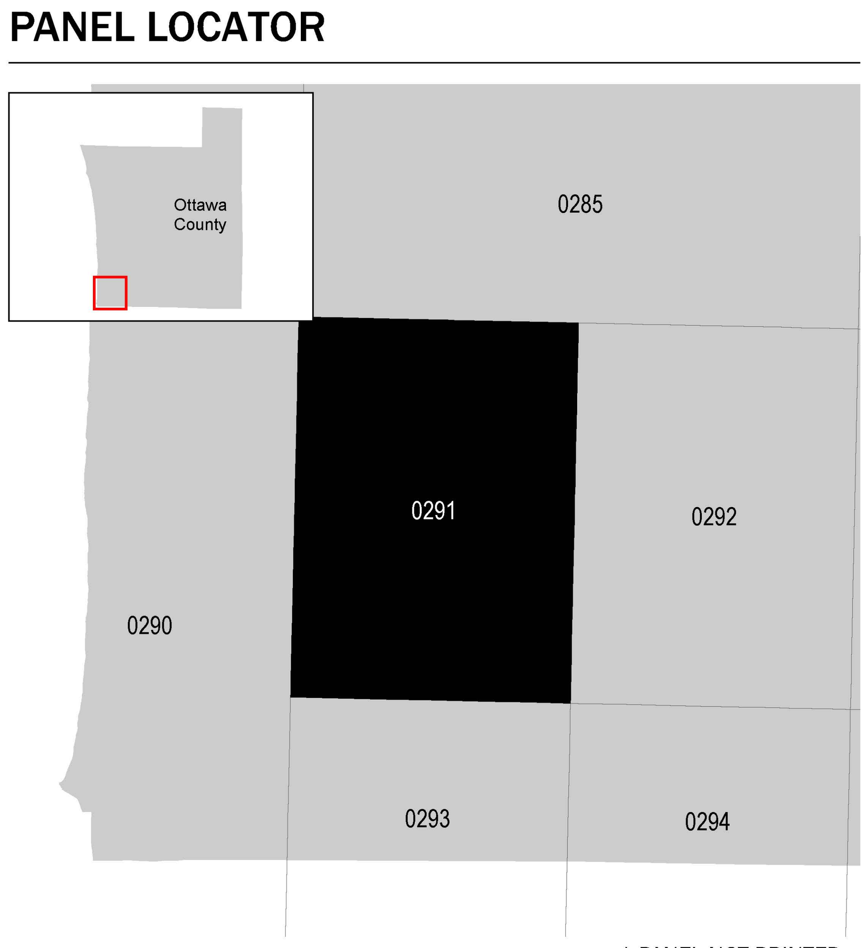
Map Projection:
NAD 1983 StatePlane Michigan South FIPS 2113 Feet;
Western Hemisphere; Vertical Datum: NAVD 88

1 inch = 500 feet   1:6,000

0   500   1,000   2,000 feet

0   125   250   500 meters

PANEL LOCATOR



* PANEL NOT PRINTED

FEMA
National Flood Insurance Program

NATIONAL FLOOD INSURANCE PROGRAM
FLOOD INSURANCE RATE MAP

OTTAWA COUNTY, MICHIGAN
(All Jurisdictions)

PANEL **291** OF **375**

FEMA

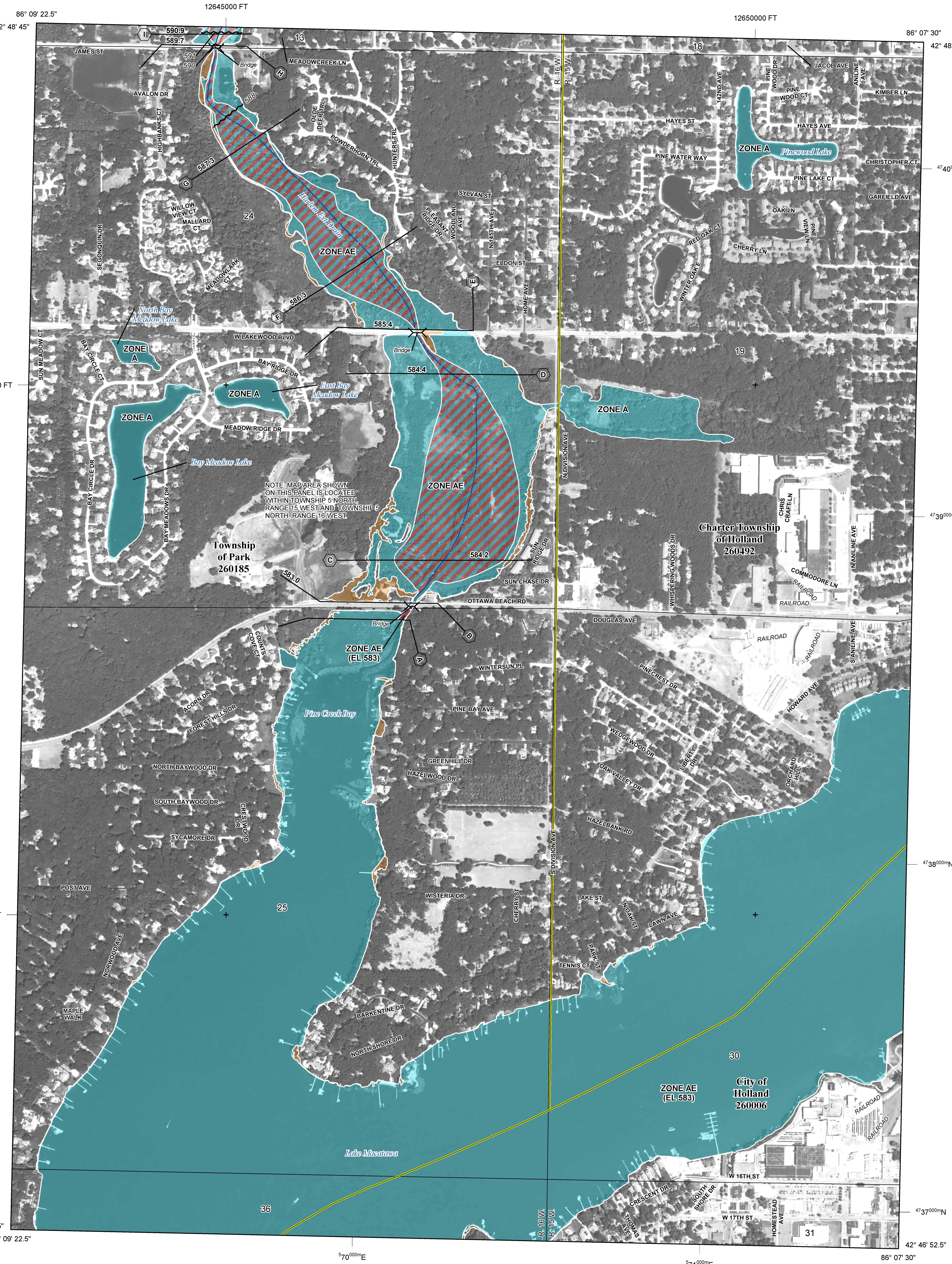
Panel Contains:

COMMUNITY	NUMBER	PANEL	SUFFIX
PARK, TOWNSHIP OF	260185	0291	F

VERSION NUMBER
2.6.2.0

MAP NUMBER
26139C0291F

MAP REVISED
OCTOBER 21, 2021



FLOOD HAZARD INFORMATION

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

THE INFORMATION DEPICTED ON THIS MAP AND SUPPORTING DOCUMENTATION ARE ALSO AVAILABLE IN DIGITAL FORMAT AT

HTTPS://MSC.FEMA.GOV

SPECIAL FLOOD HAZARD AREAS	Without Base Flood Elevation (BFE) *Zone A,V, A99*
	With BFE or Depth *Zone AE, AO, AH, VE, AR*
	Regulatory Floodway
OTHER AREAS OF FLOOD HAZARD	0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
	Future Conditions 1% Annual Chance Flood Hazard *Zone X*
	Area with Reduced Flood Risk due to Levee See Notes. *Zone X*
	Area with Flood Risk due to Levee *Zone D*
OTHER AREAS	NO SCREEN Area of Minimal Flood Hazard *Zone X*
	Area of Undetermined Flood Hazard *Zone D*
GENERAL STRUCTURES	Channel, Culvert, or Storm Sewer
	Levee, Dike, or Floodwall
	E 18.2 17.5 Cross Sections with 1% Annual Chance Water Surface Elevation
	8 Coastal Transect
	Coastal Transect Baseline
	Profile Baseline
	Hydrographic Feature
	513 Base Flood Elevation Line (BFE)
	Limit of Study
OTHER FEATURES	Jurisdiction Boundary

NOTES TO USERS

For information and questions about this Flood Insurance Rate Map (FIRM), available products associated with this FIRM, including historic versions, the current map date for each FIRM panel, how to order products, or the National Flood Insurance Program (NFIP) in general, please call the FEMA Map Information eXchange at 1-877-FEMA-MAP (1-877-336-2627) or visit the FEMA Flood Map Service Center at https://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 website.

Communities annexing land on adjacent FIRM panels must obtain a current copy of the adjacent panel as well as the current FIRM Index. These may be ordered directly from the Flood Map Service Center at the number listed above.

For community and countywide map dates refer to 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.

Base map information shown on this FIRM was derived from MCGI public land survey system data, dated 2003, Ottawa County's GIS department municipal boundary data, dated 2013, and digital imagery provided by the National Agriculture Imagery Program, dated 2016.

SCALE

Map Projection:
NAD 1983 StatePlane Michigan South FIPS 2113 Feet;
Western Hemisphere; Vertical Datum: NAVD 88

1 inch = 500 feet 1:6,000

0 500 1,000 2,000 feet

0 125 250 500 meters

PANEL LOCATOR

* PANEL NOT PRINTED

FEMA

National Flood Insurance Program

NATIONAL FLOOD INSURANCE PROGRAM
FLOOD INSURANCE RATE MAP

OTTAWA COUNTY, MICHIGAN
(All Jurisdictions)

PANEL **292** OF **375**

FEMA

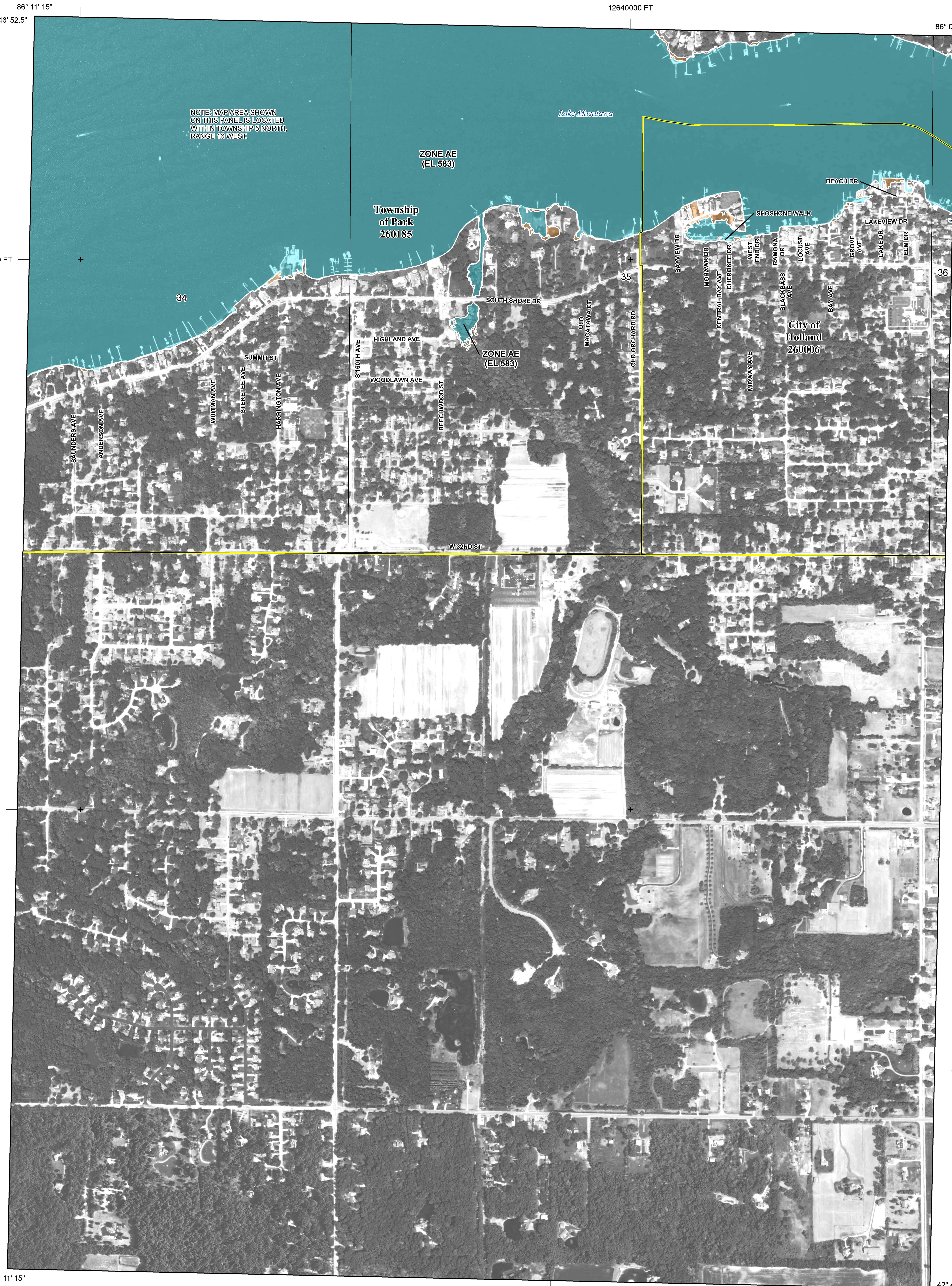
Panel Contains:

COMMUNITY	NUMBER	PANEL	SUFFIX
HOLLAND, CHARTER TOWNSHIP OF	260492	0292	F
HOLLAND, CITY OF	260006	0292	F
PARK, TOWNSHIP OF	260185	0292	F

VERSION NUMBER
2.6.2.0

MAP NUMBER
26139C0292F

MAP REVISED
OCTOBER 21, 2021



FLOOD HAZARD INFORMATION

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

THE INFORMATION DEPICTED ON THIS MAP AND SUPPORTING DOCUMENTATION ARE ALSO AVAILABLE IN DIGITAL FORMAT AT

HTTPS://MSC.FEMA.GOV

SPECIAL FLOOD HAZARD AREAS	Without Base Flood Elevation (BFE) *Zone A,V, A99* With BFE or Depth *Zone AE, AO, AH, VE, AR* Regulatory Floodway
OTHER AREAS OF FLOOD HAZARD	0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X* Future Conditions 1% Annual Chance Flood Hazard *Zone X* Area with Reduced Flood Risk due to Levee See Notes. *Zone X* Area with Flood Risk due to Levee *Zone D*
OTHER AREAS	NO SCREEN Area of Minimal Flood Hazard *Zone X* Area of Undetermined Flood Hazard *Zone D*
GENERAL STRUCTURES	Channel, Culvert, or Storm Sewer Levee, Dike, or Floodwall
OTHER FEATURES	E 18.2 17.5 Cross Sections with 1% Annual Chance Water Surface Elevation 8 Coastal Transect Coastal Transect Baseline Profile Baseline Hydrographic Feature 513 Base Flood Elevation Line (BFE) Limit of Study Jurisdiction Boundary

NOTES TO USERS

For information and questions about this Flood Insurance Rate Map (FIRM), available products associated with this FIRM, including historic versions, the current map date for each FIRM panel, how to order products, or the National Flood Insurance Program (NFIP) in general, please call the FEMA Map Information eXchange at 1-877-FEMA-MAP (1-877-336-2627) or visit the FEMA Flood Map Service Center website at https://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 website.

Communities annexing land on adjacent FIRM panels must obtain a current copy of the adjacent panel as well as the current FIRM Index. These may be ordered directly from the Flood Map Service Center at the number listed above.

For community and countywide map dates refer to 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.

Base map information shown on this FIRM was derived from MCGI public land survey system data, dated 2003, Ottawa County's GIS department municipal boundary data, dated 2013, and digital imagery provided by the National Agriculture Imagery Program, dated 2016.

SCALE

N

Map Projection:
NAD 1983 StatePlane Michigan South FIPS 2113 Feet;
Western Hemisphere; Vertical Datum: NAVD 88

1 inch = 500 feet 1:6,000

0 500 1,000 2,000 feet

0 125 250 500 meters

PANEL LOCATOR

* PANEL NOT PRINTED

FEMA

National Flood Insurance Program

NATIONAL FLOOD INSURANCE PROGRAM
FLOOD INSURANCE RATE MAP

OTTAWA COUNTY, MICHIGAN
(All Jurisdictions)

PANEL **293** OF **375**

FEMA

Panel Contains:

COMMUNITY	NUMBER	PANEL	SUFFIX
HOLLAND, CITY OF	260006	0293	F
PARK, TOWNSHIP OF	260185	0293	F

VERSION NUMBER
2.6.2.0

MAP NUMBER
26139C0293F

MAP REVISED
OCTOBER 21, 2021

FLOOD HAZARD INFORMATION

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

THE INFORMATION DEPICTED ON THIS MAP AND SUPPORTING DOCUMENTATION ARE ALSO AVAILABLE IN DIGITAL FORMAT AT

HTTPS://MSC.FEMA.GOV

SPECIAL FLOOD HAZARD AREAS	Without Base Flood Elevation (BFE) *Zone A,V, A99*
	With BFE or Depth *Zone AE, AO, AH, VE, AR*
	Regulatory Floodway
OTHER AREAS OF FLOOD HAZARD	0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
	Future Conditions 1% Annual Chance Flood Hazard *Zone X*
	Area with Reduced Flood Risk due to Levee See Notes. *Zone X*
	Area with Flood Risk due to Levee *Zone D*
OTHER AREAS	NO SCREEN Area of Minimal Flood Hazard *Zone X*
	Area of Undetermined Flood Hazard *Zone D*
GENERAL STRUCTURES	Channel, Culvert, or Storm Sewer
	Levee, Dike, or Floodwall
	E 18.2 17.5 Cross Sections with 1% Annual Chance Water Surface Elevation
	8 Coastal Transect
	Coastal Transect Baseline
	Profile Baseline
	Hydrographic Feature
	513 Base Flood Elevation Line (BFE)
OTHER FEATURES	Limit of Study
	Jurisdiction Boundary

NOTES TO USERS

For information and questions about this Flood Insurance Rate Map (FIRM), available products associated with this FIRM, including historic versions, the current map date for each FIRM panel, how to order products, or the National Flood Insurance Program (NFIP) in general, please call the FEMA Map Information eXchange at 1-877-FEMA-MAP (1-877-336-2627) or visit the FEMA Flood Map Service Center website at https://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 website.

Communities annexing land on adjacent FIRM panels must obtain a current copy of the adjacent panel as well as the current FIRM Index. These may be ordered directly from the Flood Map Service Center at the number listed above.

For community and countywide map dates refer to 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.

Base map information shown on this FIRM was derived from MCGI public land survey system data, dated 2003, Ottawa County's GIS department municipal boundary data, dated 2013, and digital imagery provided by the National Agriculture Imagery Program, dated 2016.

SCALE

N

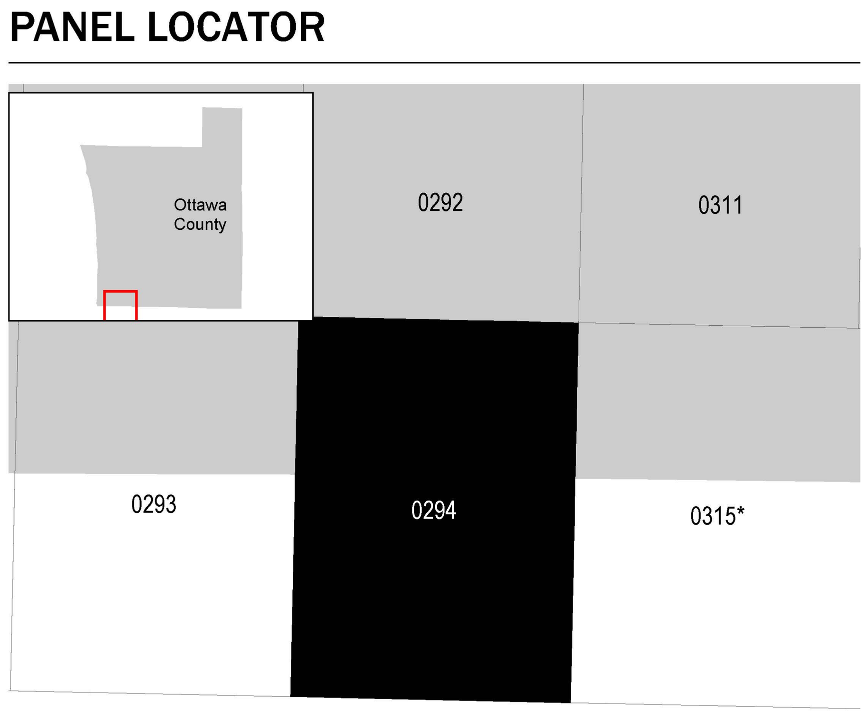
Map Projection:
NAD 1983 StatePlane Michigan South FIPS 2113 Feet;
Western Hemisphere; Vertical Datum: NAVD 88

1 inch = 500 feet 1:6,000

0 500 1,000 2,000 feet

0 125 250 500 meters

PANEL LOCATOR



* PANEL NOT PRINTED

FEMA

National Flood Insurance Program

NATIONAL FLOOD INSURANCE PROGRAM
FLOOD INSURANCE RATE MAP

OTTAWA COUNTY, MICHIGAN
(All Jurisdictions)

PANEL **294** OF **375**

FEMA

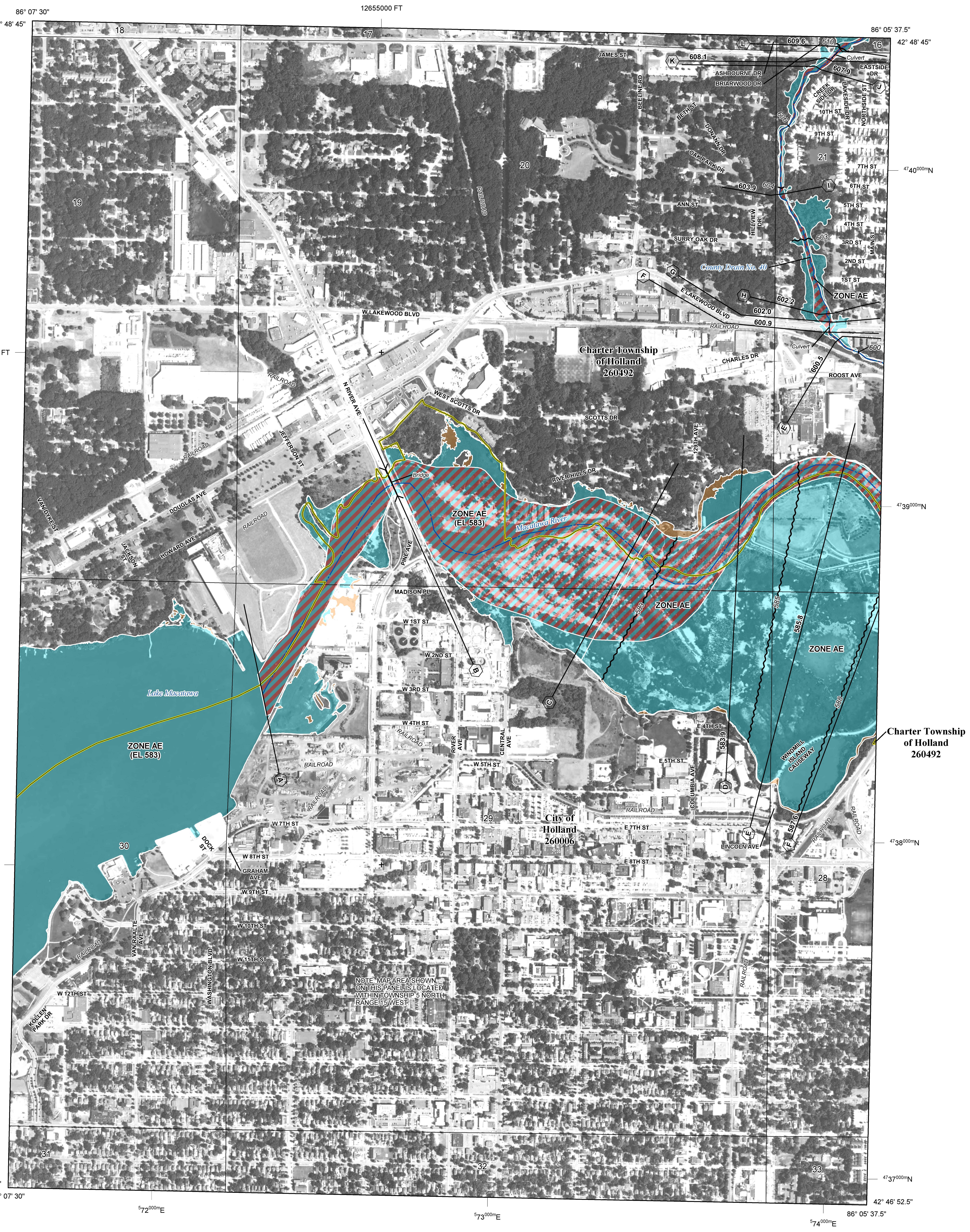
Panel Contains:

COMMUNITY	NUMBER	PANEL	SUFFIX
HOLLAND, CITY OF	260006	0294	F
PARK, TOWNSHIP OF	260185	0294	F

VERSION NUMBER
2.6.2.0

MAP NUMBER
26139C0294F

MAP REVISED
OCTOBER 21, 2021



FLOOD HAZARD INFORMATION

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

THE INFORMATION DEPICTED ON THIS MAP AND SUPPORTING DOCUMENTATION ARE ALSO AVAILABLE IN DIGITAL FORMAT AT

HTTPS://MSC.FEMA.GOV

SPECIAL FLOOD HAZARD AREAS	Without Base Flood Elevation (BFE) *Zone A, V, A99*
	With BFE or Depth *Zone AE, AO, AH, VE, AR*
	Regulatory Floodway
OTHER AREAS OF FLOOD HAZARD	0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
	Future Conditions 1% Annual Chance Flood Hazard *Zone X*
	Area with Reduced Flood Risk due to Levee See Notes. *Zone X*
	Area with Flood Risk due to Levee *Zone D*
OTHER AREAS	NO SCREEN Area of Minimal Flood Hazard *Zone X*
	Area of Undetermined Flood Hazard *Zone D*
GENERAL STRUCTURES	Channel, Culvert, or Storm Sewer
	Levee, Dike, or Floodwall
	E 18.2 17.5 Cross Sections with 1% Annual Chance Water Surface Elevation
	8 Coastal Transect
	Coastal Transect Baseline
	Profile Baseline
	Hydrographic Feature
	513 Base Flood Elevation Line (BFE)
	Limit of Study
OTHER FEATURES	Jurisdiction Boundary

NOTES TO USERS

For information and questions about this Flood Insurance Rate Map (FIRM), available products associated with this FIRM, including historic versions, the current map date for each FIRM panel, how to order products, or the National Flood Insurance Program (NFIP) in general, please call the FEMA Map Information eXchange at 1-877-FEMA-MAP (1-877-336-2627) or visit the FEMA Flood Map Service Center website at https://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 website.

Communities annexing land on adjacent FIRM panels must obtain a current copy of the adjacent panel as well as the current FIRM Index. These may be ordered directly from the Flood Map Service Center at the number listed above.

For community and countywide map dates refer to 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.

Base map information shown on this FIRM was derived from MCGI public land survey system data, dated 2003, Ottawa County's GIS department municipal boundary data, dated 2013, and digital imagery provided by the National Agriculture Imagery Program, dated 2016.

SCALE

N

Map Projection:
NAD 1983 StatePlane Michigan South FIPS 2113 Feet;
Western Hemisphere; Vertical Datum: NAVD 88

1 inch = 500 feet **1:6,000**

0 500 1,000 2,000 feet

0 125 250 500 meters

PANEL LOCATOR

* PANEL NOT PRINTED

FEMA

National Flood Insurance Program

NATIONAL FLOOD INSURANCE PROGRAM

FLOOD INSURANCE RATE MAP

OTTAWA COUNTY, MICHIGAN
(All Jurisdictions)

PANEL **311** OF **375**

FEMA

Panel Contains:

COMMUNITY	NUMBER	PANEL	SUFFIX
HOLLAND, CHARTER TOWNSHIP OF	260492	0311	F
HOLLAND, CITY OF	260006	0311	F

VERSION NUMBER
2.6.2.0

MAP NUMBER
26139C0311F

MAP REVISED
OCTOBER 21, 2021

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 Michigan State Plane South zone 6401 (FIPSZONE 2113). The **horizontal datum** was NAD83. Differences in datum, spheroid, projection or state plane 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 derived from the Ottawa County, Michigan GIS Office from photography dated 2004.

This map reflects more detailed and up-to-date **stream channel configurations** than those shown on the previous FIRM for this jurisdiction. The floodplains and floodways that were transferred from the previous FIRM may have been adjusted to conform to these new stream channel configurations. As a result, the Flood Profiles and Floodway Data tables in the Flood Insurance Study report (which contains authoritative hydraulic data) may reflect stream channel distances that differ from what is shown on this map.

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.

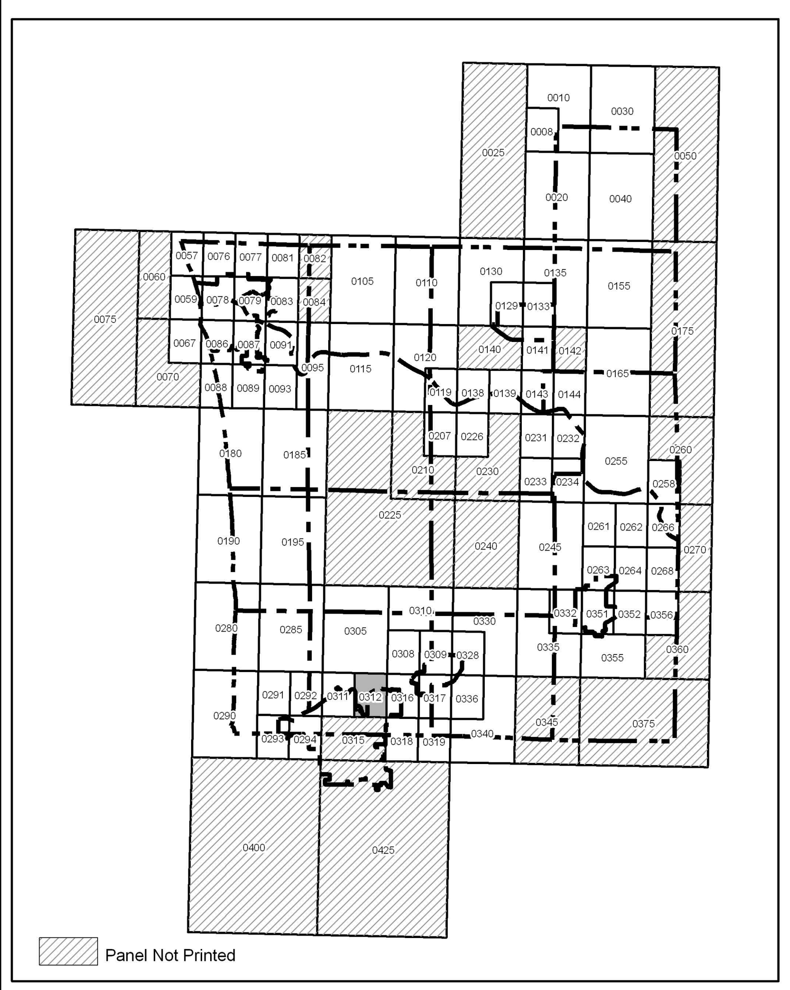
Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which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

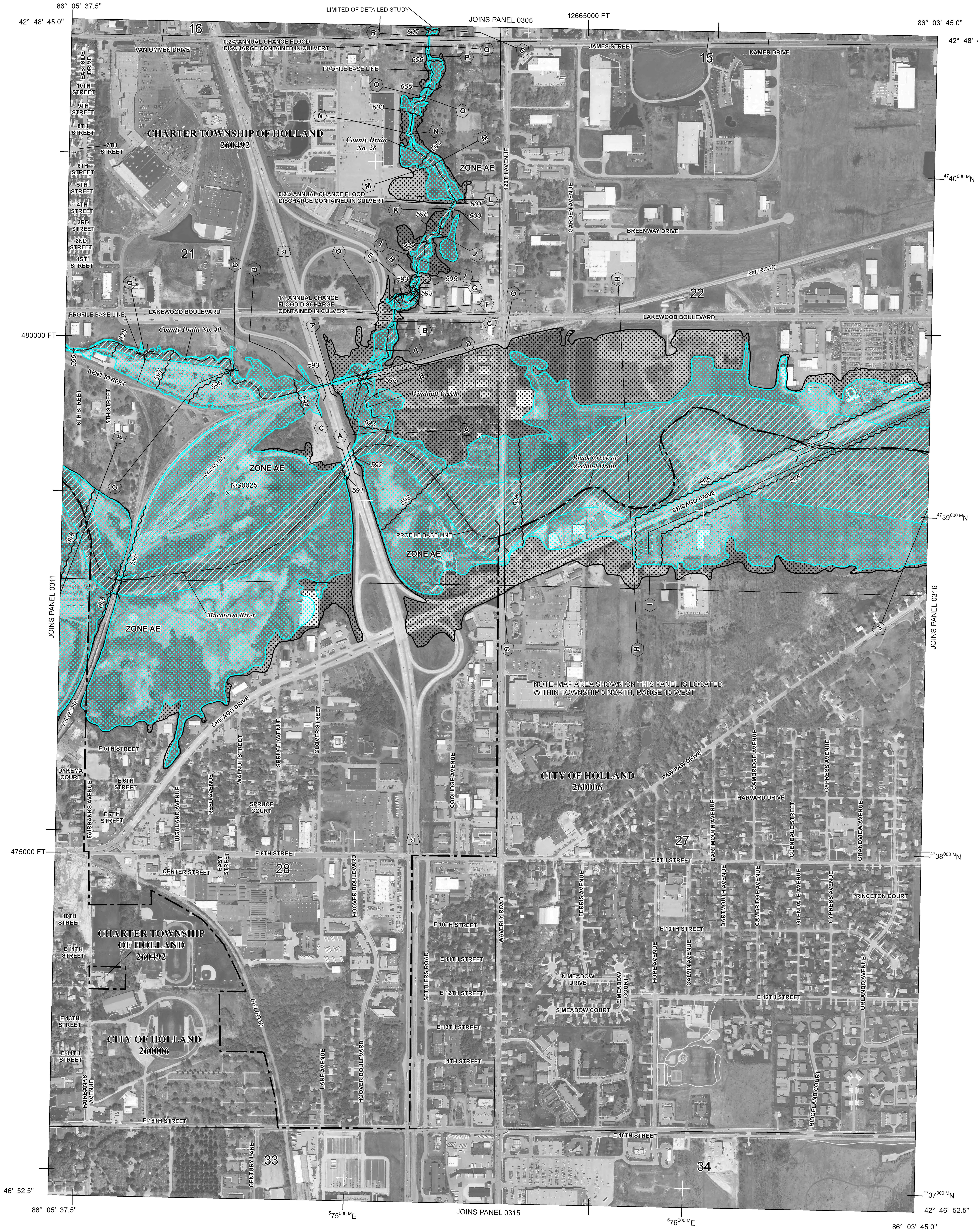
For information on available products associated with this FIRM visit the **Map Service Center (MSC)** website at http://msc.fema.gov/. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. Many of these products can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

The **profile base lines** 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 base line**, in some cases, may deviate significantly from the channel centerline or appear outside the SFHA.

PANEL INDEX





LEGEND

SPECIAL FLOOD HAZARD AREAS 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 may 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	Area of special flood hazard formerly protected from the 1% annual chance flood event 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 event 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 of 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 Areas of different Base Flood Elevations, flood depths or flood velocities.

513	Base Flood Elevation line and value; elevation in feet*
(EL 10)	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
	Bridge
	Culvert
85° 03' 45.0", 41° 24' 22.5"	Geographic coordinates referenced to the North American Datum of 1983 (NAD 83), Western Hemisphere
4587000 M	1000-meter Universal Transverse Mercator grid values, zone 16
2250000 FT	5000-foot grid ticks: Michigan State Plane South Coordinate System, 6401 zone (FIPSZONE 2113), Lambert Conformal Conic projection
KA0015 ×	Bench mark (see explanation in Notes to Users section of this FIRM panel)
● M1.5	River Mile

MAP REPOSITORY
Refer to listing of Map Repositories on Map Index

EFFECTIVE DATE OF COUNTYWIDE
FLOOD INSURANCE RATE MAP
December 16, 2011

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.

N

MAP SCALE 1" = 500'

250 0 500 1000 FEET

150 0 150 300 METERS

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0312E

FIRM

FLOOD INSURANCE RATE MAP

OTTAWA COUNTY, MICHIGAN

(ALL JURISDICTIONS)

PANEL 312 OF 425

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
HOLLAND, CHARTER TOWNSHIP OF	260492	0312	E
HOLLAND, CITY OF	260006	0312	E

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
26139C0312E

EFFECTIVE DATE
DECEMBER 16, 2011

Federal Emergency Management Agency

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 Michigan State Plane South zone 6401 (FIPSZONE 2113). The **horizontal datum** was NAD83. Differences in datum, spheroid, projection or state plane 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 derived from the Ottawa County, Michigan GIS Office from photography dated 2004.

This map reflects more detailed and up-to-date **stream channel configurations** than those shown on the previous FIRM for this jurisdiction. The floodplains and floodways that were transferred from the previous FIRM may have been adjusted to conform to these new stream channel configurations. As a result, the Flood Profiles and Floodway Data tables in the Flood Insurance Study report (which contains authoritative hydraulic data) may reflect stream channel distances that differ from what is shown on this map.

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.

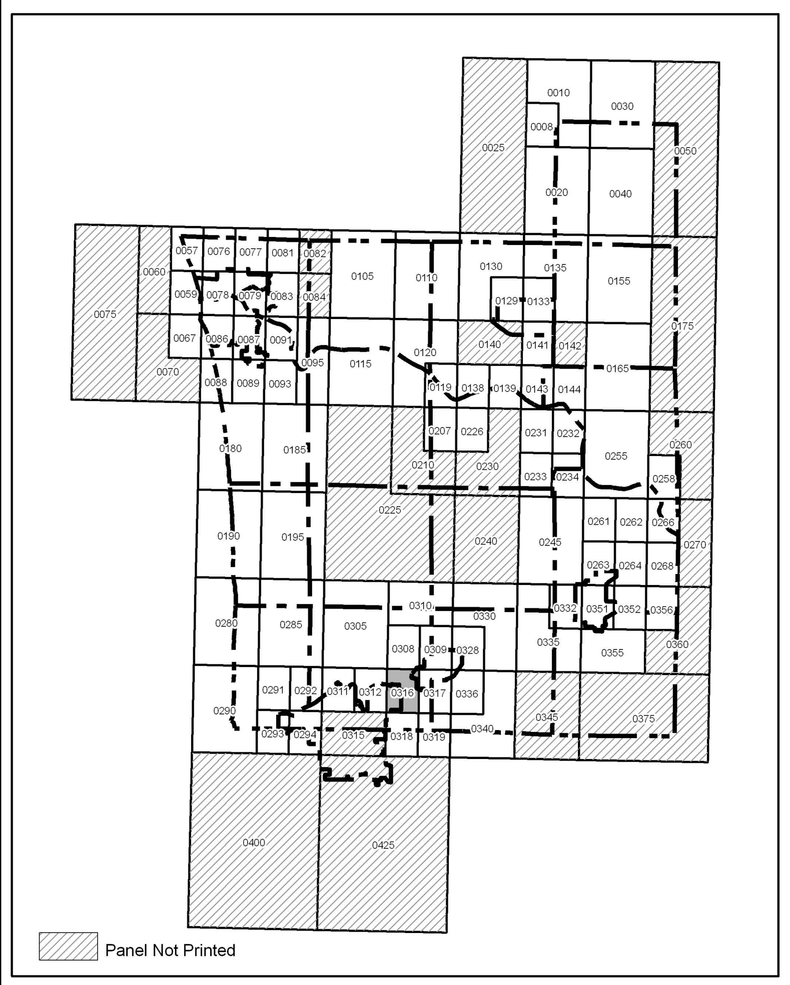
Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which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

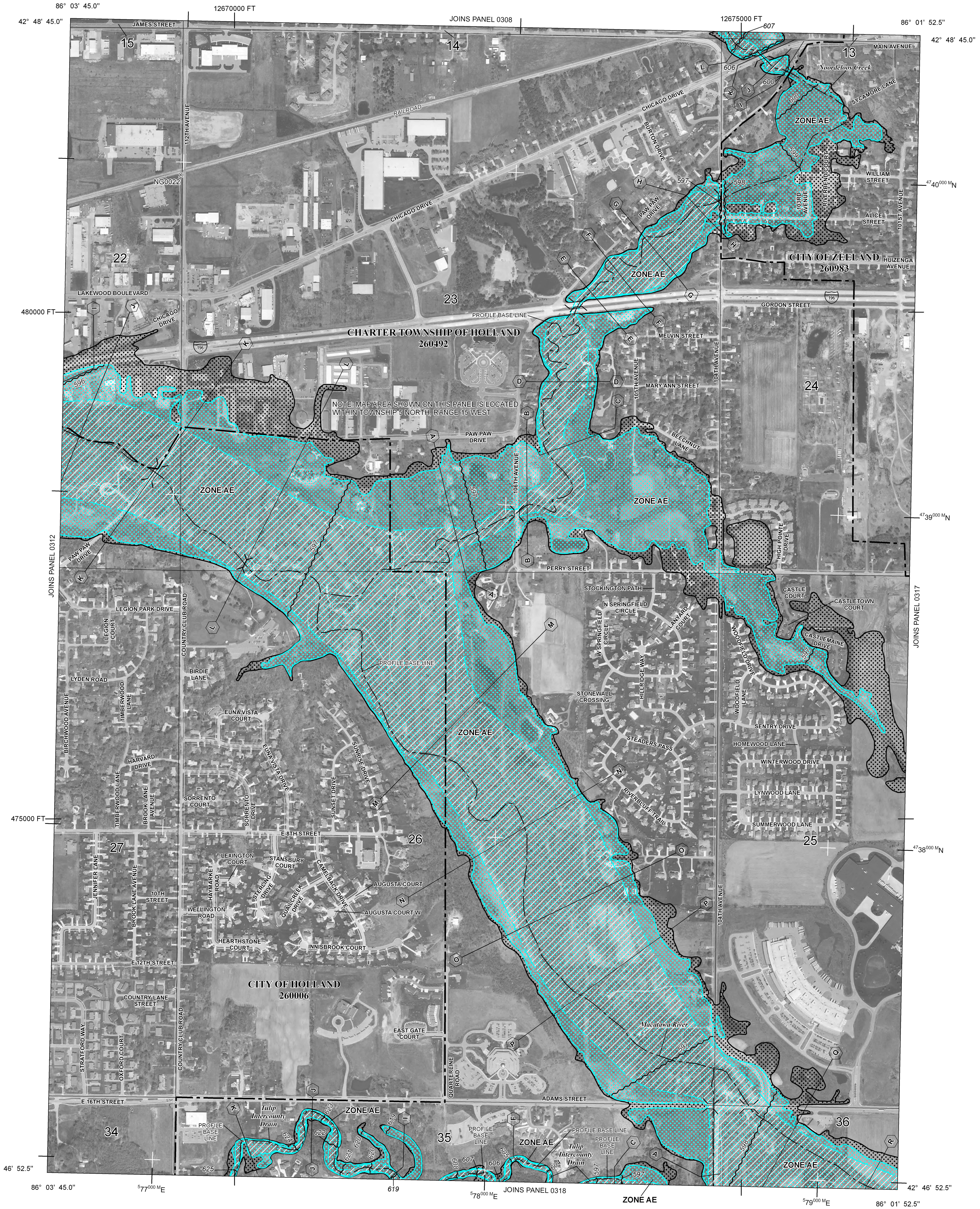
For information on available products associated with this FIRM visit the **Map Service Center (MSC)** website at http://msc.fema.gov/. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. Many of these products can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

The **profile base lines** 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 base line**, in some cases, may deviate significantly from the channel centerline or appear outside the SFHA.

PANEL INDEX





LEGEND

SPECIAL FLOOD HAZARD AREAS 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 may 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	Area of special flood hazard formerly protected from the 1% annual chance flood event 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 event 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 of 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 Areas of different Base Flood Elevations, flood depths or flood velocities.
513	Base Flood Elevation line and value; elevation in feet*
(EL 10)	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
	Bridge
	Culvert
85° 03' 45.0", 41° 24' 22.5"	Geographic coordinates referenced to the North American Datum of 1983 (NAD 83), Western Hemisphere
$^{45}87^{000}$ M	1000-meter Universal Transverse Mercator grid values, zone 16
2250000 FT	5000-foot grid ticks: Michigan State Plane South Coordinate System, 6401 zone (FIPSZONE 2113), Lambert Conformal Conic projection
KA0015 ×	Bench mark (see explanation in Notes to Users section of this FIRM panel)
● M1.5	River Mile

MAP REPOSITORY
Refer to listing of Map Repositories on Map Index

EFFECTIVE DATE OF COUNTYWIDE
FLOOD INSURANCE RATE MAP
December 16, 2011

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.

N

MAP SCALE 1" = 500'

250 0 500 1000 FEET

150 0 150 300 METERS

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0316E

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

PANEL 316 OF 425
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
HOLLAND, CHARTER TOWNSHIP OF	260492	0316	E
HOLLAND, CITY OF	260006	0316	E
ZEELAND, CITY OF	260983	0316	E

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 26139C0316E

EFFECTIVE DATE DECEMBER 16, 2011

Federal Emergency Management Agency

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 Michigan State Plane South zone 6401 (FIPSZONE 2113). The **horizontal datum** was NAD83. Differences in datum, spheroid, projection or state plane 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 derived from the Ottawa County, Michigan GIS Office from photography dated 2004.

This map reflects more detailed and up-to-date **stream channel configurations** than those shown on the previous FIRM for this jurisdiction. The floodplains and floodways that were transferred from the previous FIRM may have been adjusted to conform to these new stream channel configurations. As a result, the Flood Profiles and Floodway Data tables in the Flood Insurance Study report (which contains authoritative hydraulic data) may reflect stream channel distances that differ from what is shown on this map.

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.

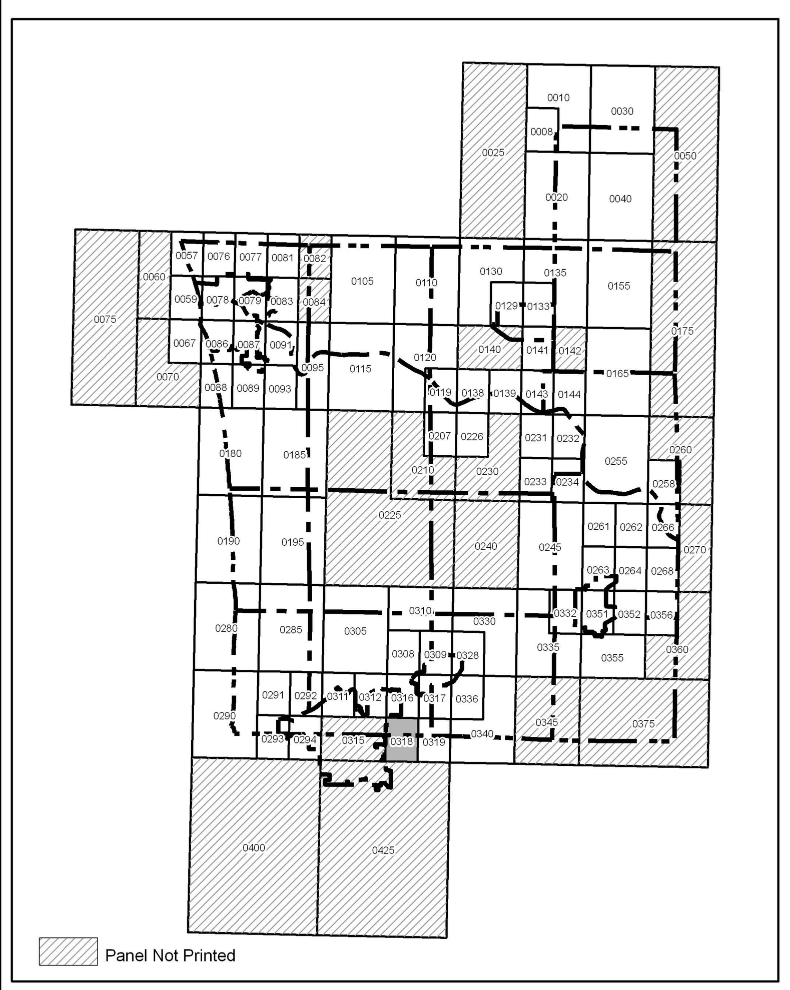
Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which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

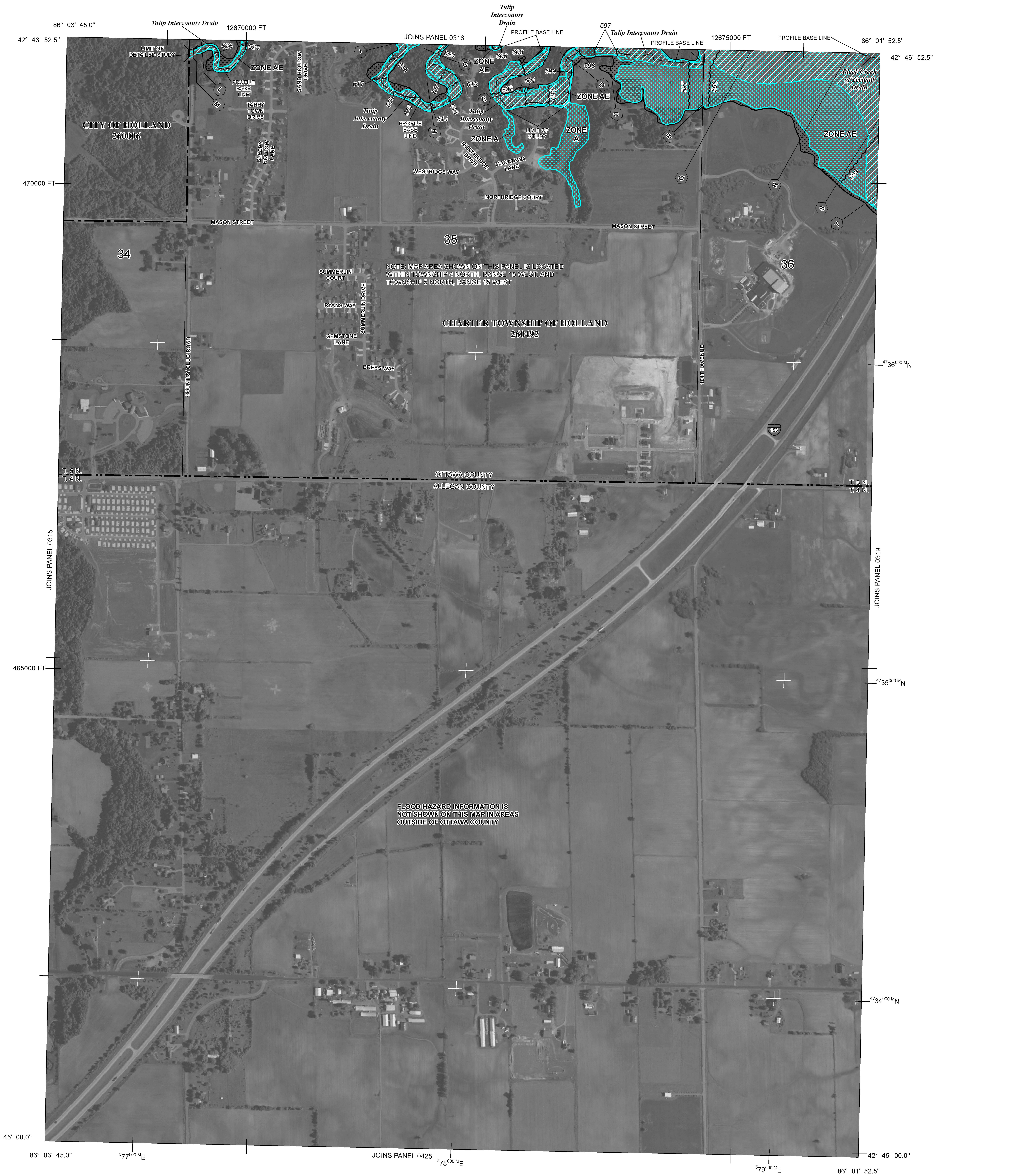
For information on available products associated with this FIRM visit the **Map Service Center (MSC)** website at http://msc.fema.gov/. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. Many of these products can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

The **profile base lines** 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 base line**, in some cases, may deviate significantly from the channel centerline or appear outside the SFHA.

PANEL INDEX





LEGEND

SPECIAL FLOOD HAZARD AREAS 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 may 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	Area of special flood hazard formerly protected from the 1% annual chance flood event 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 event 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 of 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 Areas of different Base Flood Elevations, flood depths or flood velocities.

513	Base Flood Elevation line and value; elevation in feet*
(EL 10)	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
	Bridge
	Culvert
85° 03' 45.0", 41° 24' 22.5"	Geographic coordinates referenced to the North American Datum of 1983 (NAD 83), Western Hemisphere
4587000 M	1000-meter Universal Transverse Mercator grid values, zone 16
2250000 FT	5000-foot grid ticks: Michigan State Plane South Coordinate System, 6401 zone (FIPSZONE 2113), Lambert Conformal Conic projection
KA0015 ×	Bench mark (see explanation in Notes to Users section of this FIRM panel)
● M1.5	River Mile

MAP REPOSITORY
Refer to listing of Map Repositories on Map Index

EFFECTIVE DATE OF COUNTYWIDE
FLOOD INSURANCE RATE MAP
December 16, 2011

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" = 500'

250 0 500 1000 FEET

150 0 150 300 METERS

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0318E

FIRM

FLOOD INSURANCE RATE MAP

OTTAWA COUNTY, MICHIGAN

(ALL JURISDICTIONS)

PANEL 318 OF 425

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
HOLLAND, CHARTER TOWNSHIP OF	260492	0318	E
HOLLAND, CITY OF	260006	0318	E

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
26139C0318E

EFFECTIVE DATE
DECEMBER 16, 2011

Federal Emergency Management Agency

DNR
Natural Rivers

Michigan's Natural Rivers program is a river protection effort that protects the natural quality of select river systems throughout the state by regulating their use and development through zoning rules. The Natural Rivers Program was developed to preserve, protect and enhance our state's finest river systems for the use and enjoyment of current and future generations by allowing property owners their right to reasonable development while protecting Michigan's unique river resources.

There are 16 designated Natural River systems in Michigan. The designation includes the mainstream, as well as most of the tributaries. Nearly all construction, land change/earth moving, and placement of structures is regulated within 400-feet of any designated stream segment. Please consult with Natural Rivers Program staff for specific regulatory determinations.

For more information, please email DNR-NaturalRivers@michigan.gov or reach out directly to the appropriate permitting staff.

Michigan's Designated Natural Rivers

Au Sable River

The Au Sable is a major tributary to Lake Huron. It drains a north-south basin that includes 1,932 square miles in north-central lower Michigan. The basin is approximately 90 miles long and 10 to 30 miles wide. The river basin is partially within the Huron National Forest and includes parts of Otsego, Montmorency, Crawford, Osco, Alcona, Roscommon, Ogemaw, and Iosco counties. Zoning standards for the Au Sable River system are found on pages 1-21 and 46-50.

PDF **Au Sable River Map**

PDF **Au Sable River Plan**

Betsie River

The Betsie River is located in Grand Traverse, Benzie and Manistee counties. The stream originates at Green Lake near the village of Interlochen and flows in a westerly direction to its outlet into Betsie Lake and Lake Michigan near Elberta and Frankfort. A large part of the river lies within the boundaries of the Fife Lake and Betsie River State Forests and flows through the Betsie River State Game Area near its mouth. The Betsie River drains a surface area of approximately 165,800 acres and includes about 93 linear miles of streams, 52 miles of which is mainstream. Zoning standards for the Betsie River system are found on pages 1-21 and 23-25.

PDF **Betsie River Map**

PDF **Betsie River Plan**

Boardman River

The Boardman River is located in Grand Traverse and Kalkaska counties in northwest lower Michigan. It rises in the Mahan swamp in north central Kalkaska County and flows in a southwesterly direction for 40 miles. Turning north for nine miles, it empties into Grand Traverse Bay at Traverse City. The Boardman River system drains a surface area of approximately 186,000 acres and includes about 130 linear miles of stream. Zoning standards for the Boardman River system are found on pages 1-21 and 33-35.

PDF **Boardman River Map**

PDF **Boardman River Plan**

Flat River

The Flat River flows through the counties of Montcalm, Ionia and Kent. The mainstream originates in the Six Lakes area and flows approximately 70 miles until it joins the Grand River at Lowell. Zoning standards for the Flat River system are found on pages 1-21 and 41-43.

PDF **Flat River Map**

PDF **Flat River Plan**

Fox River

The Fox River system is located in Alger, Schoolcraft and Luce counties in the eastern half of Michigan's Upper Peninsula. The mainstream of the Fox flows south from northeastern Alger County through flat sand plains and lowland hardwoods to its confluence with the Lake Branch of the Manistique River, which continues on the Lake Michigan. The Fox's East Branch, West Branch and Little Fox are its main tributaries. The East Branch joins the Fox River Mainstream about a mile above the Manistique River and is nearly equal to the Mainstream in length and discharge. The basin is approximately 26 miles long and 10 miles wide. Zoning standards for the Fox River system are found on pages 1-21 and 62-64.

PDF **Fox River Map**

PDF **Fox River Plan**

Huron River

The Huron River system flows through the southeast Michigan counties of Oakland, Ingham, Livingston, Washtenaw, Monroe and Wayne. The mainstream originates in Big Lake and the Huron Swamp northwest of Pontiac and flows roughly 125 miles to its mouth in the marshlands of Pt. Mouillee on Lake Erie. Zoning standards for the Huron River system are found on pages 1-21 and 28-31.

PDF **Huron River Map**

PDF **Huron River Plan**

Jordan River

The Jordan River is located in the northwestern part of the Lower Peninsula of Michigan. The mainstream is 33 miles in length with headwaters in northwestern Antrim County, from whence it flows southwesterly to the center of the county, flowing north by northwesterly through the county and the southern part of Charlevoix County. It empties into the South Arm of Lake Charlevoix at the Village of East Jordan (Figure 1). The river has two major tributaries, the Green River and Deer Creek with numerous minor tributaries to both the mainstream and Deer Creek. Zoning standards for the Jordan River system are found on pages 1-23.

PDF **Jordan River Map**

PDF **Jordan River Plan**

Lower Kalamazoo River

The Kalamazoo River system drains an area of approximately 2,020 square miles as it flows through portions of the southwest Michigan counties of Allegan, Barry, Eaton, Van Buren, Kalamazoo, Calhoun, Jackson, Hillsdale, Kent and Ottawa. Zoning standards for the Lower Kalamazoo River system are found on pages 1-21 and 59-61.

PDF **Lower Kalamazoo River Map**

PDF **Lower Kalamazoo River Plan**

Pere Marquette River

The Pere Marquette River located in portions of Lake, Mason, Newaygo and Oceana counties, the Pere Marquette River system drains an area of approximately 740 square miles. Roughly 53 percent of the watershed is in Lake County. The mainstream starts at the confluence of the Middle Branch and Little South Branch, known as the "Forks" and flows in a westerly direction for approximately 67 miles to its mouth at Pere Marquette Lake, just south of the City of Ludington. Zoning standards for the Pere Marquette River system are found on pages 1-21 and 36-39.

PDF **Pere Marquette River Map**

PDF **Pere Marquette River Plan**

Pigeon River

The Pigeon River is located in the north-central part of the southern peninsula of Michigan. Its headwaters are located a few miles northeast of Gaylord. The river then flows in a northerly direction to its mouth at Mullet Lake, a distance of 42 miles. The Pigeon River system drains a surface area of approximately 88,000 acres and include 80 linear miles of stream. Zoning standards for the Pigeon River system are found on pages 1-21 and 43-46.

PDF **Pigeon River Map**

PDF **Pigeon River Plan**

Pine River

The Pine River watershed is located in the northwestern portion of Michigan's lower peninsula. It has a drainage area of 265 square miles, and ultimately discharges to Tippy Dam Impoundment in Manistee County (Figure 1). The watershed includes parts of four counties: Wexford, Osceola, Lake and Manistee. The mainstream is approximately 49 miles long and is formed by the confluence of the North Branch and East branch of the Pine River near Tustin in Osceola County at an elevation of 1,102 feet (336m). Zoning standards for the Pine River system are found on pages 1-21 and 50-53.

PDF **Pine River Map**

PDF **Pine River Plan**

Rifle River

The Rifle River watershed is located in Ogemaw and Arenac counties, draining an area of approximately 385 square miles. The river originates in northeastern Ogemaw County and flows for approximately 60 miles in a southeasterly direction to its confluence with Lake Huron. Zoning standards for the Rifle River system are found on pages 1-21 and 39-41.

PDF **Rifle River Map**

PDF **Rifle River Plan**

Rogue River

The Rogue River is a major tributary of the Grand River. It drains an area of approximately 234 square miles in Newaygo and Kent counties. Its headwaters are a series of ditches that drain the old Rice Lake bed in southern Newaygo County. In this area the stream has been dredged and straightened for drainage purposes leaving limited fish habitat. Zoning standards for the Rogue River system are found on pages 1-21 and 31-33.

PDF **Rogue River Map**

PDF **Rogue River Plan**

Two Hearted River

The Two Hearted River is located in northern Luce County in the eastern third of the Upper Peninsula of Michigan. The 35-mile long mainstream flows from the northwest portion of the county in a northeasterly direction to Lake Superior. It has five major tributaries: the East, South, West and North branches, and Dawson Creek. The mainstream itself starts at the confluence of the South Branch and West Branch. Zoning standards for the Two Hearted River system are found on pages 1-21 and 57-59.

PDF **Two Hearted River Map**

PDF **Two Hearted River Plan**

Upper Manistee River

The Upper Manistee River watershed is located in the northwestern portion of Michigan's Lower Peninsula. It has a drainage area of 590 square miles. The watershed includes parts of five counties: Antrim, Otsego, Crawford, Kalkaska and Missaukee. The mainstream is approximately 78 miles long and originates in southeast Antrim County (approximately six miles from the village of Alba), at an elevation of 1,250 feet. Zoning standards for the Upper Manistee River system are found on pages 1-21 and 53-57.

PDF **Upper Manistee River Map**

PDF **Upper Manistee River Plan**

PDF **Upper Manistee River Access Action Plan**

White River

The White River is located in Newaygo, Oceana and Muskegon counties, in west central lower Michigan. The White River rises from the extensive Oxford Swamp in north central Newaygo County and flows in a southwesterly direction into White Lake then Lake Michigan, near the towns of Whitehall and Montague. The White River system drains a surface area of approximately 300,000 acres and includes about 253 linear miles of streams. Zoning standards for the White River system are found on pages 1-21 and 25-28.

PDF **White River Map**

PDF **White River Plan**

Information and Forms

General Information

PDF **Map of permitting staff**

PDF **Part 305, Natural Rivers, of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended**

Private Land Projects

PDF **Natural River Zoning Rules**

PDF **Application for Natural River Program Zoning Permit**

PDF **Application for Natural River Program Variance**

PDF **Zoning Review Board Meeting Dates**

PDF **Standards for Private Lands**

Public Interest Projects

PDF **Natural Rivers Rules for Utilities and Publicly-Provided Facilities**

PDF **Application for Natural River Program by Utility / Public Agency**

Natural River Zoning Review Board Schedule

Au Sable River meeting details

Meeting Date	Deadline for receipt of a complete variance application*
April 7, 2022	February 23, 2022
May 5, 2022	March 23, 2022
June 2, 2022	April 20, 2022
July 7, 2022	May 25, 2022
August 4, 2022	June 22, 2022
September 1, 2022	July 20, 2022
October 6, 2022	August 24, 2022

November 3, 2022	September 21, 2022
December 1, 2022	October 19, 2022

*An application is considered administratively complete when it contains all information noted in the sample site plan on the Natural Rivers Variance Application, as well as any additional information determined by the Natural Rivers zoning administrator that is necessary for the Zoning Review Board (Board) to evaluate the proposal. If an application for variance is received by the DNR prior to the application deadline, and the application is determined to be complete, it will be considered by the Board on the corresponding date noted above. If an application for variance is received by the DNR prior to the application deadline date, but determined to be incomplete, you will receive a correction request and your proposal will need to be considered at a later meeting date.

Betsie River meeting details

Meeting Date	Deadline for receipt of a complete application*
April 5, 2022	February 21, 2022
May 3, 2022	March 18, 2022
June 7, 2022	April 25, 2022
July 5, 2022	May 16, 2022
August 2, 2022	June 10, 2022
September 6, 2022	July 25, 2022
October 4, 2022	August 15, 2022
November 1, 2022	September 12, 2022
December 6, 2022	October 17, 2022

*An application is considered administratively complete when it contains all information noted in the sample site plan on the Natural Rivers Variance Application, as well as any additional information determined by the Natural Rivers zoning administrator that is necessary for the Zoning Review Board (Board) to evaluate the proposal. If an application for variance is received by the DNR prior to the application deadline, and the application is determined to be complete, it will be considered by the Board on the corresponding date noted above. If an application for variance is received by the DNR prior to the application deadline date, but determined to be incomplete, you will receive a correction request and your proposal will need to be considered at a later meeting date.

Pere Marquette meeting details

Meeting Date	Deadline for receipt of a complete application*
April 18, 2022	March 4, 2022
May 16, 2022	April 2, 2022
June 13, 2022	April 30, 2022
July 18, 2022	June 4, 2022
August 15, 2022	July 1, 2022
September 19, 2022	August 5, 2022
October 17, 2022	September 3, 2022
December 5, 2022	October 22, 2022

*An application is considered administratively complete when it contains all information noted in the sample site plan on the Natural Rivers Variance Application, as well as any additional information determined by the Natural Rivers zoning administrator that is necessary for the Pere Marquette River Zoning Review Board (Board) to evaluate the proposal. If an application for variance is received by the DNR prior to the application deadline, and the application is determined to be complete, it will be considered by the Board on the corresponding date noted above. If an application for variance is received by the DNR prior to the application deadline date, but determined to be incomplete, you will receive a correction request and your proposal will need to be considered at a later meeting date.

Pine River meeting details

Meeting Date	Deadline for receipt of a complete application*

April 6, 20222	February 22, 2022
May 4, 2022	March 18, 2022
June 1, 2022	April 19, 2022
July 6, 2022	May 15, 2022
August 3, 2022	June 11, 2022
September 7, 2022	July 26, 2022
October 5, 2022	August 16, 2022
November 2, 2022	September 13, 2022
December 7, 2022	October 18, 2022

*An application is considered administratively complete when it contains all information noted in the sample site plan on the Natural Rivers Variance Application, as well as any additional information determined by the Natural Rivers zoning administrator that is necessary for the Zoning Review Board (Board) to evaluate the proposal. If an application for variance is received by the DNR prior to the application deadline, and the application is determined to be complete, it will be considered by the Board on the corresponding date noted above. If an application for variance is received by the DNR prior to the application deadline date, but determined to be incomplete, you will receive a correction request and your proposal will need to be considered at a later meeting date.

Upper Manistee River meeting details

Meeting Date	Deadline for receipt of a complete variance application*
March 23, 2022	February 8, 2022
April 27, 2022	March 15, 2022
May 25, 2022	April 12, 2022
June 29, 2022	May 17, 2022
July 27, 2022	June 14, 2022

August 24, 2022	July 12, 2022
September 28, 2022	August 16, 2022
October 26, 2022	September 13, 2022
November 30, 2022	October 18, 2022
January 25, 2023	December 13, 2022

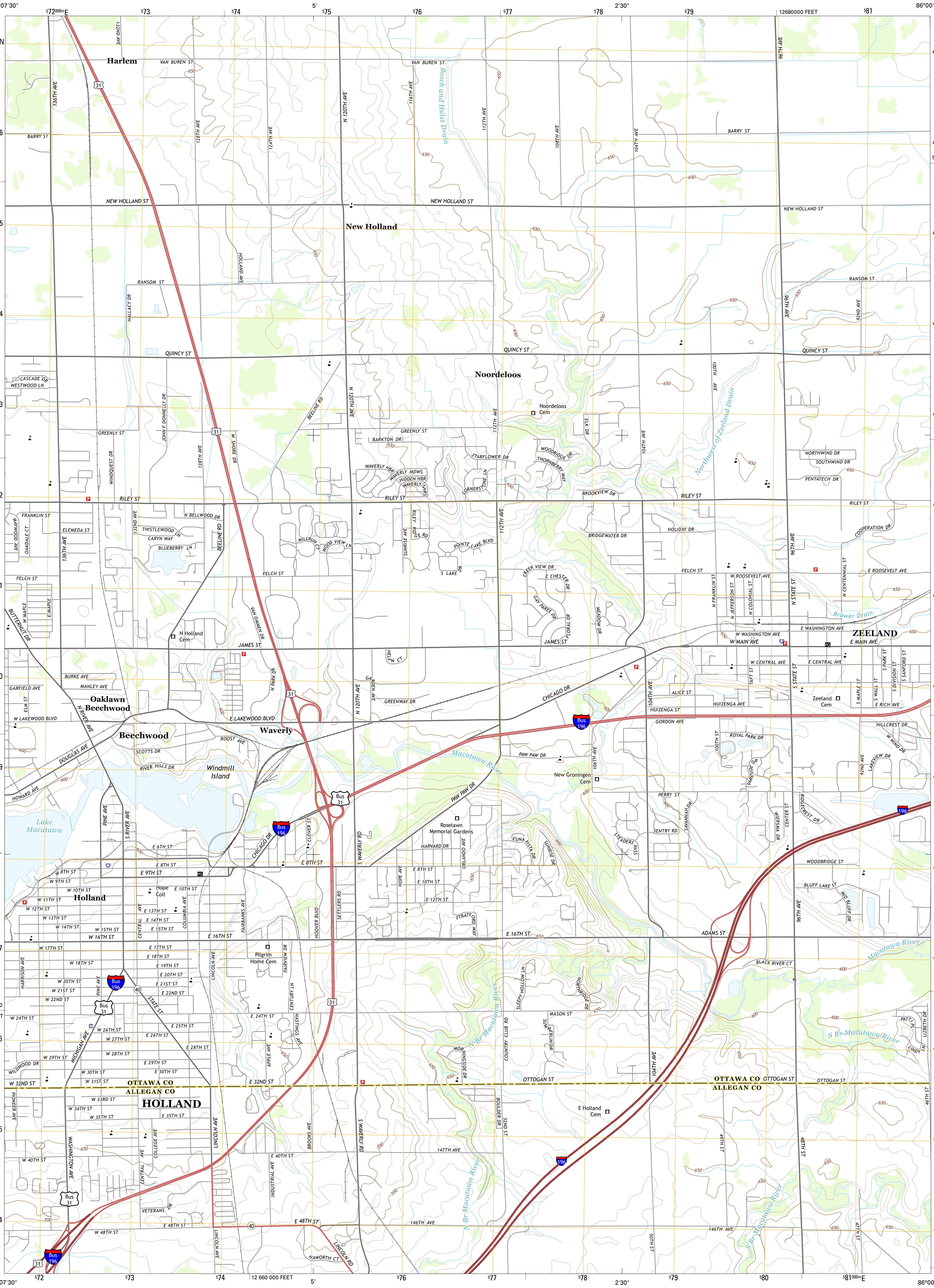
*An application is considered administratively complete when it contains all information noted in the sample site plan on the Natural Rivers Variance Application, as well as any additional information determined by the Natural Rivers zoning administrator that is necessary for the Zoning Review Board (Board) to evaluate the proposal. If an application for variance is received by the DNR prior to the application deadline, and the application is determined to be complete, it will be considered by the Board on the corresponding date noted above. If an application for variance is received by the DNR prior to the application deadline date, but determined to be incomplete, you will receive a correction request and your proposal will need to be considered at a later meeting date.

Natural Rivers

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

The National Map
US Topo

HOLLAND EAST QUADRANGLE
MICHIGAN
7.5-MINUTE SERIES



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
10 000-foot ticks: Michigan Coordinate System of 1983 (south zone)

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, June 2012
Roads....................HERE, ©2013
Names....................GNIS, 2013
Hydrography....................National Hydrography Dataset, 2012
Contours....................National Elevation Dataset, 1999
Boundaries....................Multiple sources; see metadata file 1972 - 2013
Public Land Survey System....................BLM, 2011

MN
GN
5° 14´
93 MILS
0° 38´
11 MILS

UTM GRID AND 2014 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

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

SCALE 1:24 000

KILOMETERS 1 0.5 0 1 2
METERS 1000 500 0 1000 2000
MILES 1 0.5 0 1
FEET 1000 0 1000 2000 3000 4000 5000 6000 7000 8000 9000 10000

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 0.6.16

MICHIGAN
QUADRANGLE LOCATION

1	2	3
4		5
6	7	8

ADJOINING QUADRANGLES

1 Port Sheldon
2 Borculo
3 Allendale
4 Holland West
5 Hudsonville West
6 Saugatuck
7 Hamilton West
8 Hamilton East

ROAD CLASSIFICATION

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

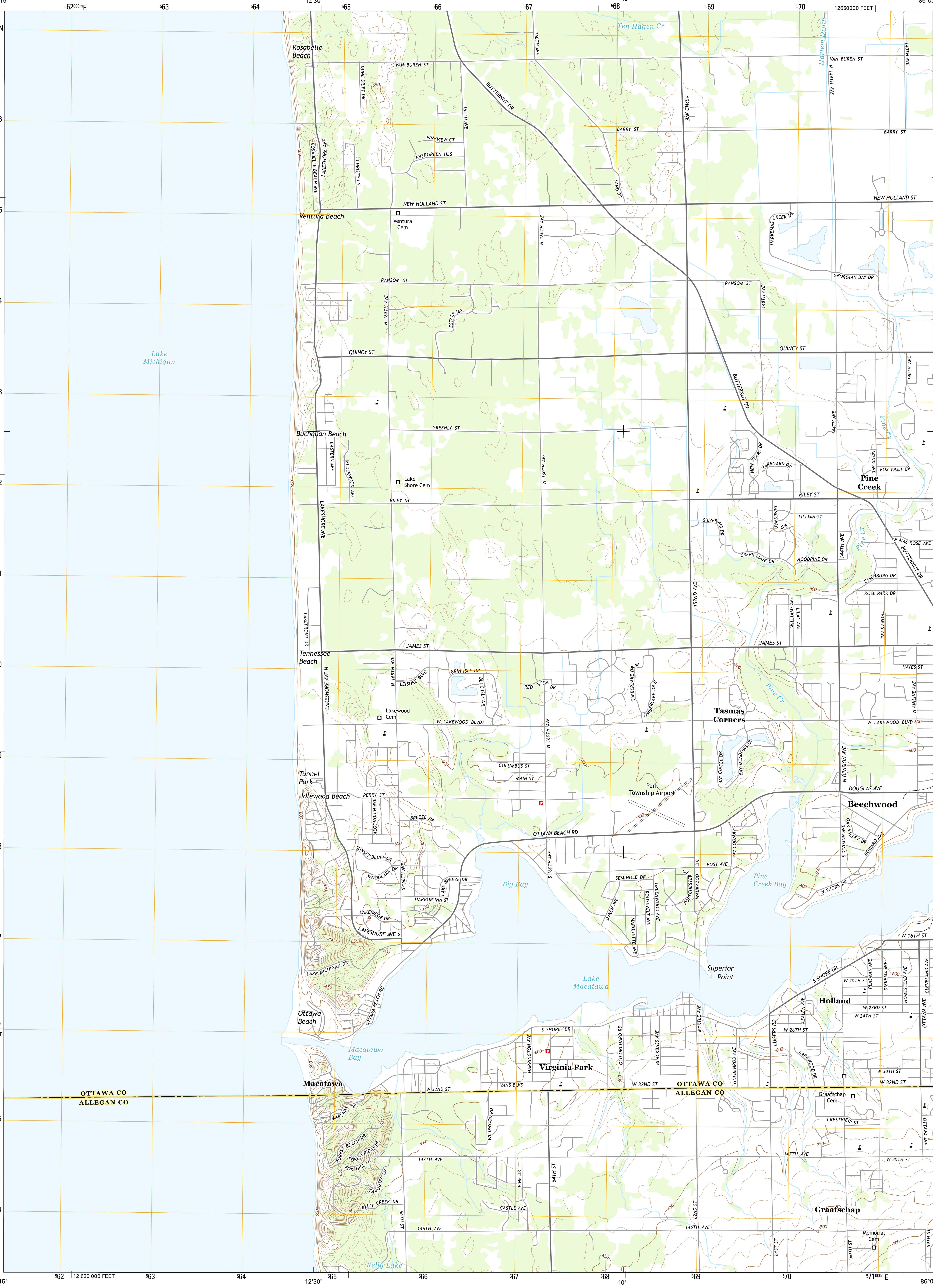
HOLLAND EAST, MI
2014

NSN. 7643016377153
NGA REF NO. USGSX24K20723

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

The National Map
US Topo

HOLLAND WEST QUADRANGLE
MICHIGAN
7.5-MINUTE SERIES



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
10 000-foot ticks: Michigan Coordinate System of 1983 (south zone)

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, June 2012
Roads....................HERE, ©2013
Names....................GNIS, 2013
Hydrography..........National Hydrography Dataset, 2012
Contours..........National Elevation Dataset, 1999
Boundaries..........Multiple sources; see metadata file 1972 - 2013
Public Land Survey System..........BLM, 2011

5° 8´
91 MILS
0° 33´
10 MILS

UTM GRID AND 2014 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

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

SCALE 1:24 000

KILOMETERS
METERS
MILES
FEET

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 0.6.16

QUADRANGLE LOCATION

ROAD CLASSIFICATION

Expressway		Local Connector	
Secondary Hwy		Local Road	
Ramp		4WD	

Interstate Route   US Route   State Route

1
2 Port Sheldon
3 Borculo
4
5 Holland East
6
7 Saugatuck
8 Hamilton West

ADJOINING QUADRANGLES

HOLLAND WEST, MI
2014

NSN. 7643016371154
NGA REF NO. USGSX24K20728

Sam Bender
Holland Board of Public Works
625 Hastings Ave.
Holland, MI 49423-5427

April 19, 2023

Re: Rare Species Review #3466 – Holland Board of Public Works - WWTP Improvements, Holland, Ottawa County, MI

Hello:

The location for the proposed project was checked against known localities for rare species and unique natural features, which are recorded in the Michigan Natural Features Inventory (MNFI) natural heritage database. This continuously updated database is a comprehensive source of existing data on Michigan's endangered, threatened, or otherwise significant plant and animal species, natural plant communities, and other natural features. Records in the database indicate that a qualified observer has documented the presence of special natural features. The absence of records in the database for a particular site may mean that the site has not been surveyed. The only way to obtain a definitive statement on the status of natural features is to have a competent biologist perform a complete field survey.

Under Act 451 of 1994, the Natural Resources and Environmental Protection Act, Part 365, Endangered Species Protection, "a person shall not take, possess, transport, …fish, plants, and wildlife indigenous to the state and determined to be endangered or threatened," unless first receiving an Endangered Species Permit from the Michigan Department of Natural Resources (MDNR), Wildlife Division. Responsibility to protect endangered and threatened species is not limited to the lists below. Other species may be present that have not been recorded in the database.

At-risk species and/or natural communities have been documented within 1.5 miles of the project location and it is possible that adverse impacts will occur. This response reflects a desktop review of the database and MNFI cannot fully evaluate this project without visiting the area. MNFI offers several levels of Rare Species Reviews, including field surveys which I would be happy to discuss with you.

Sincerely,

Michael A. Sanders

Michael A. Sanders
Environmental Review Specialist
Michigan Natural Features Inventory

MSU EXTENSION

Michigan Natural Features Inventory

PO Box 13036
Lansing MI 48901

(517) 284-6200
Fax (517) 373-9566

mnfi.anr.msu.edu

Comments for Rare Species Review #3466:
It is important to note that it is the applicant's responsibility to comply with both state and federal threatened and endangered species legislation. Therefore, if a state listed species occurs at a project site, and you think you need an endangered species permit please contact: Casey Reitz, DNR-Wildlife Division, 517-284-6210, or ReitzC@michigan.gov. If a federally listed species is involved and, you think a permit is needed, please contact Jessica Pruden, U.S. Fish and Wildlife Service, East Lansing office, 517-351-8316, or Jessica_Pruden@fws.gov.

NOTE: special concern species and natural communities are not protected under endangered species legislation, but efforts should be taken to minimize any or all impacts. Please consult MNFI's Rare Species Explorer for additional information on Michigan's rare plants and animals.

Table 1: Occurrences of Threatened & Endangered Species within 1.5 miles of Project Site

Element Category	Scientific Name	Common Name	Federal Status	State Status	G Rank	S Rank	EO Rank	First Observed Date	Last Observed Date
Plant	*Panax quinquefolius*	Ginseng		T	G3G4	S2S3	H	1914	1914-09-12
Animal	*Pyganodon subgibbosa*	Round lake floater		T	G1Q	S1	H	1901 pre	1930
Plant	*Zizania aquatica*	Wild rice		T	G5	S2S3	H	1910	1910-08-04
Animal	*Rallus elegans*	King rail		E	G4	S2	H	1894	1894-06-13
Animal	*Falco columbarius*	Merlin		T	G5	S3	E	2011-Summer	2011-Summer

Species Comments for Table 1

Merlin (*Falco columbarius*)

Habitat

Has known to nest at Tunnel Park.. Nests are frequently near lakeshores or other semi-open areas where prey (small to medium birds) may be captured. Merlins will rarely nest in cavities or on cliffs.

Management Recommendations

In North America, loss of suitable habitat may be the major factor affecting Merlin populations although pesticide contamination has also played a role. Currently, the Merlin's habitat in Michigan is not seriously threatened and there are no known factors that are critically limiting its present population in the state. In some portions of the country dying or over harvesting of preferred nesting trees in woodlots and shelterbelts is suspected to have impacted Merlin numbers. As such, nesting trees should be protected and human activity within a buffer around nests should be limited.

For more information, see the *Falco columbarius* species page on the MNFI website.

Table 2: Occurrences of Special Concern Species within 1.5 miles of Project Site

Element Category	Scientific Name	Common Name	Federal Status	State Status	G Rank	S Rank	EO Rank	First Observed Date	Last Observed Date
Plant	*Hypericum gentianoides*	Gentian-leaved St. John's-wort		SC	G5	S3	AB	1986	1986-08-22
Plant	*Pycnanthemum verticillatum*	Whorled mountain mint		SC	G5	S2	H	1910	1910-08-04
Plant	*Lycopodiella subappressa*	Northern appressed clubmoss		SC	G2	S2	H	1871	1871-05-15
Animal	*Cincinnatia cincinnatiensis*	Campeloma spire snail		SC	G5	S3	H		
Animal	*Potamilus alatus*	Pink heelsplitter		SC	G5	SNR	H		
Animal	*Bombus affinis*	Rusty-patched bumble bee	LE	SC	G2	SH	H	1954-08-05	1954-08-05

Comments for Table 2:

No concerns as the occurrences are Historic and/or far removed from project site.

Codes to accompany table

State Protection Status Code Definitions (SPROT)
E = Endangered
T = Threatened
SC = Special concern

Federal Protection Status Code Definitions (USESA)
LE = listed endangered
LT = listed threatened
LELT = partly listed endangered and partly listed threatened
PDL = proposed delist
E(S/A) = endangered based on similarities/appearance
PS = partial status (federally listed in only part of its range)
C = species being considered for federal status

Global Heritage Status Rank Definitions (GRANK)
The priority assigned by NatureServe's national office for data collection and protection based upon the element's status throughout its entire world-wide range. Criteria not based only on number of occurrences; other critical factors also apply. Note that ranks are frequently combined.
G1 = critically imperiled globally because of extreme rarity (5 or fewer occurrences range-wide or very few remaining individuals or acres) or because of some factor(s) making it especially vulnerable to extinction.
G2 = imperiled globally because of rarity (6 to 20 occurrences or few remaining individuals or acres) or because of some factor(s) making it very vulnerable to extinction throughout its range.
G3 = Either very rare and local throughout its range or found locally (even abundantly at some of its locations) in a restricted range (e.g. a single western state, a physiographic region in the East) or because of other factor(s) making it vulnerable to extinction throughout its range; in terms of occurrences, in the range of 21 to 100.
G4 = Apparently secure globally, though it may be quite rare in parts of its range, especially at the periphery.
G5 = Demonstrably secure globally, though it may be quite rare in parts of its range, especially at the periphery.
Q = Taxonomy uncertain

State Heritage Status Rank Definitions (SRANK)
The priority assigned by the Michigan Natural Features Inventory for data collection and protection based upon the element's status within the state. Criteria not based only on number of occurrences; other critical factors also apply. Note that ranks are frequently combined.
S1 = Critically imperiled in the state because of extreme rarity (5 or fewer occurrences or very few remaining individuals or acres) or because of some factor(s) making it especially vulnerable to extirpation in the state.
S2 = Imperiled in state because of rarity (6 to 20 occurrences or few remaining individuals or acres) or because of some factor(s) making it very vulnerable to extirpation from the state.
S3 = Rare or uncommon in state (on the order of 21 to 100 occurrences). S4 = apparently secure in state, with many occurrences.
S5 = demonstrably secure in state and essentially ineradicable under present conditions.
SX = apparently extirpated from state.

EO Rank Codes

Element Occurrence (EO) ranks refer to the viability or ecological integrity of the occurrence; they provide an assessment of the likelihood that if current conditions prevail the EO will persist for a defined period of time, typically 20-100 years.

A - Excellent estimated viability/ecological integrity
A? - Possibly excellent estimated viability/ecological integrity
AB - Excellent or good estimated viability/ecological integrity
AC - Excellent, good, or fair estimated viability/ecological integrity
B - Good estimated viability/ecological integrity
B? - Possibly good estimated viability/ecological integrity
BC - Good or fair estimated viability/ecological integrity
BD - Good, fair, or poor estimated viability/ecological integrity
C - Fair estimated viability/ecological integrity
C? - Possibly fair estimated viability/ecological integrity
CD - Fair or poor estimated viability/ecological integrity
D - Poor estimated viability/ecological integrity
D? - Possibly poor estimated viability/ecological integrity
E - Verified extant (viability/ecological integrity not assessed)
F - Failed to find
F? - Possibly failed to find
H - Historical
H? - Possibly historical
X - Extirpated
X? - Possibly extirpated
U - Unrankable
NR - Not ranked

Section 7 Comments for Rare Species Review #3466
Holland Board of Public Works - WWTP Improvements
Sam Bender
Holland Board of Public Works
625 Hastings Ave.
Holland, MI 49423-5427

April 19, 2023

<u>For projects involving Federal funding or a federal agency authorization</u>

The following information is provided to assist you with Section 7 compliance of the Federal Endangered Species Act (ESA). The ESA directs all Federal agencies "to work to conserve endangered and threatened species. Section 7 of the ESA, called "Interagency Cooperation," is the means by which Federal agencies ensure their actions, including those they authorize or fund, do not jeopardize the existence of any listed species."

The project falls within the range of the following federally listed/proposed/candidate species which have been identified by the U.S. Fish and Wildlife Service (USFWS) to occur in Ottawa County, Michigan:

<u>Federally Endangered</u>

Indiana bat - there appears to be suitable habitat within 1.5 miles of the project area. Indiana bats (*Myotis sodalis*) are found only in the eastern United States and are typically confined to the southern three tiers of counties in Michigan. Indiana bats that summer in Michigan winter in caves in Indiana and Kentucky. This species forms colonies and forages in riparian and mature floodplain habitats. Nursery roost sites are usually located under loose bark or in hollows of trees near riparian habitat. Indiana bats typically avoid houses or other artificial structures and typically roost underneath loose bark of dead elm, maple and ash trees. Other dead trees used include oak, hickory and cottonwood. Foraging typically occurs over slow-moving, wooded streams and rivers as well as in the canopy of mature trees. Movements may also extend into the outer edge of the floodplain and to nearby solitary trees. A summer colony's foraging area usually encompasses a stretch of stream over a half-mile in length. Upland areas isolated from floodplains and non-wooded streams are generally avoided.

Management and Conservation: the suggested seasonal tree cutting range for Indiana bat is between October 1 and March 31 (i.e., no cutting April 1-September 30). This applies throughout the Indiana bat range in Michigan.

Piping plover – there appears to be suitable habitat within 1.5 miles of the project area. In the Great Lakes region, the federal and state endangered piping plover *(Charadrius melodus)* prefers to nest and forage on sparse or non-vegetated sand-pebble beaches with less than 5% vegetative cover. Nests are simple depressions in the sand are generally placed in level areas between the water's edge and the first dune. Associated bodies of water and interdunal wetlands enhance these areas by increasing food availability. Optimal foraging areas are especially crucial along Lake Superior, where shoreline and benthic invertebrate communities are known to be naturally sparse. While feeding, open shoreline is preferred to vegetated beach areas. Piping plovers begin arriving in mid- to late-April. The nesting season is under way by mid-May and lasts until mid-August.

Management and Conservation - this species is declining throughout the Midwest due to habitat destruction and disturbance. The nests are simple depressions in the sand and are difficult to see. People walking on the beach may inadvertently destroy nests. Dogs on the beach can be especially dangerous for chicks and adults. Piping plovers are protected under the Federal Endangered Species Act and are very sensitive to human disturbance. Please avoid activity along the shoreline in this compartment between May and September.

Snuffbox – there does not appear to be suitable habitat within 1.5 miles of the project area. The state and federally endangered snuffbox mussel (*Epioblasma triquetra*) inhabits rivers and streams with cobble, gravel, or sand bottoms in swift currents and usually is deeply buried in the substrate. Glochidia, the parasitic larval stage of the mussel, are released from May to mid-July. In Michigan, the only host fish known for snuffbox is the log perch (*Percina caprodes*). In other parts of their range the banded sculpin (*Cottus carolinae*) is also a known host. After completing the parasitic stage and reaching adulthood, snuffbox remain relatively sessile on the river bottom, living between 8-10 years. The best time to survey for snuffbox is April through September.

Conservation and Management: the snuffbox mussel is sensitive to river impoundment, siltation and disturbance, due to its requirement for clean, swift current and relative immobility as an adult. To maintain the current populations in Michigan, rivers need to be protected to reduce silt loading and run-off. Maintaining or establishing vegetated riparian buffers can aid in controlling many of the threats to mussels. Control of zebra mussels is critical to preserving native mussels. And as with all mussels, protection of their hosts habitat is also crucial. Because the life cycle of the snuffbox is inherently linked with that of the logperch in Michigan, conservation and management of this fish species is needed to ensure that of the snuffbox.

Northern long-eared bat – there appears to be suitable habitat within 1.5 miles of the project area. Northern long-eared bat (*M. septentrionalis*) numbers in the northeast US have declined up to 99 percent. Loss or degradation of summer habitat, wind turbines, disturbance to hibernacula, predation, and pesticides have contributed to declines in Northern long-eared bat populations. However, no other threat has been as severe to the decline as White-nose Syndrome (WNS). WNS is a fungus that thrives in the cold, damp conditions in caves and mines where bats hibernate. The disease is believed to disrupt the hibernation cycle by causing bats to repeatedly awake thereby depleting vital energy reserves. This species was federally listed in May 2015 primarily due to the threat from WNS.

Also called northern bat or northern myotis, this bat is distinguished from other *Myotis* species by its long ears. In Michigan, northern long-eared bats hibernate in abandoned mines and caves in the Upper Peninsula; they also commonly hibernate in the Tippy Dam spillway in Manistee County. This species is a regional migrant with migratory distance largely determined by locations of suitable hibernacula sites.

Northern long-eared bats typically roost and forage in forested areas. During the summer, these bats roost singly or in colonies underneath bark, in cavities or in crevices of both living and dead trees. Roost trees are selected based on the suitability to retain bark or provide cavities or crevices. Common roost trees in southern Lower Michigan include species of ash, elm and maple. Foraging occurs primarily in areas along woodland edges, woodland clearings and over small woodland ponds. Moths, beetles and small flies are common food items. Like all temperate bats this species typically produces only 1-2 young per year.

Management and Conservation: **when there are no known roost trees or hibernacula in the project area, we encourage you to conduct tree-cutting activities and prescribed burns in forested areas during October 1 through March 31 when possible, but you are not required by the ESA to do so. When that is not possible, we encourage you to remove trees prior to June 1 or after July 31, as that will help to protect young bats that may be in forested**

Federally Threatened

Pitcher's thistle – there appears to be suitable habitat within 1.5 miles of the project area. The federal and state threatened Pitcher's thistle *(Cirsium pitcheri)* grows on open sand dunes and occasionally on lag gravel associated with dunes. All of its habitats are along the Great Lakes shores, or in very close proximity. This monocarpic (once-flowering) plant produces a rosette that will mature to flowering in 2-8 years, after which the plant dies. Seeds germinate in June, and most seedlings (rosettes) appear within 1-3 meters of parent plants. The taproot of this thistle, which can reach 2 m in length, enhances its ability to survive the often-desiccating conditions of its dune habitat. Pitcher's thistle blooms from approximately late-June to early September.

Management and Conservation - Pitcher's thistle can be locally extirpated by destruction or major disturbance of its habitat (e.g. by shoreline development, vehicular or ORV traffic, heavy foot traffic and/or intensive recreation).

Rufa red knot – there appears to be suitable habitat within 1.5 miles of the project area. The federally threatened rufa red knot (*Calidris canutus rufa*) is one of the longest-distance migrants in the animal kingdom, flying some 18,000 miles annually between its breeding grounds in the Canadian Arctic to the wintering grounds at the southern-most tip of South America. Primarily occurring along the Atlantic and Gulf coasts, small groups of this shorebird regularly use the interior of the United States such as the Great Lakes during the annual migration. The Great Lakes shorelines provide vital stopover habitat for resting and refueling during their long annual journey.

The largest concentration of rufa red knots is found in May in Delaware Bay, where the birds stop to gorge on the eggs of spawning horseshoe crabs; a spectacle attracting thousands of birdwatchers to the area. In just a few days, the birds nearly double their weight to prepare for the final leg of their long journey to the Arctic. This species may be especially vulnerable to climate change which affects coastal habitats due to rising sea levels.

Management and Conservation: applies to actions that occur along coastal areas during the Red Knot migratory window of MAY 1 - SEPTEMBER 30.

Eastern massasauga rattlesnake (EMR) - **the project falls outside of EMR Tier habitat** as designated by the U.S. Fish & Wildlife Service (USFWS). The federally threatened and state special concern eastern massasauga rattlesnake *(Sistrurus catenatus)* is Michigan's only venomous snake and occurs in a variety of wetland habitats including bogs, fens, shrub swamps, wet meadows, marshes, moist grasslands, wet prairies, and floodplain forests. Eastern massasaugas occur throughout the Lower Peninsula but are not found in the Upper Peninsula. Populations in southern Michigan are typically associated with open wetlands, particularly prairie fens, while those in northern Michigan are better known from lowland coniferous forests, such as cedar swamps. These snakes normally overwinter in crayfish or small mammal burrows often close to the groundwater level and emerge in spring as water levels rise. During late spring, these snakes move into adjacent uplands they spend the warmer months foraging in shrubby fields and grasslands in search of mice and voles, their favorite food.

Often described as "shy and sluggish", these snakes avoid human confrontation and are not prone to strike, preferring to leave the area when they are threatened. However, like any wild animal, they will protect themselves from anything they see as a potential predator. Their short fangs can easily puncture skin and they do possess potent venom. Like many snakes, the first human reaction may be to kill the snake, but it is important to remember that all snakes play vital roles in the ecosystem. Some may eat harmful insects. Others like the massasauga consider rodents a delicacy and help control their population. Snakes are also a part of a larger food web and can provide food to eagles, herons, and several mammals.

Management and Conservation: protection of extant populations and suitable wetland and adjacent upland habitats is crucial for successful conservation of the eastern massasauga. Maintaining or restoring open habitat conditions is critical for this species. Fragmentation of suitable wetland-upland habitat complexes by roads or other barriers should be avoided or minimized. Land management practices such as timber harvesting, mowing, disking or prescribed burning should be conducted in such a manner to minimize the potential for adverse impacts to massasaugas (e.g., conducting management activities during the snakes' inactive season (November through early March) or on days when snakes are less likely to be active on the surface during the active season). Protecting suitable hibernation sites also is critical. Hydrological alterations such as drawdowns should be conducted prior to or after hibernation to reduce the potential for causing winter mortality due to desiccation or freezing. Snakes are also a part of a larger food web and can provide food to eagles, herons, and several mammals. Any sightings of these snakes should be reported to the Michigan Department of Natural Resources, Wildlife Division.

Candidate Species

Monarch Butterfly (*Danaus plexipuss*) on December 15, 2020, the U.S. Fish and Wildlife Service announced that listing the monarch as endangered or threatened under the Endangered Species Act is warranted but precluded by higher priority listing actions. The decision is the result of an extensive status review of the monarch that compiled and

HOLLAND BOARD OF PUBLIC WORKS
DWRF APPLICATION – WATER SYSTEM IMPROVEMENTS
Project Information

Project Name:	Holland Board of Public Works Water System Improvements
Project Address:	46 North Lakeshore Drive, Holland, MI 49424 Areas within Park Township, Ottawa County and City of Holland in Allegan and Ottawa Counties
Federal Agency and Contact:	Karol Patton Water Infrastructure Funding and Financing Section, Department of Environment, Great Lakes, and Energy P.O. Box 30817 Lansing, MI 48909 Phone: (517) 284-5433
State Agency and Contact:	Sara Brown Water Infrastructure Funding and Financing Section, Department of Environment, Great Lakes, and Energy P.O. Box 30457 Lansing, MI 48909-7957 Phone: (517) 231-8916
Applicant Contact:	Samuel Bender Holland Board of Public Works 625 Hastings Avenue Holland, MI 49423 Phone: (616) 355-1251
Maps of Project Location:	Attached
USGS Quad Maps:	Holland West Holland East
PLSS Township, Range, Section:	T4N, R15W, Sec 3-6, 9 T4N, R16W, Sec 1-2 T5N, R16W, Sec 21, 23, 25-26, 35-36 T5N, R15W, Sec 20, 26-35

Project Description:
The Holland Board of Public Works is proposing improvements to its existing drinking water system to improve system reliability and maintain compliance with requirements for lead service line replacement. The proposed project would replace privately owned galvanized service lines that were previously connected to lead goosenecks. This work would be completed using directional drilling in lawns and driveways.

The other component of the proposed project is replacing existing chemical storage facilities at the Water Treatment Plant (WTP) from the third floor with new facilities at ground level. A new service drive for chemical deliveries would be constructed as well as a stormwater retention feature.

Description of Existing Environment:
The proposed lead service line replacements would occur in in residential and commercial lawns and driveways.

Project Information

The proposed chemical storage facility project components are located within the property of the City of Holland Water Treatment Plant (WTP). The facility includes buildings, process tanks, and landscaped areas of grass along with some trees. Across Lake Michigan Drive is Lake Michigan. The drive and stormwater feature will require removal of some brush and trees. All other work will either be in or attached to existing structures.

Photographs: See attached maps and pictures

Pictures of Project Area

Picture 1 – Proposed service drive area facing West

Picture 2 – Proposed service drive and stormwater feature location facing South West

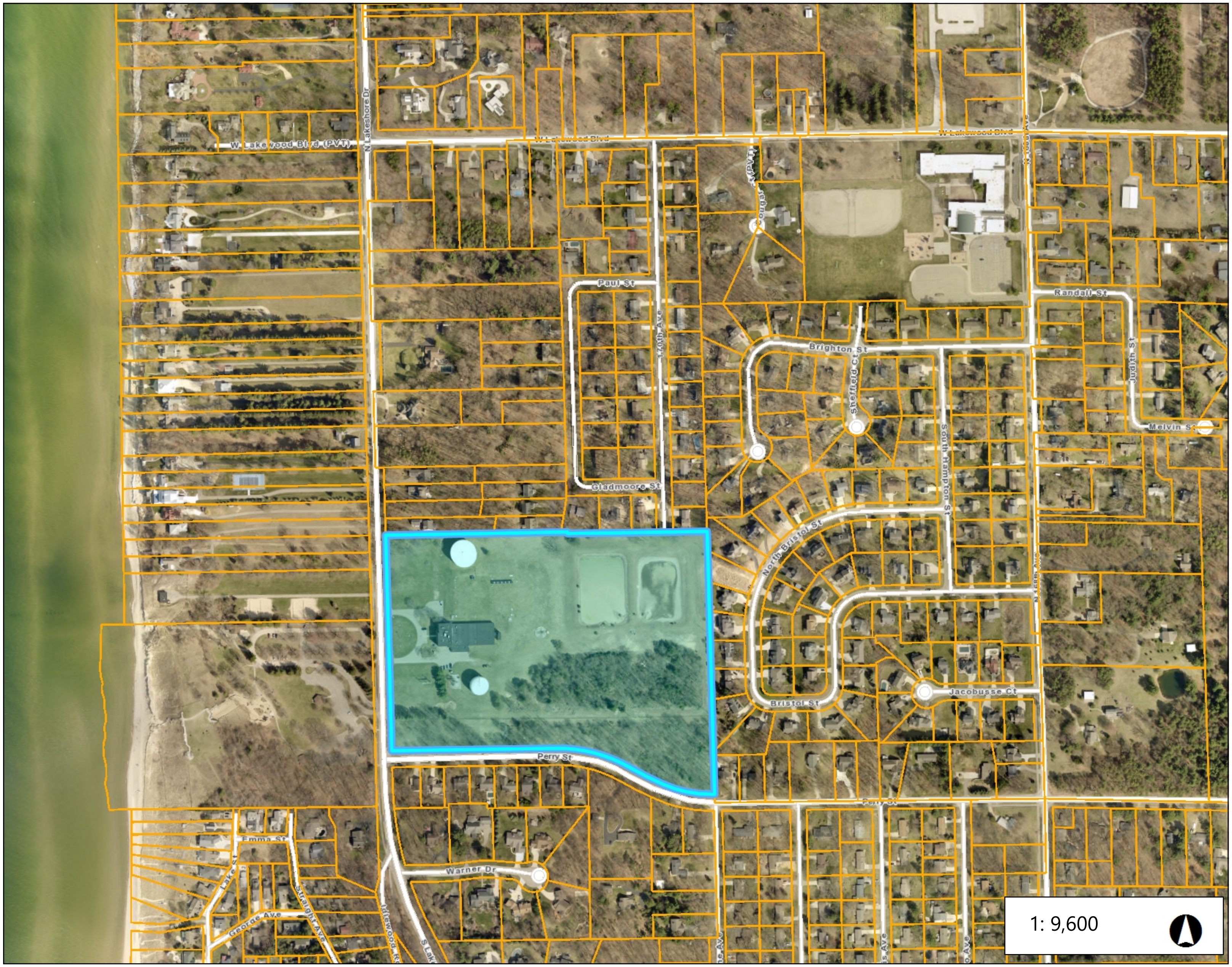
Pictures of Project Area

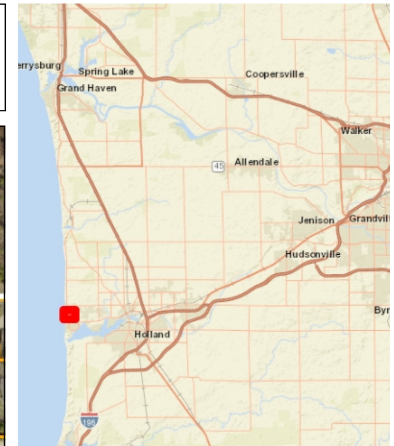
Picture 3 – Proposed service drive and stormwater feature location facing South

Picture 4 – Proposed building addition location facing North West

Ottawa County
Geospatial Insights & Solutions

Project Location Map - WTP





Legend

Parcels_

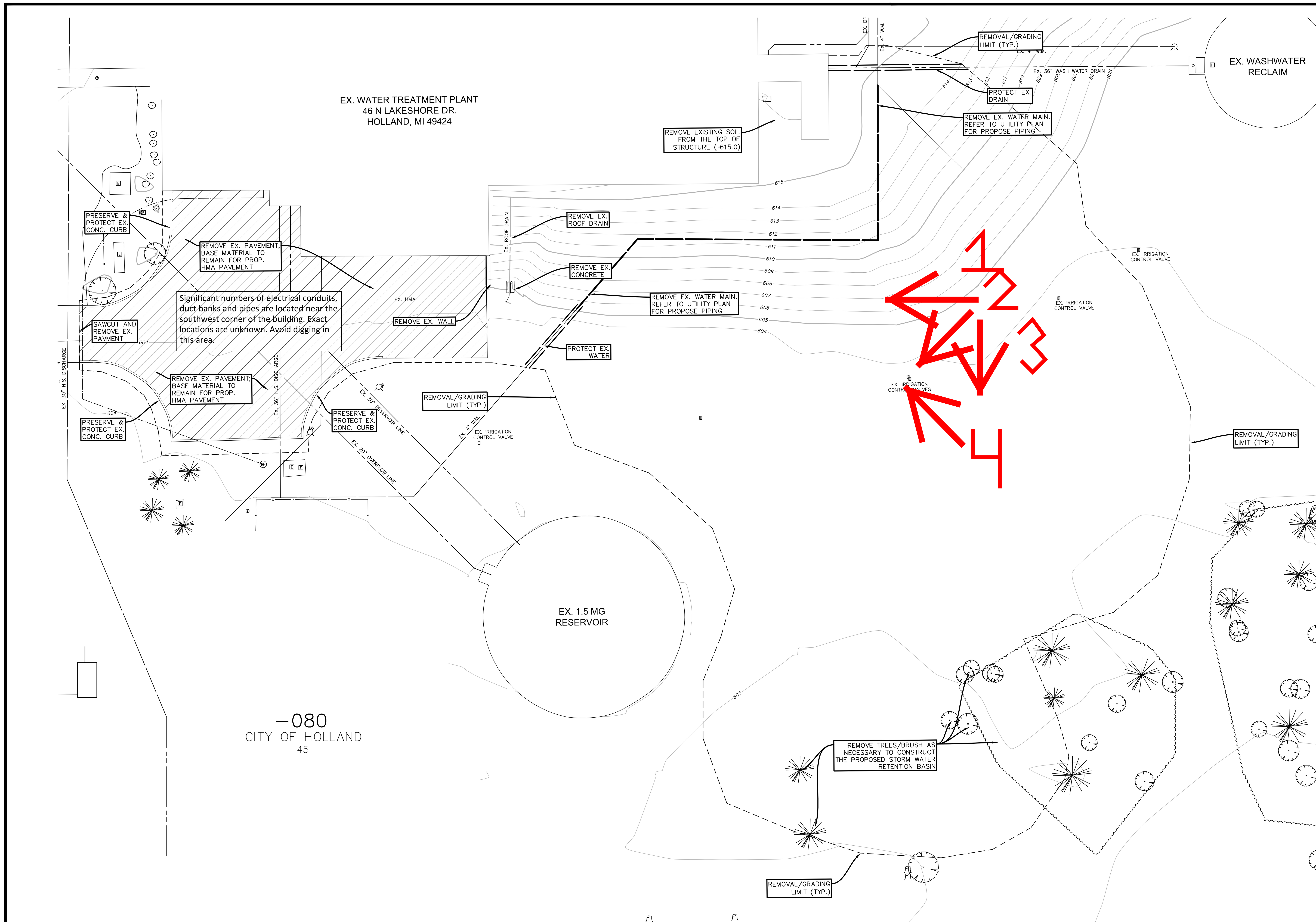
Notes

1,600.0 | 0 | 800.00 | 1,600.0 Feet

WGS_1984_Web_Mercator_Auxiliary_Sphere

This map is a user generated static output from an Internet mapping site and is for reference only. Data layers that appear on this map may or may not be accurate, current, or otherwise reliable.

THIS MAP IS NOT TO BE USED FOR NAVIGATION



N

PROPERTY DESCRIPTION:

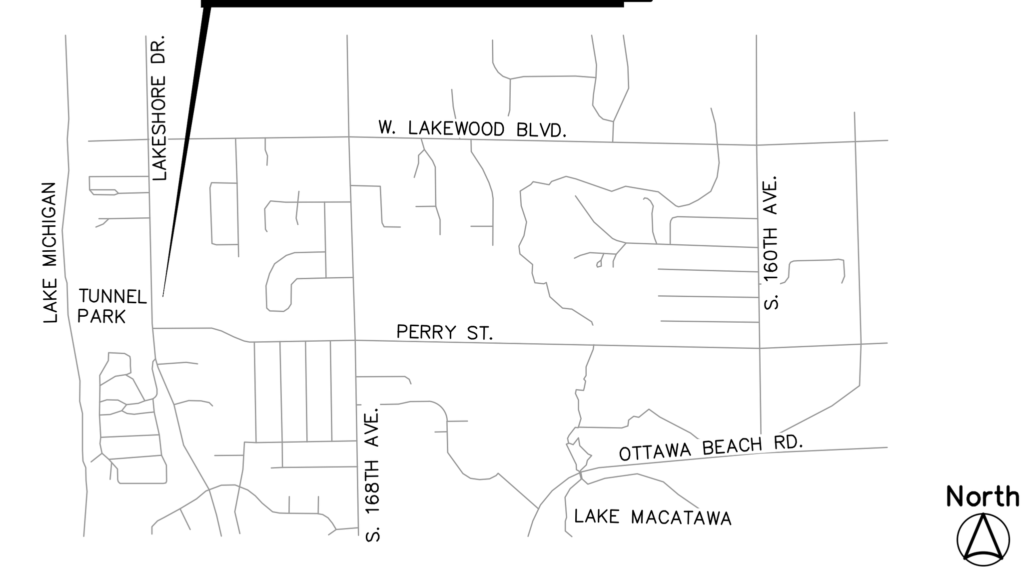
W 1/2 OF SE 1/4 LYING N OF PERRY ST. EXC N 1572 FT. SEC 21 T5N R16W

0 20' 40'

REMOVAL LEGEND

- LIMITS OF REMOVALS
- TREE PROTECTION FENCING
- PROTECT UTILITY
- TREE TO BE PROTECTED
- TREE TO BE REMOVED
- REMOVE HMA SURFACE GRANULAR BASE TO REMAIN

PROJECT LOCATION



PROJECT LOCATION

SCALE : 1" = 200'

SITE REMOVAL NOTES

1. PROTECT ALL EXISTING SITE SIGNS WITHIN THE CONSTRUCTION LIMITS (TRAFFIC, PARKING & INFORMATIONAL, ETC.), UNLESS NOTED OTHERWISE ON THE DRAWINGS OR AS DIRECTED BY THE OWNER TO BE REMOVED & DISPOSED OF ENTIRELY.
2. PROTECT & SALVAGE EXISTING BUILDING IDENTIFICATION SIGN(S), FLAGPOLE, MONUMENT MARKERS & DUMPSTERS WITHIN THE CONSTRUCTION LIMITS FOR RELOCATION OR RETURN TO OWNER, UNLESS NOTED OTHERWISE ON THE DRAWINGS OR REMOVE AND DISPOSED IN ENTIRETY AS DIRECTED BY THE OWNER.
3. COORDINATE SITE ELECTRICAL REMOVALS WITH WITH ALL ELECTRICAL PLANS FOR ANY REMOVAL OR RELOCATION OF SITE ELECTRICAL ITEMS, COORDINATE WITH ALL PROPOSED SITE ELECTRICAL UTILITIES.
4. REFER TO INDIVIDUAL UTILITY PLANS FOR ANY MODIFICATIONS TO EXISTING UTILITIES THAT ARE TO REMAIN.
5. REMOVE ALL UTILITY STRUCTURE MANHOLES & CATCH BASINS SHOWN TO BE REMOVED IN THEIR ENTIRETY. RAISE OR LOWER STRUCTURES TO REMAIN (WHETHER NOTED OR NOT) TO MATCH PROPOSED FINISH GRADES. THIS INCLUDES, BUT IS NOT LIMITED TO, SANITARY, STORM, WATER, ELECTRICAL, COMMUNICATIONS, GATE VALVE BOXES & HAND HOLES.
6. PROTECT OR SALVAGE FOR RE-USE ALL EXISTING FIRE HYDRANTS & GATE VALVES TO BE REMOVED OR SALVAGED AND RELOCATED, AND CLASSIFIED IN GOOD WORKING CONDITION ACCORDING TO THE UTILITY OWNER, FOR RE-USE. FINAL APPROVAL OF THE RE-USE OF ANY SALVAGED FIRE HYDRANT OR GATE VALVE MUST BE GIVEN BY THE UTILITY OWNER.
7. ANY CITY/MUNICIPAL/UTILITY OWNED UNDERGROUND SERVICES (GAS, WATER, SANITARY, ETC) SHOWN TO BE REMOVED MUST BE DONE SO IN THEIR ENTIRETY & AS INDICATED ON THE DRAWINGS. CAP/BULKHEAD ALL REMAINING PORTIONS AT THE PROPERTY LINE PER CITY/MUNICIPAL/UTILITY COMPANY STANDARDS. THE CONTRACTOR MUST OBTAIN ALL REQUIRED PERMITS & PROVIDE ADVANCED NOTICE TO CITY/MUNICIPAL/UTILITY COMPANY PRIOR TO DISTURBANCE OF SAID UTILITY SERVICES.
8. IT IS THE CONTRACTOR'S RESPONSIBILITY TO LOCATE & ISOLATE ANY UNDERGROUND LAWN/PLANTING BED IRRIGATION SYSTEMS PRIOR TO CONSTRUCTION TO PREVENT DAMAGE TO THE EXISTING IRRIGATION SYSTEMS THAT ARE TO REMAIN IN GROUND & OPERABLE. ANY LAWN OR PLANTING BED IRRIGATION SYSTEMS THAT ARE DAMAGED BY CONSTRUCTION MUST BE REPLACED WITH LIKE TO THE OWNER'S SATISFACTION & AT NO ADDITIONAL COST.
9. FIELD VERIFY THE PURPOSE & LOCATION OF UNDERGROUND ELECTRICAL, TELECOM & FIBER OPTIC UTILITIES & RELOCATE AS REQUIRED PRIOR TO COMMENCEMENT DEMOLITION SUCH THAT THE OWNER DOES NOT EXPERIENCE ANY "OUTAGES" OR "FAILURES" WITH THEIR INTERNAL ELECTRICAL, TELEPHONE, SECURITY OR COMPUTER SYSTEMS. REPAIR ANY CONTRACTOR-CAUSED DAMAGES AT NO COST TO THE OWNER. REFER TO THE ELECTRICAL SITE PLAN FOR COORDINATION.
10. FILL ALL PIPES CALLED TO BE ABANDONED ON THE DRAWINGS WITH FLOWABLE FILL. MEASURE VOLUME OF FILL DURING TIME OF CONSTRUCTION & SUBMIT TO ENGINEERS FOR REVIEW.
11. THE CONTRACTOR IS RESPONSIBLE FOR ALL DAMAGE TO EXISTING UTILITIES & FOR LOCATING THE DEPTH & PLACEMENT OF ANY AND ALL UTILITIES WITHIN THE CONSTRUCTION WORK LIMITS. PROCEED WITH CAUTION WHEN WORKING WITH & AROUND THESE UTILITIES. THE COST TO REPAIR DAMAGE TO ANY UTILITIES (SEWERS, WATER, GAS, ELECTRICAL, UNDERDRAIN SYSTEMS, & SPRINKLER SYSTEMS, ETC.), KNOWN OR OTHERWISE, WILL BE BORNE SOLELY BY THE CONTRACTOR. IT IS THE OWNER'S RESPONSIBILITY TO ACCEPT & APPROVE SAID REPAIRS OF THE DAMAGED UTILITY.
12. FULL DEPTH SAWCUT CONCRETE WALKS, PAVING AND CURB & GUTTER SHOWN TO BE REMOVED AT THE NEAREST EXISTING JOINT & REMOVE.
13. CONTRACTOR TO COORDINATE WITH OWNER REGARDING THEIR NEED FOR EXCESS SOIL SPOILS ON SITE. IF THE OWNER DOES NOT WANT THE SOIL, THE CONTRACTOR IS TO REMOVE THE SOIL AND HAUL DISPOSE OF IT OFFSITE.
14. REMOVE TREE AND STUMPS IN THEIR ENTIRETY AS IDENTIFIED ON THE DRAWINGS & WHEN FOUND IN THE FIELD & LOCATED WITHIN THE CONSTRUCTION AREA, OR AS DIRECTED BY THE OWNER.
15. REMOVAL OF LANDSCAPE AREAS AROUND BUILDINGS & THE SITE THAT ARE CALLED OUT TO BE REMOVED INCLUDES THE REMOVAL OF EDGING OR FENCING AND ANY ASSOCIATED PLANTINGS. REFER TO LANDSCAPE PLANS & SPECIFICATIONS FOR CARE OF AND RELOCATION OF ANY PLANT MATERIAL
16. REMOVE ANY EXISTING AGGREGATE BASE OR DELETERIOUS MATERIALS BENEATH ALL PROPOSED LAWNS AND LANDSCAPE PLANTING AREAS.

(NOT ALL ITEMS NOTED MAY PERTAIN TO ALL PROJECT SITES)

PRELIMINARY
NOT FOR CONSTRUCTION

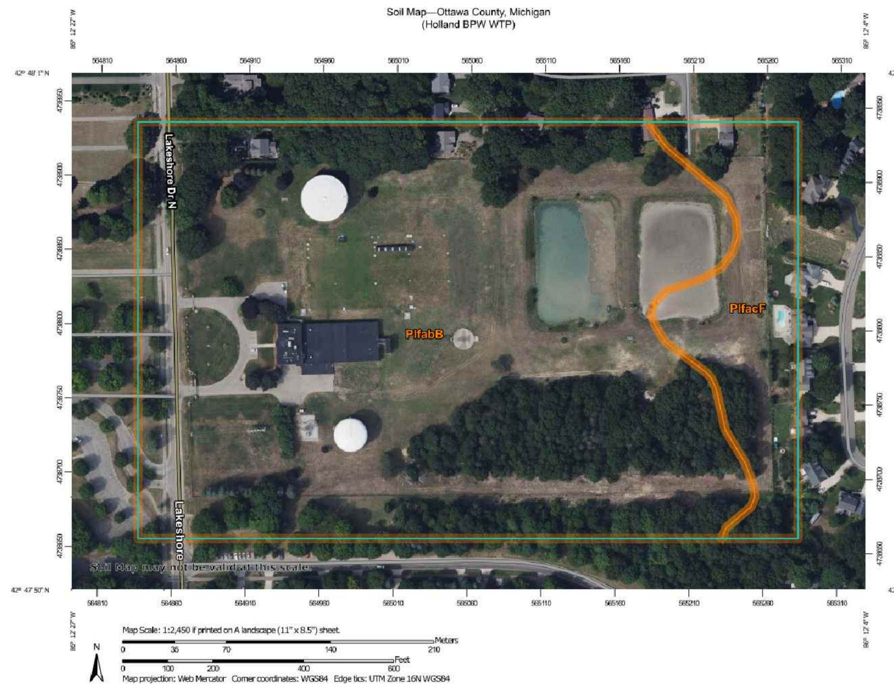
NO.	REVISIONS	BY	DATE

DRAWN ---
DATE ---
CHECKED ---
DATE ---

Prein&Newhof
Engineers▪Surveyors▪Environmental▪Laboratory

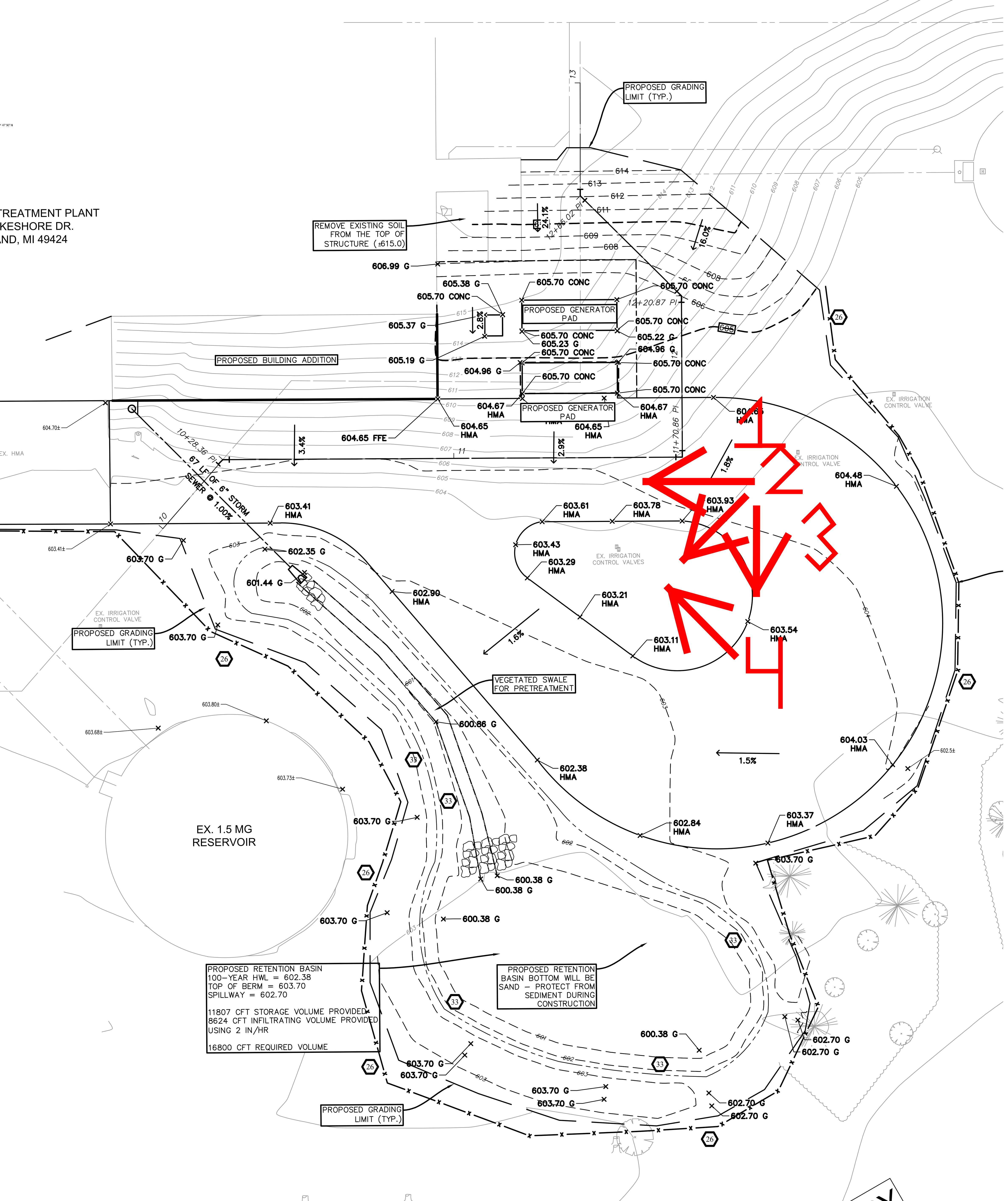
CITY OF HOLLAND BOARD OF PUBLIC WORKS
PARK TOWNSHIP, MI
WATER TREATMENT PLANT EXPANSION
EX. CONDITIONS & REMOVAL PLAN

PROJECT NO. 2220855
SHEET NO. 1 OF 5



Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
PlfabB	Plainfield sand, lake plain, 0 to 6 percent slopes	26.9	86.6%
PlfacF	Plainfield sand, dunes, 18 to 60 percent slopes	4.2	13.4%
Totals for Area of Interest		**31.1**	**100.0%**



N

0 20' 40'

GRADING LEGEND

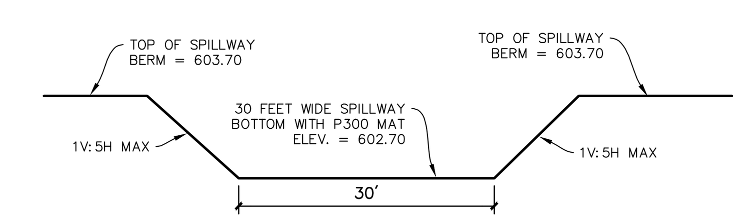
SPOT ELEVATION — 780.20
FLOW DIRECTION WITH GRADE — 2.0%
SLOPE LABEL — 5:1
CATCH BASIN (EX. | PROP.)
CULVERT END SECTION W/ RIPRAP
HYDRANT & VALVE (EX. | PROP.)
MANHOLE (EX. | PROP.)
CLEANOUT
SWALE/DITCH
GRADE BREAK
PROP. CONTOUR LINE — 780
EX. CONTOUR LINE — 780
GRADING LIMIT
SILT FENCE

EROSION CONTROL NOTES

1. THE CONTRACTOR SHALL INSPECT ALL TEMPORARY & PERMANENT EROSION CONTROL MEASURES WEEKLY & IMMEDIATELY (WITHIN 24 HOURS) AFTER A SIGNIFICANT RAINFALL EVENT. ALL MEASURES REQUIRING MAINTENANCE REPAIR, OR REPLACEMENT SHALL BE CORRECTED IMMEDIATELY AT NO ADDITIONAL COST TO THE OWNER.
2. PERMANENT SOIL EROSION CONTROL MEASURES, PLANTINGS & MULCHING FOR ALL SLOPES, CHANNELS, DITCHES, OR DISTURBED LAND AREA SHALL BE COMPLETED WITHIN FIVE (5) CALENDAR DAYS AFTER FINAL GRADING OR FINAL EARTH CHANGE HAS BEEN COMPLETED.
3. ALL SLOPES SHALL BE TRACKED PERPENDICULAR TO THE SLOPE TO AID IN EROSION CONTROL OF SLOPED AREAS.
4. WHERE SEASONAL LIMITATIONS OR CONSTRUCTION DELAYS PREVENT SCHEDULED INSTALLATION OF PERMANENT CONTROL FACILITIES, APPROVED TEMPORARY MEASURES SHALL BE INSTALLED WITHIN FIVE (5) CALENDAR DAYS & MAINTAINED UNTIL REPLACED BY PERMANENT FACILITY.
5. THE LOCATION OF ANY TOPSOIL STOCKPILE SHALL BE DESIGNATED PRIOR TO CONSTRUCTION. THIS AREA SHALL BE ENCLOSED BY SILT FENCE A REASONABLE DISTANCE FROM THE TOE OF SLOPE UNTIL SUCH TIME IT IS USED TO TOPSOIL THE SITE.

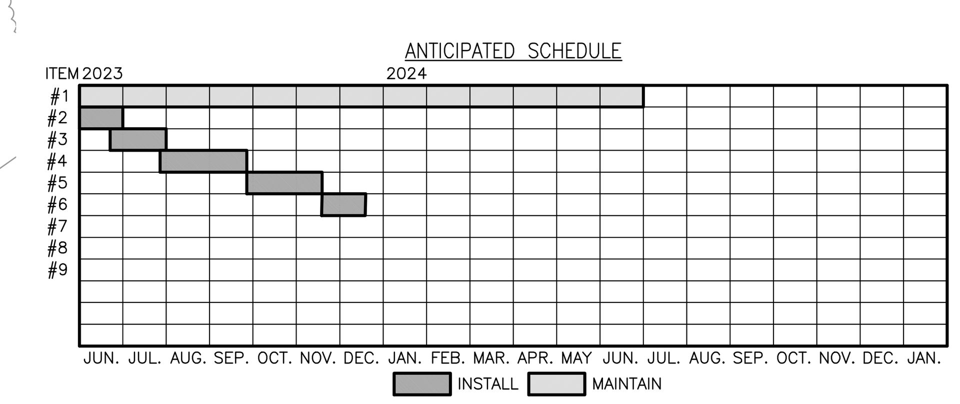
CONSTRUCTION SEQUENCING

1. APPLY FOR & OBTAIN ALL REQUIRED PERMITS
2. INSTALL SILT FENCING & PERIMETER SOIL EROSION CONTROL MEASURES INDICATED ON THE PLANS & MAINTAIN AT ALL TIMES DURING CONSTRUCTION.
3. STRIP TOPSOIL AND REMOVE UNSUITABLE MATERIALS UNDER THE PROPOSED HARD SURFACED AREAS. STOCKPILE TOPSOIL IN AN AREA OUTSIDE OF THE IMPROVED AREAS AS DESIGNATED BY THE OWNER.
4. CONSTRUCT PROPOSED IMPROVEMENTS
5. RESTORE ALL DISTURBED AREAS IN ACCORDANCE WITH THE SPECIFICATIONS.
6. AFTER ALL DISTURBED AREAS HAVE BEEN RESTORED & VEGETATION IS ESTABLISHED, REMOVE SOIL EROSION CONTROL MEASURES.



EMERGENCY SPILLWAY DETAIL

SCALE: NONE



#1 – INSTALL EROSION CONTROL DEVICES
#2 – DEMOLITION
#3 – INSTALL UNDERGROUND SITE UTILITIES
#4 – SITE GRADING
#5 – INSTALL SITE IMPROVEMENTS
#6 – INSTALL LANDSCAPING

GRADING NOTES

HMA = HOT MIX ASPHALT (BITUMINOUS PAVT.)
CONC = TOP OF CONC.
FL = FLOW LINE
FC = FLUSH CURB
G = GROUND SPOT
INV = PIPE/END SECTION INVERT
RIM = UTILITY STRUCTURE
WALK = SIDEWALK
TC = TOP OF CURB
TW = TOP OF WALL

1. REFER TO SPECIFICATIONS FOR ADDITIONAL ABBREVIATIONS FOR CIVIL/SITE AMMENITIES.
2. APPLY 4 INCHES OF TOPSOIL, SEED, AND MULCH BLANKET OVER ALL SLOPES EXCEEDING 20 PERCENT.
3. CONTRACTOR TO REPAIR ALL DAMAGED IRRIGATION VALVES.

SOIL EROSION CONTROL LEGEND

3 PERMANENT/TEMPORARY SEEDING (T/P)
7 RIPRAP (P)
26 GEOTEXTILE SILT FENCE (T)
29 INLET PROTECTION SILT SACK (T)
33 MULCH BLANKETS & HIGH VELOCITY MULCH BLANKETS (P)

(T) TEMPORARY CONTROL MEASURE
(P) PERMANENT CONTROL MEASURE

29 PLACE CATCH BASIN SILT SACK OR EQUIVALENT AT ALL EXISTING AND PROPOSED CATCH BASINS. ADDITIONALLY, PLACE FILTER SOCKS AROUND ALL INLETS IN UNPAVED AREAS.

INSTALL SILT FENCE AROUND THE ENTIRE SITE PERIMETER

ALL MEASURES PLACED IN ACCORDANCE OF MDOT STANDARD DETAIL R–96–D SOIL EROSION AND SEDIMENTATION CONTROL MEASURES

TEMPORARY SEEDING SHALL BE CAST ON ALL AREAS WITHIN 1 WEEK OF DISTURBANCE

WESTERN EXCELSIOR "EXCEL SS–2" DOUBLE NET SOIL EROSION CONTROL BLANKET (OR APPROVED EQUAL) SHALL BE PLACED ON ALL DISTURBED SLOPES 1 AND 4 OR STEEPER AND ON ALL DISTURBED DITCH BOTTOMS

WESTERN EXCELSIOR "EXCEL SR–1" SINGLE NET SOIL EROSION CONTROL BLANKET (OR APPROVED EQUAL) SHALL BE PLACED ON ALL DISTURBED AREAS 1 AND 4 OR FLATTER

4" OF TOPSOIL AND SEED SHALL BE INSTALLED AT ALL DISTURBED AREAS

AREA OF PROPOSED EARTH CHANGE/DISTURBANCE IS X.XX ACRES

SOILS ARE TYPE A, SANDY SOILS PER 1997 GEOTECHNICAL REPORT AND USGS SOIL SURVEY

THE DISTANCE FROM THE PROPOSED EARTH CHANGE TO THE NEAREST WATER FEATURE IS

PRELIMINARY
NOT FOR CONSTRUCTION

NO.	REVISIONS	BY	DATE

DRAWN ___
DATE ___
CHECKED ___
DATE ___

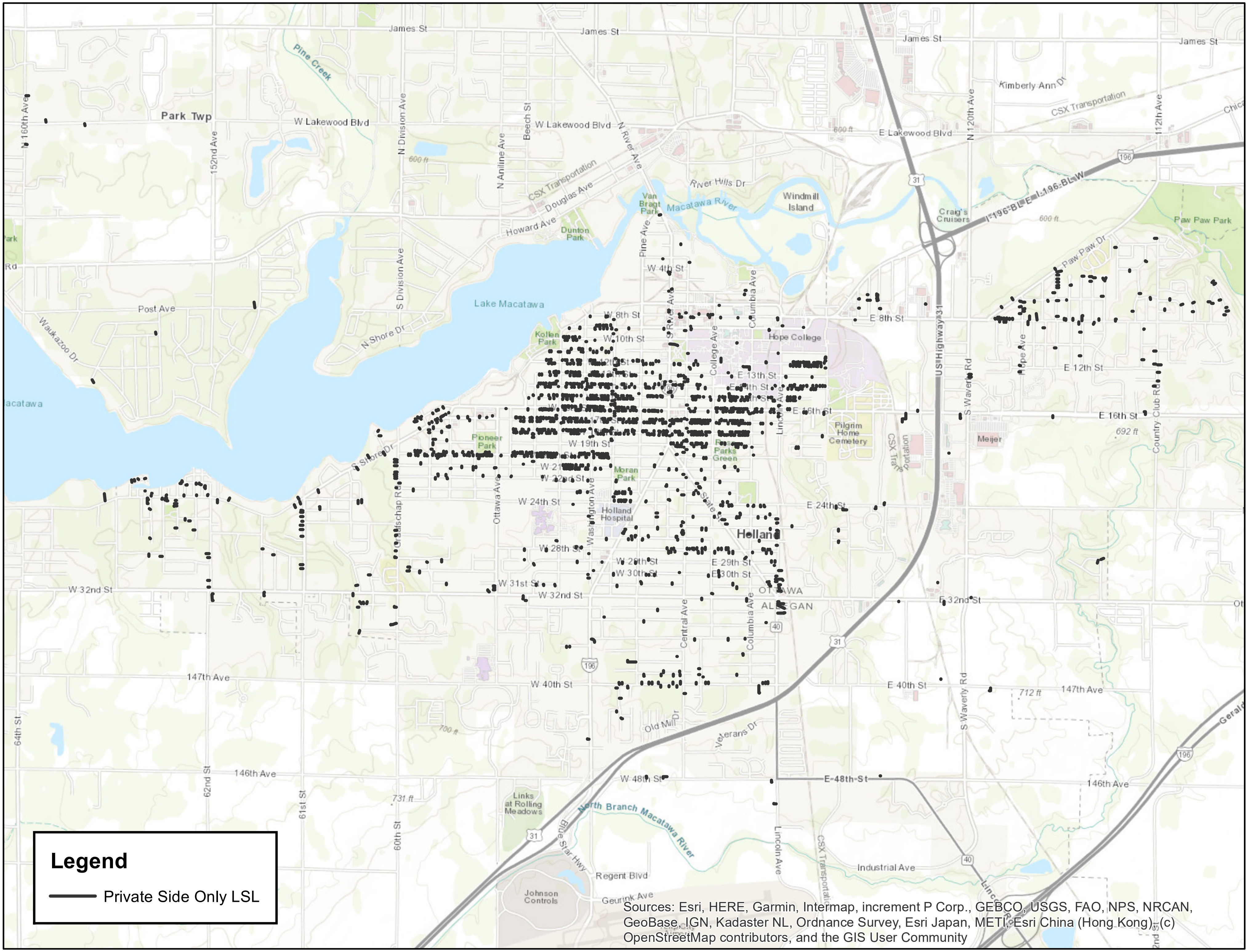
Prein&Newhof
Engineers•Surveyors•Environmental•Laboratory

CITY OF HOLLAND BOARD OF PUBLIC WORKS
PARK TOWNSHIP, MI
WATER TREATMENT PLANT EXPANSION
GRADING PLAN

PROJECT NO. 2220855
SHEET NO. 3 OF 5

T:\CIVIL3D PROJECTS\2022\2220855_HOLLAND BPW_WTP CHEMICAL STORAGE\4_PROD\2220855 – C300 GRADING AND SESC.DWG – MILLER – Feb. 24, 2023 – 10:36am – PreinNewhof

Project Location Map - Lead Service Line Replacements



assessed the monarch's current and future status. The monarch is now a candidate under the Endangered Species Act; we will review its status annually until a listing decision is made.

Management and Conservation: neither section 7 of the Endangered Species Act nor the implementing regulations for section 7 contain requirements for federal agencies with respect to candidate species. Habitat loss and fragmentation has occurred throughout the monarch's range. Pesticide use can destroy the milkweed monarchs need to survive. A changing climate has intensified weather events which may impact monarch populations.

USFWS Section 7 Consultation Technical Assistance can be found at:

https://www.fws.gov/service/esa-section-7-consultation

The website offers step-by-step instructions to guide you through the Section 7 consultation process with prepared templates for documenting "no effect." as well as requesting concurrence on "may affect, but not likely to adversely affect" determinations.

Please let us know if you have questions.

Michael A. Sanders
Environmental Review Specialist
Michigan Natural Features Inventory

Appendix F

Soils and Geology/Hydrology

Groundwater Mapping Project

County Summaries

Ottawa Summary

Ottawa County is in the western Lower Peninsula of Michigan. The western portion of the county borders the Lake Michigan shoreline. Black-Macatawa, Kalamazoo, Lower Grand, Pere Marquette-White, and Lake Michigan watersheds drain Ottawa County. According to the February 2005 Wellogic database, approximately 62% of the wells in Ottawa County are completed in the glacial deposits, and 31% in the bedrock units. There is insufficient information to make this distinction for 7% of the wells in the county.

Aquifers in the glacial deposits consist largely of sands and gravels, and vary regionally in thickness and permeability. With the available information, glacial lithologies cannot be regionally correlated in the subsurface. This is likely due to the lateral and vertical heterogeneity of glacial deposits that resulted from a complex depositional history (Westjohn and others, 1994). The thickness of glacial deposits in Ottawa County ranges from less than 100 to greater than 400 ft thick (Vanlier, 1968). Lacustrine deposits, outwash, till, and dune sand comprise the surficial deposits in the county (Deutsch and others, 1958; Vanlier, 1968; Farrand and Bell, 1982). Lacustrine deposits are concentrated in the western and central portions of the county, and consist primarily of lacustrine sand and gravel (Farrand and Bell, 1982). In the Holland area, lacustrine deposits are either clay-rich or sand-rich deposits. The clay lacustrine deposits may act as a confining layer. The sandy lacustrine deposits and shallow outwash are considered one aquifer in the Holland area, because these deposits are interbedded and hard to distinguish from each other (Deutsch and others, 1958). According to the Public Water Supply database, the estimated transmissivity for glacial wells ranges from approximately 3,740 to 45,985 ft^2/day.

The sand and gravel outwash is the most important water-yielding deposit. Glacial outwash occurs primarily in the eastern portion of the county. However, shallow and buried outwash is present in the Holland area. The shallow outwash deposits contain some gravel, but are primarily fine to coarse sand. Domestic and industrial wells obtain water from the shallow outwash. In the Holland area, buried outwash occurs in two channels, the south channel and the east channel. The south channel occurs northeast of Holland, and continues westward along the shared Ottawa and Allegan County line. The south channel is an approximately 400 ft thick, confined aquifer that varies in permeability, and yields highly mineralized water. The east channel trends southeast to northwest and occurs along the eastern Holland city limit. The east channel is a confined aquifer that is up to 100 ft thick. The east channel supplies good quality water. The transmissivity in the east channel ranges from 5,347 to 13,902 ft^2/day. Lenses of outwash also occur interbedded within the till deposits (Deutsch and others, 1958).

Till occurs primarily in the southern and eastern portions of the county (Vanlier, 1968; Farrand, 1982). In general, the morainal deposits and till plains consist of till that has a high porosity, but low permeability. Till generally contains boulders, gravel, and sand in a clay and silt matrix. In some locales of the Holland area, more permeable sand lenses are present, but often these yield mineralized water. Lower permeability till is considered a confining layer in some areas. Sand dunes are present along the western portion of the county, bordering Lake Michigan (Deutsch and others, 1958; Farrand, 1982). Sand dunes usually lie above the water table and may provide areas of recharge (Deutsch and others, 1958).

Bedrock underlies the glacial deposits. The bedrock surface in Ottawa County includes, from northeast to southwest, the Michigan Formation, Marshall Sandstone, and Coldwater Shale. The Michigan Formation consists of layers of sandstone, siltstone, anhydrite or gypsum, dolomite, limestone, and shale. The lower permeability lithologies of the Michigan Formation are considered a confining unit. The thickness of the Michigan confining unit ranges from less than 50 to 400 ft within the State (Westjohn and Weaver, 1998).

The Marshall Sandstone underlies the Michigan Formation. The Marshall Sandstone consists of one or more stratigraphically continuous permeable sandstones. The upper sandstone is a quartzarenite to sublitharenite that is referred to as the Napoleon

Sandstone Member. A shale, siltstone, and/or carbonate layer separates the Napoleon Sandstone Member from the underlying lower Marshall sandstone. The lower Marshall sandstone is comprised of two units. The upper unit is generally 50 to 125 ft of fine- to medium-grained quartzarenite to sublitharenite. At the base of the Marshall Sandstone is a fine- to medium-grained litharenite that ranges in thickness from 30 to 125 ft. Permeable sandstones in the Marshall Sandstone comprise the Marshall aquifer. The Marshall aquifer ranges in thickness from 75 to greater than 200 ft within the State (Westjohn and Weaver, 1998). In the northeastern portion of the Holland area, the Marshall Sandstone underlies the glacial deposits and yields fresh water. The Marshall Sandstone is mostly eroded and only the lower Marshall sandstone is present in the Holland area. Here, the Marshall Sandstone ranges in thickness from 0 to 58 ft (Deutsch and others, 1958). Thus, in the Holland area, the Marshall aquifer cannot supply large amounts of water, because it is too thin (Deutsch and others, 1958). However, in other areas of the county, the Marshall aquifer is capable of supplying water. According to the Public Water Supply database, the estimated transmissivity for glacial wells ranges from approximately 615 to 1,070 ft^2/day. In Ottawa County, the southern portion of the county may obtain freshwater, while the northern portion of the county may obtain saline water from the Marshall aquifer (Westjohn and Weaver, 1996c).

The Coldwater Shale is generally considered a confining unit within the State, and ranges in thickness from 500 to 1,300 ft thick The Coldwater Shale consists of shale, sandstone, siltstone, and carbonates. More sandstone beds are present in the Coldwater Shale in the eastern part of the State (Westjohn and Weaver, 1998). In Ottawa County, fractured portions of the carbonates in the Coldwater Shale may yield water. However, the water is highly mineralized and is not suitable for several uses. In the Holland area, the mineralized water from the Coldwater Shale has migrated upward in areas where heavy pumping of overlying aquifers takes place (Deutsch and others, 1958).

PROGRESS REPORT NUMBER TWENTY

STATE OF MICHIGAN
DEPARTMENT OF CONSERVATION
GERALD E. EDDY, DIRECTOR

GEOLOGICAL SURVEY DIVISION
WILLIAM L. DAOUST, STATE GEOLOGIST

SUMMARY OF GROUND-WATER INVESTIGATIONS IN THE HOLLAND AREA, MICHIGAN

BY

MORRIS DEUTSCH, E. M. BURT, AND K. E. VANLIER

PREPARED COOPERATIVELY BY THE
UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

1958

GEOLOGY

Summary of Geologic History

The consolidated rocks lying immediately below the glacial drift in the Holland area consist of strata of shale, sandstone, siltstone, and dolomite deposited in shallow seas which covered the Michigan Basin during the Mississippian period of the Paleozoic era. During the Mesozoic and most of the Cenozoic eras, Paleozoic sedimentary rocks in the Michigan Basin were subjected to erosion, which formed the preglacial bedrock topography. Several deep valleys cut into the bedrock surface in the Holland area during the long erosional interval were subsequently filled with Pleistocene glacial sediments.

In the Pleistocene epoch ice migrated into the Great Lakes region from the north during at least four major glacial stages. Many of the present surface features of the area are the result of deposition and erosion during the latest (Wisconsin) of the great continental ice sheets. The glacier scoured and abraded the surface, and transported and reworked vast amounts of rock material picked up during its advance. This glacial drift was redeposited over the bedrock surface, either as the ice moved or when it melted. Much of the drift in the Holland area consists of clay derived from shale of the underlying bedrock.

A large part of the Holland area was submerged beneath the waters of glacial Lake Chicago. This lake was formed during the period of recession of the Lake Michigan glacial lobe and is ancestral to the present Lake Michigan. The Glenwood, Calumet, and Toleston beaches mark successive stages of Lake Chicago. Fine sand and clay, as well as coarser outwash materials, were deposited in Lake Chicago. Outwash deposits along the Black River represent deltas formed where the river emptied into the lake.

Southwesterly winds during and after the glacial epoch formed the large sand dunes which now border the Lake Michigan shore.

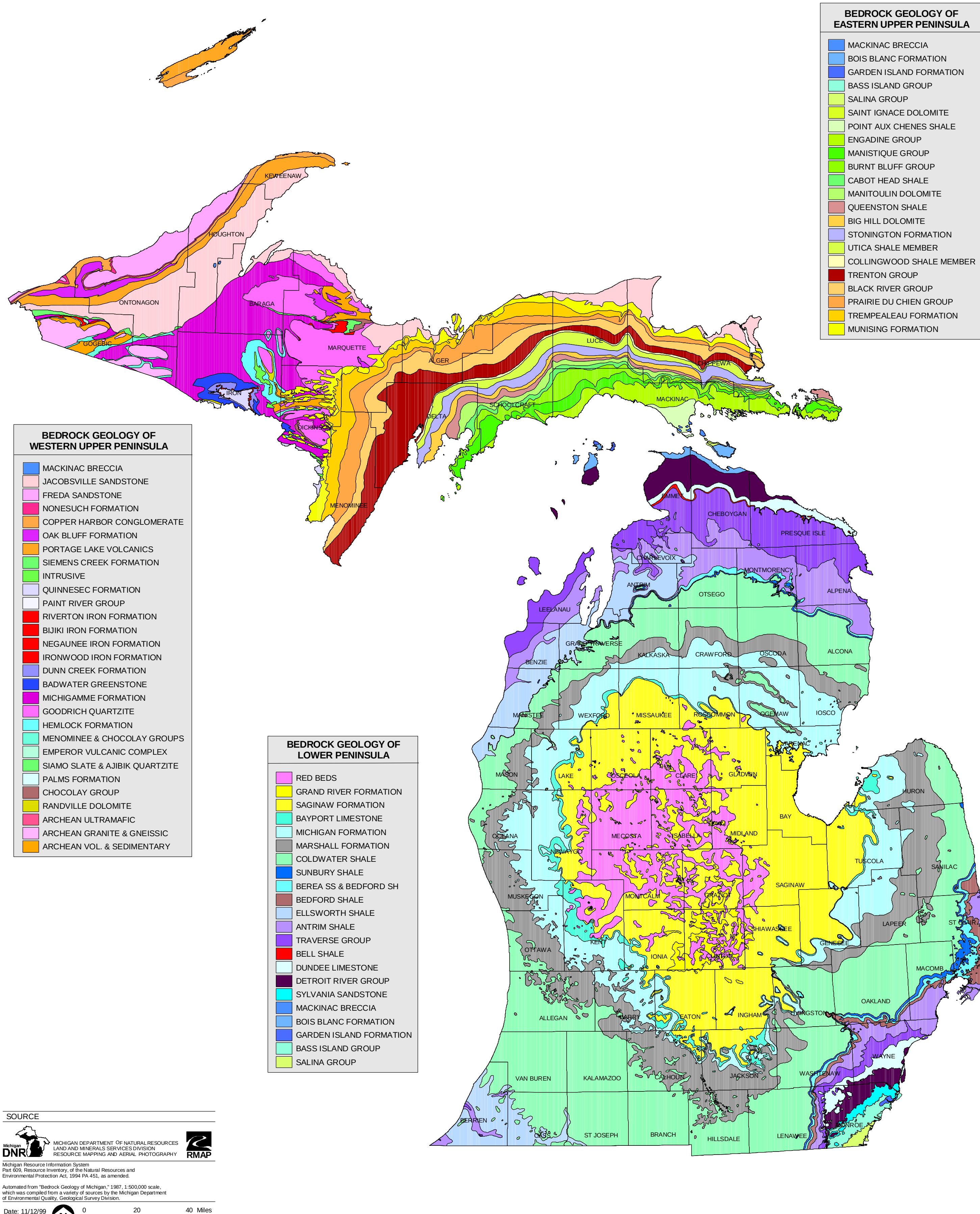
Bedrock Structure

The Paleozoic sediments of the Michigan basin were deposited in nearly horizontal layers, but gradual subsidence and compaction of the beds, which was contemporaneous with deposition and was greatest in the center of the basin, produced a bowl-shaped structure or basin. The youngest rocks are exposed at the surface in the central part of this structure and the successively older formations crop out in roughly concentric bands around them. The Holland area is on the southwest flank of the basin, where Mississippian rock formations compose the bedrock surface. Older rocks of the southwest flank of the basin crop out under Lake Michigan and in eastern Wisconsin.

Anticlinal and related structures in the Holland area are the result of folding due to compressional forces from two directions (Riggs, 1938). Entrapment of petroleum within the area is controlled by these local alterations in the basin structure.

This page intentionally left blank

1987 BEDROCK GEOLOGY OF MICHIGAN



United States Department of Agriculture

NRCS

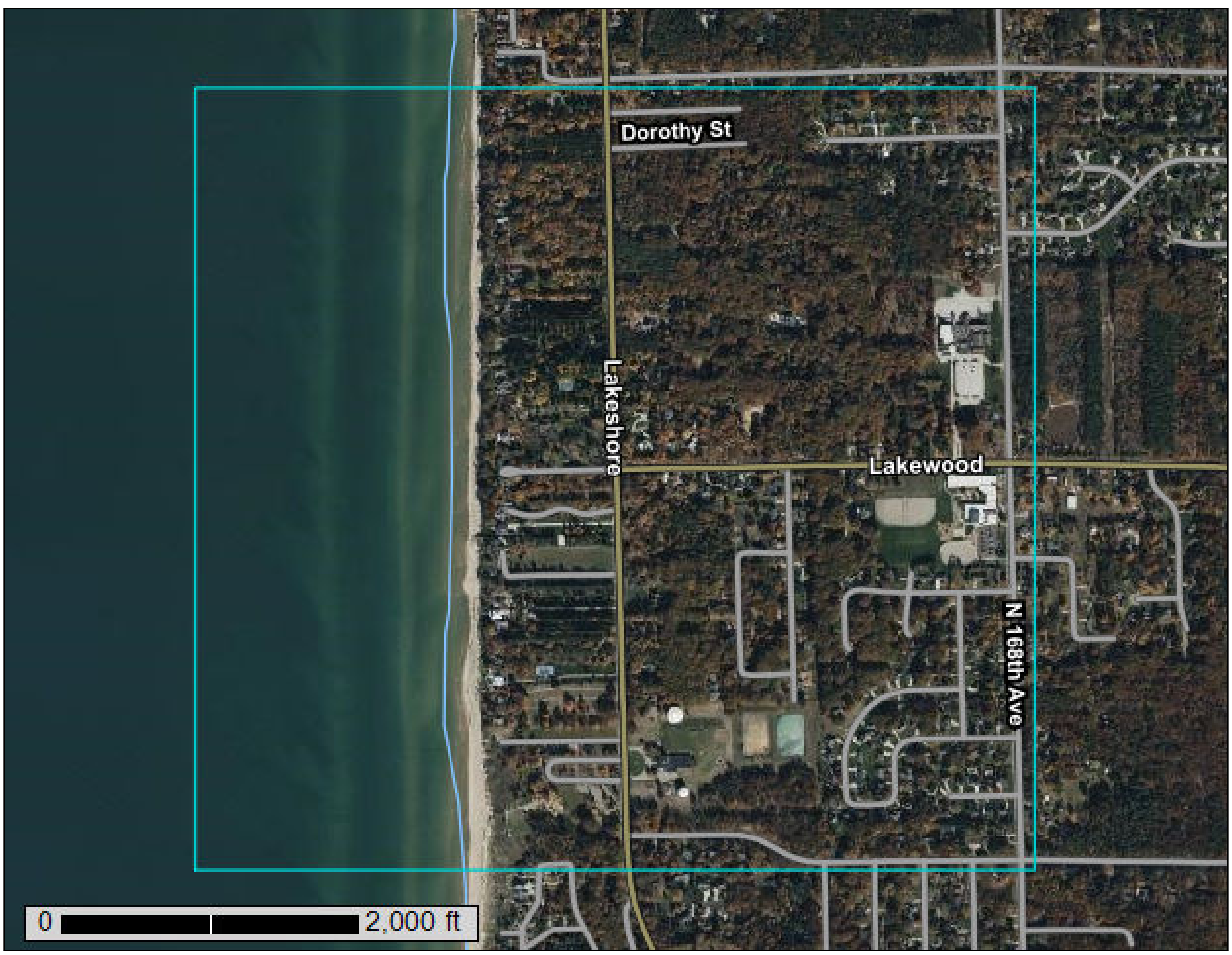
Natural Resources Conservation Service

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

Ottawa County, Michigan

Holland Water Treatment Plant



March 24, 2023

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 (https://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.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD). To file a complaint of discrimination, write to USDA, Director, Office of Civil Rights, 1400 Independence Avenue, S.W., Washington, D.C. 20250-9410 or call (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal opportunity provider and employer.

Contents

Preface........ 2
How Soil Surveys Are Made........ 5
Soil Map........ 8
Soil Map........ 9
Legend........ 10
Map Unit Legend........ 11
Soil Information for All Uses........ 12
Suitabilities and Limitations for Use........ 12
Land Classifications........ 12
Farmland Classification........ 12
References........ 18

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.

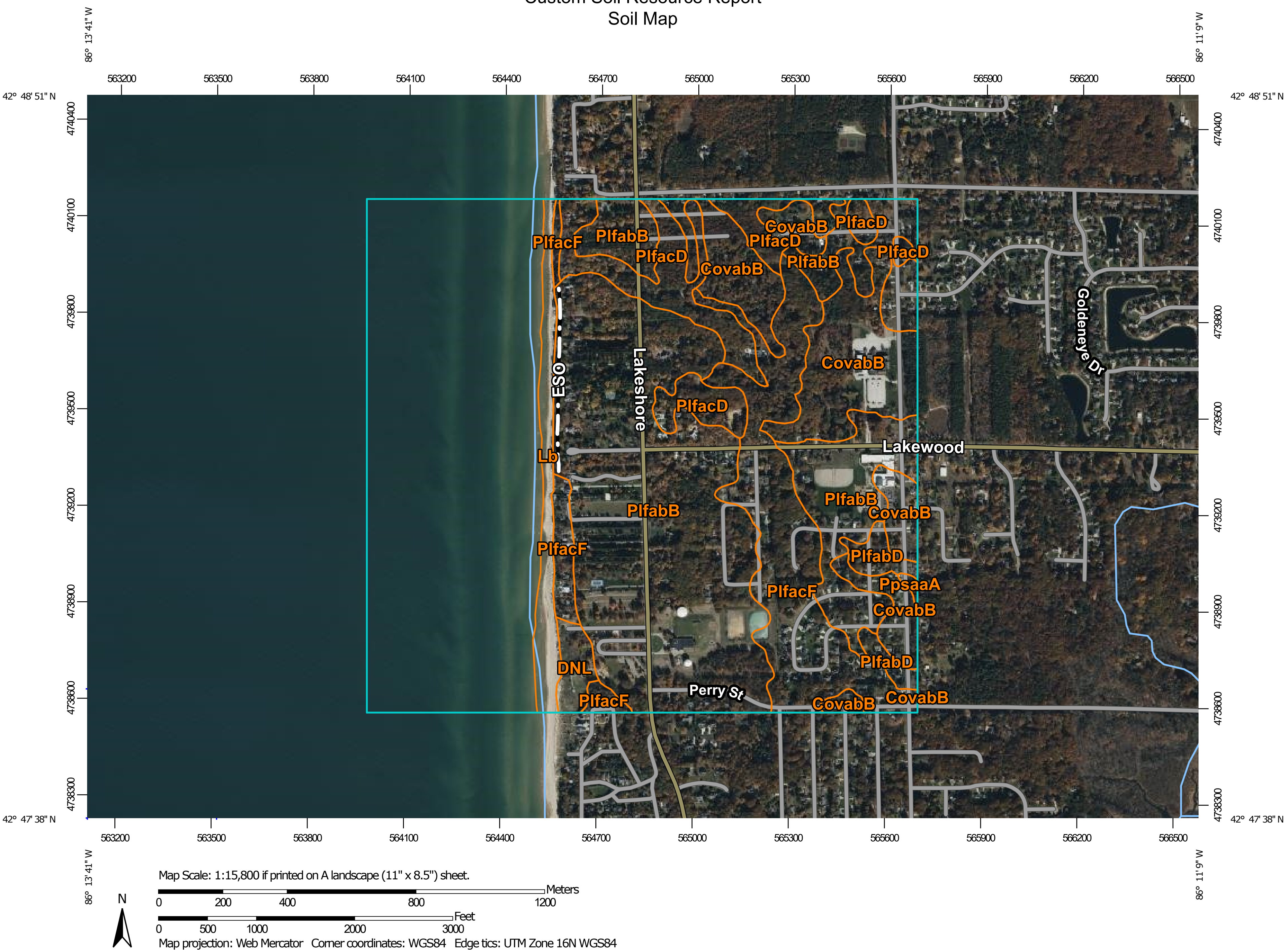
Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree 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 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.

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

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
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: Ottawa County, Michigan
Survey Area Data: Version 17, Aug 29, 2022

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

Date(s) aerial images were photographed: Oct 4, 2022—Oct 28, 2022

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

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
CovabB	Covert-Pipestone sands, 0 to 6 percent slopes	77.1	11.3%
DNL	Dune land	6.8	1.0%
Lb	Lake beaches	18.0	2.6%
PlfabB	Plainfield sand, lake plain, 0 to 6 percent slopes	230.0	33.8%
PlfabD	Plainfield sand, lake plain, 6 to 18 percent slopes	8.2	1.2%
PlfacD	Plainfield sand, dunes, 6 to 18 percent slopes	45.5	6.7%
PlfacF	Plainfield sand, dunes, 18 to 60 percent slopes	79.9	11.7%
PpsaaA	Pipestone-Covert-Saugatuck sands, 0 to 3 percent slopes	0.7	0.1%
Totals for Area of Interest		**680.3**	**100.0%**

Soil Information for All Uses

Suitabilities and Limitations for Use

The Suitabilities and Limitations for Use section includes various soil interpretations displayed as thematic maps with a summary table for the soil map units in the selected area of interest. A single value or rating for each map unit is generated by aggregating the interpretive ratings of individual map unit components. This aggregation process is defined for each interpretation.

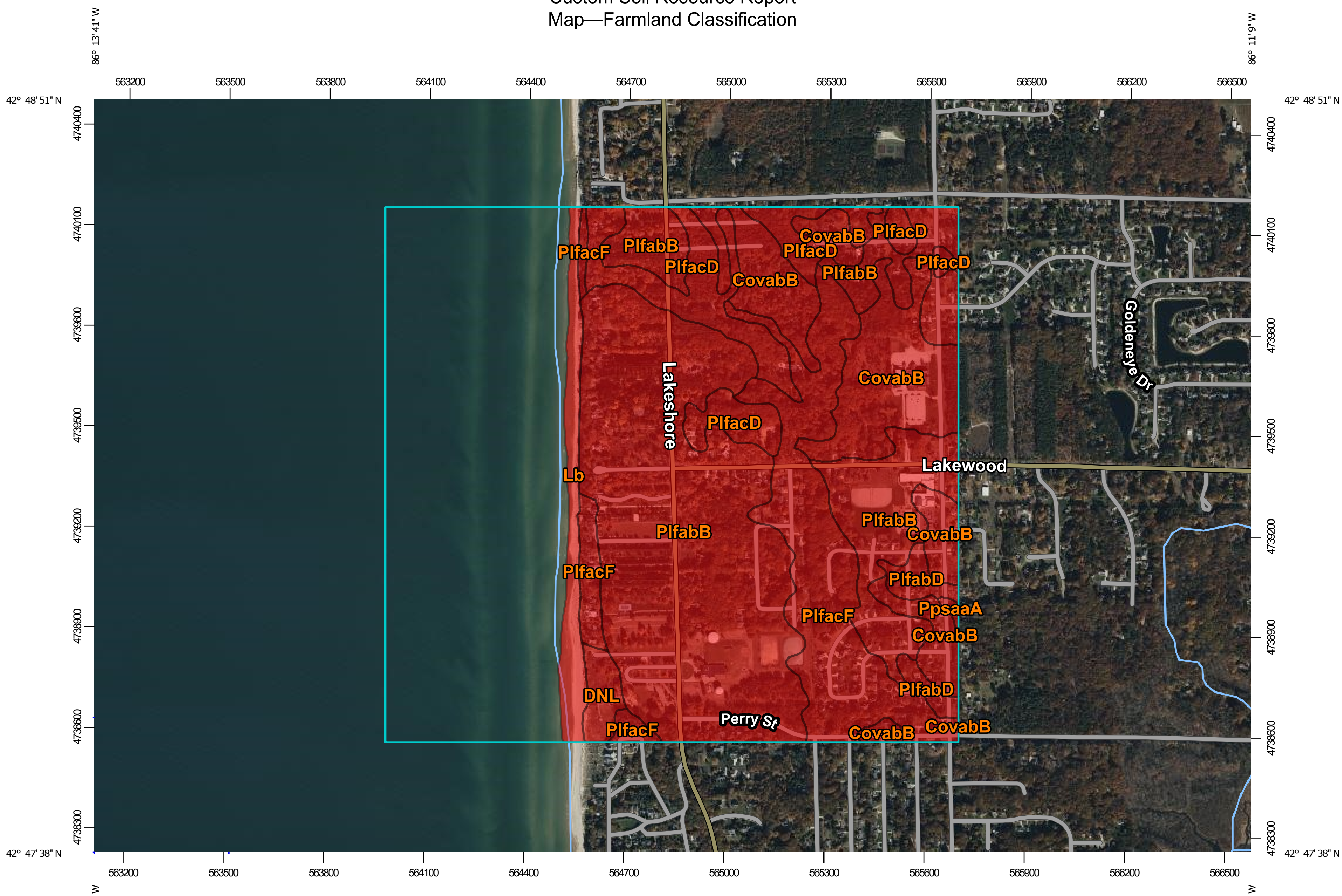
Land Classifications

Land Classifications are specified land use and management groupings that are assigned to soil areas because combinations of soil have similar behavior for specified practices. Most are based on soil properties and other factors that directly influence the specific use of the soil. Example classifications include ecological site classification, farmland classification, irrigated and nonirrigated land capability classification, and hydric rating.

Farmland Classification

Farmland classification identifies map units as prime farmland, farmland of statewide importance, farmland of local importance, or unique farmland. It identifies the location and extent of the soils that are best suited to food, feed, fiber, forage, and oilseed crops. NRCS policy and procedures on prime and unique farmlands are published in the "Federal Register," Vol. 43, No. 21, January 31, 1978.

Map—Farmland Classification



Map Scale: 1:15,800 if printed on A landscape (11" x 8.5") sheet.

Meters: 0, 200, 400, 800, 1200

Feet: 0, 500, 1000, 2000, 3000

N

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 Rating Polygons

- Not prime farmland
- All areas are prime farmland
- Prime farmland if drained
- Prime farmland if protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated
- Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated and drained
- Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if subsoiled, completely removing the root inhibiting soil layer
- Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
- Prime farmland if irrigated and reclaimed of excess salts and sodium
- Farmland of statewide importance
- Farmland of statewide importance, if drained
- Farmland of statewide importance, if protected from flooding or not frequently flooded during the growing season
- Farmland of statewide importance, if irrigated
- Farmland of statewide importance, if drained and either protected from flooding or not frequently flooded during the growing season
- Farmland of statewide importance, if irrigated and drained
- Farmland of statewide importance, if irrigated and either protected from flooding or not frequently flooded during the growing season
- Farmland of statewide importance, if subsoiled, completely removing the root inhibiting soil layer
- Farmland of statewide importance, if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
- Farmland of statewide importance, if irrigated and reclaimed of excess salts and sodium
- Farmland of statewide importance, if drained or either protected from flooding or not frequently flooded during the growing season
- Farmland of statewide importance, if warm enough, and either drained or either protected from flooding or not frequently flooded during the growing season
- Farmland of statewide importance, if warm enough
- Farmland of statewide importance, if thawed
- Farmland of local importance
- Farmland of local importance, if irrigated
- Farmland of unique importance
- Not rated or not available

Soil Rating Lines

- Not prime farmland
- All areas are prime farmland
- Prime farmland if drained
- Prime farmland if protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated
- Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated and drained
- Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season

- Prime farmland if subsoiled, completely removing the root inhibiting soil layer
- Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
- Prime farmland if irrigated and reclaimed of excess salts and sodium
- Farmland of statewide importance
- Farmland of statewide importance, if drained
- Farmland of statewide importance, if protected from flooding or not frequently flooded during the growing season
- Farmland of statewide importance, if irrigated
- Farmland of statewide importance, if drained and either protected from flooding or not frequently flooded during the growing season
- Farmland of statewide importance, if irrigated and drained
- Farmland of statewide importance, if irrigated and either protected from flooding or not frequently flooded during the growing season
- Farmland of statewide importance, if subsoiled, completely removing the root inhibiting soil layer
- Farmland of statewide importance, if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
- Farmland of statewide importance, if irrigated and reclaimed of excess salts and sodium
- Farmland of statewide importance, if drained or either protected from flooding or not frequently flooded during the growing season
- Farmland of statewide importance, if warm enough, and either drained or either protected from flooding or not frequently flooded during the growing season
- Farmland of statewide importance, if warm enough
- Farmland of statewide importance, if thawed
- Farmland of local importance
- Farmland of local importance, if irrigated
- Farmland of unique importance
- Not rated or not available

Soil Rating Points

- Not prime farmland
- All areas are prime farmland
- Prime farmland if drained
- Prime farmland if protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated
- Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated and drained
- Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if subsoiled, completely removing the root inhibiting soil layer
- Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
- Prime farmland if irrigated and reclaimed of excess salts and sodium
- Farmland of statewide importance
- Farmland of statewide importance, if drained
- Farmland of statewide importance, if protected from flooding or not frequently flooded during the growing season
- Farmland of statewide importance, if irrigated

Farmland of statewide importance, if drained and either protected from flooding or not frequently flooded during the growing season

Farmland of statewide importance, if irrigated and drained

Farmland of statewide importance, if irrigated and either protected from flooding or not frequently flooded during the growing season

Farmland of statewide importance, if subsoiled, completely removing the root inhibiting soil layer

Farmland of statewide importance, if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60

Farmland of statewide importance, if irrigated and reclaimed of excess salts and sodium

Farmland of statewide importance, if drained or either protected from flooding or not frequently flooded during the growing season

Farmland of statewide importance, if warm enough, and either drained or either protected from flooding or not frequently flooded during the growing season

Farmland of statewide importance, if warm enough

Farmland of statewide importance, if thawed

Farmland of local importance

Farmland of local importance, if irrigated

Farmland of unique importance

Not rated or not available

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

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

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

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
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: Ottawa County, Michigan
Survey Area Data: Version 17, Aug 29, 2022

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

Date(s) aerial images were photographed: Oct 4, 2022—Oct 28, 2022

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.

Table—Farmland Classification

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
CovabB	Covert-Pipestone sands, 0 to 6 percent slopes	Not prime farmland	77.1	11.3%
DNL	Dune land	Not prime farmland	6.8	1.0%
Lb	Lake beaches	Not prime farmland	18.0	2.6%
PlfabB	Plainfield sand, lake plain, 0 to 6 percent slopes	Not prime farmland	230.0	33.8%
PlfabD	Plainfield sand, lake plain, 6 to 18 percent slopes	Not prime farmland	8.2	1.2%
PlfacD	Plainfield sand, dunes, 6 to 18 percent slopes	Not prime farmland	45.5	6.7%
PlfacF	Plainfield sand, dunes, 18 to 60 percent slopes	Not prime farmland	79.9	11.7%
PpsaaA	Pipestone-Covert-Saugatuck sands, 0 to 3 percent slopes	Not prime farmland	0.7	0.1%
Totals for Area of Interest			**680.3**	**100.0%**

Rating Options—Farmland Classification

Aggregation Method: No Aggregation Necessary

Tie-break Rule: Lower

References

American Association of State Highway and Transportation Officials (AASHTO). 2004. Standard specifications for transportation materials and methods of sampling and testing. 24th edition.

American Society for Testing and Materials (ASTM). 2005. Standard classification of soils for engineering purposes. ASTM Standard D2487-00.

Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. Classification of wetlands and deep-water habitats of the United States. U.S. Fish and Wildlife Service FWS/OBS-79/31.

Federal Register. July 13, 1994. Changes in hydric soils of the United States.

Federal Register. September 18, 2002. Hydric soils of the United States.

Hurt, G.W., and L.M. Vasilas, editors. Version 6.0, 2006. Field indicators of hydric soils in the United States.

National Research Council. 1995. Wetlands: Characteristics and boundaries.

Soil Survey Division Staff. 1993. Soil survey manual. Soil Conservation Service. U.S. Department of Agriculture Handbook 18. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_054262

Soil Survey Staff. 1999. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. 2nd edition. Natural Resources Conservation Service, U.S. Department of Agriculture Handbook 436. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053577

Soil Survey Staff. 2010. Keys to soil taxonomy. 11th edition. U.S. Department of Agriculture, Natural Resources Conservation Service. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053580

Tiner, R.W., Jr. 1985. Wetlands of Delaware. U.S. Fish and Wildlife Service and Delaware Department of Natural Resources and Environmental Control, Wetlands Section.

United States Army Corps of Engineers, Environmental Laboratory. 1987. Corps of Engineers wetlands delineation manual. Waterways Experiment Station Technical Report Y-87-1.

United States Department of Agriculture, Natural Resources Conservation Service. National forestry manual. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/home/?cid=nrcs142p2_053374

United States Department of Agriculture, Natural Resources Conservation Service. National range and pasture handbook. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/landuse/rangepasture/?cid=stelprdb1043084

United States Department of Agriculture, Natural Resources Conservation Service. National soil survey handbook, title 430-VI. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/scientists/?cid=nrcs142p2_054242

United States Department of Agriculture, Natural Resources Conservation Service. 2006. Land resource regions and major land resource areas of the United States, the Caribbean, and the Pacific Basin. U.S. Department of Agriculture Handbook 296. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053624

United States Department of Agriculture, Soil Conservation Service. 1961. Land capability classification. U.S. Department of Agriculture Handbook 210. http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_052290.pdf

United States Department of Agriculture

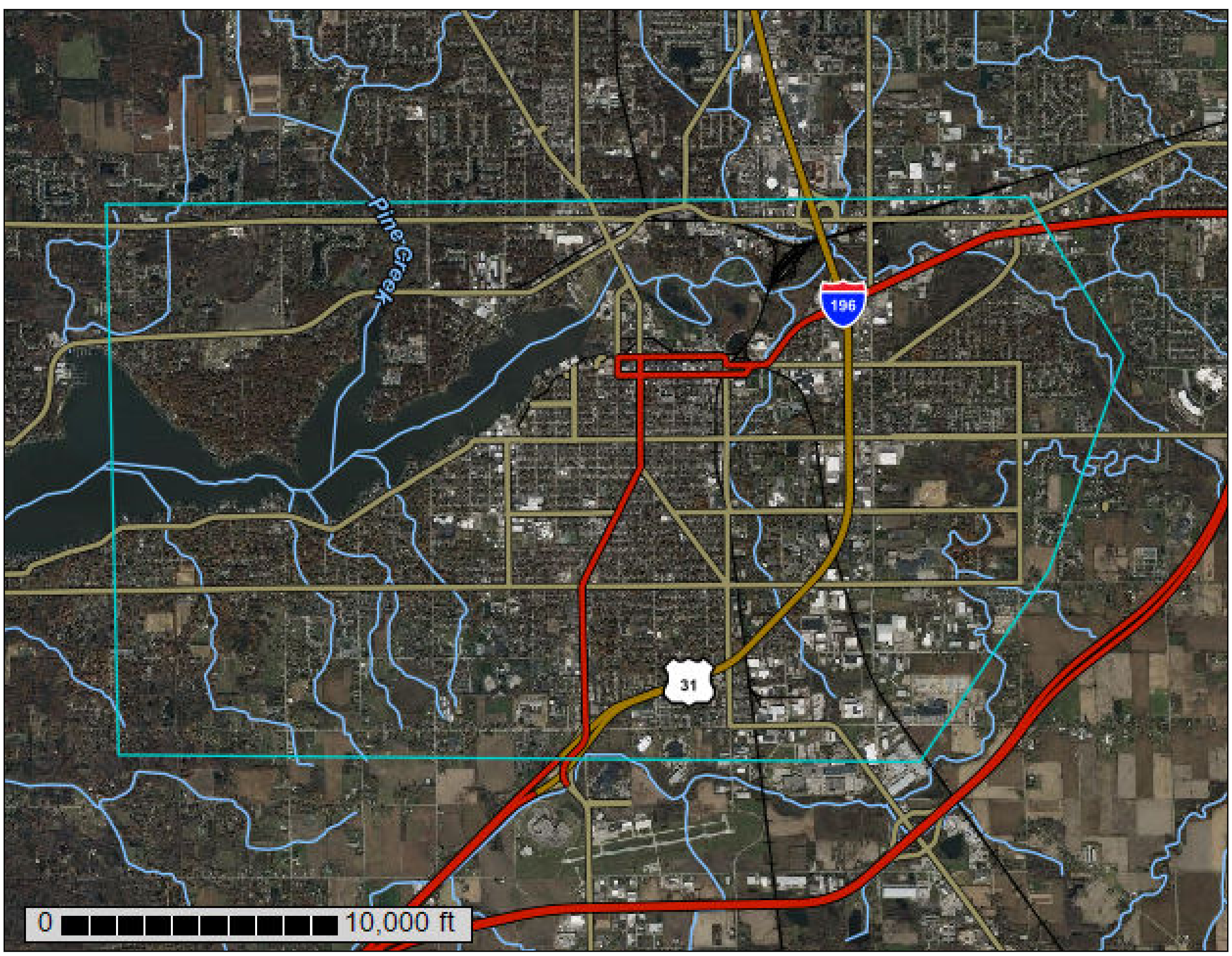
NRCS

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
Allegan County, Michigan, and Ottawa County, Michigan

HBPW Service Area



March 24, 2023

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 (https://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.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD). To file a complaint of discrimination, write to USDA, Director, Office of Civil Rights, 1400 Independence Avenue, S.W., Washington, D.C. 20250-9410 or call (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal opportunity provider and employer.

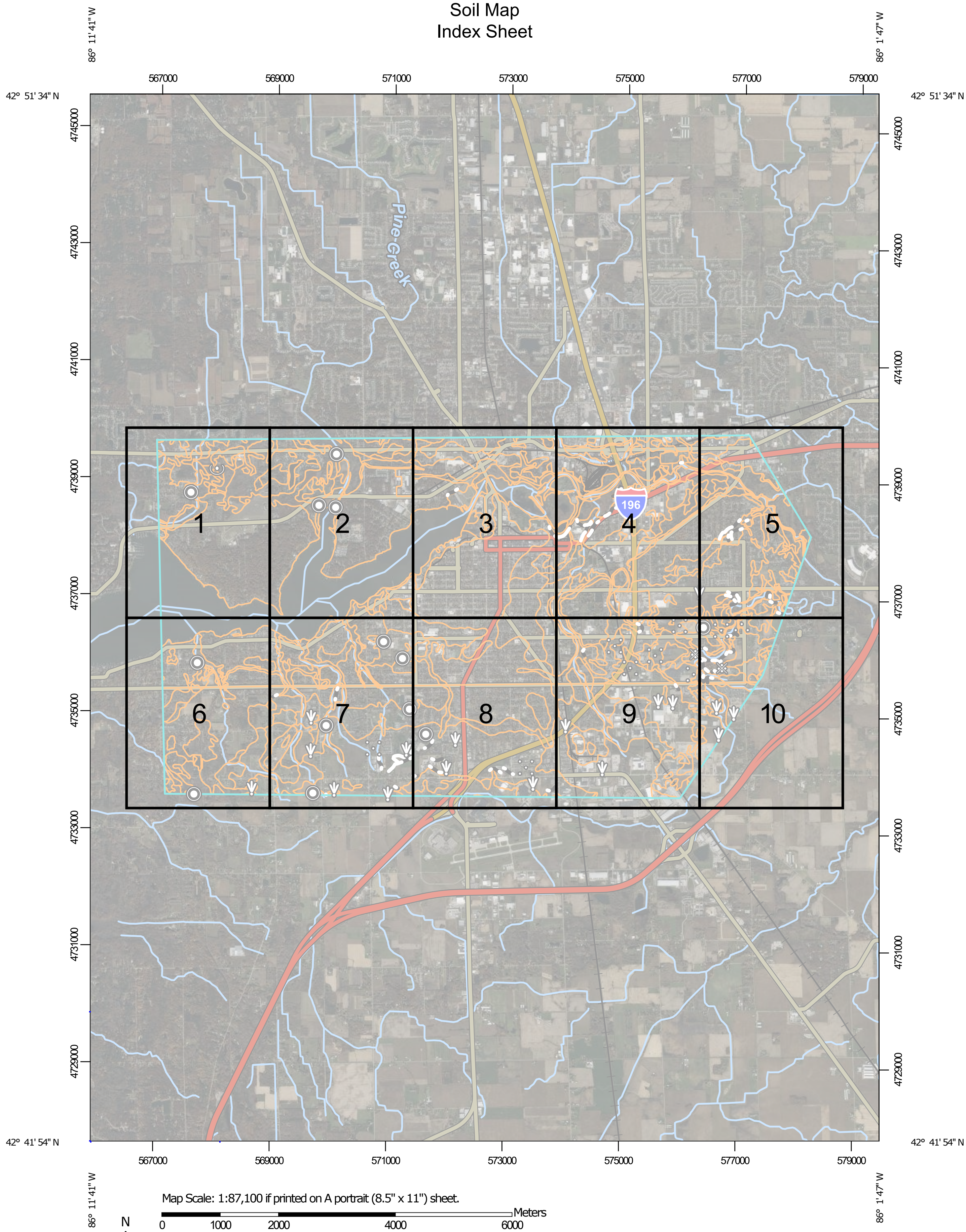
Contents

Preface.......... 2
Soil Map.......... 5
Soil Map.......... 6
Legend.......... 17
Map Unit Legend.......... 19
Soil Information for All Uses.......... 23
Suitabilities and Limitations for Use.......... 23
Land Classifications.......... 23
Farmland Classification.......... 23
References.......... 43

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
Index Sheet



Map Scale: 1:87,100 if printed on A portrait (8.5" x 11") sheet.

Meters: 0, 1000, 2000, 4000, 6000

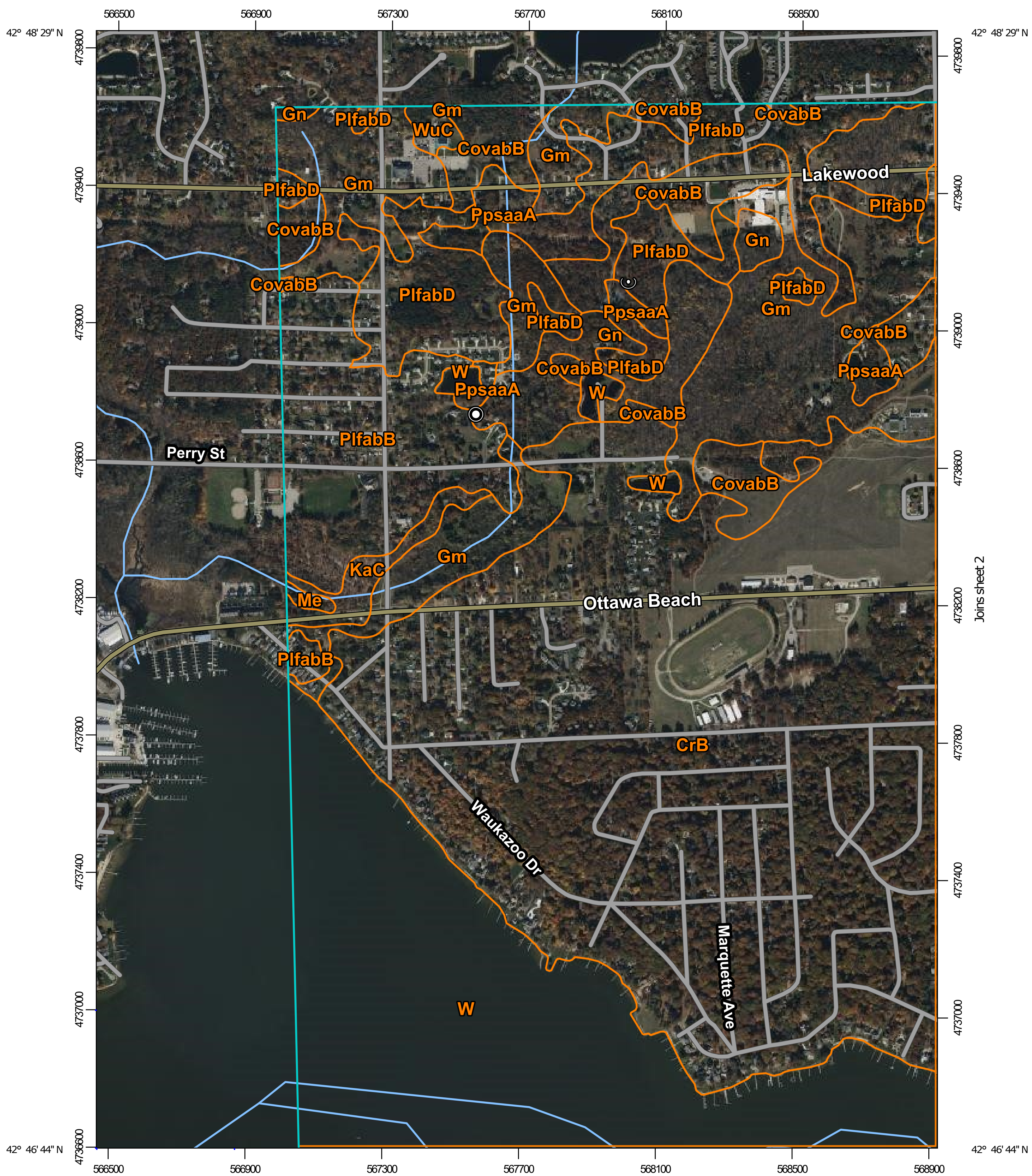
Feet: 0, 4000, 8000, 16000, 24000

N

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

Soil Map

Map sheet 1 of 10



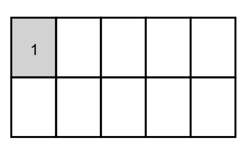
Map Scale: 1:15,800 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0, 200, 400, 800, 1200

Feet: 0, 500, 1000, 2000, 3000

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



Map Sheet Location

Soil Map

Map sheet 2 of 10

Map Scale: 1:15,800 if printed on A portrait (8.5" x 11") sheet.

Meters: 0, 200, 400, 800, 1200

Feet: 0, 500, 1000, 2000, 3000

N

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

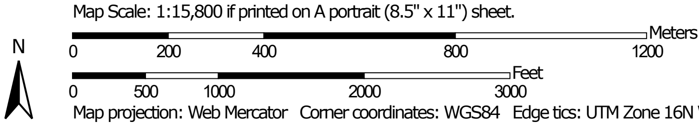
2

Map Sheet Location

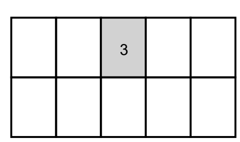
Soil Map

Map sheet 3 of 10

Map Scale: 1:15,800 if printed on A portrait (8.5" x 11") sheet.



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



Map Sheet Location

Soil Map

Map sheet 4 of 10

Soil Map

Map sheet 5 of 10

Map Scale: 1:15,800 if printed on A portrait (8.5" x 11") sheet.

Meters: 0, 200, 400, 800, 1200

Feet: 0, 500, 1000, 2000, 3000

N

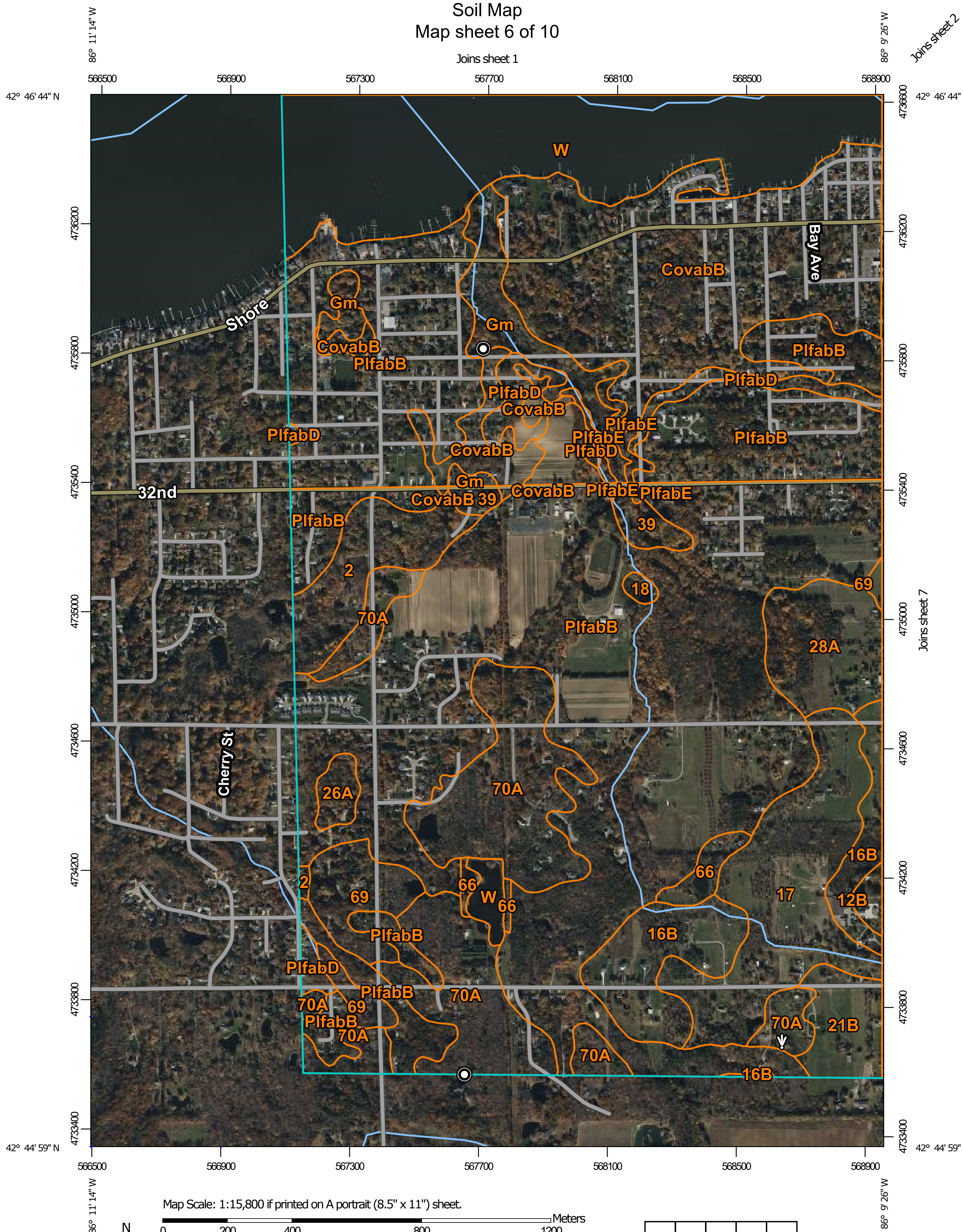
Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 16N WGS84

Map Sheet Location

5

Soil Map

Map sheet 6 of 10



Map Scale: 1:15,800 if printed on A portrait (8.5" x 11") sheet.

Meters: 0, 200, 400, 800, 1200

Feet: 0, 500, 1000, 2000, 3000

N

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

Map Sheet Location

6

Soil Map

Map sheet 7 of 10

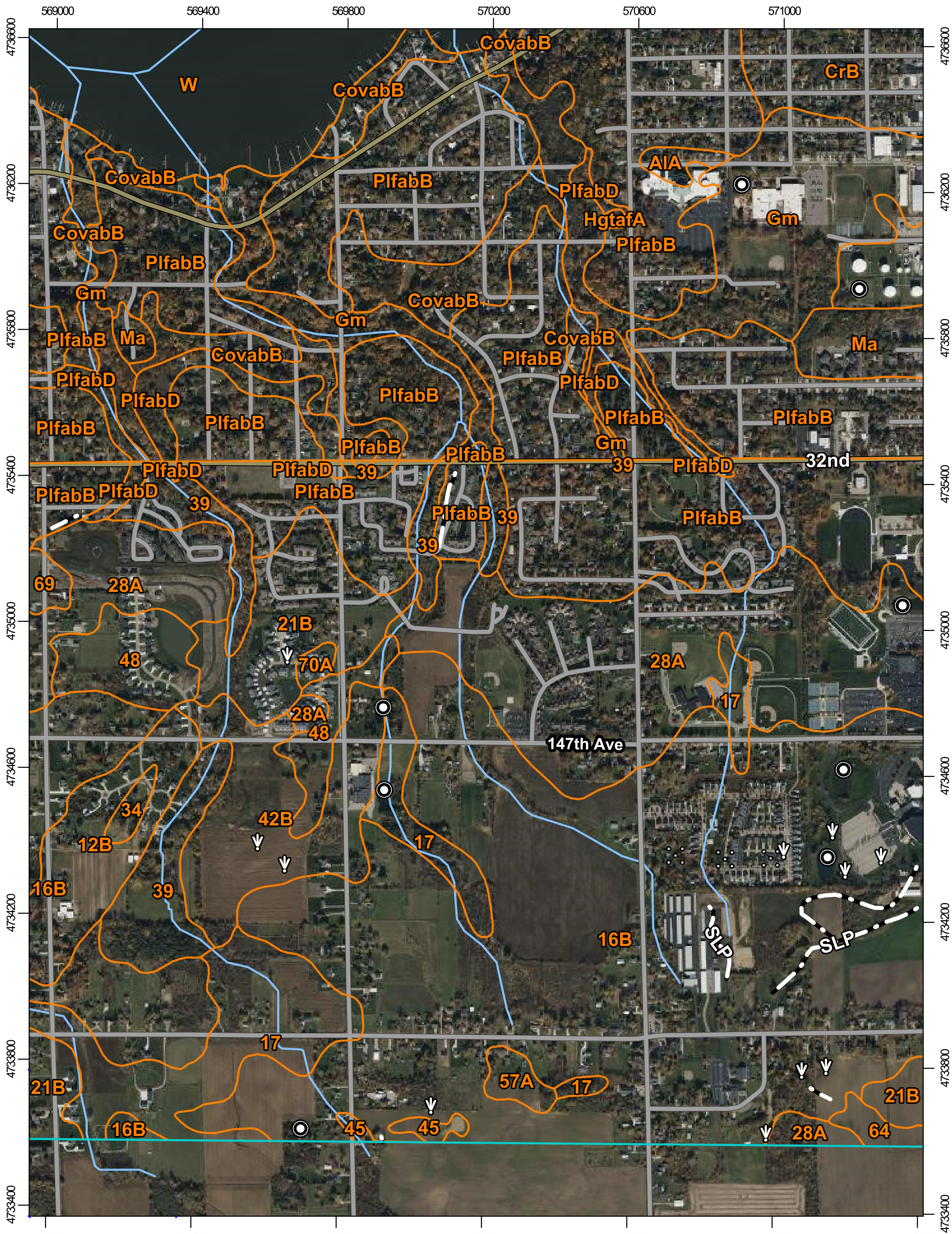
Joins sheet 1

86° 9' 26" W

Joins sheet 2

86° 7' 38" W

Joins sheet 3



86° 9' 26" W

86° 7' 38" W

Map Scale: 1:15,800 if printed on A portrait (8.5" x 11") sheet.

Meters: 0 200 400 800 1200

Feet: 0 500 1000 2000 3000

N

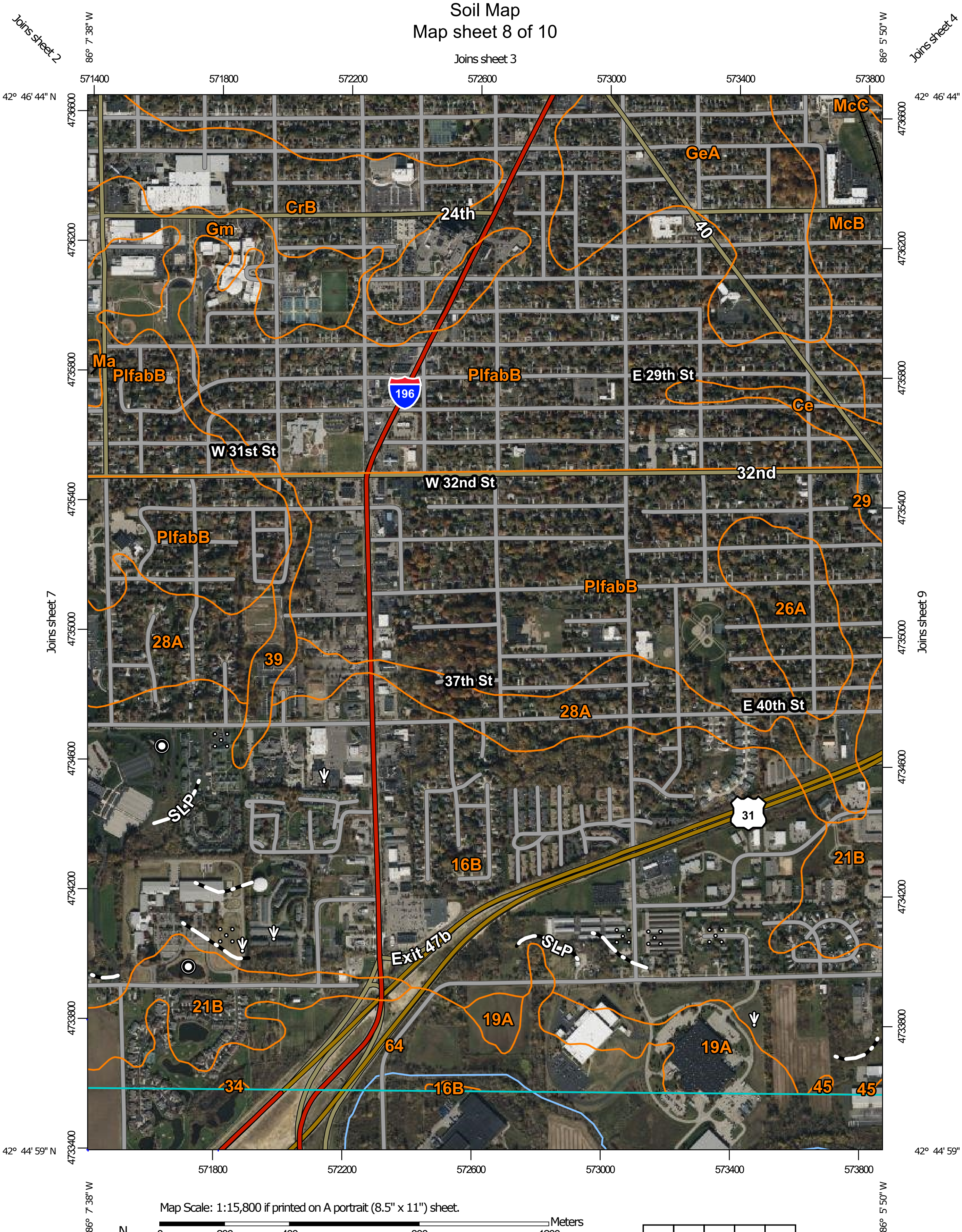
Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 16N WGS84

7

Map Sheet Location

Soil Map

Map sheet 8 of 10



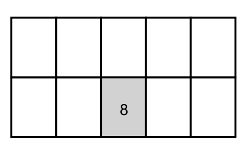
Map Scale: 1:15,800 if printed on A portrait (8.5" x 11") sheet.

Meters: 0, 200, 400, 800, 1200

Feet: 0, 500, 1000, 2000, 3000

N

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



Map Sheet Location

Soil Map

Map sheet 9 of 10

Map Scale: 1:15,800 if printed on A portrait (8.5" x 11") sheet.

Meters: 0, 200, 400, 800, 1200

Feet: 0, 500, 1000, 2000, 3000

N

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

9

Map Sheet Location

Soil Map

Map sheet 10 of 10

Map Scale: 1:15,800 if printed on A portrait (8.5" x 11") sheet.

Meters: 0, 200, 400, 800, 1200

Feet: 0, 500, 1000, 2000, 3000

N

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

Map Sheet Location: 10

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.

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

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
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: Allegan County, Michigan
Survey Area Data: Version 20, Aug 24, 2022

Soil Survey Area: Ottawa County, Michigan
Survey Area Data: Version 17, Aug 29, 2022

Your area of interest (AOI) includes more than one soil survey area. These survey areas may have been mapped at different scales, with a different land use in mind, at different times, or at different levels of detail. This may result in map unit symbols, soil properties, and interpretations that do not completely agree across soil survey area boundaries.

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

Date(s) aerial images were photographed: Oct 4, 2022—Oct 28, 2022

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background

MAP LEGEND	MAP INFORMATION
	imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
2	Glendora loamy sand	32.0	0.2%
11B	Oshtemo-Chelsea complex, 0 to 6 percent slopes	18.8	0.1%
11C	Oshtemo-Chelsea complex, 6 to 12 percent slopes	1.2	0.0%
12B	Ockley loam, 1 to 6 percent slopes	38.0	0.2%
16B	Capac loam, Lake Michigan lobe, 0 to 4 percent slopes	1,103.6	7.0%
17	Brookston loam, 0 to 2 percent slopes	148.3	0.9%
18	Pits	1.8	0.0%
19A	Brady sandy loam, 0 to 3 percent slopes	49.8	0.3%
21B	Capac-Wixom complex, 1 to 4 percent slopes	486.8	3.1%
26A	Pipestone sand, 0 to 4 percent slopes	41.8	0.3%
28A	Rimer loamy sand, 0 to 4 percent slopes	550.8	3.5%
29	Cohoctah silt loam	72.7	0.5%
34	Aquents, sandy and loamy	3.7	0.0%
36	Corunna sandy loam	62.3	0.4%
39	Granby loamy sand, lake plain, 0 to 2 percent slopes	77.2	0.5%
41B	Blount silt loam, 1 to 4 percent slopes	331.3	2.1%
42B	Metamora sandy loam, 1 to 4 percent slopes	53.8	0.3%
45	Pewamo silt loam	77.8	0.5%
48	Belleville loamy sand	43.3	0.3%
49A	Tedrow fine sand, 0 to 4 percent slopes	6.4	0.0%
51A	Thetford loamy fine sand, 0 to 4 percent slopes	85.3	0.5%
57A	Covert sand, 0 to 4 percent slopes	5.4	0.0%
64	Belleville-Brookston complex	88.8	0.6%
66	Udipsamments, nearly level to gently sloping	8.8	0.1%
69	Newton mucky fine sand	30.3	0.2%

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
70A	Morocco fine sand, 0 to 3 percent slopes	126.6	0.8%
75B	Capac-Marlette loams, 1 to 6 percent slopes	21.8	0.1%
CovabB	Covert-Pipestone sands, 0 to 6 percent slopes	0.7	0.0%
PlfabB	Plainfield sand, lake plain, 0 to 6 percent slopes	903.0	5.7%
PlfabD	Plainfield sand, lake plain, 6 to 18 percent slopes	6.5	0.0%
PlfabE	Plainfield sand, high ecological site, 18 to 30 percent slopes	0.7	0.0%
W	Water	5.6	0.0%
Subtotals for Soil Survey Area		**4,484.8**	**28.6%**
Totals for Area of Interest		**15,706.9**	**100.0%**

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
AdraeA	Adrian muck, lake moderated, 0 to 1 percent slopes	27.4	0.2%
AlA	Allendale sandy loam, 0 to 4 percent slopes	49.5	0.3%
AmB	Au Gres loamy sand, 0 to 6 percent slopes	167.3	1.1%
ArB	Au Gres loamy sand, loamy substratum, 0 to 6 percent slopes	1.6	0.0%
BlA	Blount loam, 0 to 2 percent slopes	10.0	0.1%
BlB	Blount loam, 2 to 6 percent slopes	651.8	4.1%
Bu	Breckenridge sandy loam	107.2	0.7%
Bv	Brevort sandy loam	18.9	0.1%
Ce	Ceresco loam	84.7	0.5%
ChB	Coloma loamy sand, 0 to 6 percent slopes	19.6	0.1%
ChC	Coloma loamy sand, 6 to 12 percent slopes	14.4	0.1%
Cm	Cohoctah loam	276.0	1.8%
CovabB	Covert-Pipestone sands, 0 to 6 percent slopes	378.7	2.4%
CrB	Croswell sand, 0 to 6 percent slopes	1,038.6	6.6%
Gd	Gilford sandy loam, 0 to 2 percent slopes, gravelly subsoil	284.1	1.8%
GeA	Gladwin sandy loam, 0 to 2 percent slopes	235.2	1.5%

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
GeB	Gladwin sandy loam, 2 to 6 percent slopes	162.1	1.0%
Gl	Glendora sandy loam	11.2	0.1%
Gm	Granby loamy sand, lake plain, 0 to 2 percent slopes	530.3	3.4%
Gn	Granby fine sandy loam, lake plain, 0 to 2 percent slopes	51.9	0.3%
Gr	Gravel pits	6.8	0.0%
HgtafA	Houghton-Adrian mucks, lake moderated, 0 to 1 percent slopes	106.5	0.7%
IoA	Iosco loamy sand, 0 to 4 percent slopes	39.4	0.3%
KaC	Kalkaska sand, 0 to 12 percent slopes	11.8	0.1%
KnA	Kawkawlin loam, 0 to 2 percent slopes	19.2	0.1%
KnB	Kawkawlin loam, 2 to 6 percent slopes	8.8	0.1%
La	Lacota silt loam	26.8	0.2%
Ls	Linwood muck	9.5	0.1%
Ma	Made land	141.7	0.9%
MaraaB	Marlette-Capac-Thetford complex, 2 to 6 percent slopes	2.1	0.0%
McA	Mancelona loamy sand, 0 to 2 percent slopes	154.3	1.0%
McB	Mancelona loamy sand, 2 to 6 percent slopes	775.4	4.9%
McC	Mancelona loamy sand, 6 to 12 percent slopes	49.8	0.3%
Me	Marsh	318.0	2.0%
MmB	Menominee loamy sand, 2 to 6 percent slopes	29.3	0.2%
MmC	Menominee loamy sand, 6 to 12 percent slopes	1.6	0.0%
MnA	Metamora sandy loam, 0 to 2 percent slopes	79.4	0.5%
MnB	Metamora sandy loam, 2 to 6 percent slopes	210.6	1.3%
MoB	Wawasee loam, 2 to 6 percent slopes	1.5	0.0%
MoC	Wawasee loam, 6 to 12 percent slopes	32.5	0.2%
MtB	Morley loam, 2 to 6 percent slopes	139.9	0.9%
MtC2	Morley loam, 6 to 12 percent slopes, eroded	121.5	0.8%

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
MtE2	Morley loam, 18 to 25 percent slopes, eroded	6.7	0.0%
MuF3	Morley clay loam, 25 to 45 percent slopes, severely eroded	60.4	0.4%
NeC	Onekama loam, Lake Michigan Lobe, 6 to 12 percent slopes	4.5	0.0%
NwB	Newaygo sandy loam, 0 to 6 percent slopes	7.9	0.1%
OwB	Owosso sandy loam, 2 to 6 percent slopes	105.8	0.7%
PlfabB	Plainfield sand, lake plain, 0 to 6 percent slopes	2,568.1	16.3%
PlfabD	Plainfield sand, lake plain, 6 to 18 percent slopes	371.5	2.4%
PlfabE	Plainfield sand, high ecological site, 18 to 30 percent slopes	5.4	0.0%
PlfabF	Plainfield sand, high ecological site, 30 to 50 percent slopes	16.3	0.1%
PpsaaA	Pipestone-Covert-Saugatuck sands, 0 to 3 percent slopes	29.1	0.2%
RcA	Richter sandy loam, 0 to 2 percent slopes	41.1	0.3%
RcB	Richter sandy loam, 2 to 6 percent slopes	8.7	0.1%
Sh	Shoals loam	9.6	0.1%
Sl	Sewage lagoons	18.4	0.1%
Sm	Sims loam	27.5	0.2%
Sn	Sloan loam	58.9	0.4%
TknabD	Tekenink-Spinks loamy sands, 12 to 18 percent slopes	21.3	0.1%
To	Tonkey sandy loam	2.7	0.0%
W	Water	1,443.5	9.2%
Wt	Washtenaw loam	0.8	0.0%
WuC	Wind eroded land, sloping	4.0	0.0%
Subtotals for Soil Survey Area		**11,218.9**	**71.4%**
Totals for Area of Interest		**15,706.9**	**100.0%**

Soil Information for All Uses

Suitabilities and Limitations for Use

The Suitabilities and Limitations for Use section includes various soil interpretations displayed as thematic maps with a summary table for the soil map units in the selected area of interest. A single value or rating for each map unit is generated by aggregating the interpretive ratings of individual map unit components. This aggregation process is defined for each interpretation.

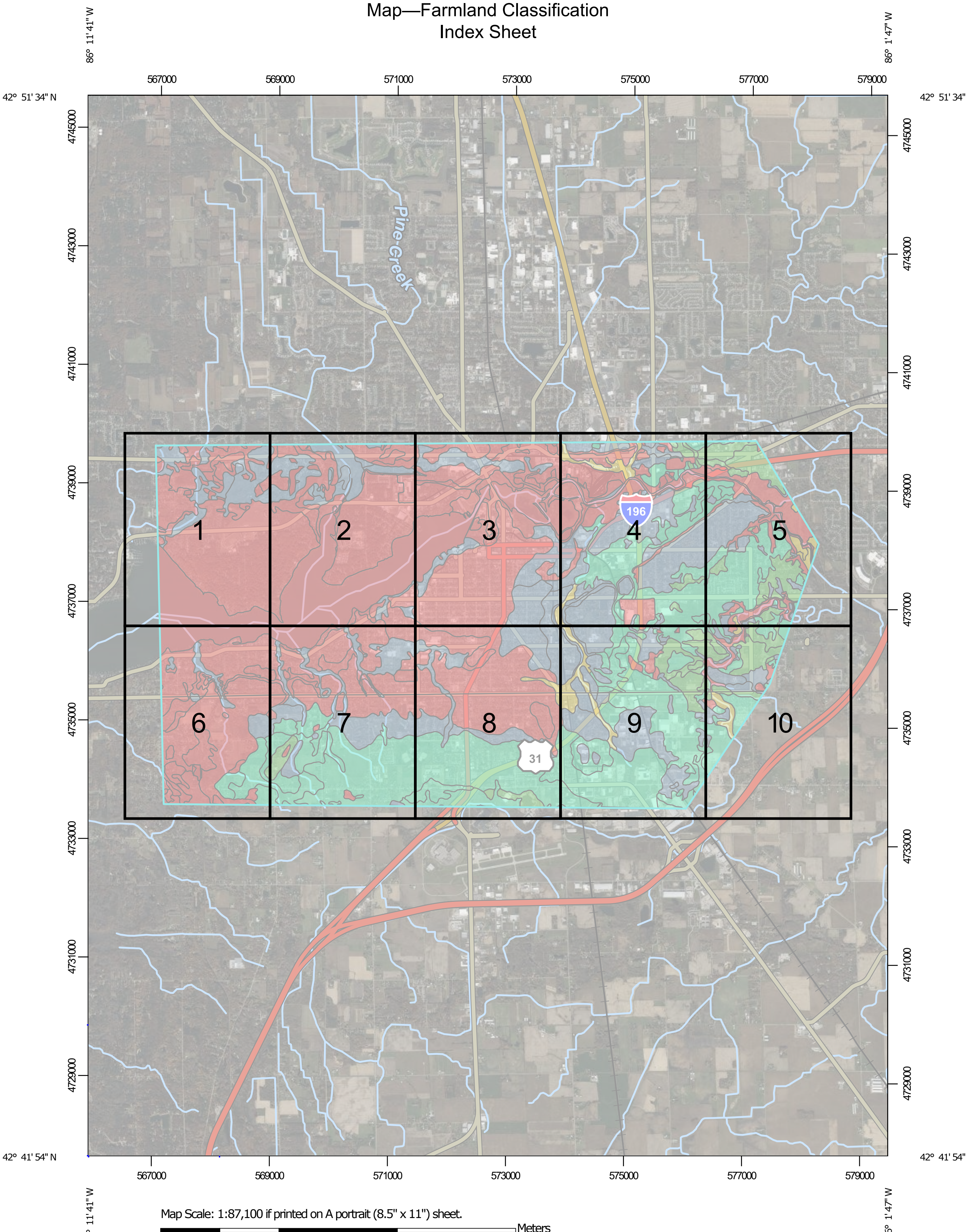
Land Classifications

Land Classifications are specified land use and management groupings that are assigned to soil areas because combinations of soil have similar behavior for specified practices. Most are based on soil properties and other factors that directly influence the specific use of the soil. Example classifications include ecological site classification, farmland classification, irrigated and nonirrigated land capability classification, and hydric rating.

Farmland Classification

Farmland classification identifies map units as prime farmland, farmland of statewide importance, farmland of local importance, or unique farmland. It identifies the location and extent of the soils that are best suited to food, feed, fiber, forage, and oilseed crops. NRCS policy and procedures on prime and unique farmlands are published in the "Federal Register," Vol. 43, No. 21, January 31, 1978.

Custom Soil Resource Report
Map—Farmland Classification
Index Sheet



Map Scale: 1:87,100 if printed on A portrait (8.5" x 11") sheet.

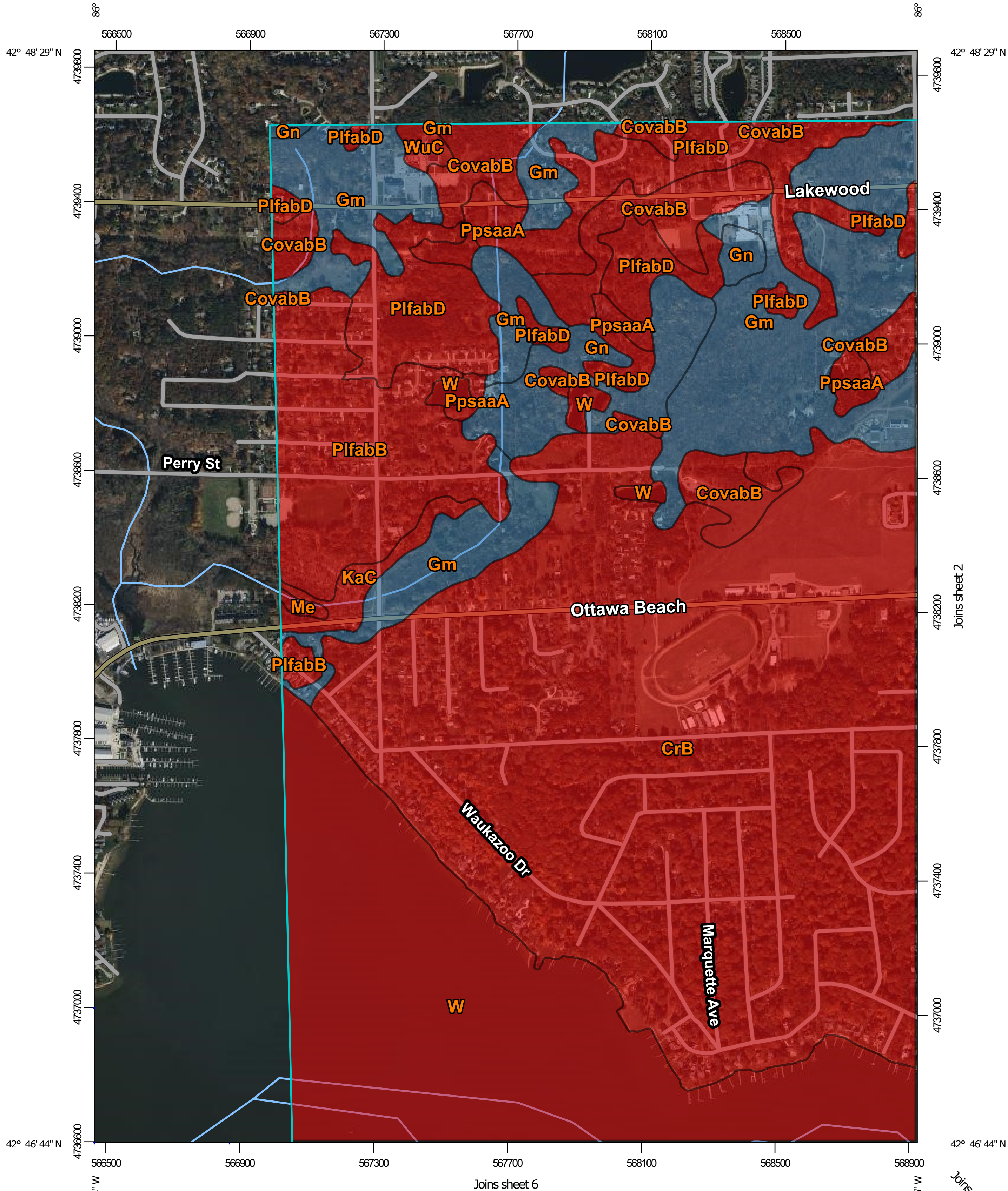
Meters: 0, 1000, 2000, 4000, 6000

Feet: 0, 4000, 8000, 16000, 24000

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

Map—Farmland Classification

Map sheet 1 of 10



Map Scale: 1:15,800 if printed on A portrait (8.5" x 11") sheet.

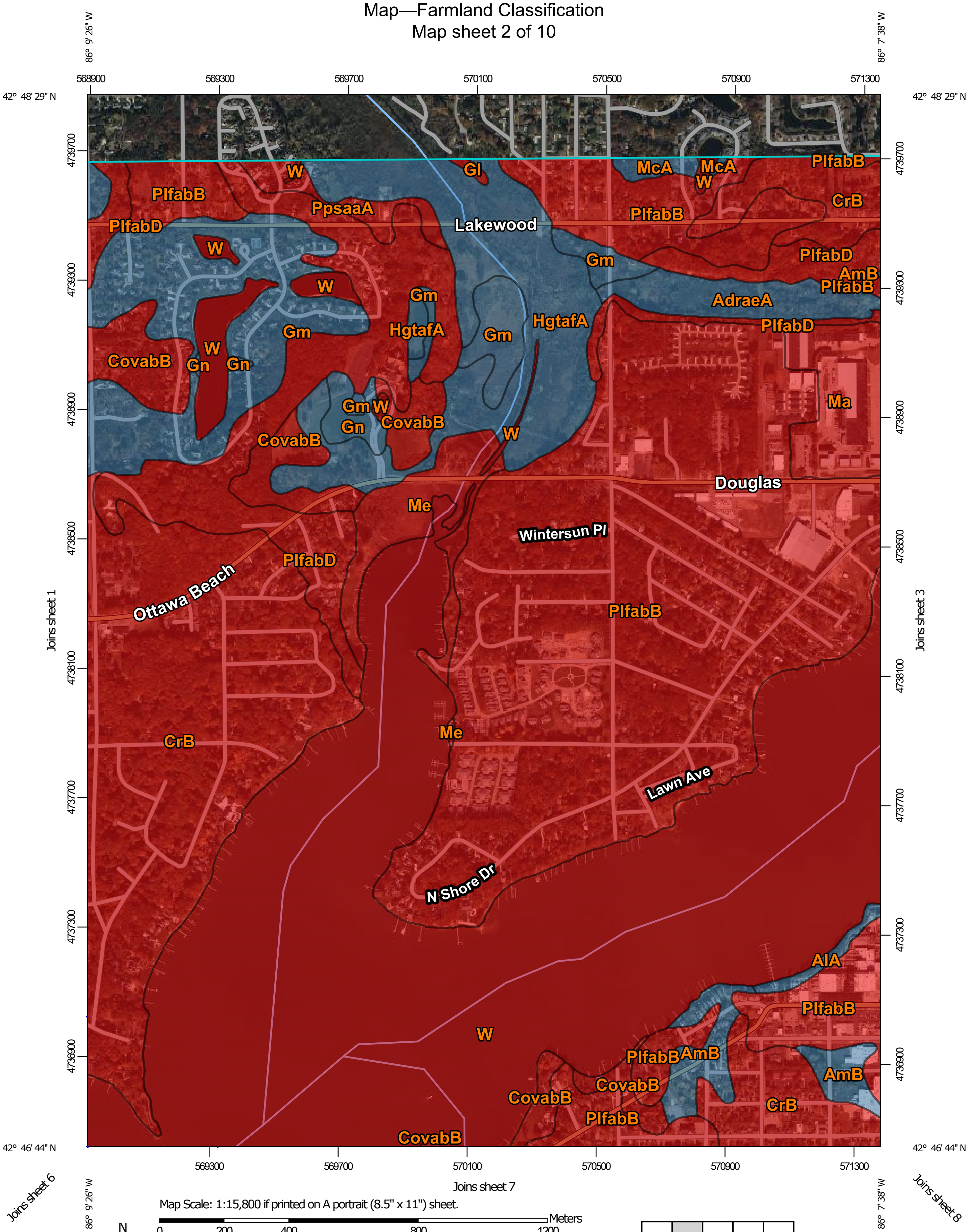
Meters: 0, 200, 400, 800, 1200

Feet: 0, 500, 1000, 2000, 3000

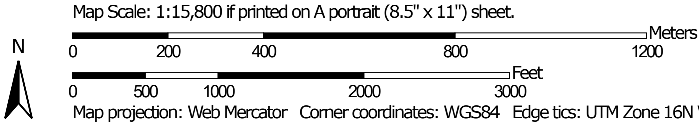
N

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

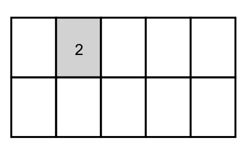
Map Sheet Location (sheet 1)



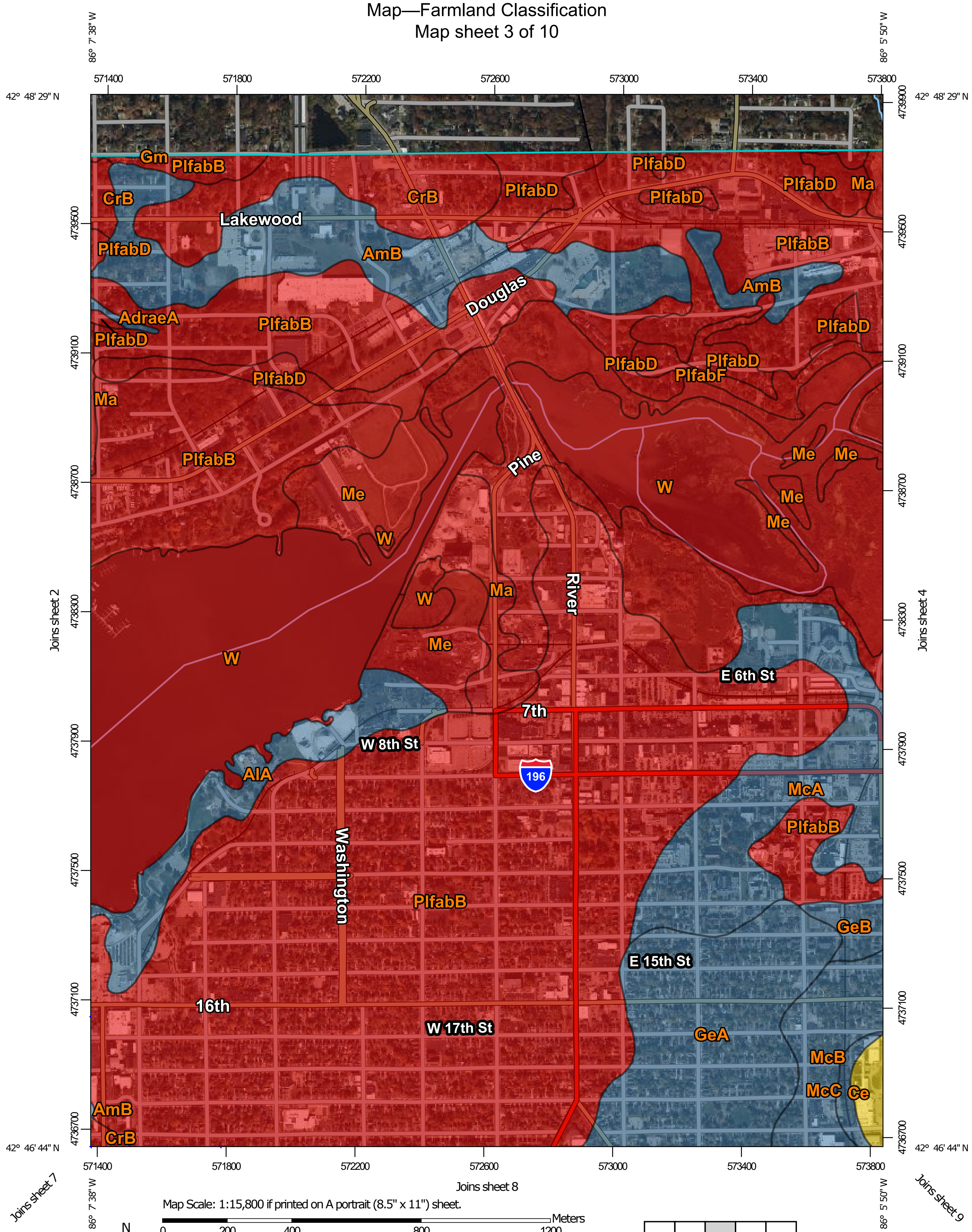
Map Scale: 1:15,800 if printed on A portrait (8.5" x 11") sheet.



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



Map Sheet Location



Map Scale: 1:15,800 if printed on A portrait (8.5" x 11") sheet.

Meters: 0 200 400 800 1200

Feet: 0 500 1000 2000 3000

N

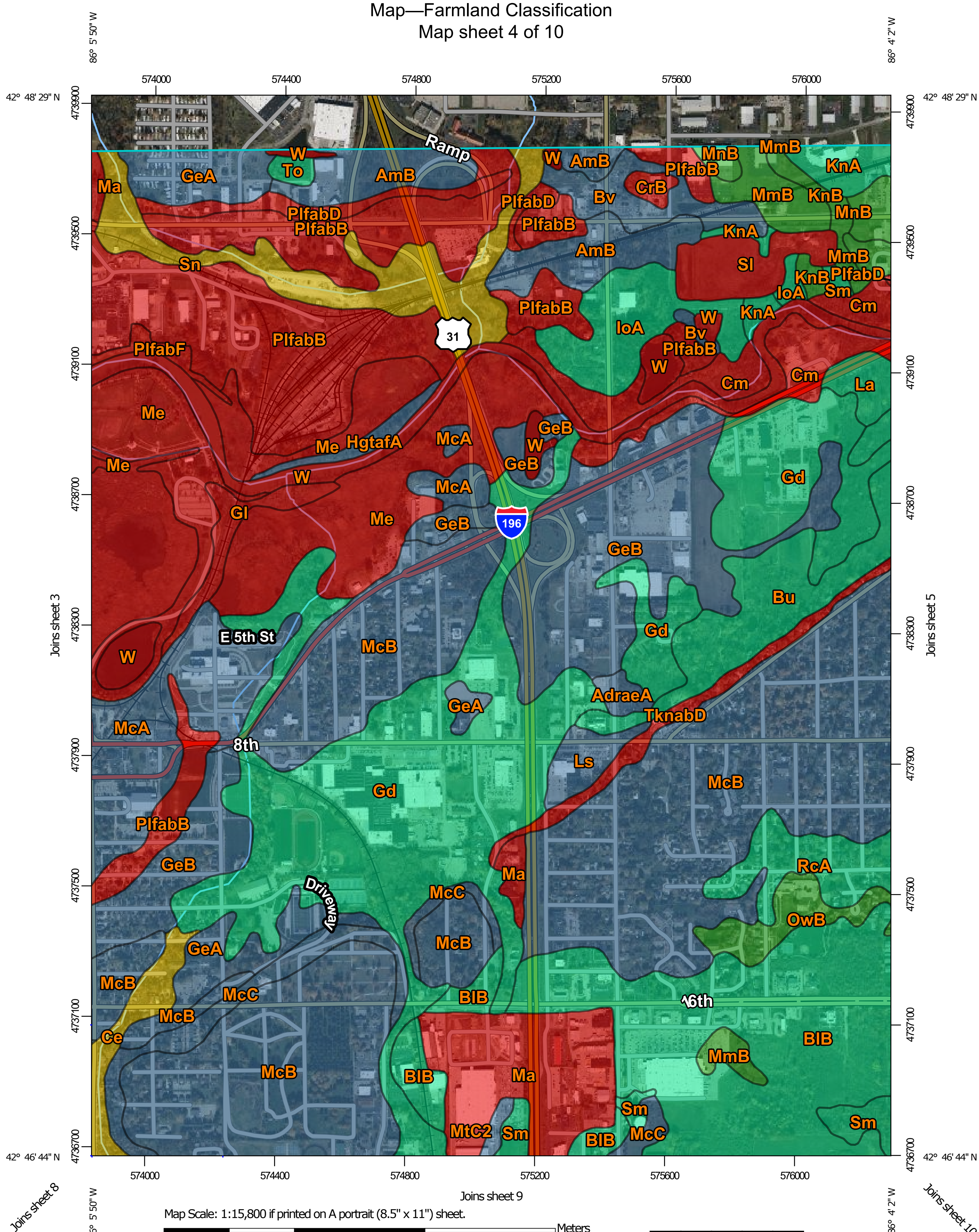
Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 16N WGS84

Map Sheet Location

3

Map—Farmland Classification

Map sheet 4 of 10



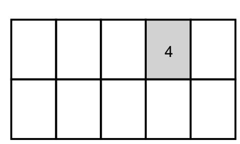
Map Scale: 1:15,800 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0, 200, 400, 800, 1200

Feet: 0, 500, 1000, 2000, 3000

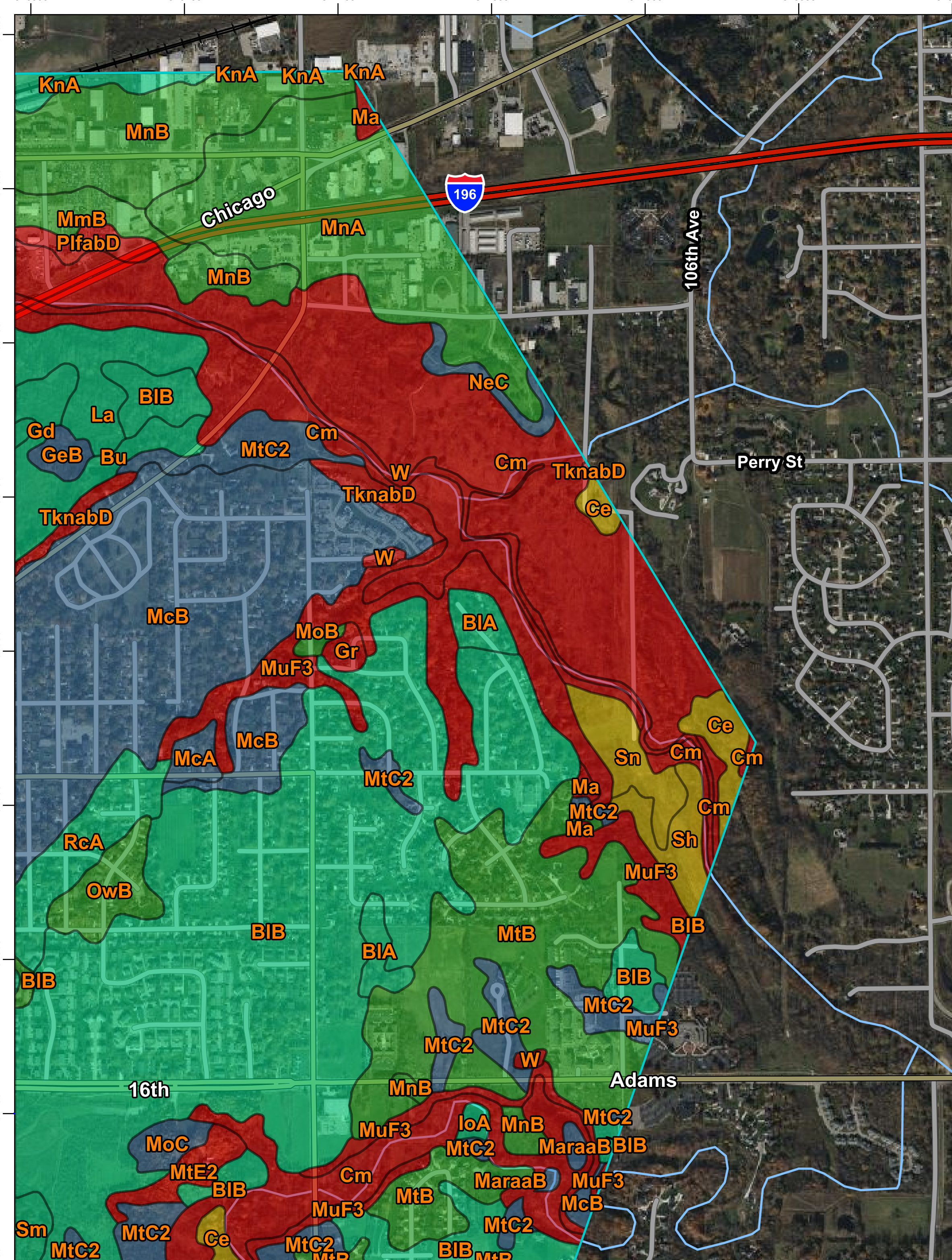
Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 16N WGS84



Map Sheet Location

Map—Farmland Classification

Map sheet 5 of 10



Map Scale: 1:15,800 if printed on A portrait (8.5" x 11") sheet.

Meters: 0, 200, 400, 800, 1200

Feet: 0, 500, 1000, 2000, 3000

N

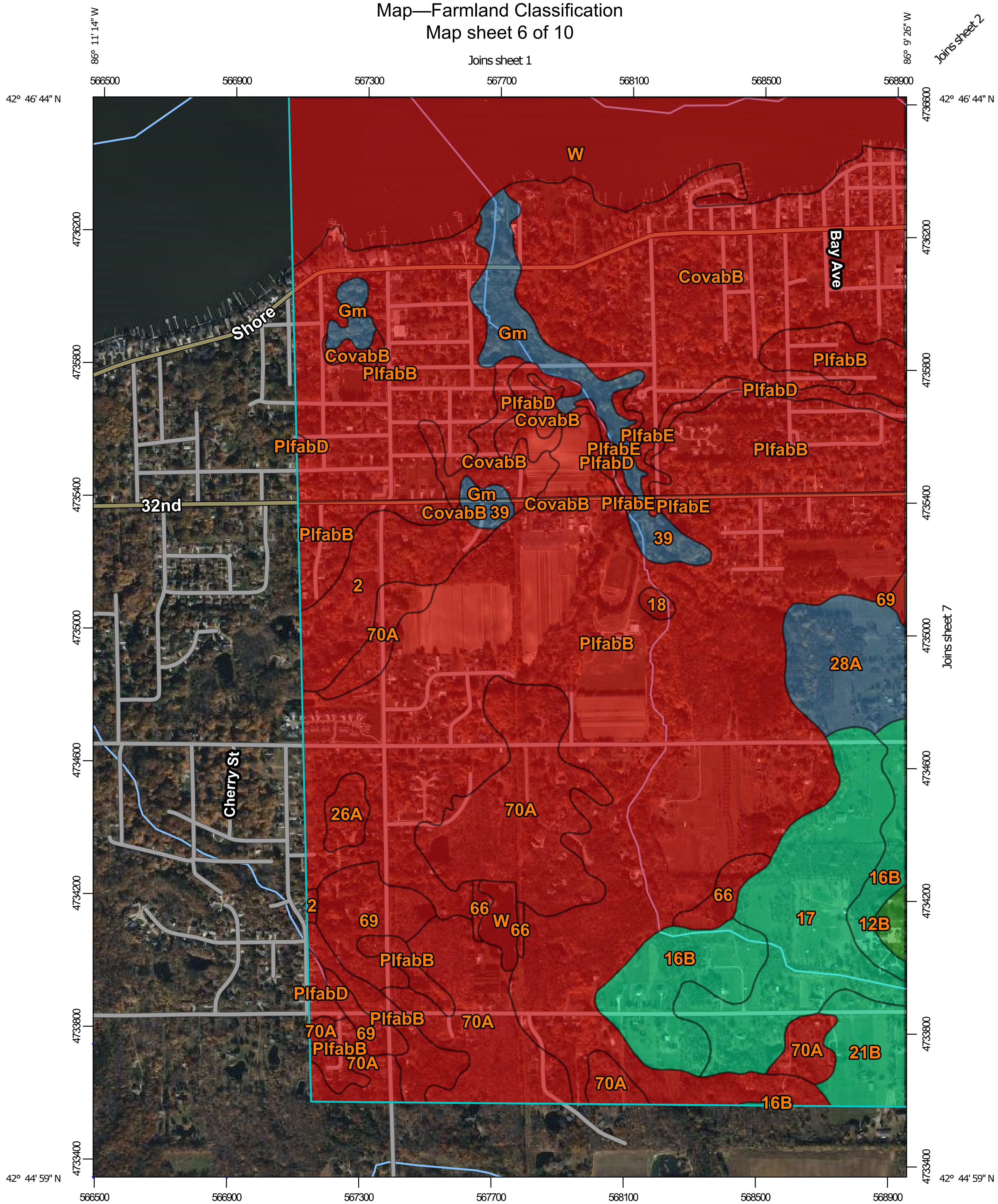
Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 16N WGS84

				5

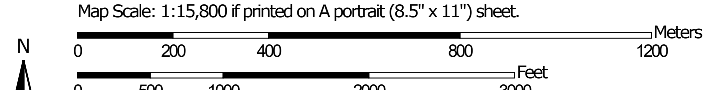
Map Sheet Location

Map—Farmland Classification

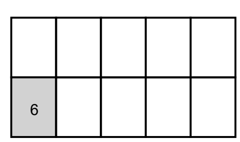
Map sheet 6 of 10



Map Scale: 1:15,800 if printed on A portrait (8.5" x 11") sheet.



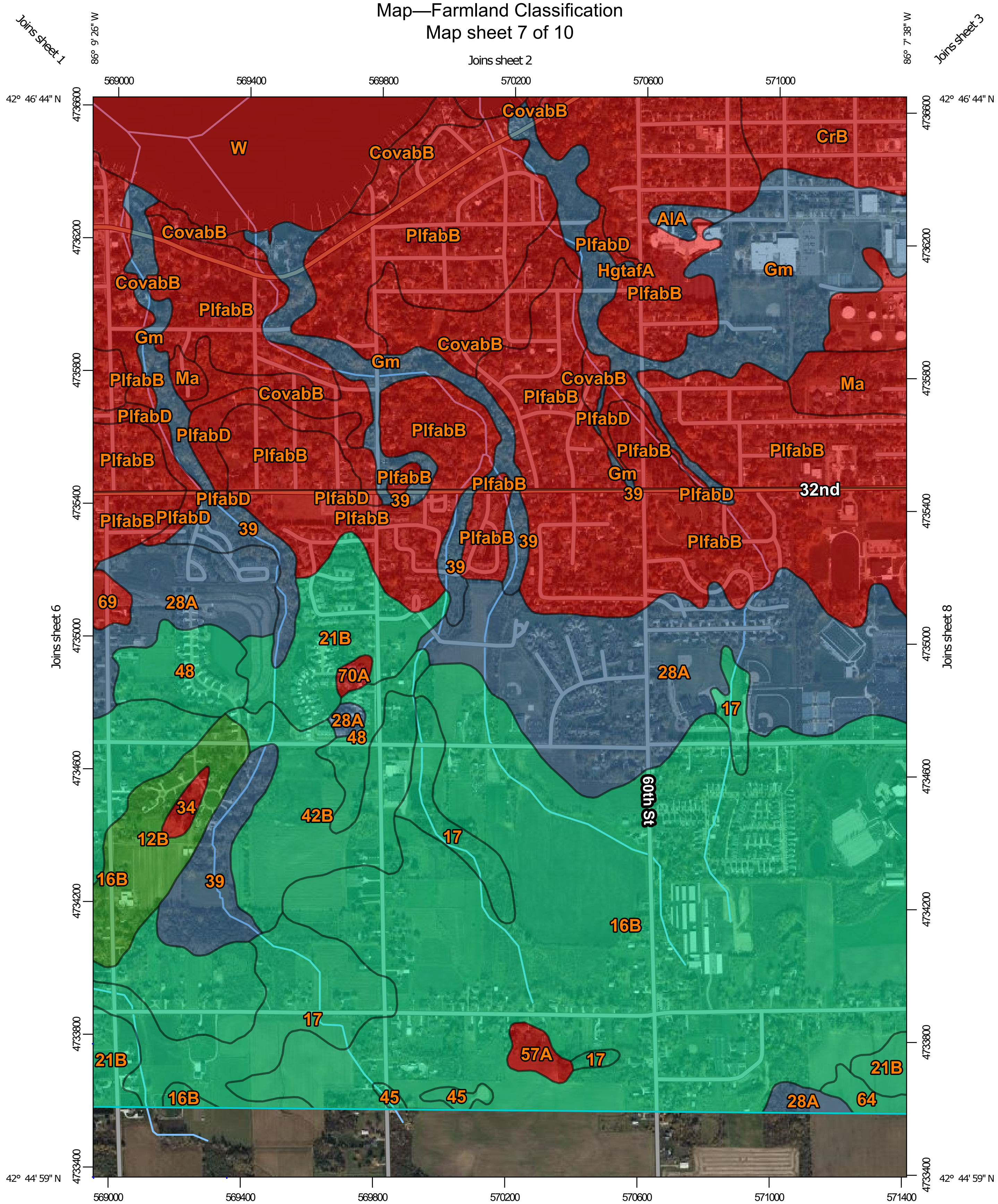
Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 16N WGS84



Map Sheet Location

Map—Farmland Classification

Map sheet 7 of 10



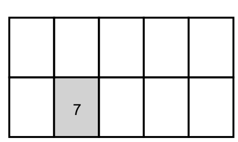
Map Scale: 1:15,800 if printed on A portrait (8.5" x 11") sheet.

Meters: 0, 200, 400, 800, 1200

Feet: 0, 500, 1000, 2000, 3000

N

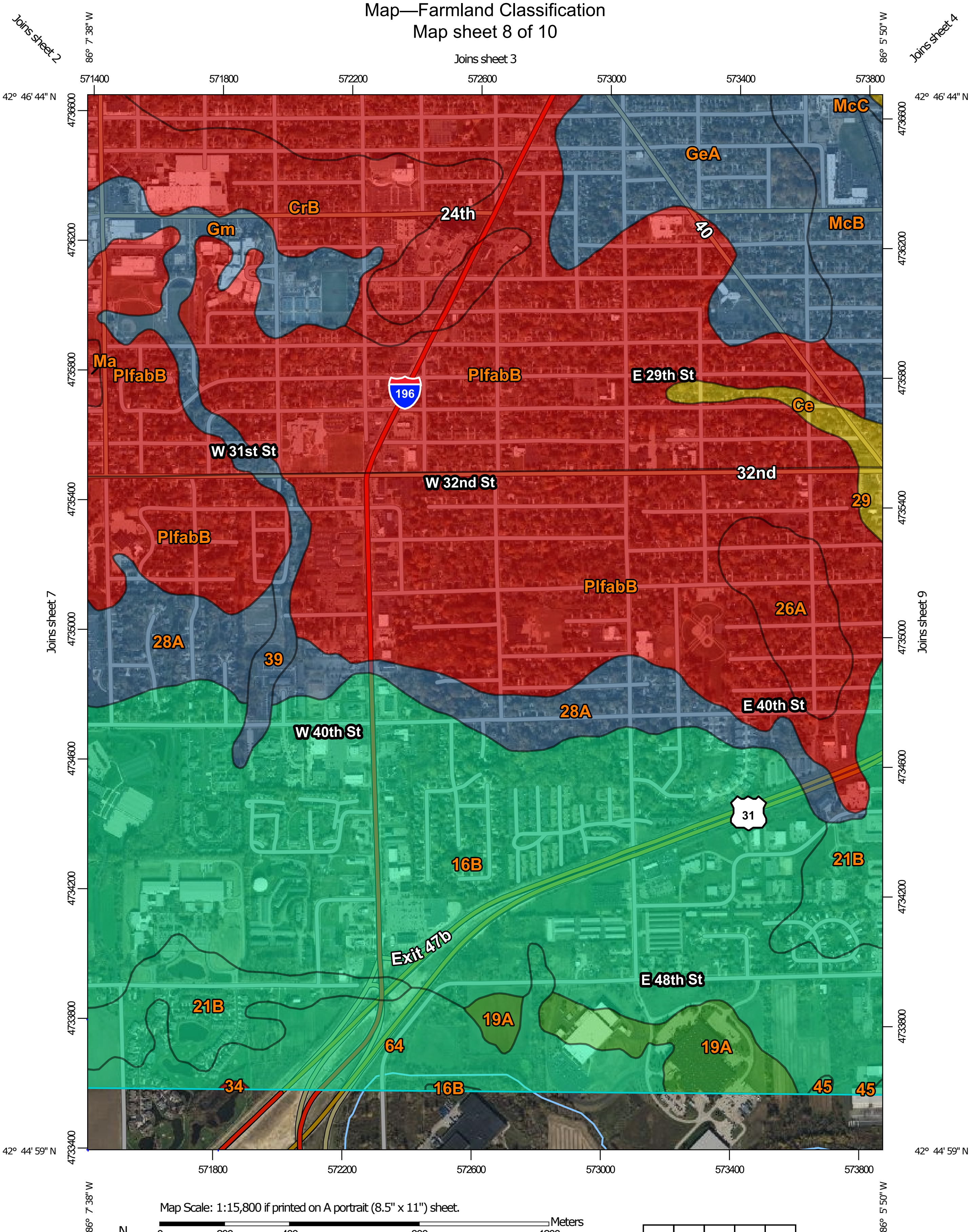
Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 16N WGS84



Map Sheet Location

Map—Farmland Classification

Map sheet 8 of 10



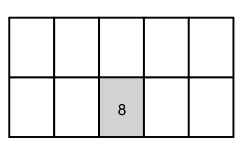
Map Scale: 1:15,800 if printed on A portrait (8.5" x 11") sheet.

Meters: 0, 200, 400, 800, 1200

Feet: 0, 500, 1000, 2000, 3000

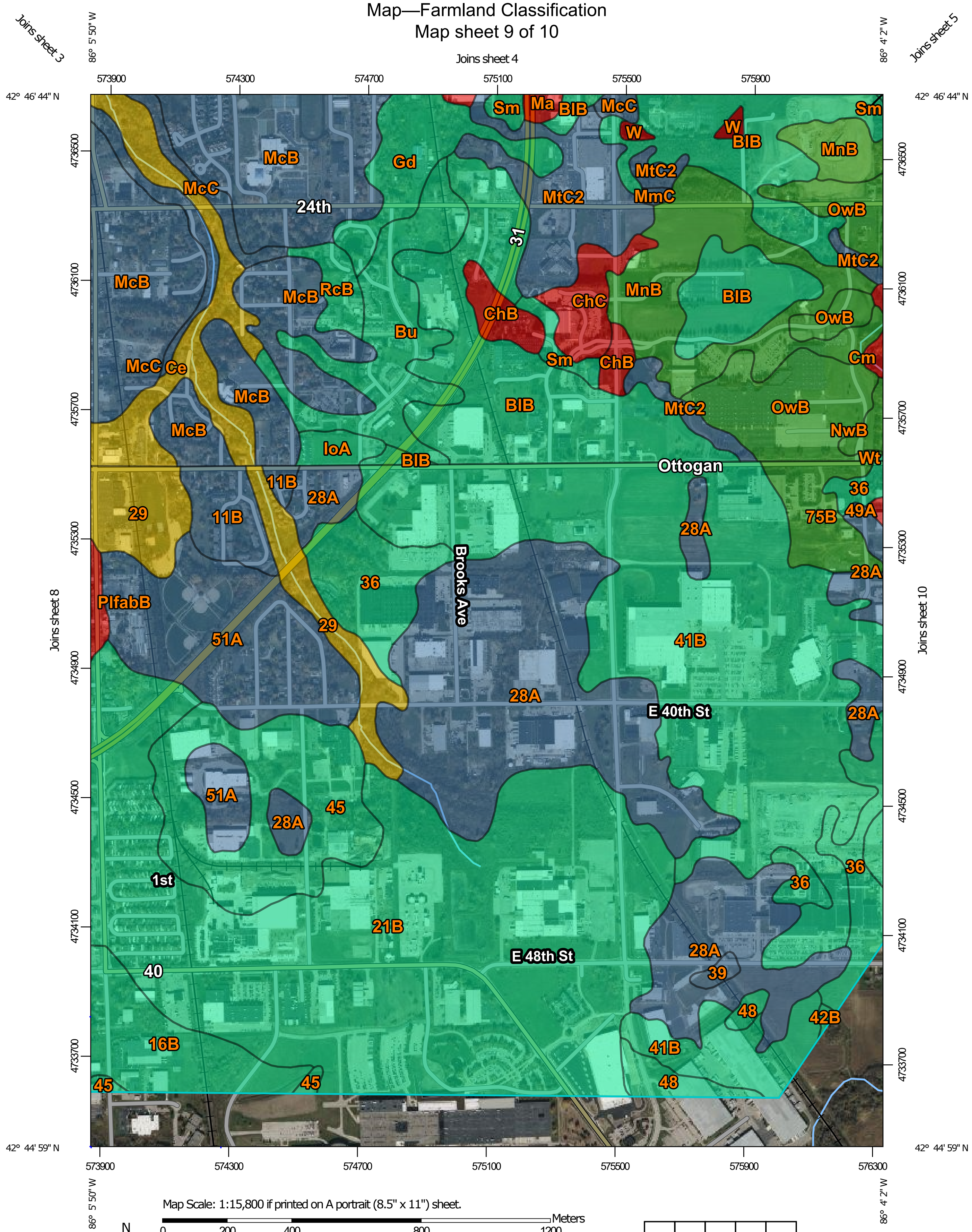
N

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



Map Sheet Location

Map—Farmland Classification
Map sheet 9 of 10



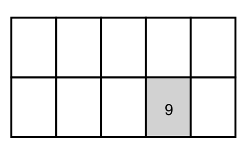
Map Scale: 1:15,800 if printed on A portrait (8.5" x 11") sheet.

Meters: 0, 200, 400, 800, 1200

Feet: 0, 500, 1000, 2000, 3000

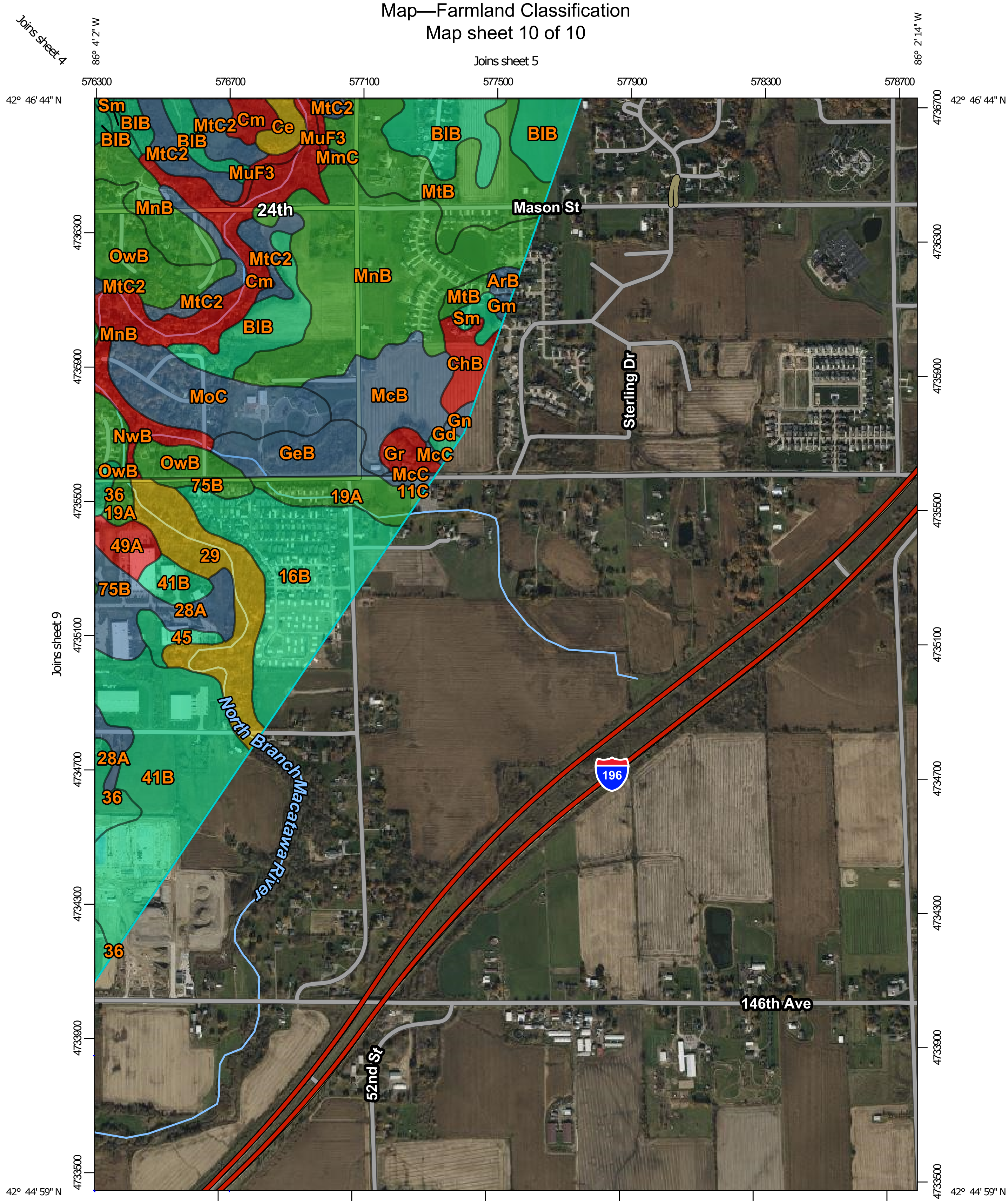
N

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

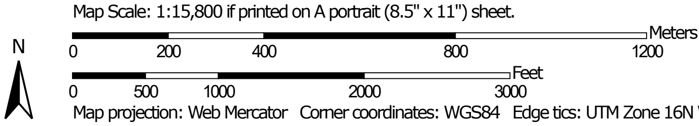


Map Sheet Location

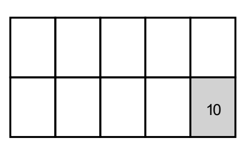
Map—Farmland Classification



Map Scale: 1:15,800 if printed on A portrait (8.5" x 11") sheet.



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



Map Sheet Location

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

Soil Rating Polygons

- Not prime farmland
- All areas are prime farmland
- Prime farmland if drained
- Prime farmland if protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated
- Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated and drained
- Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if subsoiled, completely removing the root inhibiting soil layer
- Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
- Prime farmland if irrigated and reclaimed of excess salts and sodium
- Farmland of statewide importance
- Farmland of statewide importance, if drained
- Farmland of statewide importance, if protected from flooding or not frequently flooded during the growing season
- Farmland of statewide importance, if irrigated
- Farmland of statewide importance, if drained and either protected from flooding or not frequently flooded during the growing season
- Farmland of statewide importance, if irrigated and drained
- Farmland of statewide importance, if irrigated and either protected from flooding or not frequently flooded during the growing season
- Farmland of statewide importance, if subsoiled, completely removing the root inhibiting soil layer
- Farmland of statewide importance, if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
- Farmland of statewide importance, if irrigated and reclaimed of excess salts and sodium
- Farmland of statewide importance, if drained or either protected from flooding or not frequently flooded during the growing season
- Farmland of statewide importance, if warm enough, and either drained or either protected from flooding or not frequently flooded during the growing season
- Farmland of statewide importance, if warm enough
- Farmland of statewide importance, if thawed
- Farmland of local importance
- Farmland of local importance, if irrigated
- Farmland of unique importance
- Not rated or not available

Soil Rating Lines

- Not prime farmland
- All areas are prime farmland
- Prime farmland if drained
- Prime farmland if protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated
- Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated and drained
- Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season

Prime farmland if subsoiled, completely removing the root inhibiting soil layer

Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60

Prime farmland if irrigated and reclaimed of excess salts and sodium

Farmland of statewide importance

Farmland of statewide importance, if drained

Farmland of statewide importance, if protected from flooding or not frequently flooded during the growing season

Farmland of statewide importance, if irrigated

Farmland of statewide importance, if drained and either protected from flooding or not frequently flooded during the growing season

Farmland of statewide importance, if irrigated and drained

Farmland of statewide importance, if irrigated and either protected from flooding or not frequently flooded during the growing season

Farmland of statewide importance, if subsoiled, completely removing the root inhibiting soil layer

Farmland of statewide importance, if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60

Farmland of statewide importance, if irrigated and reclaimed of excess salts and sodium

Farmland of statewide importance, if drained or either protected from flooding or not frequently flooded during the growing season

Farmland of statewide importance, if warm enough, and either drained or either protected from flooding or not frequently flooded during the growing season

Farmland of statewide importance, if warm enough

Farmland of statewide importance, if thawed

Farmland of local importance

Farmland of local importance, if irrigated

Farmland of unique importance

Not rated or not available

Soil Rating Points

Not prime farmland

All areas are prime farmland

Prime farmland if drained

Prime farmland if protected from flooding or not frequently flooded during the growing season

Prime farmland if irrigated

Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season

Prime farmland if irrigated and drained

Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season

Prime farmland if subsoiled, completely removing the root inhibiting soil layer

Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60

Prime farmland if irrigated and reclaimed of excess salts and sodium

Farmland of statewide importance

Farmland of statewide importance, if drained

Farmland of statewide importance, if protected from flooding or not frequently flooded during the growing season

Farmland of statewide importance, if irrigated

- Farmland of statewide importance, if drained and either protected from flooding or not frequently flooded during the growing season
- Farmland of statewide importance, if irrigated and drained
- Farmland of statewide importance, if irrigated and either protected from flooding or not frequently flooded during the growing season
- Farmland of statewide importance, if subsoiled, completely removing the root inhibiting soil layer
- Farmland of statewide importance, if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
- Farmland of statewide importance, if irrigated and reclaimed of excess salts and sodium
- Farmland of statewide importance, if drained or either protected from flooding or not frequently flooded during the growing season
- Farmland of statewide importance, if warm enough, and either drained or either protected from flooding or not frequently flooded during the growing season
- Farmland of statewide importance, if warm enough
- Farmland of statewide importance, if thawed
- Farmland of local importance
- Farmland of local importance, if irrigated
- Farmland of unique importance
- Not rated or not available

Water Features

- Streams and Canals

Transportation

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

Background

- Aerial Photography

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

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

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
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: Allegan County, Michigan
Survey Area Data: Version 20, Aug 24, 2022

Soil Survey Area: Ottawa County, Michigan
Survey Area Data: Version 17, Aug 29, 2022

Your area of interest (AOI) includes more than one soil survey area. These survey areas may have been mapped at different scales, with a different land use in mind, at different times, or at different levels of detail. This may result in map unit symbols, soil properties, and interpretations that do not completely agree across soil survey area boundaries.

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

Date(s) aerial images were photographed: Oct 4, 2022—Oct 28, 2022

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.

Table—Farmland Classification

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
2	Glendora loamy sand	Not prime farmland	32.0	0.2%
11B	Oshtemo-Chelsea complex, 0 to 6 percent slopes	Farmland of local importance	18.8	0.1%
11C	Oshtemo-Chelsea complex, 6 to 12 percent slopes	Farmland of local importance	1.2	0.0%
12B	Ockley loam, 1 to 6 percent slopes	All areas are prime farmland	38.0	0.2%
16B	Capac loam, Lake Michigan lobe, 0 to 4 percent slopes	Prime farmland if drained	1,103.6	7.0%
17	Brookston loam, 0 to 2 percent slopes	Prime farmland if drained	148.3	0.9%
18	Pits	Not prime farmland	1.8	0.0%
19A	Brady sandy loam, 0 to 3 percent slopes	All areas are prime farmland	49.8	0.3%
21B	Capac-Wixom complex, 1 to 4 percent slopes	Prime farmland if drained	486.8	3.1%
26A	Pipestone sand, 0 to 4 percent slopes	Not prime farmland	41.8	0.3%
28A	Rimer loamy sand, 0 to 4 percent slopes	Farmland of local importance	550.8	3.5%
29	Cohoctah silt loam	Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season	72.7	0.5%
34	Aquents, sandy and loamy	Not prime farmland	3.7	0.0%
36	Corunna sandy loam	Prime farmland if drained	62.3	0.4%
39	Granby loamy sand, lake plain, 0 to 2 percent slopes	Farmland of local importance	77.2	0.5%
41B	Blount silt loam, 1 to 4 percent slopes	Prime farmland if drained	331.3	2.1%
42B	Metamora sandy loam, 1 to 4 percent slopes	Prime farmland if drained	53.8	0.3%
45	Pewamo silt loam	Prime farmland if drained	77.8	0.5%
48	Belleville loamy sand	Prime farmland if drained	43.3	0.3%
49A	Tedrow fine sand, 0 to 4 percent slopes	Not prime farmland	6.4	0.0%
51A	Thetford loamy fine sand, 0 to 4 percent slopes	Farmland of local importance	85.3	0.5%

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
57A	Covert sand, 0 to 4 percent slopes	Not prime farmland	5.4	0.0%
64	Belleville-Brookston complex	Prime farmland if drained	88.8	0.6%
66	Udipsamments, nearly level to gently sloping	Not prime farmland	8.8	0.1%
69	Newton mucky fine sand	Not prime farmland	30.3	0.2%
70A	Morocco fine sand, 0 to 3 percent slopes	Not prime farmland	126.6	0.8%
75B	Capac-Marlette loams, 1 to 6 percent slopes	All areas are prime farmland	21.8	0.1%
CovabB	Covert-Pipestone sands, 0 to 6 percent slopes	Not prime farmland	0.7	0.0%
PlfabB	Plainfield sand, lake plain, 0 to 6 percent slopes	Not prime farmland	903.0	5.7%
PlfabD	Plainfield sand, lake plain, 6 to 18 percent slopes	Not prime farmland	6.5	0.0%
PlfabE	Plainfield sand, high ecological site, 18 to 30 percent slopes	Not prime farmland	0.7	0.0%
W	Water	Not prime farmland	5.6	0.0%
Subtotals for Soil Survey Area			**4,484.8**	**28.6%**
Totals for Area of Interest			**15,706.9**	**100.0%**

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
AdraeA	Adrian muck, lake moderated, 0 to 1 percent slopes	Farmland of local importance	27.4	0.2%
AlA	Allendale sandy loam, 0 to 4 percent slopes	Farmland of local importance	49.5	0.3%
AmB	Au Gres loamy sand, 0 to 6 percent slopes	Farmland of local importance	167.3	1.1%
ArB	Au Gres loamy sand, loamy substratum, 0 to 6 percent slopes	Farmland of local importance	1.6	0.0%
BlA	Blount loam, 0 to 2 percent slopes	Prime farmland if drained	10.0	0.1%
BlB	Blount loam, 2 to 6 percent slopes	Prime farmland if drained	651.8	4.1%
Bu	Breckenridge sandy loam	Prime farmland if drained	107.2	0.7%
Bv	Brevort sandy loam	Farmland of local importance	18.9	0.1%

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
Ce	Ceresco loam	Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season	84.7	0.5%
ChB	Coloma loamy sand, 0 to 6 percent slopes	Not prime farmland	19.6	0.1%
ChC	Coloma loamy sand, 6 to 12 percent slopes	Not prime farmland	14.4	0.1%
Cm	Cohoctah loam	Not prime farmland	276.0	1.8%
CovabB	Covert-Pipestone sands, 0 to 6 percent slopes	Not prime farmland	378.7	2.4%
CrB	Croswell sand, 0 to 6 percent slopes	Not prime farmland	1,038.6	6.6%
Gd	Gilford sandy loam, 0 to 2 percent slopes, gravelly subsoil	Prime farmland if drained	284.1	1.8%
GeA	Gladwin sandy loam, 0 to 2 percent slopes	Farmland of local importance	235.2	1.5%
GeB	Gladwin sandy loam, 2 to 6 percent slopes	Farmland of local importance	162.1	1.0%
Gl	Glendora sandy loam	Not prime farmland	11.2	0.1%
Gm	Granby loamy sand, lake plain, 0 to 2 percent slopes	Farmland of local importance	530.3	3.4%
Gn	Granby fine sandy loam, lake plain, 0 to 2 percent slopes	Farmland of local importance	51.9	0.3%
Gr	Gravel pits	Not prime farmland	6.8	0.0%
HgtafA	Houghton-Adrian mucks, lake moderated, 0 to 1 percent slopes	Farmland of local importance	106.5	0.7%
IoA	Iosco loamy sand, 0 to 4 percent slopes	Prime farmland if drained	39.4	0.3%
KaC	Kalkaska sand, 0 to 12 percent slopes	Not prime farmland	11.8	0.1%
KnA	Kawkawlin loam, 0 to 2 percent slopes	Prime farmland if drained	19.2	0.1%
KnB	Kawkawlin loam, 2 to 6 percent slopes	All areas are prime farmland	8.8	0.1%
La	Lacota silt loam	Prime farmland if drained	26.8	0.2%
Ls	Linwood muck	Farmland of local importance	9.5	0.1%
Ma	Made land	Not prime farmland	141.7	0.9%
MaraaB	Marlette-Capac-Thetford complex, 2 to 6 percent slopes	Farmland of local importance	2.1	0.0%
McA	Mancelona loamy sand, 0 to 2 percent slopes	Farmland of local importance	154.3	1.0%

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
McB	Mancelona loamy sand, 2 to 6 percent slopes	Farmland of local importance	775.4	4.9%
McC	Mancelona loamy sand, 6 to 12 percent slopes	Farmland of local importance	49.8	0.3%
Me	Marsh	Not prime farmland	318.0	2.0%
MmB	Menominee loamy sand, 2 to 6 percent slopes	All areas are prime farmland	29.3	0.2%
MmC	Menominee loamy sand, 6 to 12 percent slopes	Farmland of local importance	1.6	0.0%
MnA	Metamora sandy loam, 0 to 2 percent slopes	All areas are prime farmland	79.4	0.5%
MnB	Metamora sandy loam, 2 to 6 percent slopes	All areas are prime farmland	210.6	1.3%
MoB	Wawasee loam, 2 to 6 percent slopes	All areas are prime farmland	1.5	0.0%
MoC	Wawasee loam, 6 to 12 percent slopes	Farmland of local importance	32.5	0.2%
MtB	Morley loam, 2 to 6 percent slopes	All areas are prime farmland	139.9	0.9%
MtC2	Morley loam, 6 to 12 percent slopes, eroded	Farmland of local importance	121.5	0.8%
MtE2	Morley loam, 18 to 25 percent slopes, eroded	Not prime farmland	6.7	0.0%
MuF3	Morley clay loam, 25 to 45 percent slopes, severely eroded	Not prime farmland	60.4	0.4%
NeC	Onekama loam, Lake Michigan Lobe, 6 to 12 percent slopes	Farmland of local importance	4.5	0.0%
NwB	Newaygo sandy loam, 0 to 6 percent slopes	All areas are prime farmland	7.9	0.1%
OwB	Owosso sandy loam, 2 to 6 percent slopes	All areas are prime farmland	105.8	0.7%
PlfabB	Plainfield sand, lake plain, 0 to 6 percent slopes	Not prime farmland	2,568.1	16.3%
PlfabD	Plainfield sand, lake plain, 6 to 18 percent slopes	Not prime farmland	371.5	2.4%
PlfabE	Plainfield sand, high ecological site, 18 to 30 percent slopes	Not prime farmland	5.4	0.0%
PlfabF	Plainfield sand, high ecological site, 30 to 50 percent slopes	Not prime farmland	16.3	0.1%
PpsaaA	Pipestone-Covert-Saugatuck sands, 0 to 3 percent slopes	Not prime farmland	29.1	0.2%
RcA	Richter sandy loam, 0 to 2 percent slopes	Prime farmland if drained	41.1	0.3%

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
RcB	Richter sandy loam, 2 to 6 percent slopes	Prime farmland if drained	8.7	0.1%
Sh	Shoals loam	Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season	9.6	0.1%
Sl	Sewage lagoons	Not prime farmland	18.4	0.1%
Sm	Sims loam	Prime farmland if drained	27.5	0.2%
Sn	Sloan loam	Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season	58.9	0.4%
TknabD	Tekenink-Spinks loamy sands, 12 to 18 percent slopes	Not prime farmland	21.3	0.1%
To	Tonkey sandy loam	Prime farmland if drained	2.7	0.0%
W	Water	Not prime farmland	1,443.5	9.2%
Wt	Washtenaw loam	Prime farmland if drained	0.8	0.0%
WuC	Wind eroded land, sloping	Not prime farmland	4.0	0.0%
Subtotals for Soil Survey Area			**11,218.9**	**71.4%**
Totals for Area of Interest			**15,706.9**	**100.0%**

Rating Options—Farmland Classification

Aggregation Method: No Aggregation Necessary

Tie-break Rule: Lower

References

American Association of State Highway and Transportation Officials (AASHTO). 2004. Standard specifications for transportation materials and methods of sampling and testing. 24th edition.

American Society for Testing and Materials (ASTM). 2005. Standard classification of soils for engineering purposes. ASTM Standard D2487-00.

Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. Classification of wetlands and deep-water habitats of the United States. U.S. Fish and Wildlife Service FWS/OBS-79/31.

Federal Register. July 13, 1994. Changes in hydric soils of the United States.

Federal Register. September 18, 2002. Hydric soils of the United States.

Hurt, G.W., and L.M. Vasilas, editors. Version 6.0, 2006. Field indicators of hydric soils in the United States.

National Research Council. 1995. Wetlands: Characteristics and boundaries.

Soil Survey Division Staff. 1993. Soil survey manual. Soil Conservation Service. U.S. Department of Agriculture Handbook 18. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_054262

Soil Survey Staff. 1999. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. 2nd edition. Natural Resources Conservation Service, U.S. Department of Agriculture Handbook 436. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053577

Soil Survey Staff. 2010. Keys to soil taxonomy. 11th edition. U.S. Department of Agriculture, Natural Resources Conservation Service. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053580

Tiner, R.W., Jr. 1985. Wetlands of Delaware. U.S. Fish and Wildlife Service and Delaware Department of Natural Resources and Environmental Control, Wetlands Section.

United States Army Corps of Engineers, Environmental Laboratory. 1987. Corps of Engineers wetlands delineation manual. Waterways Experiment Station Technical Report Y-87-1.

United States Department of Agriculture, Natural Resources Conservation Service. National forestry manual. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/home/?cid=nrcs142p2_053374

United States Department of Agriculture, Natural Resources Conservation Service. National range and pasture handbook. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/landuse/rangepasture/?cid=stelprdb1043084

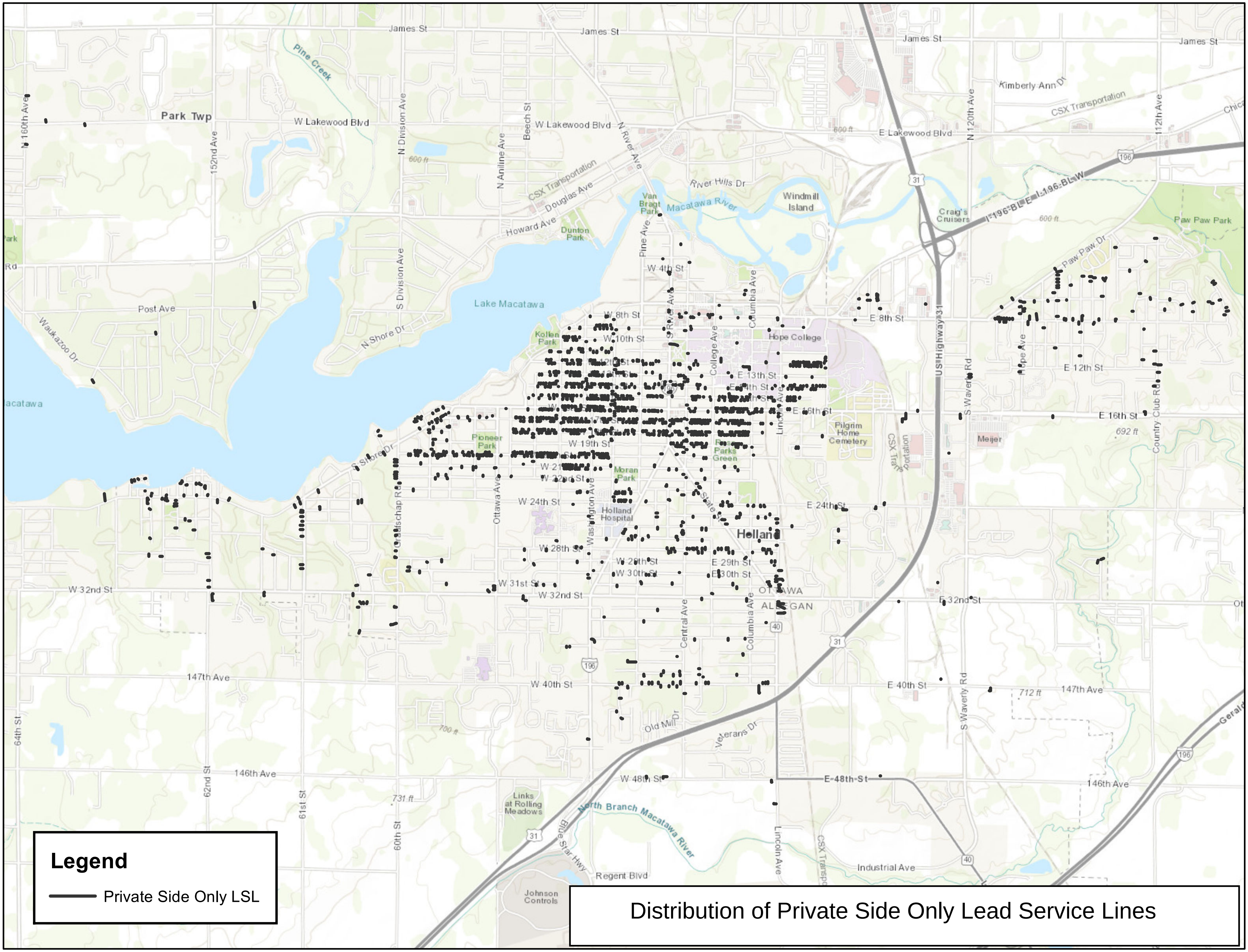
United States Department of Agriculture, Natural Resources Conservation Service. National soil survey handbook, title 430-VI. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/scientists/?cid=nrcs142p2_054242

United States Department of Agriculture, Natural Resources Conservation Service. 2006. Land resource regions and major land resource areas of the United States, the Caribbean, and the Pacific Basin. U.S. Department of Agriculture Handbook 296. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053624

United States Department of Agriculture, Soil Conservation Service. 1961. Land capability classification. U.S. Department of Agriculture Handbook 210. http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_052290.pdf

Appendix G

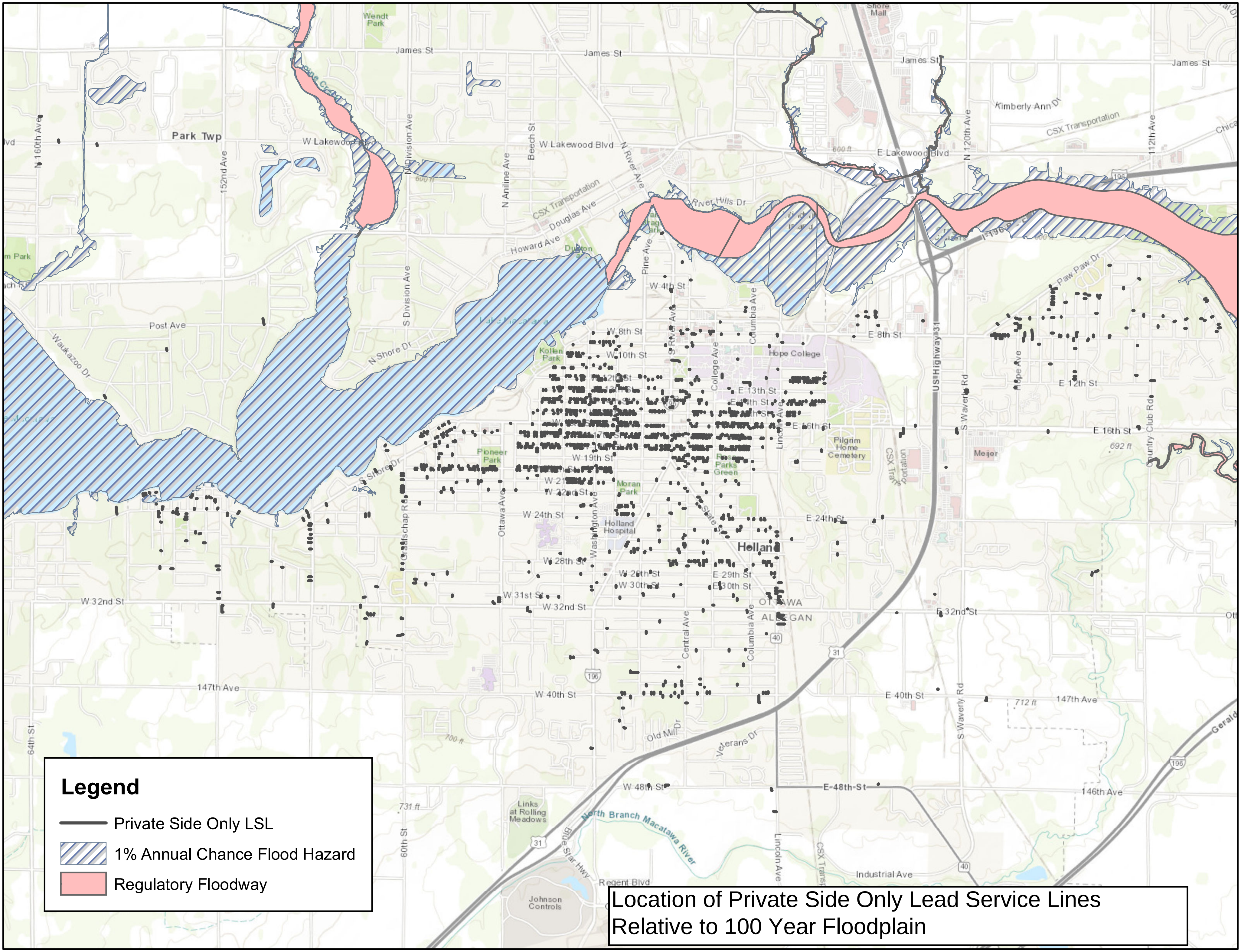
Lead Service Line Maps



Legend

Private Side Only LSL

Distribution of Private Side Only Lead Service Lines



Location of Private Side Only Lead Service Lines Relative to 100 Year Floodplain

Appendix H

Project Need Documentation

Note - PowerPoint Slides are an excerpt from a Water Utility update provided to HBPW's Board of Directors at their 1/23/23 Study Session.

Water Distribution

Lead Service Lines

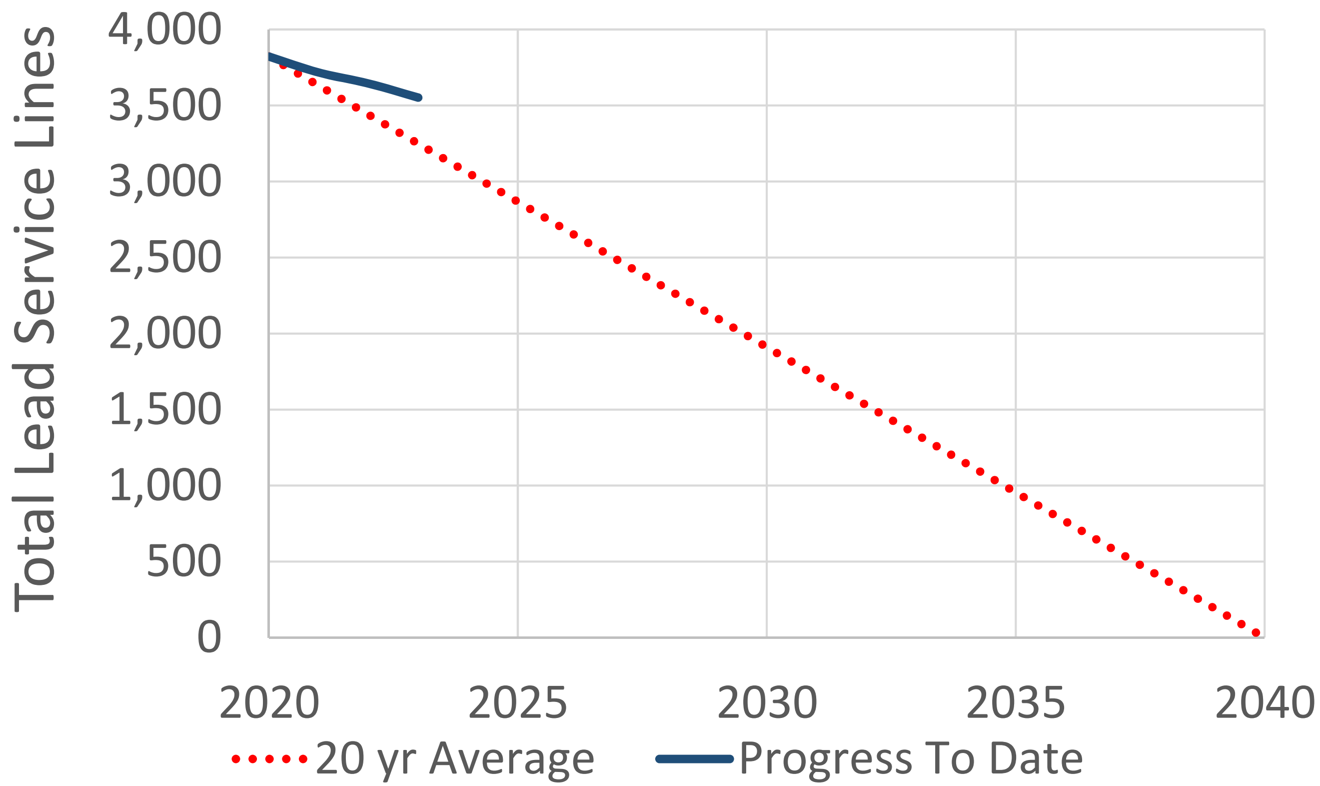
Lead Service Line Replacement

	2020	2021	2022
Private Side Replacements	9	14	0
Right of Way Replacements	6	4	1
Full Replacements	90	54	92
Total	**105**	**72**	**93**

Current LSL Inventory	
Private Side LSL	1,610
Right of Way LSL	65
Full LSL	1,877
Total	**3,552**

Lead Service Line Replacement

- Private Side Replacements
  - SRF Intent to Apply Submitted for 2024 funding cycle
  - $6M to fund all private side only replacements
- Full Service Replacements
  - Anticipate completing in parallel with main replacements



Service Replacement Costs

Holland BPW	2020	2021	2022	2023
Short Side (ROW)	$ 2,600	$ 2,300	$ 2,600	$ 2,600
Long Side (ROW)	$ 3,300	$ 3,200	$ 3,100	$ 3,800
Private Side	$ 3,000	$ 3,800	$ 3,900	$ 4,000

Supply chain concerns:

- War in Ukraine impacting manganese supply
    - Brass valves, fittings, water meter housings
- Competition for copper pipe impacting cost and availability

Nikopol Manganese Basin

Lead Service Line Expense Mitigation

- Drinking Water Revolving Fund (DWRF)
  - Low interest loan and potential for partial loan forgiveness
  - Intent to apply submitted October 2022
  - Application and project plan due June 2023
  - Notice of Award by October 2023
- HBPW Installation Crew
  - Boring equipment and operators
- Compare HBPW Crew expense against contractor proposals (with or without DWRF funding)

Distribution Main Replacement

Lead Service Line Driven Main Replacement

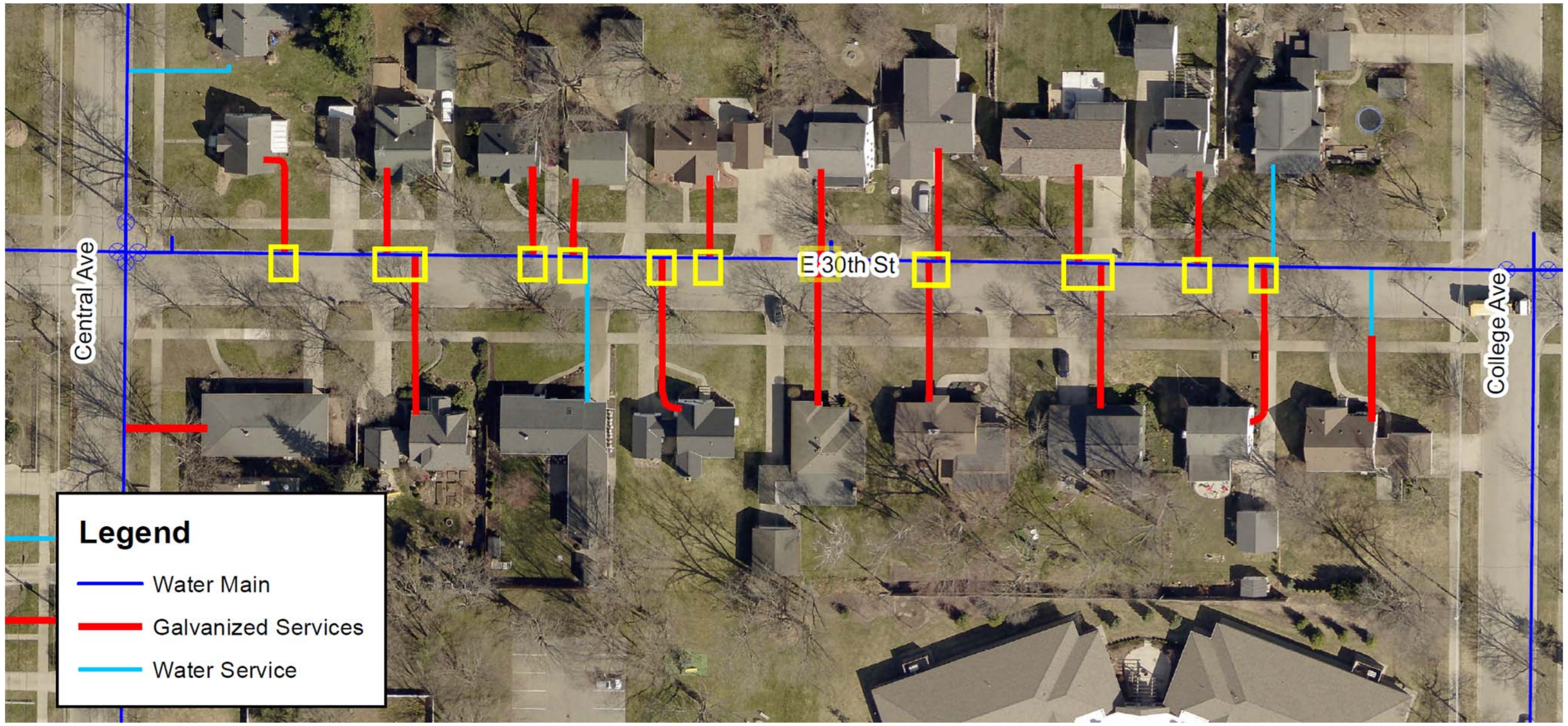
<u>30th St Example:</u>

Cost to Only Replace LSL:

- 15 LSL in ROW
- Requires mill and overlay
- Exposes ~20% of main
- Cost ~$200k

Additional cost to include water main replacement with LSL Work = ~$240k (250 $/ft)

Cost to replace water main at a later time ~$400k (410 $/ft)

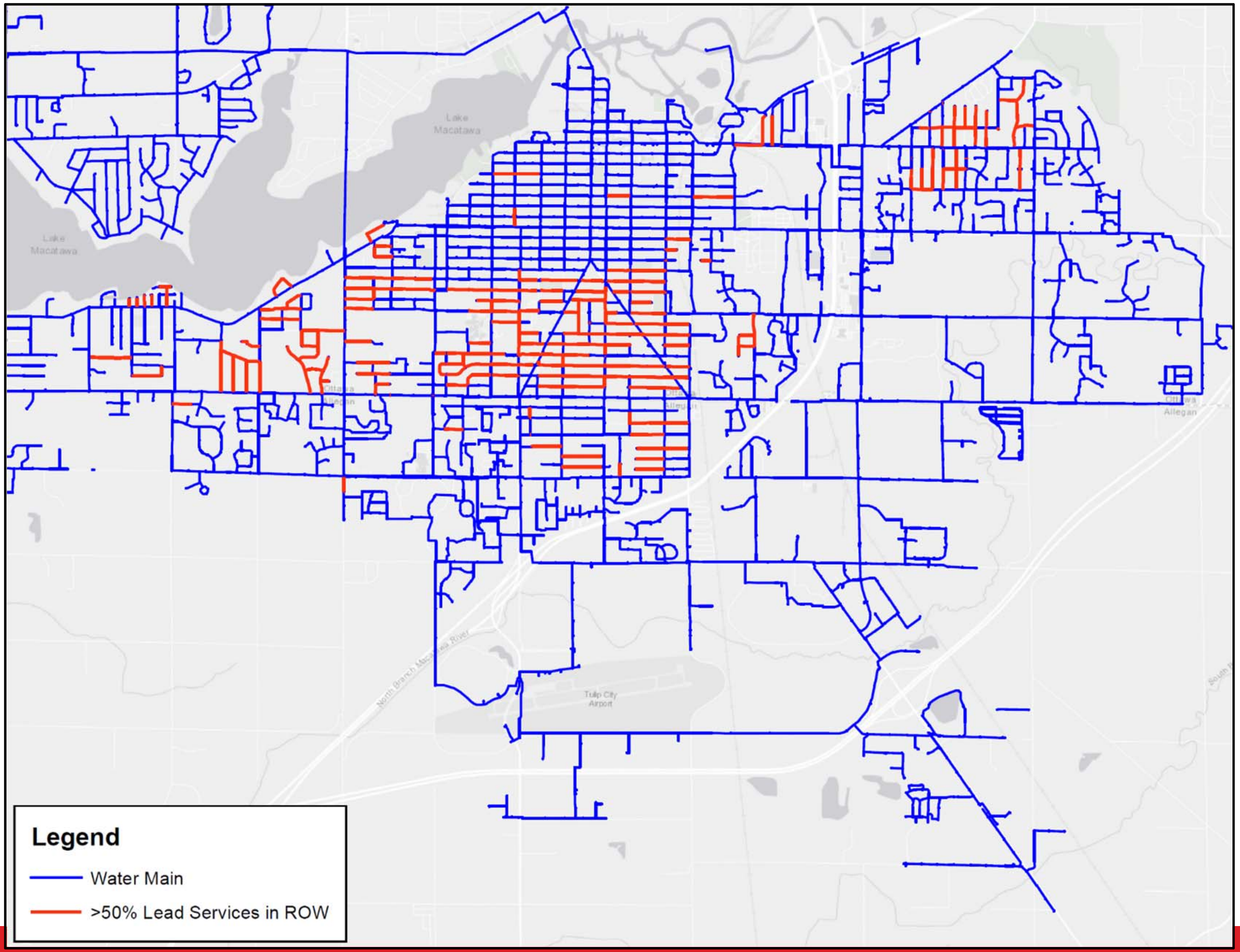


*Based on 2023 Contract Pricing

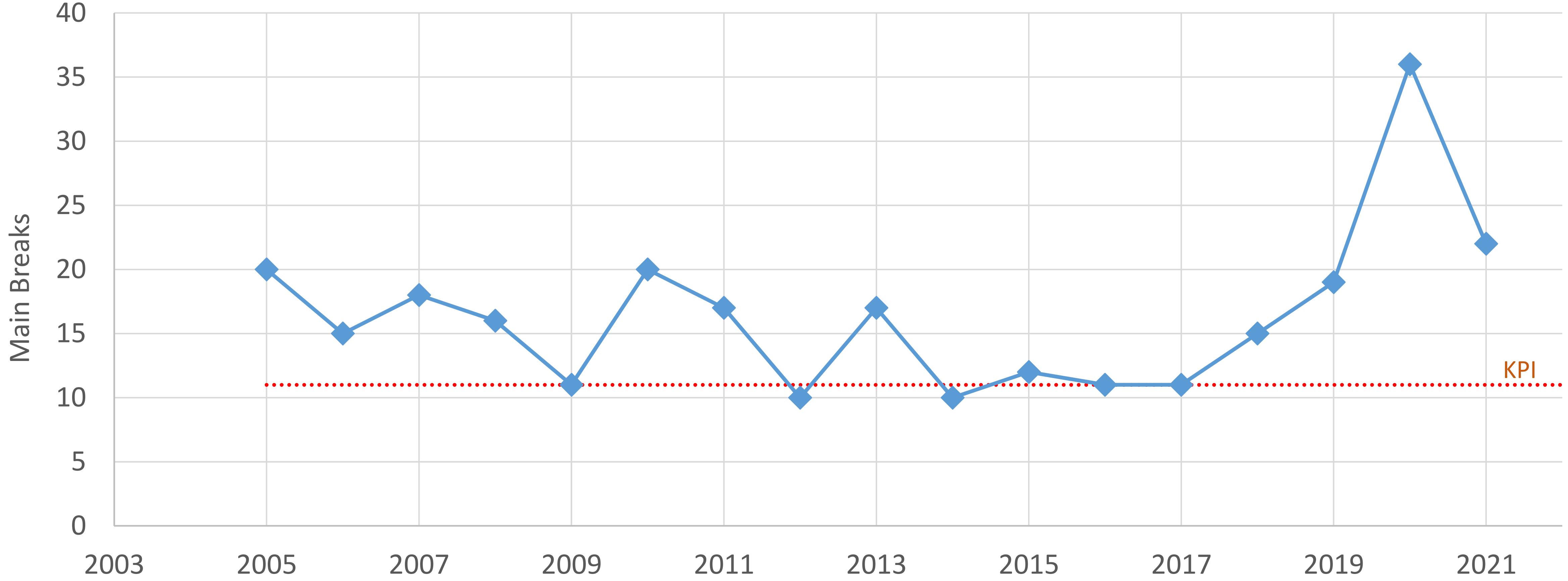
LSL Driven Main Replacement

- Main replacement where >50% of ROW services are LSL
- 28 miles of mains (147,000 ft)
- 17 years left

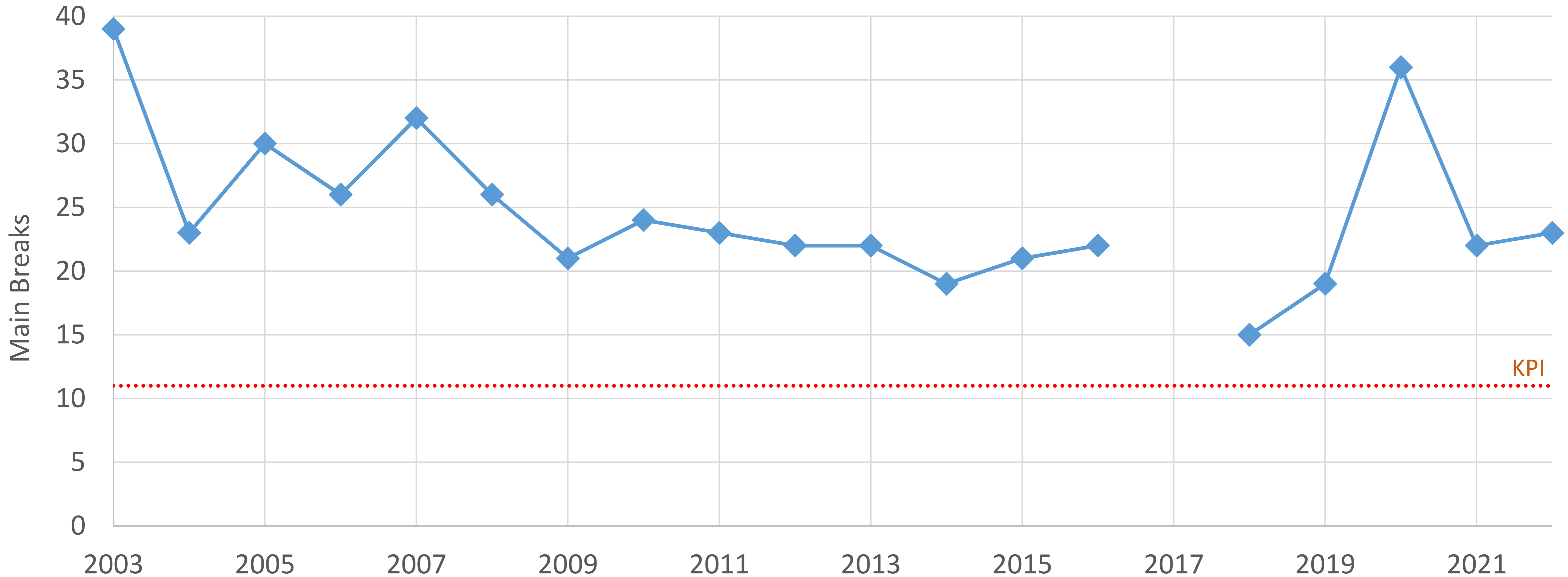
8,650 ft of replacement per year



Main Break KPI – Previously Presented (Based on GIS Data)

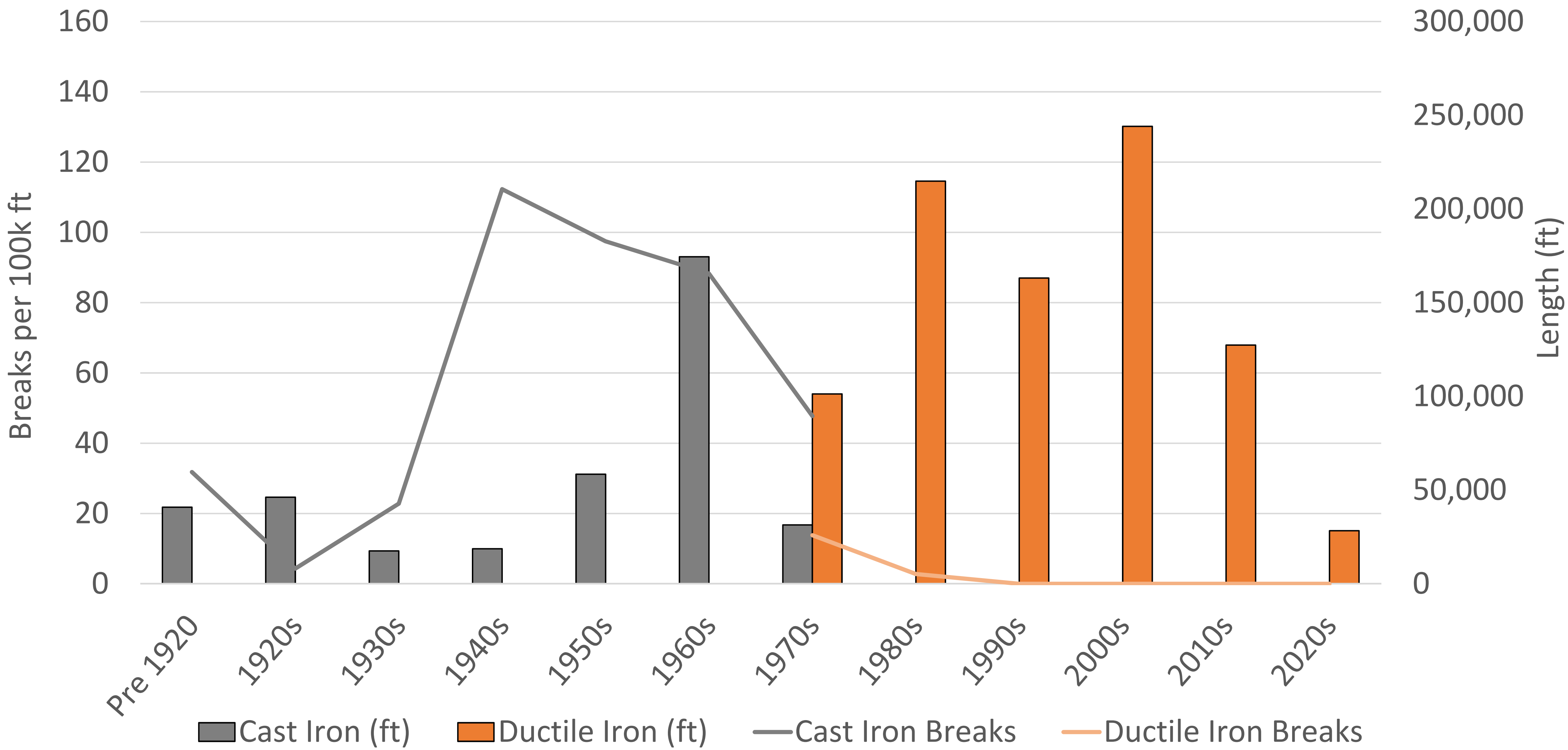


Main Break KPI – Updated using GIS and Street Cut Permits



Condition Driven Main Replacement

Decade of Pipe	Cast Iron Pipe			Ductile Iron Pipe			Plastic Pipe		
	Ft of Main	# of Breaks	Breaks per 100k ft	Ft of Main	# of Breaks	Breaks per 100k ft	Ft of Main	# of Breaks	Breaks per 100k ft
Pre 1920	40,885	13	32						
1920s	46,188	2	4						
1930s	17,528	4	23						
1940s	18,702	21	112						
1950s	58,485	57	97						
1960s	174,457	154	88						
1970s	31,426	15	48	101,324	14	14			
1980s				214,847	6	3	2,176	0	0
1990s				163,122	0	0	0	0	0
2000s				244,104	0	0	6,231	0	0
2010s				127,377	0	0	8,179	0	0
2020s				28,314	0	0	13,128	0	0
Total	**387,671**	**266**	**69**	**879,088**	**20**	**2**	**29,714**	**0**	**0**

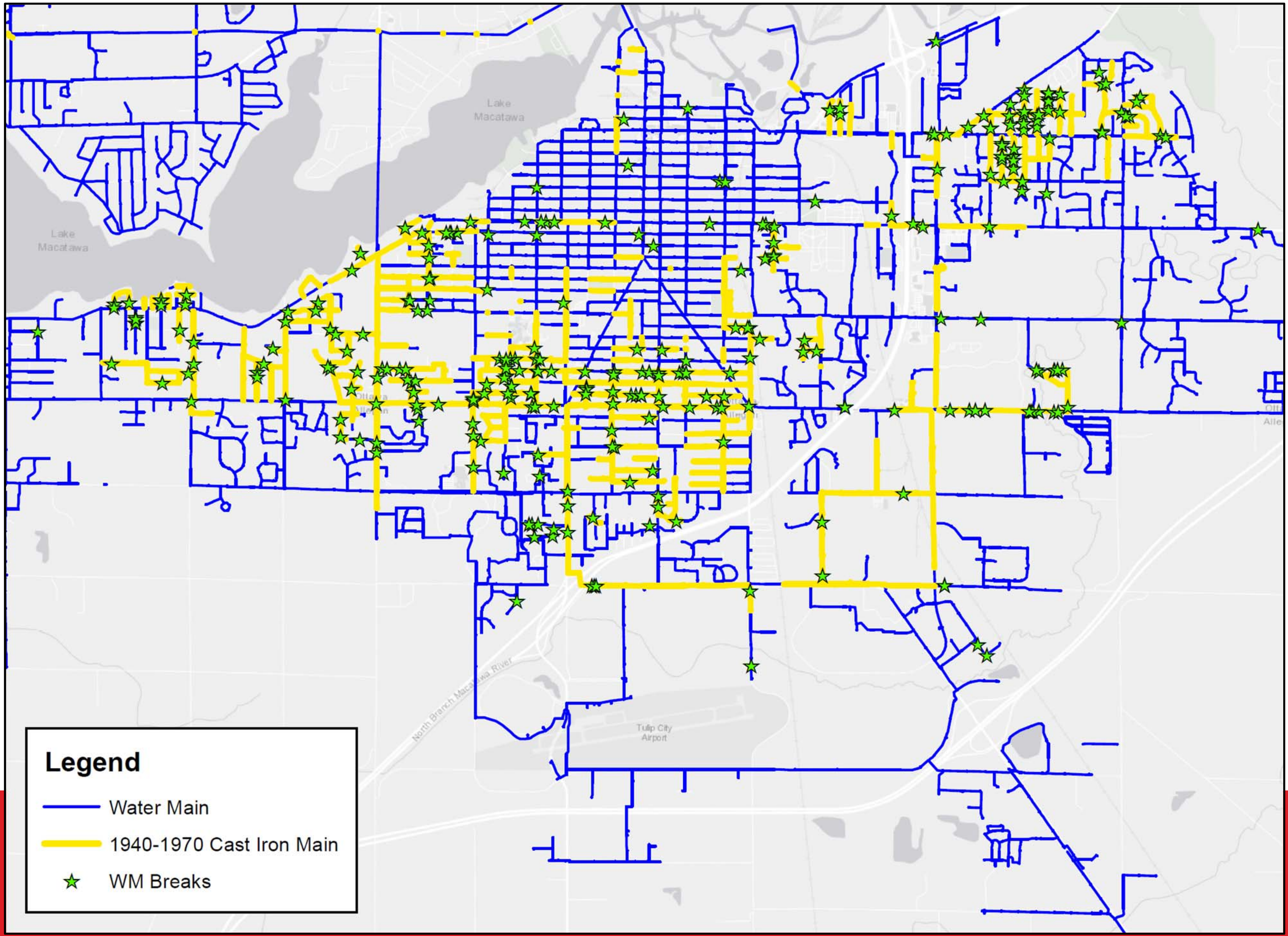


Breaks per 100k ft
Length (ft)
160
140
120
100
80
60
40
20
0
300,000
250,000
200,000
150,000
100,000
50,000
0
Pre 1920
1920s
1930s
1940s
1950s
1960s
1970s
1980s
1990s
2000s
2010s
2020s
Cast Iron (ft)
Ductile Iron (ft)
Cast Iron Breaks
Ductile Iron Breaks

Condition Driven Main Replacement

1940–1970 Cast Iron Main

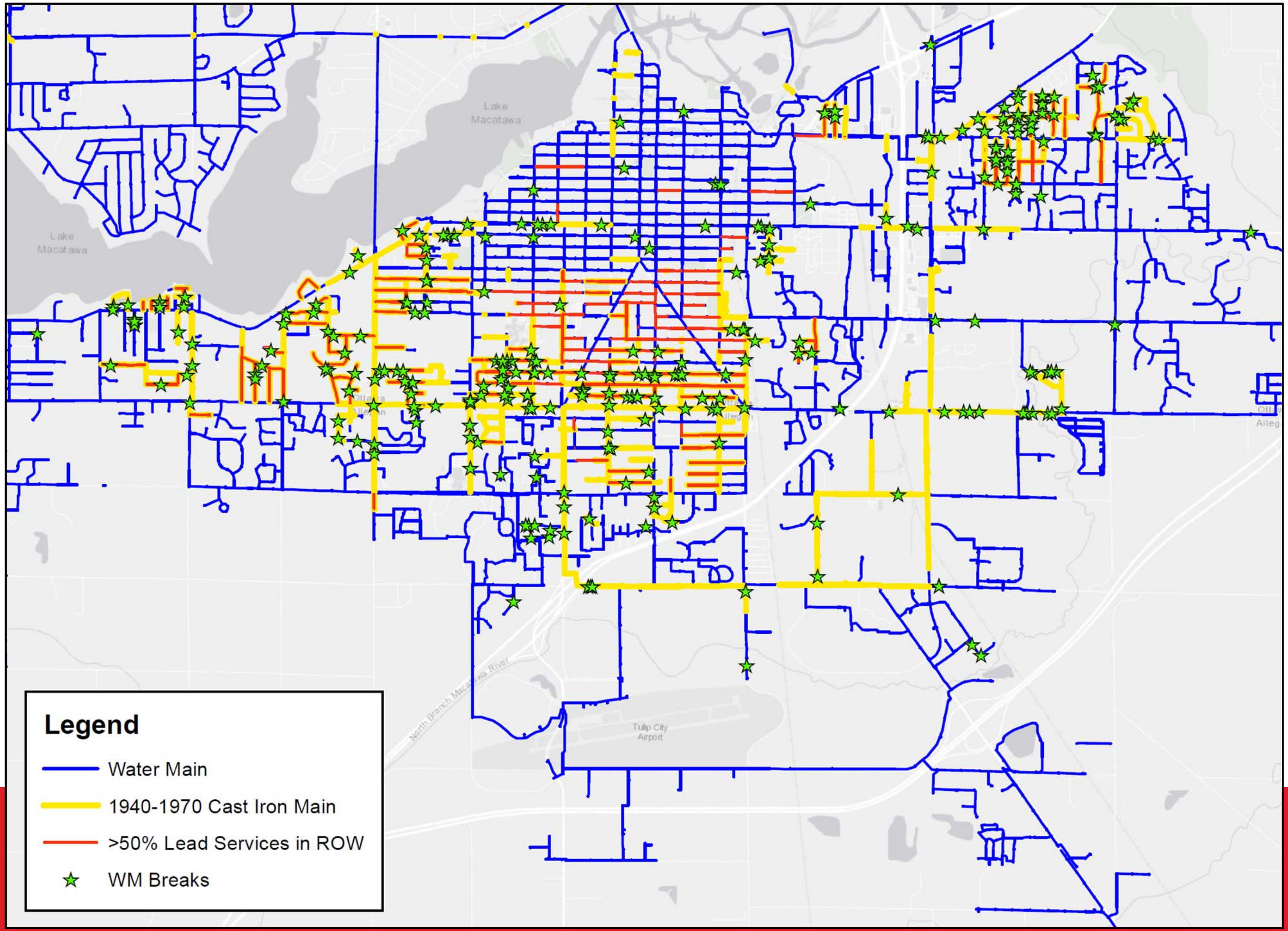
- 54 miles
- 283,000 ft



Condition Driven Main Replacement

1940–1970 Cast Iron Main

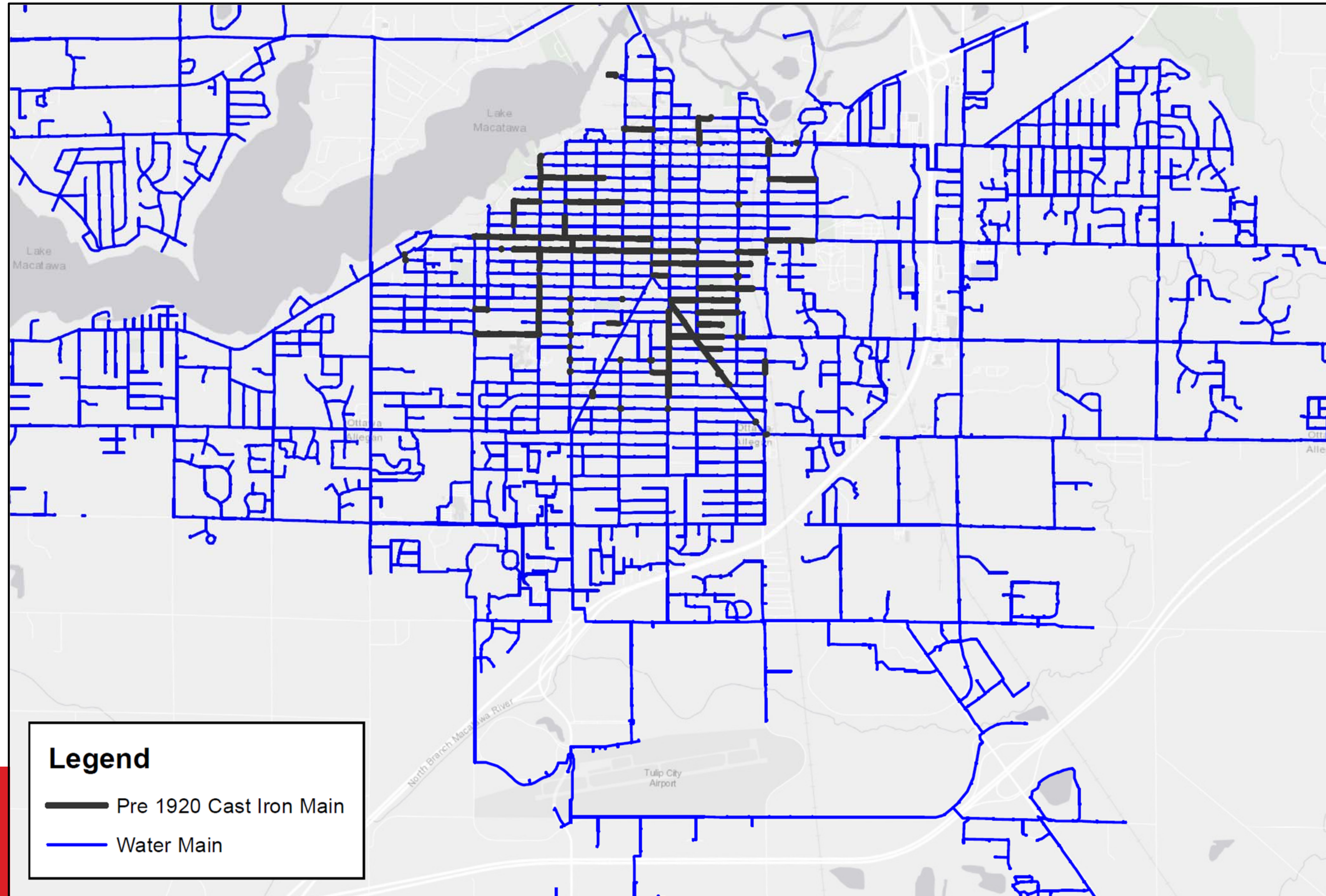
- Includes 23 miles of main with >50% LSL in ROW (121,400 ft)



End of Life Main Replacement

Historic Water Main

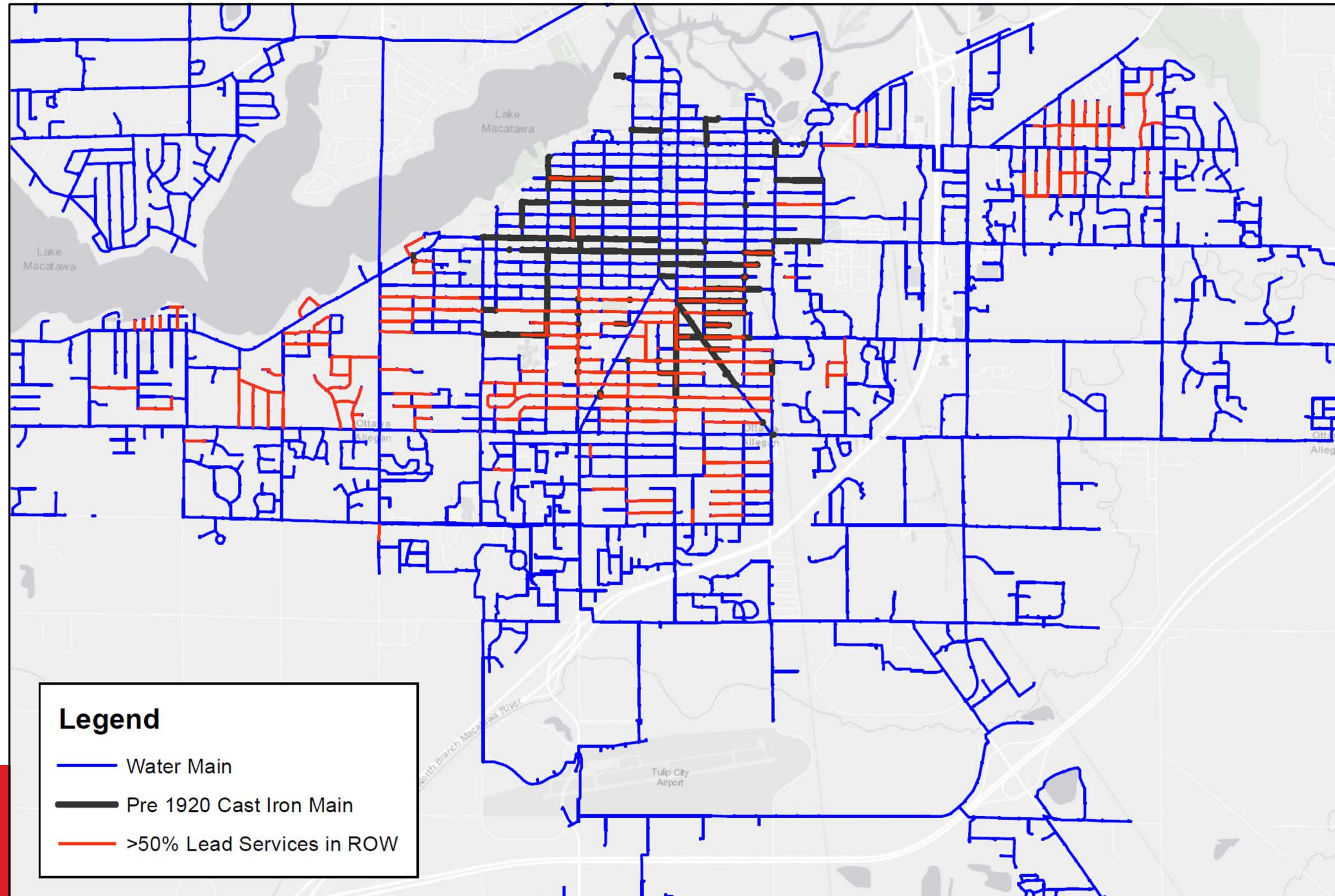
- Pre 1920 water main
- 100-130 yrs old
- 7.8 miles (41,000ft)

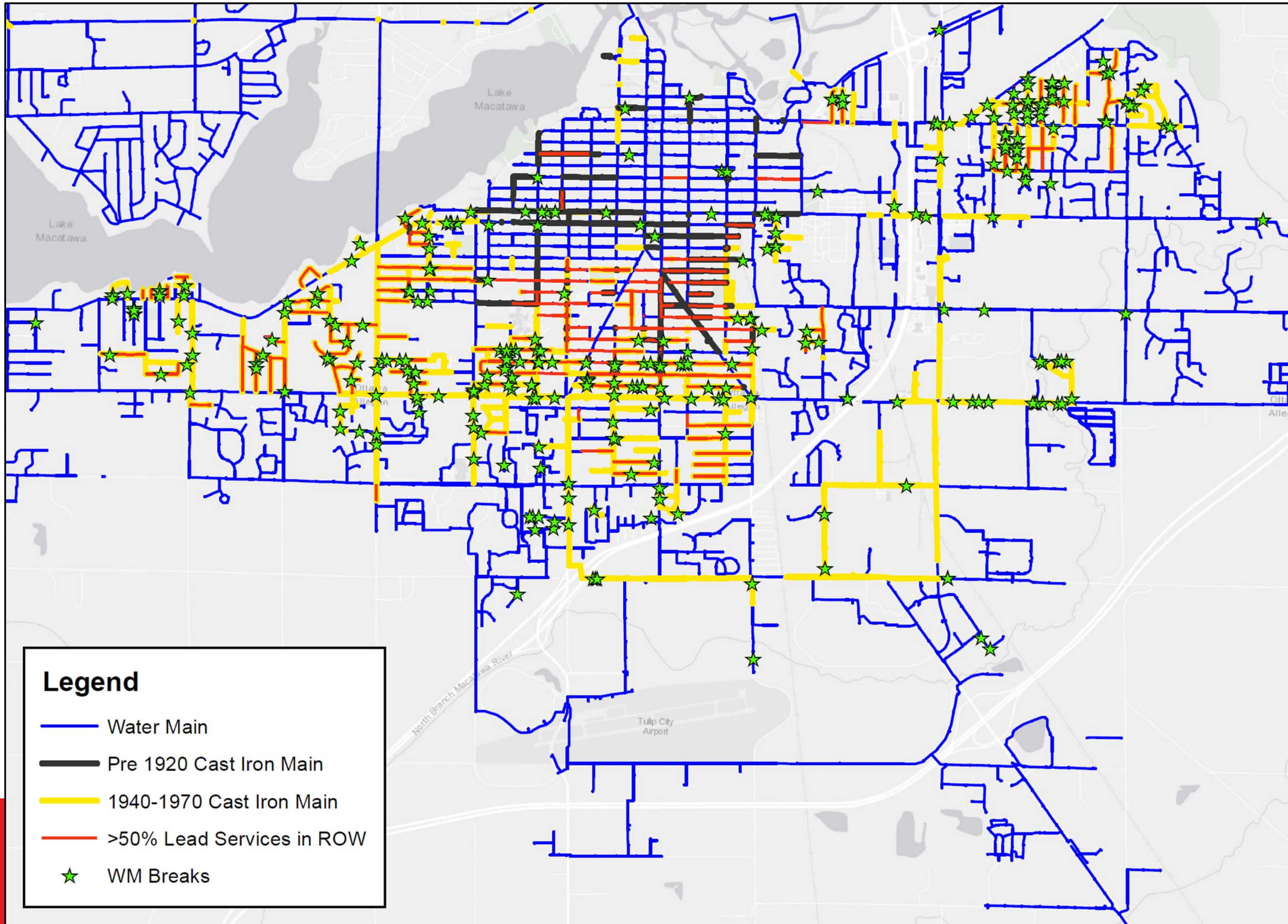


End of Life Main Replacement

Historic Water Main

- 2.8 miles of main with >50% LSL in ROW (15,100 ft)




Lake Macatawa
Lake Macatawa
North Branch Macatawa River
Tulip City Airport
Legend
Water Main
Pre 1920 Cast Iron Main
1940-1970 Cast Iron Main
>50% Lead Services in ROW
WM Breaks

Main Replacement Assumptions:

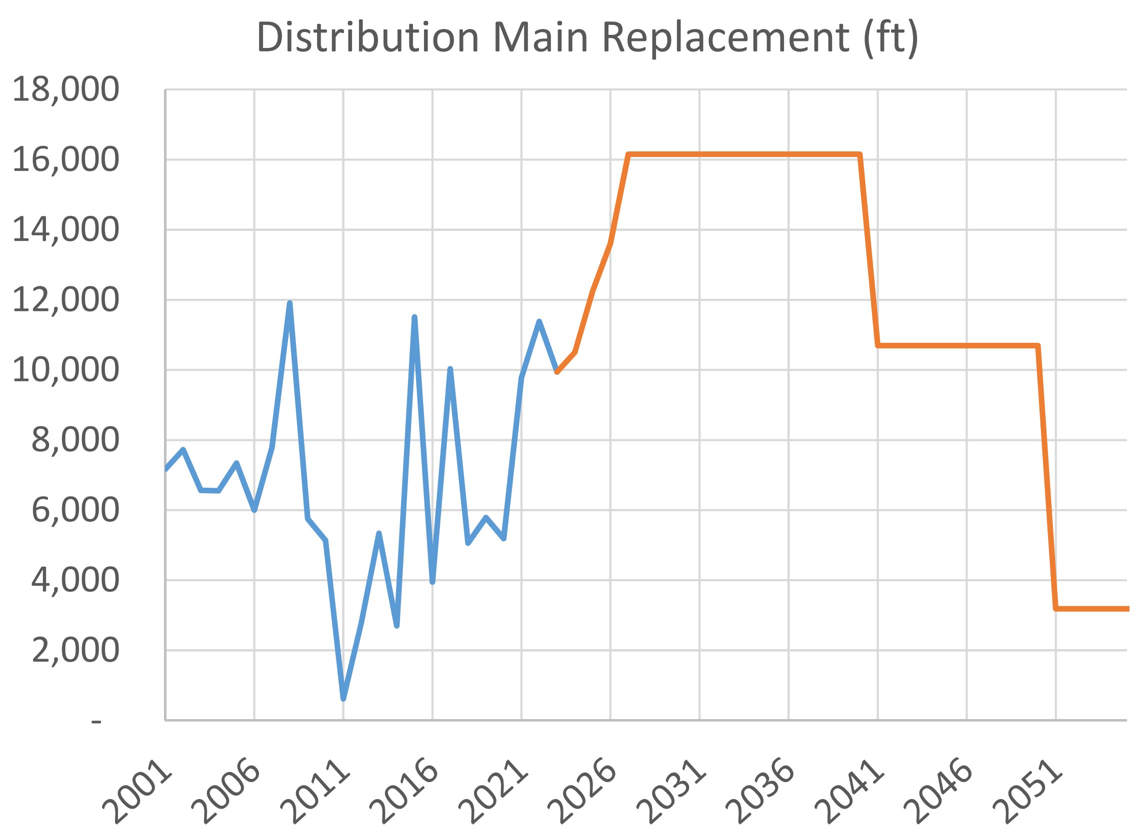
LSL Driven Main Replacement	Complete by 2040 per EGLE Requirements
Pre-1920 Main	Already at average life of ~120 years Replace in 20 years to prior to reaching 140 years
1920-1940 Main	Target 120 year life Start replacement after 2040
1940-1970 Main	Won’t reach 120 year life, Potential Scenarios: 80, 90, 100, or 110 year life

Scenario 1. 1940-1970 Pipe @ 80yr Life

	Ft	Miles	Timeline	ft / Yr
1940-1970 Cast Iron with >50% LSL	121,400	23		
Pre 1920 Cast Iron with >50% LSL	15,100	3		
Other Mains with >50% LSL	10,500	2		
Total LSL Driven Main Replacement	147,000	28	By 2040	8,647

Remaining Pre-1920 Cast Iron Main	25,900	5	By 2040 (140 year average life)	1,524
1920-1940 Cast Iron Main	63,716	12	2040-2060 (120 year average life)	3,186
Remaining 1940-1970 Cast Iron Main	161,600	31	By 2050 (80 year average Life)	5,985

Average Annual Replacement Need	**2024-2040**	**16,156**
	2040-2050	**10,695**
	2050-2060	**3,186**

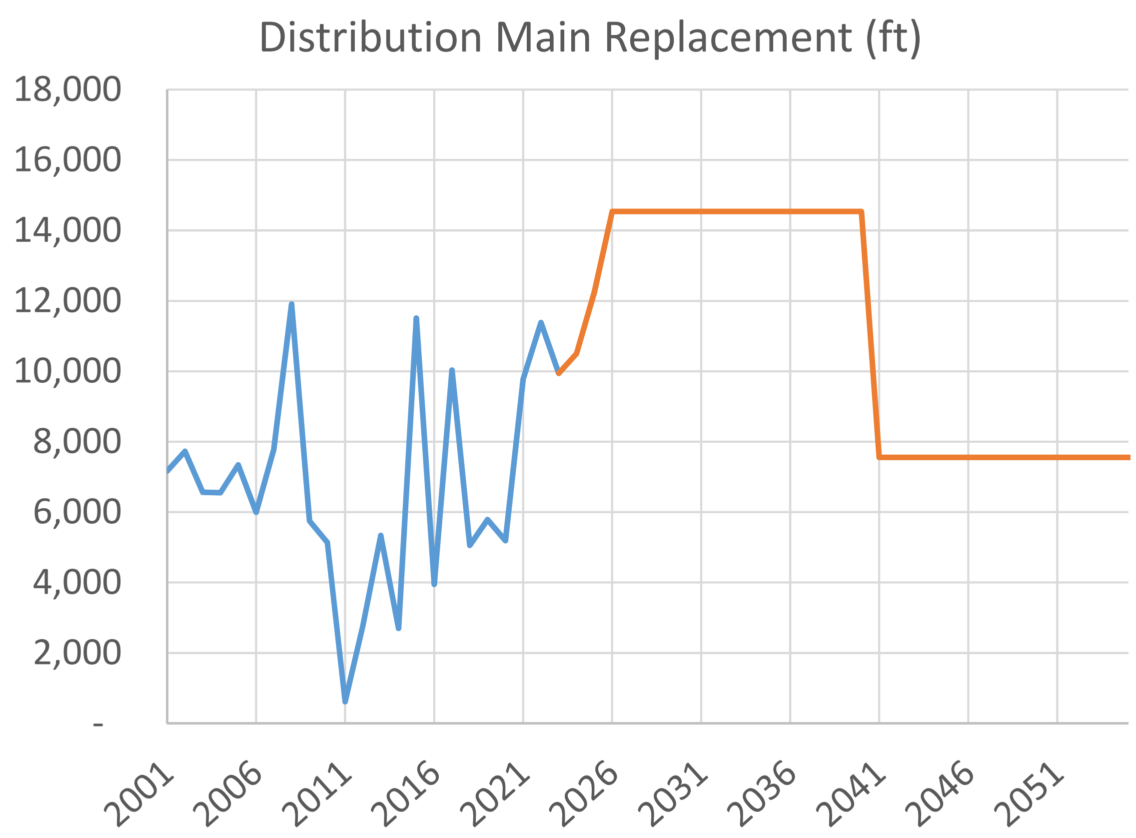


Scenario 2. 1940-1970 Pipe @ 90yr Life

	Ft	Miles	Timeline	ft / Yr
1940-1970 Cast Iron with >50% LSL	121,400	23		
Pre 1920 Mains with >50% LSL	15,100	3		
Other Mains with >50% LSL	10,500	2		
Total LSL Driven Main Replacement	147,000	28	By 2040	8,647

Remaining Pre-1920 Cast Iron Main	25,900	5	By 2040 (140 year life)	1,524
1920-1940 Cast Iron Main	63,716	12	2040-2060 (120 year life)	3,186
Remaining 1940-1970 Cast Iron Main	161,600	31	By 2060 (90 year life)	4,368

Average Annual Replacement Need	**2024-2040**	**14,538**
	2040-2060	**7,553**

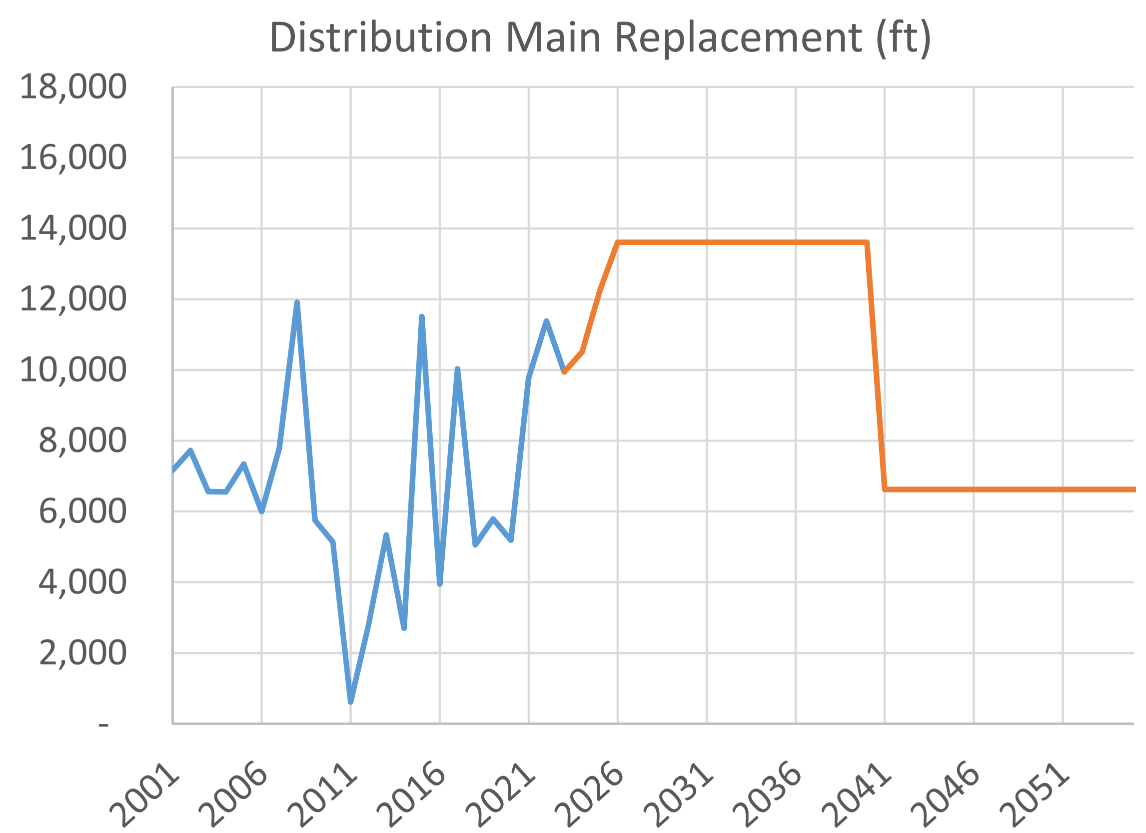


Scenario 3. 1940-1970 Pipe @ 100yr Life

	Ft	Miles	Timeline	ft / Yr
1940-1970 Cast Iron with >50% LSL	121,400	23		
Pre 1920 Mains with >50% LSL	15,100	3		
Other Mains with >50% LSL	10,500	2		
Total LSL Driven Main Replacement	147,000	28	By 2040	8,647

Remaining Pre-1920 Cast Iron Main	25,900	5	By 2040 (140 year life)	1,524
1920-1940 Cast Iron Main	63,716	12	2040-2060 (120 year life)	3,186
Remaining 1940-1970 Cast Iron Main	161,600	31	By 2070 (100 year life)	3,438

Average Annual Replacement Need	**2024-2040**	**13,609**
	2040-2060	**6,624**

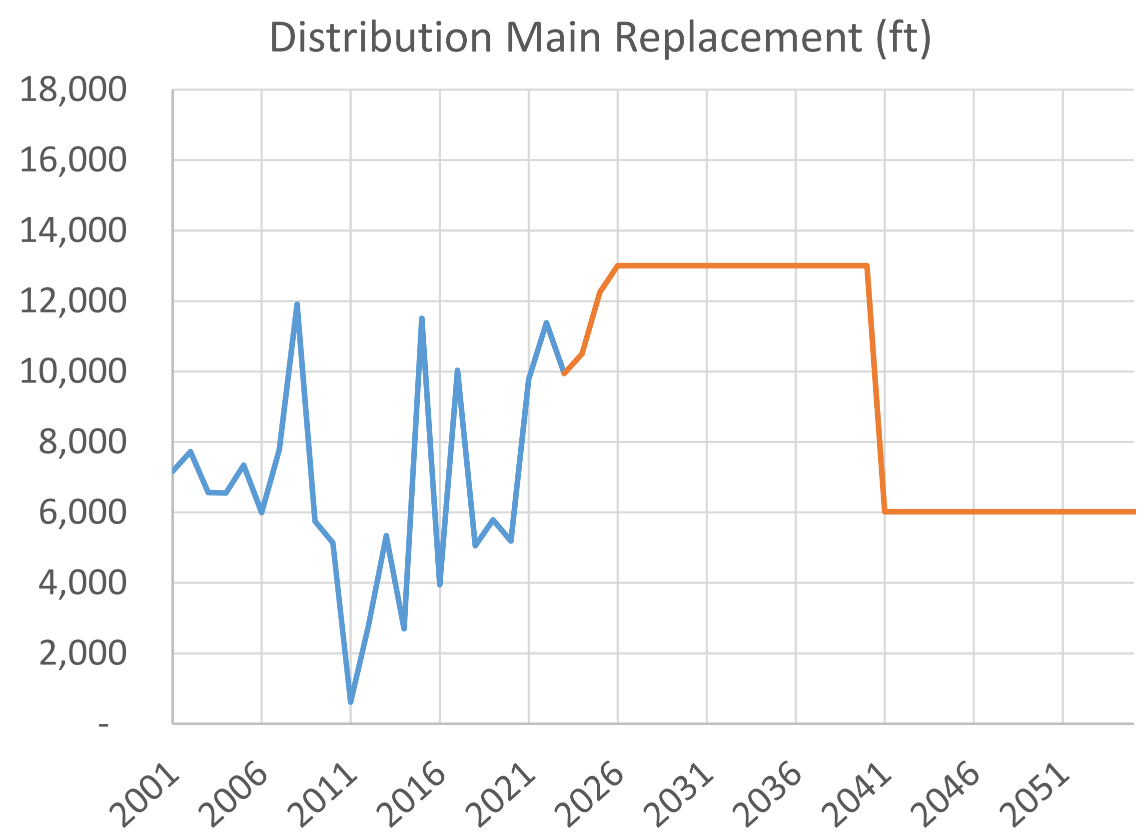


Scenario 4. 1940-1970 Pipe @ 110yr Life

	Ft	Miles	Timeline	ft / Yr
1940-1970 Cast Iron with >50% LSL	121,400	23		
Pre 1920 Mains with >50% LSL	15,100	3		
Other Mains with >50% LSL	10,500	2		
Total LSL Driven Main Replacement	147,000	28	By 2040	8,647

Remaining Pre-1920 Cast Iron Main	25,900	5	By 2040 (140 year life)	1,524
1920-1940 Cast Iron Main	63,716	12	2040-2060 (120 year life)	3,186
Remaining 1940-1970 Cast Iron Main	161,600	31	By 2080 (110 year life)	2,835

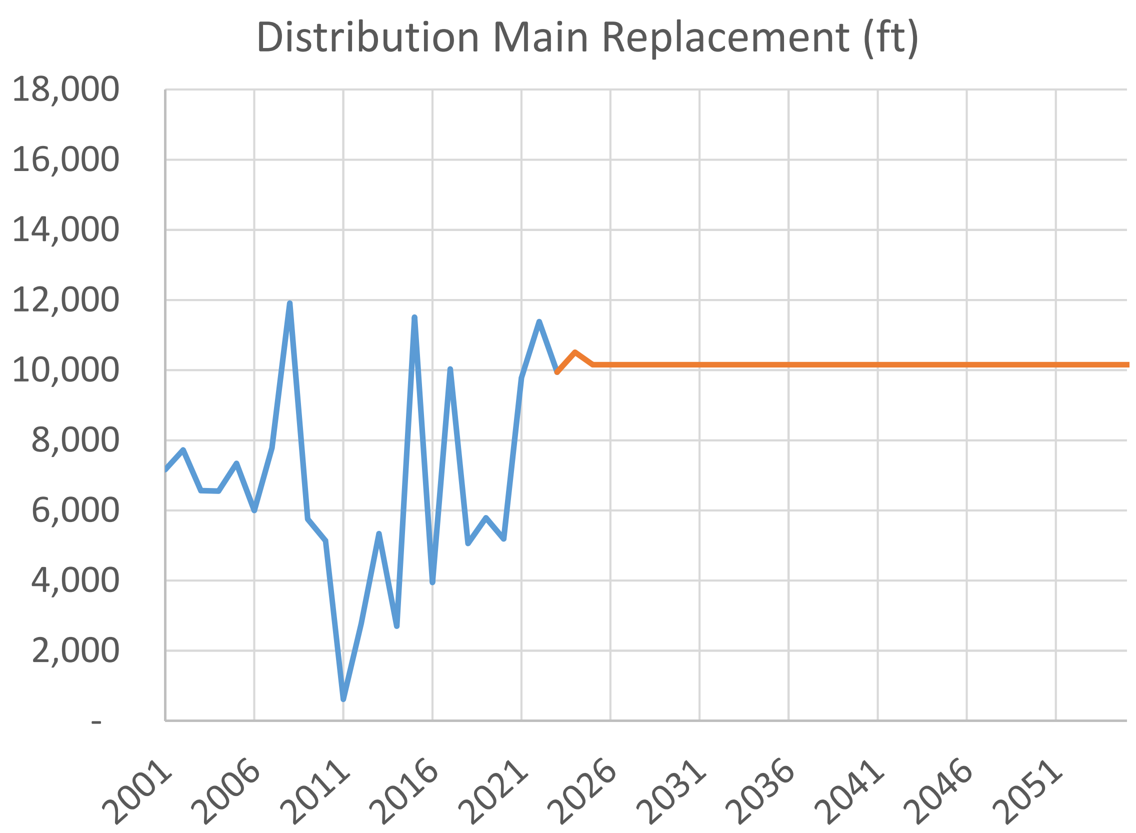
Average Annual Replacement Need	**2024-2040**	**13,006**
	2040-2060	**6,021**



Comparison: No LSL Driven Timeline

Pre 1920s Cast Iron Main	41,000	8	By 2040 (140 year average life)	2,412
1920-1940 Cast Iron Main	63,716	12	By 2060 (120 year average life)	1,722
1940-1970 Cast Iron Main	283,000	54	By 2070 (100 year average Life)	6,021

Average Annual Replacement Need	**2024-2060**	**10,155**
	2060+	**6,021**



Water Main replacement Costs

Past Costs (Adjusted to 2022 Value)

- SW Heights = **380 $/ft**
  - 40% of restoration paid by City
- Legion Park = **394 $/ft**
  - No curb or sidewalk
- College Ave = **367 $/ft**
  - 50% of restoration paid by City
  - Limited LSL replacement
- 20th/21st St = **381 $/ft**
  - 40% of restoration paid by City
- 19th St = **449 $/ft**
  - 25% of restoration paid by City

Future Costs: **Assume 410 $/ft starting FY25**

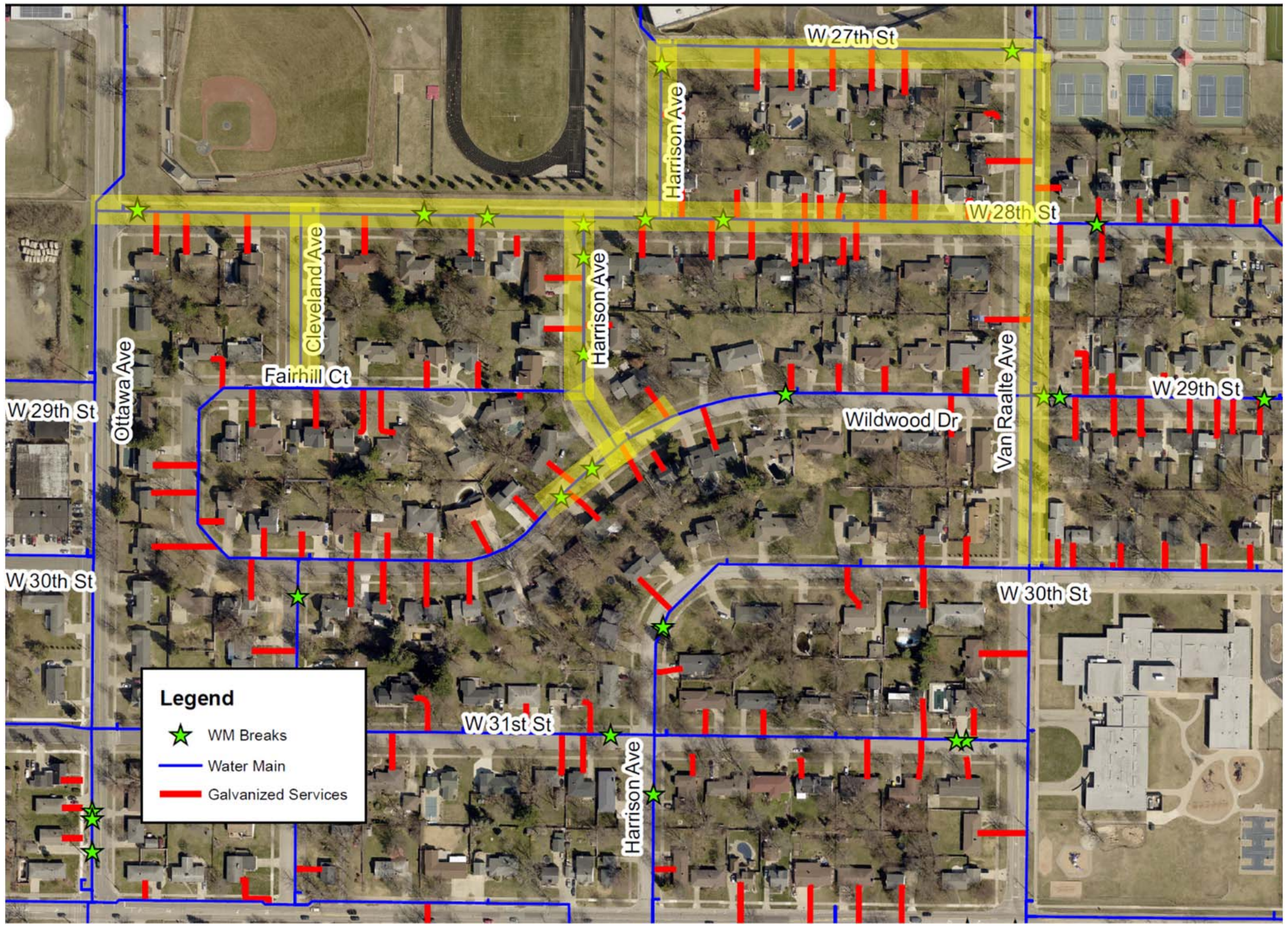
Year	Scenario 1	Scenario 2	Scenario 3	Scenario 4	No LSL Driver
2025	$ 6,700,000	$ 6,000,000	$ 5,600,000	$ 5,400,000	$ 4,200,000
2030	$ 7,700,000	$ 7,000,000	$ 6,500,000	$ 6,200,000	$ 4,900,000
2035	$ 9,000,000	$ 8,100,000	$ 7,500,000	$ 7,200,000	$ 5,600,000
2040	$ 10,400,000	$ 9,300,000	$ 8,700,000	$ 8,400,000	$ 6,500,000
2045	$ 8,000,000	$ 5,600,000	$ 5,000,000	$ 4,500,000	$ 7,600,000
2050	$ 9,200,000	$ 6,500,000	$ 5,700,000	$ 5,200,000	$ 8,800,000
2055	$ 3,200,000	$ 7,600,000	$ 6,600,000	$ 6,000,000	$ 10,200,000
2060	$ 3,700,000	$ 8,800,000	$ 7,700,000	$ 7,000,000	$ 11,800,000

*Escalated using i=3%

Capital Project Highlights

CY23 28th & Wildwood

- **$2.2M**
- 5,500 ft of 8” main
- 78 Full lead service lines
- Storm sewer relocation



CY23 10th & 11th St Recon

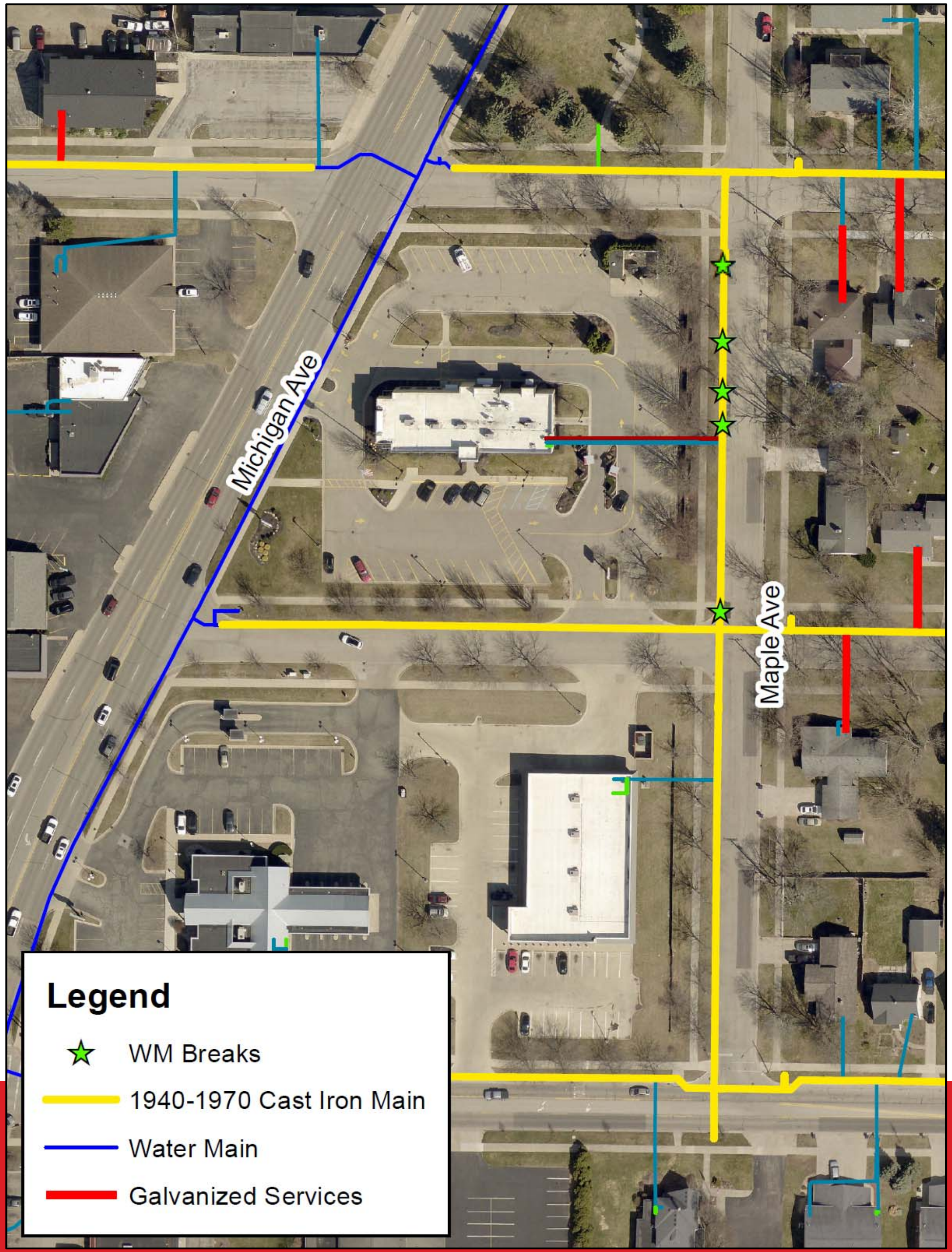
- **$750K**

- 10th St
  - 13 Private side LSL replacements

- 11th St
  - 1,450 ft of 1895 6” cast iron main
  - 29 LSL replacements
    - 15 full
    - 13 private side
    - 1 ROW

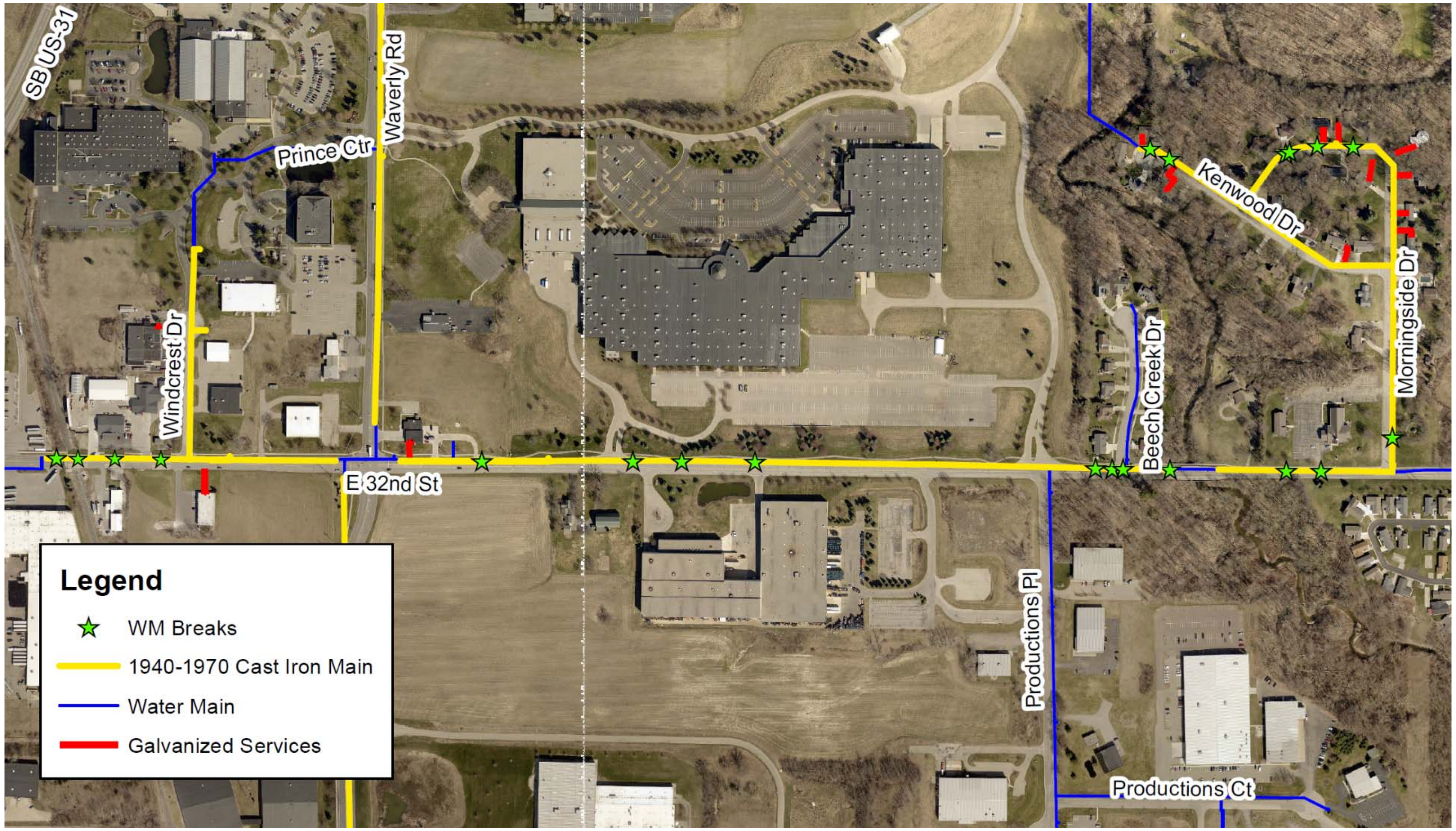
Maple Ave Reconstruction

- 1,100 ft of 1956 Cast Iron Main
- No galvanized services
- At least 5 breaks so far
- ~$220k



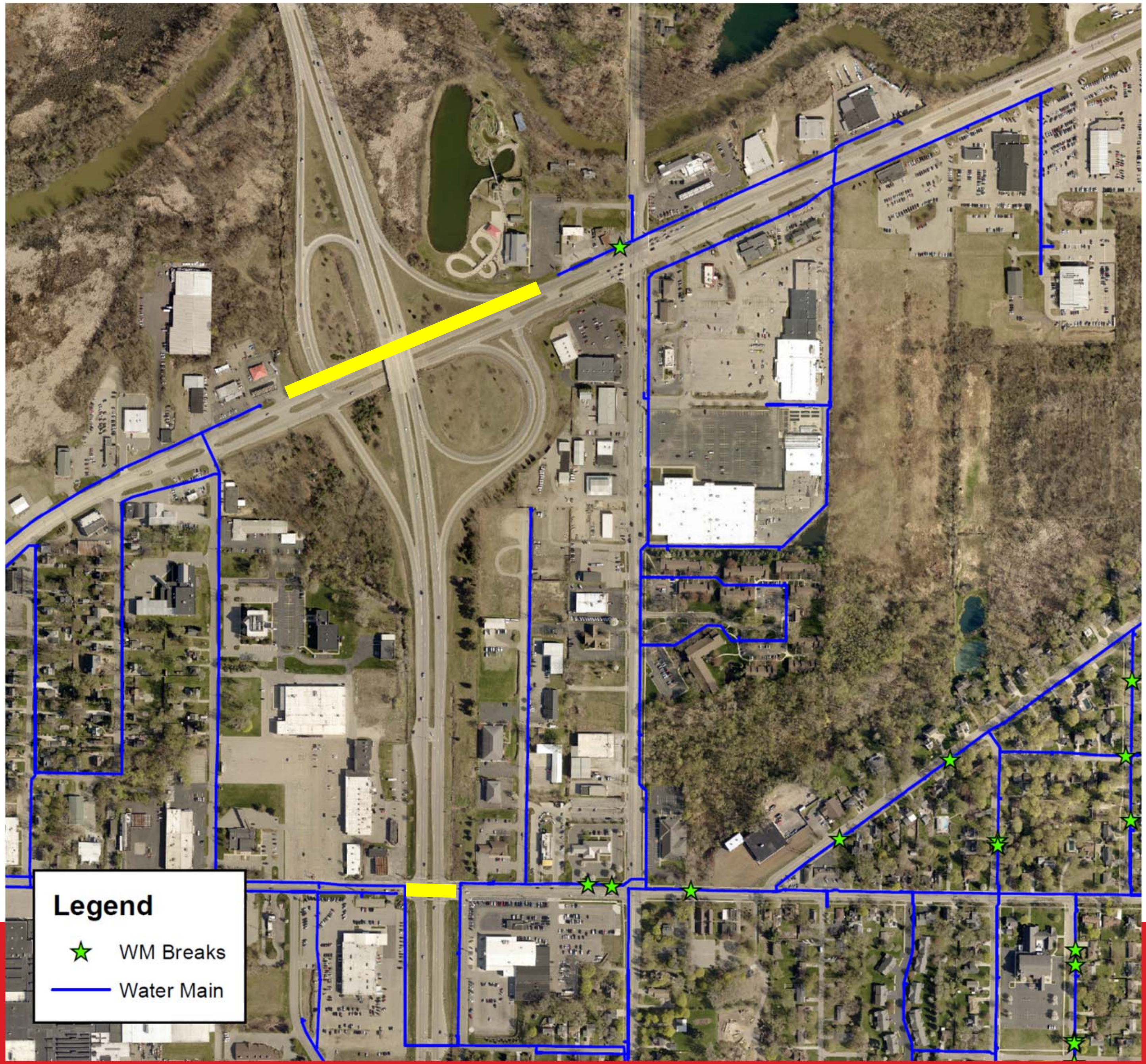
CY 24 32nd & Morningside

- **$3.6M**
- 8,000 ft of 1968 Cast Iron Main
- 14 LSL
- At least 22 breaks so far



CY23/24 Chicago Dr Looping

- Only non-looped commercial area
- Lower chlorine residuals
- 8th St and Chicago Dr scheduled for reconstruction in CY24 (City, Township, and MDOT Projects)



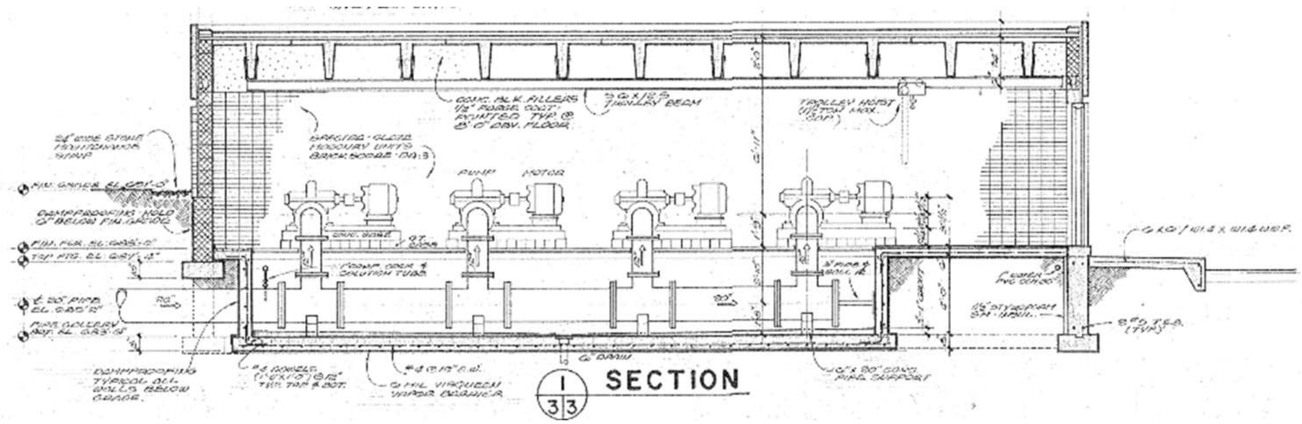
CY24 Southside PS Rehabilitation

<u>Southside Pump Station</u>

- 1983 construction
- Failing controls, limited parts
- Hydraulic concerns

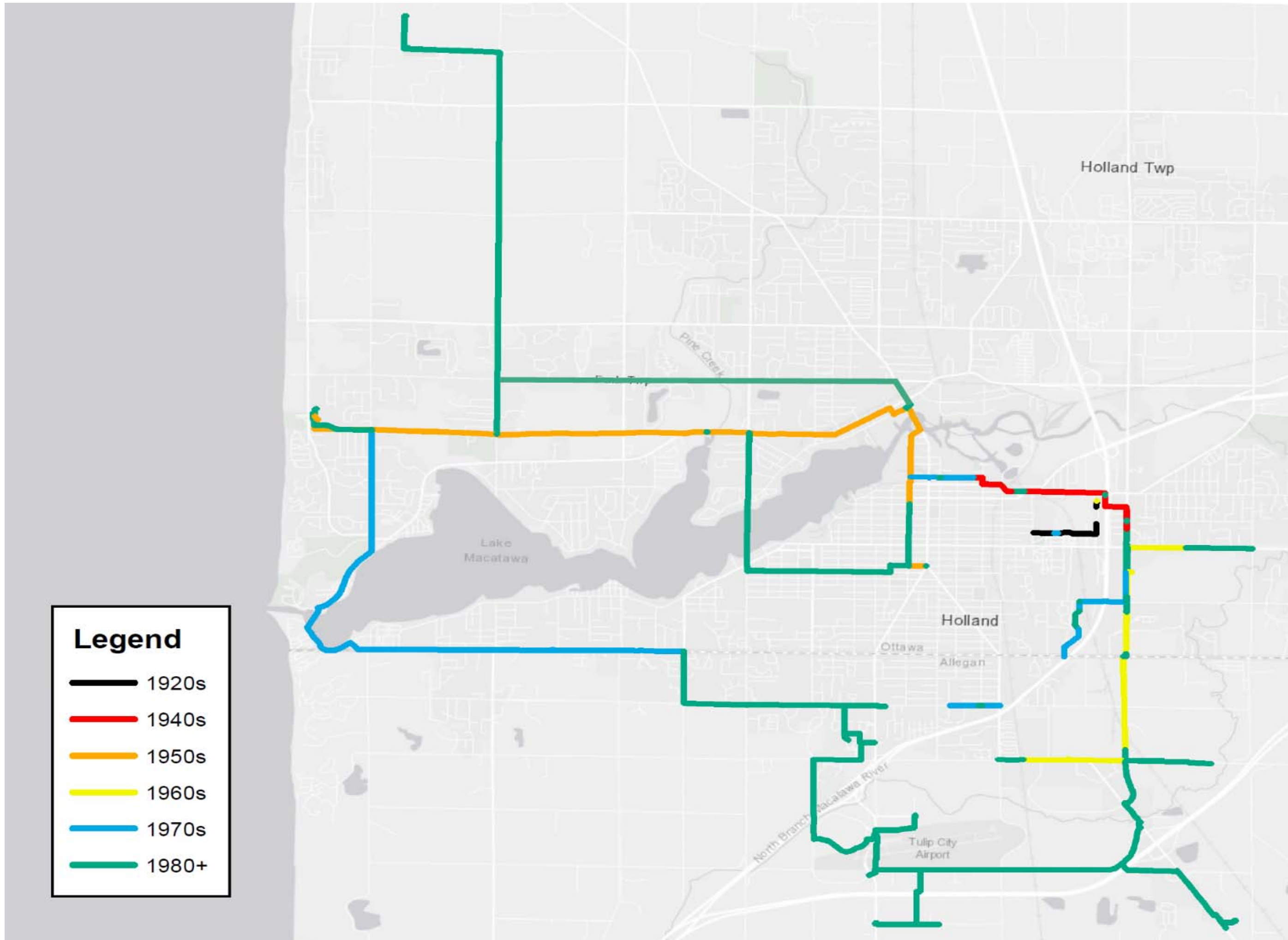
FY23/24 Rehabilitation:

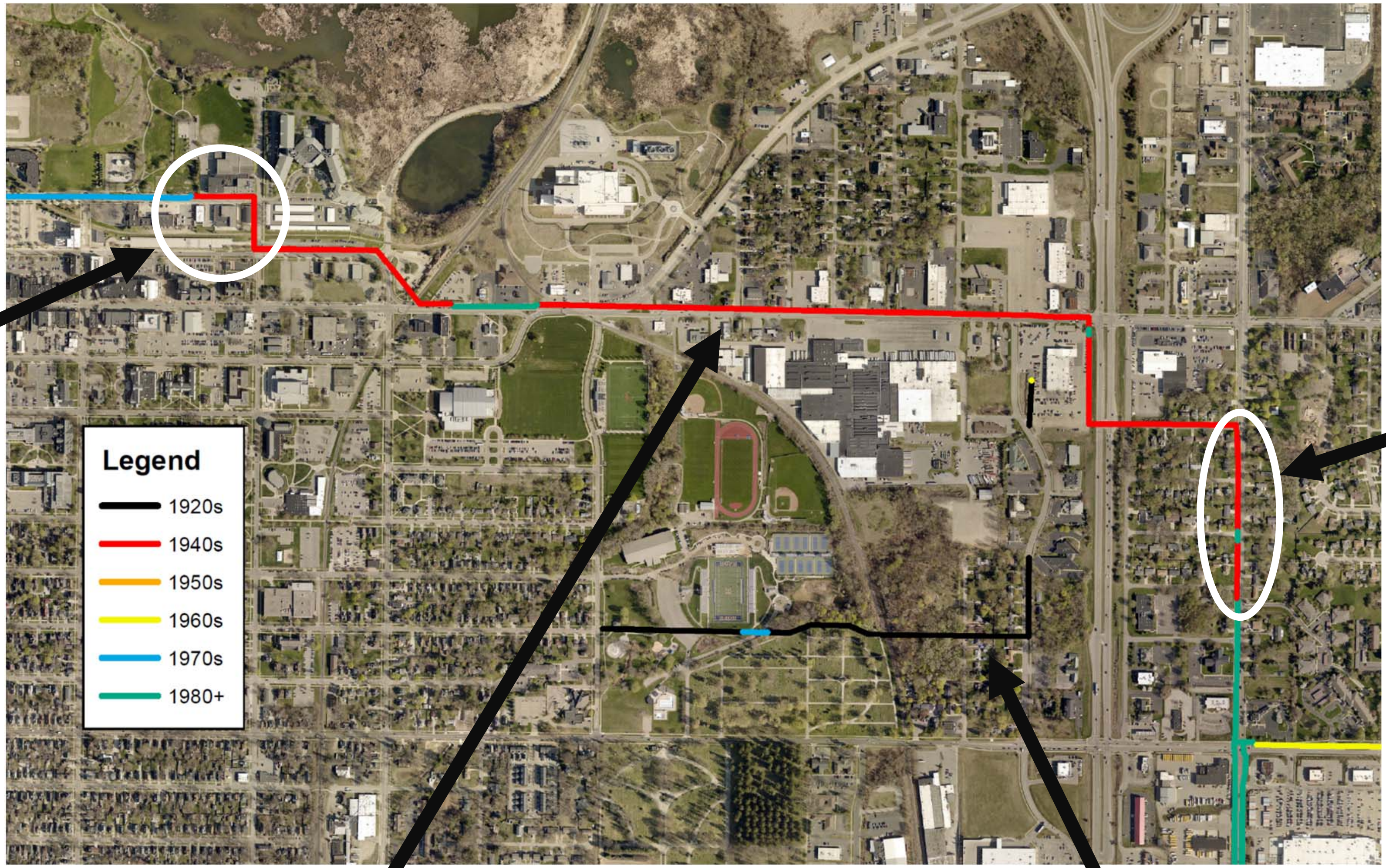
- **$1.1 M**
- Replacement of:
  - Pumps
  - Motors
  - Controls
  - Valves
  - Site Piping
  - Building improvements



Transmission System

Transmission System Age





6th St Project

Waverly Reconstruction
(CY24/25)

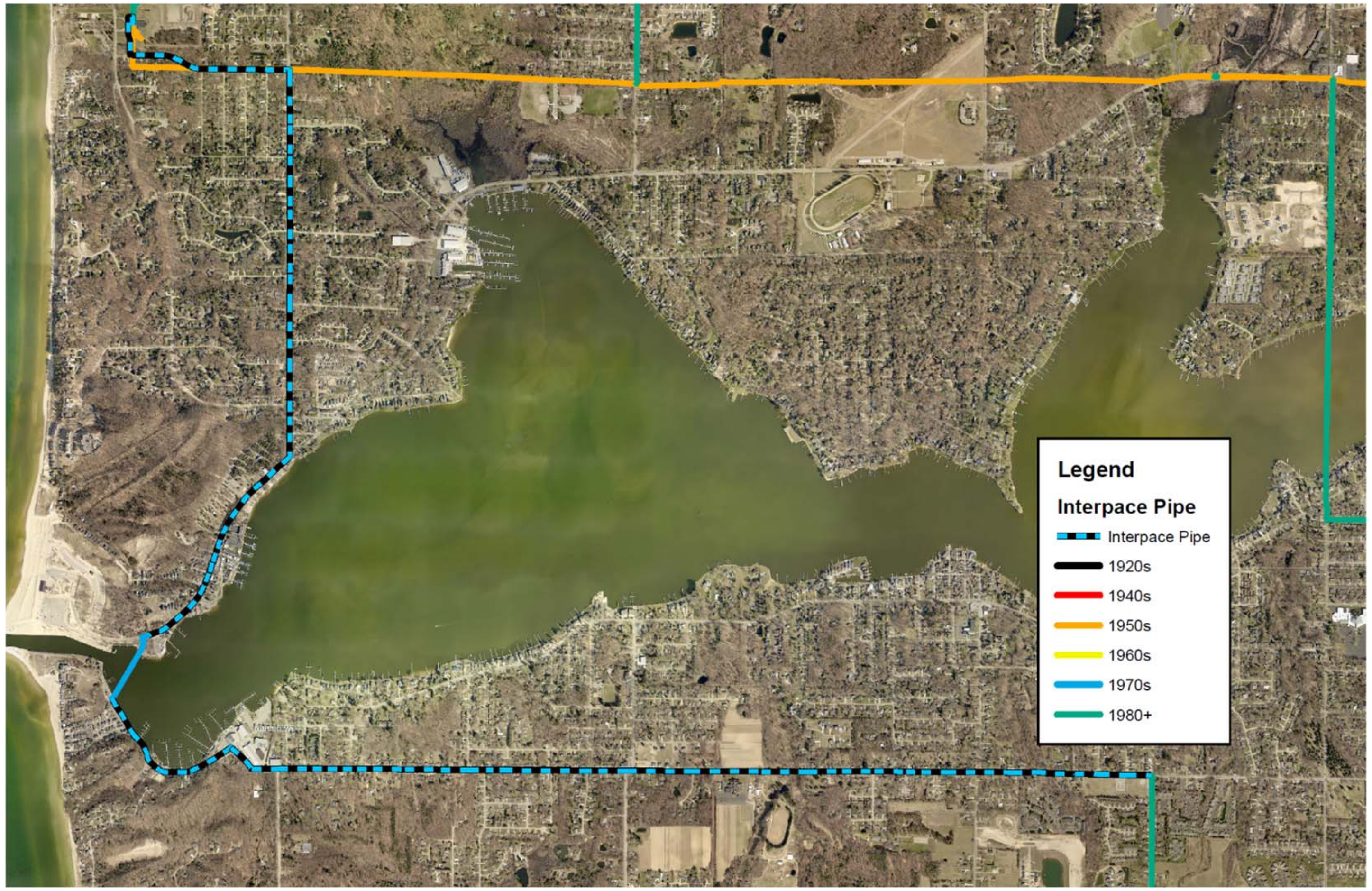
Future CIPP Lining

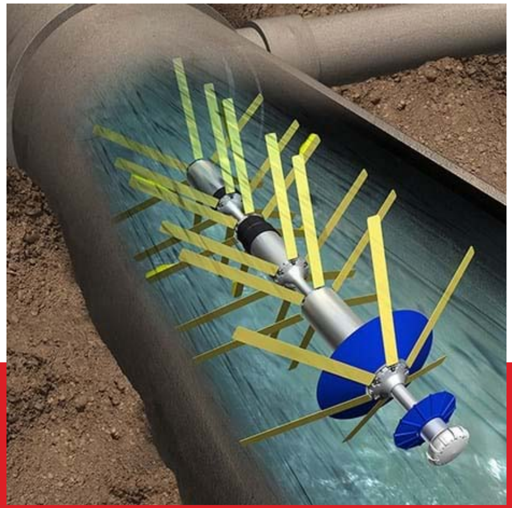
1920s Legacy Main
Future Slip Lining

1970s Interpace Pipe

- Spiral wound cylinder pipe
- Potential for premature failures
- Tapped for water services in Laketown

- Repair vs Replace
    - Future condition assessment (~$750k)
    - Electromangetic pipe wall inspection
    - Acoustic leak detection
    - CCTV visual interior inspection





Distribution System Storage Tanks

- Recent inspections indicate good condition
- Continue routine cleaning and coating
- Point repairs as needed

Location	Volume (MG)	Year Constructed	Age	Material
Waverly	5	1964	59	Steel
48th St	0.5	1968	55	Steel
South Side	5	1986	37	Concrete
M40	1	2002	21	Steel


48th St - Before & after routine cleaning

Current 5-Year Capital Improvement Plan for Water Distribution System

Projet Description	Completion Date	Depr Yrs	Total Project Cost	Prior Years Spent	FY 2023 Spend	FY 2024 Spend	FY 2025 Spend	FY2026 Spend	FY2027 Spend	FY2028 Spend
Replace Pickup Truck #80	12/31/2023	5	50,000.00			50,000.00				
Maple Ave Reconstruction 29th to 32nd	6/30/2024	50	220,000.00			220,000.00				
Storage Tank Rehab Program (48th)	6/30/2024	5	150,000.00			150,000.00				
10th & 11th Reconstruction	6/30/2024	50	750,000.00			750,000.00				
Corroded Main Replacement FY23 (SWC - 28th & Wildwood)	6/30/2024	50	2,200,000.00	51,479.42	398,520.58	1,750,000.00				
Scenic Shores Pump Station Upgrades	6/30/2024	20	475,000.00		75,000.00	400,000.00				
Southside PS Rehabilitation	6/30/2024	50	1,025,000.00		125,000.00	900,000.00				
Replace Pickup Truck #71	6/30/2024	5	55,000.00			55,000.00				
Replace Pickup Truck #77	6/30/2024	5	55,000.00			55,000.00				
6th St Reconstruction (River to Columbia)	6/30/2024	50	1,600,000.00		400,000.00	1,200,000.00				
Corroded Main Replacement FY24 (32nd & Morningside)	6/30/2025	50	3,850,000.00			600,000.00	3,250,000.00			
Storage Tank Rehab Program(Southside)	6/30/2025	5	200,000.00				200,000.00			
Replace Crane Truck #73 (50/50 split with W/WW)	12/31/2025	10	250,000.00					250,000.00		
Water Main Looping Program CY25 (Chicago Dr & 8th)	6/30/2026	50	750,000.00				750,000.00			
24th St (Waverly to Greenwood Cir)	6/30/2026	50	1,500,000.00				400,000.00	1,100,000.00		
Main Replacement Program CY25	6/30/2026	50	3,600,000.00				750,000.00	2,850,000.00		
Water Main Looping Program CY26	6/30/2027	50	500,000.00					500,000.00		
Main Replacement Program CY26	6/30/2027	50	3,800,000.00					800,000.00	3,000,000.00	
Storage Tank Rehab Program (Waverly)	6/30/2027	5	200,000.00						200,000.00	
City Transportation Joint Project Placeholder (Project TBD)	6/30/2027	50	1,500,000.00						1,500,000.00	
Main Replacement Program CY27	6/30/2028	50	3,800,000.00						800,000.00	3,000,000.00
City Transportation Joint Project Placeholder (Project TBD)	6/30/2028	50	1,500,000.00							1,500,000.00
Water Main Looping Program FY28 (Residential Looping)	6/30/2029	50	300,000.00							300,000.00
Main Replacement Program CY28	6/30/2029	50	800,000.00							800,000.00
Meter & MTU Replacement	6/30/20XX	10	250,000.00			50,000.00	50,000.00	50,000.00	50,000.00	50,000.00
ROW Service Replacements	6/30/20XX	50	480,000.00		80,000.00	80,000.00	80,000.00	80,000.00	80,000.00	80,000.00
Unplanned Failed Infrastructure Replacements (Main breaks, Valves, Hydrants)	6/30/20XX	50	1,000,000.00		250,000.00			250,000.00	250,000.00	250,000.00
Park Service Lines	6/30/20XX	20	150,000.00		30,000.00	30,000.00	30,000.00	30,000.00	30,000.00	
						6,290,000.00	5,510,000.00	5,910,000.00	5,910,000.00	5,980,000.00

Note - Private side lead service line replacements are not included in 5-year CIP because they are currently being treated as operating expenses rather than capitalized improvements.

Current 5-Year Capital Improvement Plan for Water Treatment Plant

Projet Description	Completion Date	Depr Yrs	Total Project Cost	Prior Years Spent	FY 2023 Spend	FY 2024 Spend	FY 2025 Spend	FY2026 Spend	FY2027 Spend	FY2028 Spend
Replace LS Vacuum Priming System	6/30/2024	20	60,000.00		45,000.00	15,000.00				
Onsite Electrical Generation-Engineering/Construction	6/30/2024	20	1,250,000.00	13,776.00	1,000,000.00	236,224.00				
Low Service Pump #1 Replacement	6/30/2024	20	170,000.00		30,000.00	140,000.00				
Replace Rooftop Blowers (Ventilation for WTP and LS)	6/30/2024	10	56,000.00			56,000.00				
New Ventilation in East Floc Building	6/30/2024	10	45,000.00			45,000.00				
HS Pump #2 Rebuild (Pump Only)	6/30/2024	10	35,000.00			35,000.00				
1.5MG Tank Improvements	6/30/2024	10	256,000.00			256,000.00				
Replace Non-Filter Turbidimeters (6)	6/30/2024	7	50,000.00			50,000.00				
Alternative Chemical Storage Solutions and Risk Mitigation - Construction&Engineering	6/30/2025	20	3,500,000.00		250,000.00	1,250,000.00	2,000,000.00			
Replace LS Basket guiderails and baskets	6/30/2025	20	80,000.00				80,000.00			
Transfer Pump #4 Rebuild	6/30/2025	10	80,000.00				80,000.00			
Replace Invasive Species Control System Land Side (from WTP to LS)	6/30/2025	20	130,000.00				130,000.00			
Replace Vehicle - Electrician Truck #86(1/2)	6/30/2025	5	32,500.00				32,500.00			
Replace Dehumidifier (BryAir)	6/30/2025	15	175,000.00				175,000.00			
Basin Rehabilitations/overhaul	6/30/2026	10	125,000.00					125,000.00		
Roof Replacement All (CO from FY2019)	6/30/2026	20	250,000.00					250,000.00		
Transfer Pump #1 Rebuild	6/30/2026	10	85,000.00					85,000.00		
Replace HS 2 and 3 Effluent Actuators	6/30/2026	10	25,000.00					25,000.00		
Replace Lab Equipment; Autoclave and Spectrophotometer	6/30/2026	10	38,000.00					38,000.00		
Low Service Backup Power - New	6/30/2027	20	600,000.00					400,000.00	200,000.00	
Basin Rehabilitations	6/30/2027	10	145,000.00						145,000.00	
Transfer Pump #2 Rebuild	6/30/2027	10	90,000.00						90,000.00	
Replace Ops/Maintenance Truck #76	6/30/2027	5	55,000.00						55,000.00	
Replace WTP Lab Chlorine Analyzers	6/30/2027	10	42,500.00						42,500.00	
Replace HSP2, 3 VFDs and Cabinets	6/30/2027	10	300,000.00						300,000.00	
Transfer Pump #3 Rebuild	6/30/2028	10	95,000.00							95,000.00
Replace Invasive Species Control System Wet Side - Based on engineered study to be performed FY 22/23.	6/30/2028	20	350,000.00							350,000.00
Replace Vehicle - Electrician Truck #92 (1/2)	6/30/2028	5	36,000.00							36,000.00
Basin Rehabilitations	6/30/2028	10	175,000.00							175,000.00
Transfer Pumps1, 3, and 5 VFD Replacements	6/30/2028	10	130,000.00							130,000.00
						2,083,224.00	2,497,500.00	923,000.00	832,500.00	786,000.00

Excerpt from appendices of 2019 Reliability Study showing lead service line replacements were identified in the plan

Distribution System 5-year Capital Improvement Plan

Project	Year	Cost
20th St Galvanized Services, Maple to Michigan (w/ 21st St Project)	2020	$240,000
Water Main Replacement - 8th St - Hwy 31 to Walnut	2020	$500,000
Water Main Replacement - College - 14th to 24th	2020	$75,000
Water Main Replacement - Country Club 8th to Birdie lane	2020	$600,000
Water Main Replacement - Van Raalte - 9th to 24th	2020	$200,000
Water Main Replacement on 21st St, Van Raalte-Cleveland	2020	$900,000
Assessment of Transmission Mains	2021	$200,000
MTU Replacement Project	2021	$800,000
Water Main Replacement - 10th St, College to Columbia	2021	$600,000
Water Main Replacement - 29th, Pine - College	2022	$700,000
Water Main Replacement - 31st, Pine - Central	2022	$450,000
Water Main Replacement - 32nd St, Brooks / CSX to City Limits	2022	$2,400,000
Water Main Replacement - Pine Ave - 7th to 22nd	2022	$1,800,000
Looping of Chicago Dr and 8th St under US 31	2023	$350,000
Transmission Main Replacement, 36" North Side Transmission Main	2023	$11,500,000
Water Main Replacement - Columbia - 9th to 24th	2023	$2,300,000
Water Main Replacement - Maple, Pine, Central - 28th to 32nd	2023	$1,100,000
Water Main Replacement - 28th, Wildwood, 31st - Ottawa to Van Raalte	2024	$1,800,000
Water Main Replacement - 6th - River to Columbia	2024	$100,000
Water Main Replacement - Van Raalte Harrison Cleveland - 32nd to 28th	2025	$1,400,000
Galvanized Service Replacements	Ongoing	$350,000 per year
Miscellaneous Distribution System Improvements	Ongoing	$300,000 per year
New or Replacement Hydrants	Ongoing	$70,000 per year
New or Replacement Meters	Ongoing	$20,000 per year
New or Replacement Valves	Ongoing	$40,000 per year

Excerpt from appendices of 2019 Reliability Study showing chemical storage improvements were identified in that plan

Water Treatment Plant Capital Improvement Plan

Capital Project	# of Units	Unit Cost	Year	Total Annual Capital Investments
Reznor Unit (Roof)-Main Building	2	$ 22,000	2020	
Replace Vehicle 93	1	$ 15,000	2020	
High Service Pump Replacement (Construction)	2	$ 890,000	2020	
High Service Pump Replacement (Engineering)	1	$ 100,000	2020	$ 1,027,000
Polymer Feed Skid	1	$ 16,500	2021	
High Service Pump Flow Metering Replacement	2	$ 175,000	2021	
Vehicle	1	$ 30,000	2021	
High Service Pump Repalcement (Installation/Build)	2	$ 1,560,000	2021	
Replace Invasive Species Control System		$ 132,000	2021	$ 1,913,500
Mag Meters-Chemical Feed	5	$ 20,000	2022	
Vehicle	1	$ 32,000	2022	
Onsite Electrical Generation (Installation/Build)	1	$ 1,250,000	2022	
Chemical Storage Facility (Engineering)	1	$ 300,000	2022	$ 1,602,000
Chemical Storage Facility (Installation/Build))	1	$ 2,100,000	2023	
Dehumidifier Replacement	1	$ 90,000	2023	
Roof Top Blowers	9	$ 14,175	2023	
Replace Lab Particle Counters	3	$ 15,420	2023	
Autoclave (Replacement)	1	$ 12,000	2023	
Vehicle-Electrician-40%	0.4	$ 15,000	2023	
Roof Replacement	8	$ 200,000	2023	
Power Factor Controllers	5	$ 17,850	2023	$ 2,464,445
Repave/Surface	2	TBD	2024	
Filter Rehabilitation	5	$ 170,000	2024	
Replace Floc Drives, VFDs	4	$ 33,600	2024	
Basin Rehabilitations	1	$ 100,000	2024	$ 303,600
Repaint Low Service Interior	1	$ 100,000	2025	
Filter Rehabilitation	5	$ 170,000	2025	
Filter Media Addition	5	$ 35,000	2025	
Replace Low Service Pump Valves	4	$ 200,000	2025	$ 505,000

Capital Project	# of Units	Unit Cost	Year	Total Annual Capital Investments
Chemical Feed Pump Replacement (Alum)	4	$ 36,000	2026	
Chemical Feed Pump Replacement (Sodium Hypo)	7	$ 60,000	2026	
Chlorine Analyzers	5	$ 35,000	2026	
Spectrophotometer	1	$ 11,323	2026	
Raw Water Intake Pipe and Crib	1	$ 6,500,000	2026	
Basin Rehabilitations	1	$ 100,000	2026	
Furniture Replacement	1	$ 20,000	2026	
Heating Upgrades	2	$ 14,000	2026	
High Service/Transfer/Filter Piping painting	1	$ 400,000	2026	$ 7,176,323
Bulk Chemical Storage-Level Monitoring	12	$ 36,000	2027	
Vehicle-Electrician-1/2	40%	$ 15,000	2027	
Replace Evasive Control System	1	$ 120,000	2027	
SUS-HS Switchboard (MCC-HS, #1 Transfer, P-1, HS 2 & 3	1	$ 126,000	2027	
Basin Rehabilitations	1	$ 200,000	2027	
Replace Lab Particle Counters	3	$ 30,000	2028	
Replace LS Electric Valve Actuators	6	$ 60,000	2027	
SUS-HS Transformer (480 Volt)	1	$ 50,400	2027	$ 637,400
Chlorine Analyzers	5	$ 40,000	2028	
Basin Rehabilitations	1	$ 200,000	2028	
Vehicle-Electrician-1/2	40%	$ 14,000	2028	
VFDs-Transfer Pumps	2	$ 25,000	2028	
Replace Vehicle 93	1	$ 35,000	2028	
Desiccant Wheel	1	$ 15,000	2028	
Main Switchgear	1	$ 315,000	2028	
SUS-HS Switchboard (MCC-HS, #1 Transfer, P-1, HS 2 & 3	1	$ 126,000	2028	
PLC Rebuild	1	$ 900,000	2028	
Upgrade Communications Control Panel	1		2028	$ 1,670,000
American Standard (Roof HVAC)	2	$ 18,900	2029	
SCADA Software/Programming	5	$ 900,000	2029	
Chemical Feed Pump Replacement	7	$ 52,000	2029	
Chemical Feed Pump Replacement	4	$ 40,000	2029	
MCC-HS (MCC, #1 Transfer, HS 2 & 3)	1	$ 157,500	2029	
Variable frequency drive replacement (HS 2 & 3)	2	$ 50,000	2029	$ 1,218,400
Turbidity Meter Replacement	17	$ 119,000	2030	
Reznor Unit (Roof)-Main Building	2	$ 22,000	2030	
Replace Turbidity Meters	15	$ 80,000	2030	$ 221,000
Chemical Feed Pump Replacement (Sodium Hypo)	7	$ 60,000	2031	

Capital Project	# of Units	Unit Cost	Year	Total Annual Capital Investments
Chemical Feed Pump Replacement (Alum)	4	$ 36,000	2031	
Bulk Chemical Tank Replacement	4	$ 120,000	2031	$ 216,000
SCADA Software/Programming	1	$ 900,000	2032	
Blowers	9	$ 14,175	2032	
Reznor Unit (Roof)	2	$ 16,800	2032	
Replace Alum Storage Tanks	3		2032	$ 930,975
Mag Meters-Chemical Feed	5	$ 20,000	2033	
Replace Lab Particle Counters	3	$ 25,000	2033	
Replace Sodium Fluoride Storage Tanks	2	$ 50,000	2033	$ 95,000
Replace Chemical Transfer Pumps (Alum)	2	$ 10,000	2034	
Filter Media Addition	10	$ 35,000	2034	
Replace Chemical Transfer Pumps (Alum)	2	$ 10,000	2034	$ 55,000
Furniture Replacement	1	$ 50,000	2035	
Replace Evasive Control System	1	$ 120,000	2035	
Repave/Surface	2	$ 70,000	2035	
Filter Sweeps	10	$ 25,000	2035	$ 265,000
Chlorine Analyzers	5	$ 40,000	2036	
Roof Replacement	8	$ 300,000	2036	$ 340,000
SCADA Software/Programming	5	$ 900,000	2038	
Total		**$ 21,540,643**		
Average Capital Expenditures/Year		**$ 1,077,032**		

STATE OF MICHIGAN
DEPARTMENT OF
ENVIRONMENT, GREAT LAKES, AND ENERGY
GRAND RAPIDS DISTRICT OFFICE

GRETCHEN WHITMER
GOVERNOR

EGLE

LIESL EICHLER CLARK
DIRECTOR

July 30, 2019

Mr. Joel Davenport, Operations Director and
Mr. Jonathan Van Uffelen, Utility Services Director
Holland Board of Public Works
625 Hastings Avenue
Holland, Michigan 49423

WSSN: **03190**

Dear Mr. Davenport & Mr. Van Uffelen

SUBJECT: Holland Board of Public Works (City) – Community Water Supply Sanitary Survey

This letter will confirm visits with staff from the Holland Board of Public Works (HBPW) on various dates in 2019 with representatives of the Department of Environment, Great Lakes, and Energy (EGLE), and summarize the subsequent review and discussion of the water supply facilities. The purpose of these meetings was to evaluate the water system with respect to the requirements of the Michigan Safe Drinking Water Act, 1976 PA 399, as amended (Act 399).

Since the 2016 Sanitary Survey review, several improvements have occurred to address previous findings:

- Expanded the cross-connection program to begin to address residential customers.
- Developed and submitted an Asset Management Program.
- Study of the Wyoming-HBPW interconnect for water quality.
- Volunteered to be part of Area Wide Optimization Program exercise.
- Conducted study of TOC removal in Lake Michigan water.
- Investigated low readings on SWAN Turbiwell turbidimeters.

These improvements help to significantly improve operations of the water system and create a sustainable water supply for the HBPW. Proactive planning for and maintenance of the water system is to be commended.

The following table summarizes our findings from our survey of the water system:

Survey Element	Findings
Source	Recommendations Made
Treatment	Recommendations Made
Distribution System	Recommendations Made
Finished Water Storage	**Deficiency Identified**
Pumps	Recommendations Made
Monitoring & Reporting	Recommendations Made
Management & Operations	Recommendations Made
Operator Compliance	Recommendations Made
Security	No Recommendations/Deficiencies
Financial	No Recommendations/Deficiencies
Other	No Recommendations/Deficiencies

Deficiencies:

Deficiencies indicate non-compliance with one or more Act 399 requirements, which include defects in a water system's infrastructure, design, operation, maintenance, or management that cause, or may cause, interruptions to the "multiple barrier" protection system and adversely affect the system's ability to produce safe and reliable drinking water in adequate quantities.

D1. The Waverly ground tanks were designed and constructed with an internal overflow pipe that directly connects to a storm sewer in a manhole. Ground tank overflow pipes must be fitted with an acceptable air gap to prevent entry of contaminants and allow for visual identification of an overflow event. Submit a plan to study and correct this sanitary hazard within 30 days.

Recommendations:

There are several recommendations that are intended to enhance the operation and maintenance of the water supply. A complete list of recommendations may be found on the enclosed document. The below are a selection of the first several recommendations included.

R1. The flocculation and sedimentation basins were originally constructed in 1954, resulting in a few aspects that are not up to today's standards (buried/inaccessible, low volume/detention time, floc drives subject to flooding). Prior to investing in a large capital project such as expansion, retrofitting with plate settlers, or relocating the floc drive motors, staff at the water plant may wish to study optimization of the current treatment to maximize public health protection and potentially enhanced reduction of organics.

a. Turbidimeter location and accuracy;
b. Coagulant addition location and dose;
c. Flocculation mixing speeds (as they may vary with temperature);
d. Short-circuiting through floc-sed basins;
e. Even flow splitting through different basins;
f. Weir overflow consistency;
g. Effect of sludge buildup on turbidity.

R2. The distribution system for HBPW was previously cited in the 2016 sanitary survey for a limited number of qualified S-1 operators. Recently, the operator in charge (OIC) position became vacant, presenting an opportunity for upward advancement. Because current operators are without adequate licensure, the position is being covered temporarily by Mr. Van Uffelen. The system has several practices in place to foster growth and encourage leadership, including covering costs for education and testing, small annual bonuses for licensure, and vertical growth opportunities. We have identified a roadblock to licensing for the management in the HBPW structure, as field experience is difficult to account for. This will be discussed with EGLE's Operator Certification Unit. Simultaneously, the HBPW should consider implementing pay increases for staff that obtain maximum licensure, similar those that exist for staff at the HBPW water and wastewater plants.

R3. SWAN turbidimeters have been the subject of debate, in terms of manufacturer's recommendations for calibration and the Environmental Protection Agency's (EPA) approval of the SWAN method for measuring turbidity. At this time, it is necessary to conduct quarterly verification of calibration using a wet primary standard as defined by the EPA in the *Guidance Manual for Compliance with the Interim Enhanced Surface Water Treatment Rule: Turbidity Provisions*, April 1999. For the SWAN AMI Turbiwell units, the most reliable way to ensure an approved verification of the calibration is to utilize an approved wet standard within the body of the turbidimeter at least quarterly. Use of a primary standard, such as Formazin, should be coordinated with the manufacturer to ensure it is compatible. If the instrument is found to be out of range (+/- 10 percent), it must be removed from service until it is recalibrated.

R4. The capacity of the HBPW water plant and intake system are at approximately 80 percent of the maximum day demands in the summer (see attached demand trend). Rule 1204 requires rated capacity of the water supply to be able to meet demands of the water system. The HBPW has begun to study options to address growth. The following recommendations should help support the HBPW as it continues to plan for future capacity needs:

a. Study high service pumping along with transmission capabilities.
b. Study water quality impacts of long-term use of Wyoming interconnect.
c. Study transmission limitations of using Wyoming interconnect.
d. Consider a feasibility study of installing another raw water intake with a treatment plant expansion to meet growing demands.

R5. The last reliability study submitted by HBPW was in 2014. A five-year update is due at this time based on Rule 1203 (2).

R6. The bulk chemical storage was designed to be and is currently located on the second floor of the water plant. The age of the tanks is such that a redesign is being considered, although installation of liners has delayed the need to some degree. By relocating the bulk chemical storage, the water plant would be less susceptible to the impacts of inadvertent chemical mixing or leaks from the bulk tanks. We support the HBPW in moving the bulk chemical storage, to increase safety and replace the aging tanks.

R7. To ensure optimum disinfection practices, water plant operators should make daily calculations of the minimum disinfection achieved that day by calculating chlorine contact time (CT). Daily results should then be reported on the monthly operations report. This is more precise than adhering to guidelines based on worst-case scenarios at rated pumping capacities.

Please submit a written response within 30 days of receipt of this letter that outlines the City's plan and timeline for addressing the findings of this sanitary survey review.

If you have any questions, feel free to contact us below; email at sarkipatoe@michigan.gov and hendersons8@michigan.gov; or EGLE, Drinking Water and Environmental Health Division, Grand Rapids District Office, 350 Ottawa Avenue NW, Unit 10, Grand Rapids, Michigan 49503.

Sincerely,

Ernie Sarkipato, P.E.
Surface Water Treatment Specialist
Engineering Unit
Drinking Water and Environmental
Health Division
616-307-0261

Shannon Henderson, EIT
Surface Water Engineer
Engineering Unit
Drinking Water and Environmental
Health Division
517-539-1687

Enclosure

cc: Ottawa County Health Department
cc/encl: Mr. Jim Van De Wege, Water Plant Superintendent
Mr. Mike Bolf, Engineering Unit Supervisor, EGLE (via email)

Excerpt from 2016 WTP Master Plan discussing need for chemical storage improvements

Chemical Addition & Mixing

Existing System

The two 30-inch raw water transmission mains connect to two parshall flumes in the northwest corner of the WTP Operations building. The flumes provide a location for flow metering while also providing energy to facilitate the rapid mixing of chemicals. Alum, fluoride, and chlorine (sodium hypochlorite) are added at this stage. Each flume has an estimated volume of 3,230 gallons, and a corresponding velocity gradient (G) of 340-440 per second[45].

Alum and sodium hypochlorite are stored in a series of fiberglass reinforced plastic bulk storage and day tanks located on the second and third floors of the plant Operations building. Fluoride is stored on the ground floor in the southwest corner of the operations building.

Challenges, Concerns, or Limitations

The existing bulk chemical storage tanks were installed with the 1998 plant expansion, and have a 15 year design life. One sodium hypochlorite tank already developed a leak and needed to be repaired. The location of the alum and sodium hypochlorite tanks on the second and third of the building is concerning for plant staff since any leaks could spread to lower floors[46].

The existing fluoride tanks are installed in a storage area that was originally used for chlorine gas storage and feed equipment.

Neither of the chemical offloading areas on the north or south side of the operations building have facilities for the containment of the bulk delivery trucks in the case of a large spill.

Of the three major chemicals used at the WTP, the chemicals that pose the greatest risk to human health (per the NFPA ratings) are sodium hypochlorite and fluorosilicic acid. These chemicals both rank as a “serious” health risk, scoring 3 out of 4 on the NFPA scale of increasing hazard. Aluminum sulfate, on the other hand, is only a “slight” health hazard (1 out of 4). All three of the chemicals have a “minimal” risk for both flammability and instability. With that said, inadvertent mixing of these chemicals can have disastrous consequences, as occurred at the WTP in 1998 when a truck meant to be delivering aluminum sulfate delivered sodium hypochlorite into the alum tanks instead, generating chlorine gas that sent at least 8 people to the hospital and caused significant equipment damage.

Pending regulations may eventually require water plants to minimize perchlorate formation, which research indicates may be possible by diluting sodium hypochlorite by a factor of 2-4. If dilution proves to be necessary in the future, it may impact how much chemical storage space is needed. This could also necessitate the purchase of higher capacity chemical feed pumps.

Process Improvement Opportunities

Due to the concerns with the aging chemical storage equipment on the upper floors of the operations building, a study was commissioned in 2015 to look into alternatives for the WTP’s bulk chemical storage. FTC&H considered two alternatives: the first alternative includes replacement of the tanks in their current locations; the second alternative includes a new building for all bulk chemical storage.

[45] MDEQ, 2012, p. 7
[46] FTC&H, 2015, p. 3

Alternative 1- Upgrade in Place: There is not enough space in the existing bulk chemical storage areas to accommodate sodium hypochlorite dilution, so it was assumed that smaller, more frequent chemical deliveries may be necessary. Under this alternative, seven (7) bulk tanks and two (2) day tanks would be replaced. This work would require demolition of some existing containment, piping, and portions of the wall or roof of portions of the plant during construction. Along with the new tanks, there would be new piping, containment, level sensors, electrical panels, and control system integration installed.

Alternative 2- Separate Chemical Storage Building: A separate chemical storage building would allow all chemical storage and feed systems to be relocated out of the Operation building. There would need to be a pipe tunnel or direct-buried pipe for connection back to the existing plant. Hypochlorite dilution could be accommodated at an increased project cost of about 25 percent. Possible locations for the building that were considered include an area southwest of the 3 MG storage tank as well as an area east of the 1.5 MG storage tank.

As a step down from the full bulk chemical storage building concept (Alternative 2), a smaller building could be constructed that only houses the sodium hypochlorite bulk storage tanks (or on-site sodium hypochlorite generation equipment- see below). This would remove the bulk chemical with the highest health risk from the third floor of the plant, removing the risk of undetected sodium hypochlorite leaks getting down to lower floors. It would also reduce the risk for unintentional mixing of chemicals during a spill or emergency event, since the three bulk chemicals would all be in separate locations. Finally, the space created by the removal of the bleach tanks from the third floor would allow for the construction of new secondary containment and storage tanks for alum with limited impacts to the existing alum feed system.

Other alternatives for bulk chemical storage have been investigated by plant staff. One option is the on-site generation of sodium hypochlorite. One major benefit of this approach is that the process produces a lower concentration (0.8%) of hypochlorite that is far less hazardous to human health than the delivered 12.5% product. The only inputs to the process are salt, softened water, and electricity, and the only major byproducts are hydrogen gas which can be vented to atmosphere. Since HBPW currently buys its sodium hypochlorite as part of a collective of local water plants, producing its own hypochlorite is not as cost-competitive as it would be otherwise.

<u>CIP Projects: Existing Plant</u>

Based on the long term WTP capital outlook, there are eight capital projects anticipated for the existing chemical addition and mixing process over the next ten years. This does not include regularly scheduled inspections and maintenance activities. The majority of these projects are tank repairs that would not be necessary if a new chemical storage building was completed before the tank repairs were scheduled to occur.

CIP Projects: Existing Plant	Qty	Total Estimated Cost	Year
Chemical Transfer Pump	1	$7,500	2016
Bulk Chemical Tank Repair	1	$50,000	2016
Bulk Chemical Storage-Level Monitoring	12	$36,000	2017
Repair Sodium Hypochlorite Storage Tanks	2	$50,000	2017
Repair Alum Storage Tanks	3	$75,000	2017
Repair Sodium Hypochlorite Storage Tanks	3	$50,000	2018
Chemical Feed Pump Replacement	4	$28,000	2019
Replace Chemical Transfer Pumps (Alum)	2	$10,000	2024

Chemical Storage: Alternative 1	1	$978,000	2017
Chemical Storage: Alternative 2	1	$3,943,000*	2017

**The addition of dilution tanks to Alternative 2 would add an estimate $990,000 to the amount above*

Table 3-X: Chemical Addition- Capital Projects 10-Year Forecast- Existing Plant Capacity

5-year estimated capital costs (2016-2020): $296,500
10-year estimated capital costs (2016-2025): $306,500
Costs do not include estimates for chemical storage Alternatives 1 or 2 (see above)

CIP Projects: Plant Expansion

If the existing plant is expanded with the addition of 20 MGD capacity as proposed in the 2000 feasibility study, there would potentially need to be additional chemical storage tanks and feed equipment installed. Since there is no space to install additional tanks within the existing chemical storage areas, expanding the plant's treatment capacity would either require the construction of a separate chemical storage building similar to what is proposed in Alternative 2, above, or the plant would need to operate with fewer days of supply on-hand. However, since Alternative 2 was developed and budgeted based on the existing chemical storage volume requirements, a new chemical storage building (assuming existing bulk tanks are relocated at that time) to accommodate a higher treatment capacity would be more expensive than what is currently estimated.

HOLLAND WATER TREATMENT PLANT
BULK CHEMICAL STORAGE EVALUATION
NEW BULK CHEMICAL STORAGE BUILDING
PRELIMINARY COST ESTIMATE

PREPARED FOR:

HOLLAND BOARD OF PUBLIC UTILITIES

HOLLAND, MICHIGAN

JANUARY 15, 2015
PROJECT NO. G140688PS

1515 Arboretum Drive, SE
Grand Rapids, Michigan 49546 | 616.575.3824
www.ftch.com | Fishbeck, Thompson, Carr & Huber, Inc.
engineers | scientists | architects | constructors

TABLE OF CONTENTS

1.0 INTRODUCTION 1

2.0 BASIS OF DESIGN DISCUSSION 1

3.0 SODIUM HYPOCHLORITE DILUTION 2

4.0 ALTERNATIVE 1 – REPLACE TANKS IN CURRENT LOCATION 2

5.0 ALTERNATIVE 1 - COST ESTIMATE 4

6.0 ALTERNATIVE 2 – NEW CHEMICAL STORAGE BUILDING 4

7.0 ALTERNATIVE 2 - COST ESTIMATE 5

LIST OF FIGURES

Figure 1 Potential Locations for New Building
Figure 2 Chemical Storage Floor Plan

LIST OF APPENDICES

Appendix 1 Preliminary Cost Estimates

1.0 INTRODUCTION

This report summarizes an evaluation of bulk chemical storage analysis completed for the Holland Board of Public Works (BPW) Water Treatment Plant (WTP). The WTP has several fiberglass reinforced plastic (FRP) bulk chemical storage tanks that were installed in 1998 as part of a plant improvement project. The plant has budgeted for replacement of the tanks, due to them being near the end of their estimated 15-year service life. One of the tanks had previously developed a leak, which was likely caused by an installation issue when the tank was installed in 1998.

With the new tanks currently being considered for replacement, the BPW wished to explore and evaluate an alternate location for bulk storage of the sodium hypochlorite, alum, and fluoride chemicals. The existing sodium hypochlorite and alum bulk storage tanks are located in a chemical storage area on the third floor of the WTP. This location is a concern, as any leakage from the containment area could potentially impact other floors of the plant below. Installation of new tanks on the third floor would be complicated and expensive. It would require bringing the tanks up in pieces and assembling them onsite, or temporary removal of a plant wall or roof structure to accommodate installation.

The existing fluoride tanks are installed in a chemical storage area which was formerly used for chlorine gas storage and feed equipment. Neither of the existing chemical storage areas have facilities for the containment of bulk trucks unloading onsite.

To alleviate some of the concerns with bulk storage in the plant, the BPW would like to consider construction of a new, separate building for bulk chemical storage. A new building would allow the bulk tanks to be removed from the existing building and would also free up space for storage, maintenance, and other uses in the existing building.

This study develops two alternatives for bulk chemical storage. The first alternative includes replacement of the tanks in their current locations. The second alternative includes a new building for all bulk chemical storage. The following sections develop and provide cost estimates for each alternative

2.0 BASIS OF DESIGN DISCUSSION

All chemical feed tank sizing is based on the current WTP capacity of 38.5 million gallons per day (mgd). It is understood that there is potential to expand the plant beyond 38.5 mgd in the future, if water demands require it. The proposed capacity for expansion has not been clearly defined at this point. Therefore, we have not included provisions for expansion of the proposed chemical storage beyond the current plant capacity in the current preliminary layouts.

3.0 SODIUM HYPOCHLORITE DILUTION

Another consideration impacting the size and layout of the building is the potential for sodium hypochlorite dilution. Pending regulations may eventually require water plants to consider minimizing perchlorate formation. Research has suggested that diluting sodium hypochlorite from full strength (15%) by a factor of 2 to 4 times can slow degradation of the chemical and reduce perchlorate formation. The plant is currently completing some sampling and analysis to evaluate whether dilution may be advantageous.

For the purposes of this study, we have included a separate cost to expand the building to add sodium hypochlorite dilution, as part of Alternative 2. We have based the building size on a dilution ratio of 3.5:1, which would require five additional bulk storage tanks. It is assumed that all bulk tanks have a capacity of between 5,000 and 5,500 gallons of working capacity. If dilution is in fact deemed desirable, it may make sense to base the design on fewer tanks, with a greater capacity in each tank. This could result in a more efficient layout and reduced building space requirements.

For Alternative 1, it is assumed that providing additional sodium hypochlorite storage within the existing plant is not feasible. It would be possible to achieve some level of dilution by a combination of managing chemical deliveries, taking smaller delivery loads, or having less chemical inventory onsite. This would likely require some discussion and approval from Michigan Department of Environmental Quality (MDEQ). Alternately, a new, smaller building could be constructed solely for additional hypochlorite storage and dilution. This alternative was not investigated.

4.0 ALTERNATIVE 1 – REPLACE TANKS IN CURRENT LOCATION

Alternative 1 would replace the existing FRP tanks with new tanks of the same capacity. It is assumed that the existing steel, rubber-lined Alum tanks will remain in service in the current location. The new bulk tanks will provide adequate chemical storage capacity for the treatment plant capacity of 38.5 million gallons per day (mgd).

Tank replacement includes the following scope items:

1. Provide nine new FRP storage tanks. The seven FRP bulk tanks and the two day tanks on the third floor will be replaced. The rubber-lined steel alum tanks will remain in place. The following tanks will be replaced:
    a. Three 5,400-gallon hypochlorite bulk tanks.
    b. One 500-gallon hypochlorite day tank.
    c. Two 2,200-gallon alum bulk tanks.
    d. One 500-gallon alum day tank.
    e. Two 4,200-gallon fluoride bulk tanks.

2. Demo the section of masonry wall east of the hypochlorite containment area to allow tank installation. Provide temporary support and a new lintel as required.
3. Crane rental for tank placement (two days).
4. Heavy moving and rigging for tank installation.
5. Demo the third floor containment area wall between the alum and hypochlorite containment areas as needed for tank installation.
6. Demo the existing hypochlorite and alum tanks, and chemical transfer pipe as required to remove and replace tanks.
7. Install new hypochlorite and alum tanks on the third level.
8. Install new hypochlorite and alum pipe in the containment areas.
9. Provide a recirculation transfer pump and water supply for hypochlorite dilution.
10. Re-build the exterior masonry wall on the third level. Replace the two existing louvers and window.
11. Re-build the containment area wall on the third level, between the alum and hypo areas.
12. Apply new secondary containment coatings in the alum and hypochlorite containment areas. Removal of existing coatings is assumed.
13. Demo the two existing fluoride tanks. Demo the chemical pipe in the fluoride room as required for tank removal and installation.
14. Demo a portion of the containment wall in the fluoride room to accommodate tank removal and installation. Rebuild the containment wall after the new tank installation.
15. Install two new fluoride bulk tanks.
16. New process pipe in the fluoride room.
17. New secondary containment coatings in the fluoride room. Removal of existing coatings is assumed.
18. It is assumed that the temporary bulk chemical storage facilities will be required during construction. An allowance has been provided in the cost estimate for temporary facilities to provide bulk storage, secondary containment, and chemical transfer.
19. Some minor work in the chemical feed pump room may be required to interface with the new bulk storage and temporary storage facilities. An allowance for this work has been included in the estimate.
20. Provide new ultrasonic level sensor instruments for all new tanks.
21. New truck offloading panels for sodium hypochlorite, alum, and fluoride.
22. Install electrical panels and sensors. Electrical demolition.
23. Controls system integration for new sensors, panels.

Other assumptions and clarifications for Alternative 1 include:

1. If dilution is desired, new higher capacity chemical feed pumps will likely be required. New pumps have not been included in this estimate.
2. Pipe replacement is limited to pipe within the containment areas that need to be removed to install new tanks. It would also be possible to re-install and re-use some existing pipe.
3. No modification to existing building mechanical / ventilation systems.
4. Electrical work is limited to power and installation of level sensors.

5.0 ALTERNATIVE 1 - COST ESTIMATE

A preliminary cost estimate for Alternative 1 has been developed based on the assumptions above, and is presented in Appendix 1. The estimated cost for this Alternative 1 is $978,000.

6.0 ALTERNATIVE 2 – NEW CHEMICAL STORAGE BUILDING

Alternative 2 would move bulk chemical storage from the existing plant to a new building. A conceptual layout has been developed for a new chemical storage building. Figure 1 shows two potential locations for the new building. Figure 2 provides a conceptual building layout and other assumed details.

New chemical storage building includes the following main components:

1. Chemical feed systems in this building include hypochlorite, fluoride, and alum. Some space has also been allocated for other low dosage chemicals (polymer, etc).
2. A pipe tunnel for connection to existing plant. Alternately, double-wall pipe for chemical transfer could be direct-buried between the new building and the WTP.
3. Mechanical/Electrical Room for motor control center and control panel.
4. Provide knockout panel in each room for tank removal.
5. Demo of each the existing bulk chemical storage systems in the WTP.
6. New bulk storage tanks and chemical transfer pumps.
7. Ultrasonic level sensor with local readout and exterior fill panel with alarms.
8. Provide separate ventilation and heating for each room in new building.
9. Provide lighting/receptacles for each room.
10. Secondary containment coatings extended up the walls for two to three feet above the floor.
11. Containment area outdoors at truck unloading area will be provided.

Other assumptions and improvements associated with Alternative 2 include:

1. Day tank and chemical feed remain in WTP, with minor modifications to connect new transfer pipes.
2. For dilution option, new higher capacity chemical feed pumps will be required in the WTP.
3. Power for the new building will be fed from existing WTP, routed through pipe tunnel. It has been assumed that there is adequate available electrical capacity in the existing plant to serve the new building, but this has not been investigated or verified.
4. Allowances have been included for sight lighting.
5. Building will be brick-faced, to match the existing WTP building. An alternate cost estimate has been developed for a building constructed of split-faced concrete block.
6. A new access gate with controller will be provided.
7. Fencing will be extended, to match existing metal fence with brick column design.

For Alternative 2, the chemical storage building could be located onsite in an area which could accommodate a future expansion after the initial construction. If it is decided that the building should be expandable, that should be considered during the preliminary design phase for the building.

7.0 ALTERNATIVE 2 - COST ESTIMATE

A preliminary cost estimate has been developed based on the assumptions above, and is presented in Appendix 1. The estimated cost for the new bulk chemical storage building is $3,943,000. This cost is based on Location 1 shown on Figure 1 for the new building, which is near Lakeshore Drive and north of the WTP.

The additional cost for the hypochlorite dilution tanks and the building addition to house the tanks and dilution system is an additional $990,000.

There would be a cost reduction if the building construction was constructed of split-faced block instead of brick. The project cost would be reduced by $65,000 to $3,878,000.

Figures

NORTH

SITE PLAN

SCALE: 1" = 1500'

0 750 1500 3000

engineers
scientists
architects
constructors

fishbeck, thompson, carr & huber, inc.

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

City of Holland
Holland, Michigan

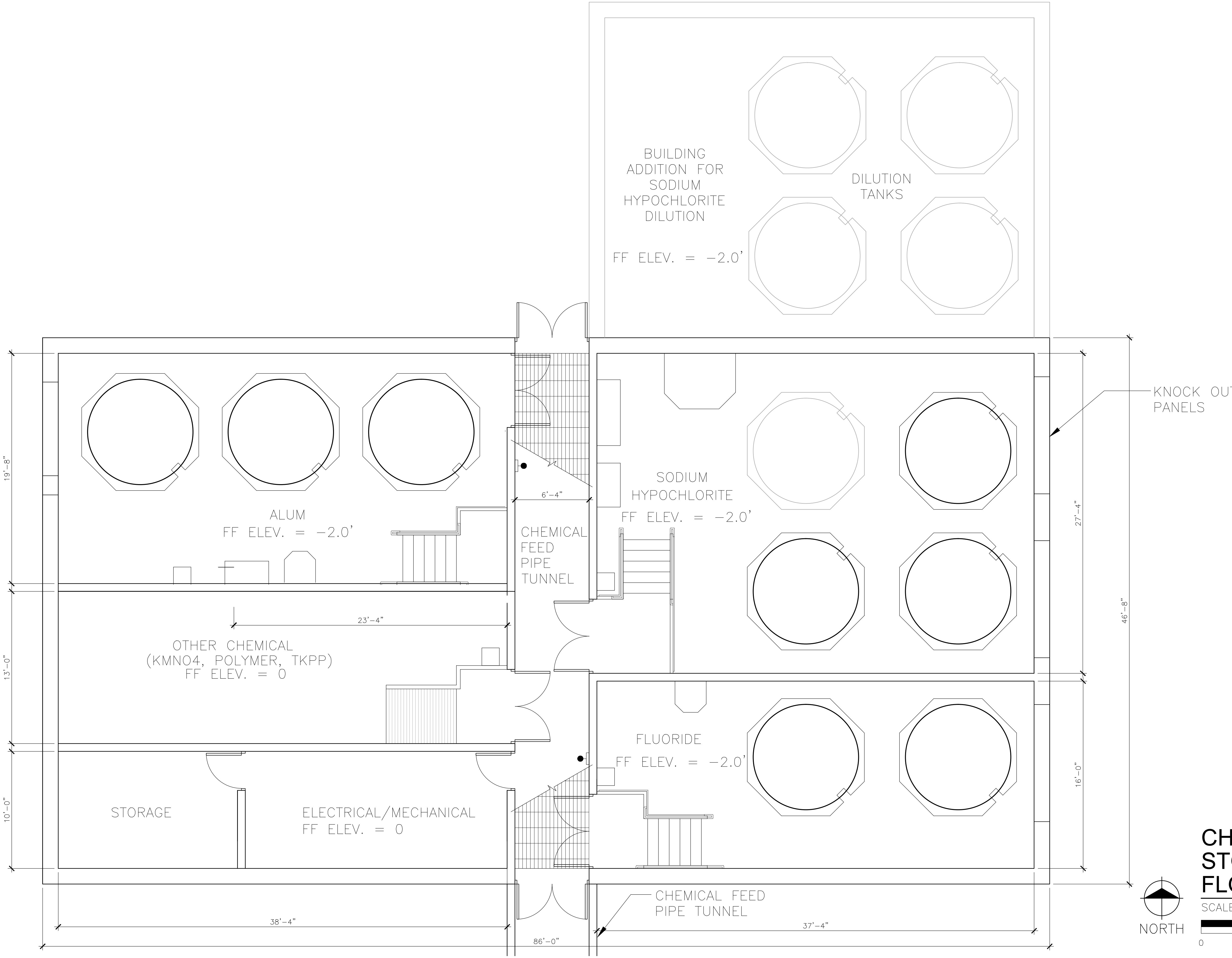
WTP BULK CHEMICAL STORAGE EVALUATION

PRELIMINARY

PROJECT NO.
G140688

FIGURE NO.
1

PLOT INFO: Z:\2014\140688\CAD_FIGURES\FIG01.DWG LAYOUT: SITE PLAN DATE: 11/7/2014 TIME: 9:53:21 AM USER: RS2



CHEMICAL STORAGE FLOOR PLAN

SCALE: 1/8" = 1'−0"

0 4 8 16

ftc&h

engineers
scientists
architects
constructors

fishbeck, thompson, carr & huber, inc.

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

City of Holland
Holland, Michigan

WTP BULK CHEMICAL STORAGE EVALUATION

PRELIMINARY

PROJECT NO.
G140688

FIGURE NO.
2

PLOT INFO: Z:\2014\140688\CAD_FIGURES\FIG01.DWG LAYOUT: BLDG FLOOR PLAN DATE: 1/14/2015 TIME: 10:21:50 AM USER: RS2

Appendix 1

Preliminary Construction Cost Estimate

Alternative 1 - Bulk Chemical Storage Evaluation

New Tanks in Existing Building

Holland, Michigan

November 17, 2014

Work Item Description	Units	Factored Quantity	Unit Cost	Total Cost
Building Construction:				
New Chemical Storage Tanks	LS	1	$ 191,000	$ 191,000
Other Process Equipment, Pipe	LS	1	$ 47,000	$ 47,000
Demo & Install, Rebuild Walls, etc	LS	1	$ 139,000	$ 139,000
Containment Coatings	LS	1	$ 105,000	$ 105,000
Temporary Bulk Storage Allowance	LS	1	$ 50,000	$ 50,000
Level Instruments, Electrical, Controls	LS	1	$ 63,000	$ 63,000
Building Construction:				**$ 595,000**

	Total Cost
TOTAL BASE CONSTRUCTION COST	$ 595,000
DESIGN AND ESTIMATING CONTINGENCY (15%)	$ 89,250
BUILDING PERMITS (1%)	$ 5,950
GENERAL CONTRACTORS OVERHEAD, PROFIT AND GC'S (13%)	$ 89,726
CONSTRUCTION CONTINGENCY During Construction (9%)	$ 70,193
ADMINISTRATION AND ENGINEERING (15%)	$ 127,518
Base Construction Budget	**$ 977,637**

EXCLUDES

Abatement Cost

Soft Costs (Legal, Environmental)

Preliminary Construction Cost Estimate

Alternative 2 - Bulk Chemical Storage Evaluation

New Chemical Storage Building

Holland, Michigan

November 10, 2014

Work Item Description	Units	Factored Quantity	Unit Cost	Total Cost
Building Construction:				
New Chemical Storage building	SF	4050	$ 365	$ 1,478,250
Demo existing tanks	LS	1	$ 25,000	$ 25,000
New pipe and equipment	LS	1	$ 430,000	$ 430,000
Building Construction:				**$ 1,933,250**
Civil Work :				
6' Precast crawl tunnel	LF	225	$ 700	$ 157,500
6" Asphalt drive, conc. curbs, and striping	LF	610	$ 250	$ 152,500
8" Concrete unloading pad	SF	2100	$ 10	$ 20,475
New fence, gate, access controller and power	LS	1	$ 35,000	$ 35,000
Extend metal fence and brick columns	LF	300	$ 267	$ 80,000
Misc. Site pole lighting (allowance)	EA	6	$ 3,500	$ 21,000
Civil Work :				**$ 466,475**

	TOTAL COST
TOTAL BASE CONSTRUCTION COST	**$ 2,399,725**
DESIGN AND ESTIMATING CONTINGENCY (15%)	**$ 359,959**
BUILDING PERMITS (1%)	**$ 23,997**
GENERAL CONTRACTORS OVERHEAD, PROFIT AND GC'S (13%)	**$ 361,879**
CONSTRUCTION CONTINGENCY During Construction (9%)	**$ 283,100**
ADMINISTRATION AND ENGINEERING (15%)	**$ 514,299**
BASE CONSTRUCTION BUDGET	**$ 3,942,959**

EXCLUDES

Over excavation caused by bad soils

Special foundation construction - Ie, piles, grade beams, inc.

Abatement Cost

Soft Costs (Legal, Environmental)

Preliminary Construction Cost Estimate
Alternative 2 - Dilution Tank Building Addition
Holland, Michigan
November 10, 2014

Work Item Description	Units	Factored Quantity	Unit Cost	Total Cost
Building Construction:				
Additional Chemical Storage building	SF	1150	$ 300	$ 345,000
New pipe and equipment	LS	1	$ 249,000	$ 249,000
Building Construction:				**$ 594,000**
Civil Work :				
Misc. Site pole lighting (allowance)	EA	2	$ 3,500	$ 7,000
Civil Work :				**$ 7,000**

	TOTAL COST
TOTAL BASE CONSTRUCTION COST	**$ 601,000**
DESIGN AND ESTIMATING CONTINGENCY (15%)	**$ 90,150**
BUILDING PERMITS (1%)	**$ 6,010**
GENERAL CONTRACTORS OVERHEAD, PROFIT AND GC'S (13%)	**$ 90,631**
CONSTRUCTION CONTINGENCY During Construction (9%)	**$ 70,901**
ADMINISTRATION AND ENGINEERING (15%)	**$ 128,804**
BASE CONSTRUCTION BUDGET	**$ 987,496**

EXCLUDES
Over excavation caused by bad soils
Special foundation construction - Ie, piles, grade beams, inc.
Abatement Cost
Soft Costs (Legal, Environmental)

Appendix I

Cost Data

<u>Lead Service Line Replacement Opinion of Probable Cost</u>

	Unit Cost*	Qty	**Estimated Total Cost**
Alternative 1 - Trenchless Installation	$3,500.00	1,717	**$ 6.0 M**
Alternative 2 - Conventional Excavation	$5,750.00	1,717	**$ 10.0 M**

* Unit Costs Based on recent Bids for Similar Work

Chemical Storage Alternative 2 Opinion of Probable Cost:

Construct New Chemical Storage Building on WTP Site

Item	Estimated Cost
Demolish Existing Tanks	$ 59,000
Demolition of Freight Elevator	$ 64,000
Third Floor Office Renovation	$ 250,000
Extend Elevator to Third Floor	$ 248,000
Chemical Storage Tanks, Equipment, Piping	$ 575,000
New Chemical Storage Building (w/ MEP)	$ 1,978,000
Precast Crawl Tunnel	$ 211,000
Civil Site Improvements	$ 413,000
Estimated Construction Cost	$ 3,798,000
Engineering and Administration (15%)	$ 570,000
Contractor Overhead, Profit and General Conditions (13%)	$ 494,000
Design and Construction Contingency (30%)	$ 1,459,000
Estimated Total Project Cost	$ 6,300,000

Chemical Storage Alternative 3 Opinion of Probable Cost:

Expand and Modify Existing Filter Building for Chemical Storage

Item	Estimated Cost
Demolition of Existing Tanks	$ 59,000
Demolition of Freight Elevator	$ 64,000
Third Floor Office Renovation	$ 250,000
Extend Elevator to Third Floor	$ 248,000
Chemical Storage Tanks	$ 230,000
Chemical Feed Equipment	$ 222,000
Secondary Containment Coatings	$ 101,000
Building and Mechanical	$ 880,000
Electrical, Instrumentation & Controls	$ 296,000
Civil Site Improvements	$ 24,000
Estimated Construction Cost	$ 2,374,000
Engineering and Administration (15%)	$ 356,000
Contractor Overhead, Profit and General Conditions (13%)	$ 309,000
Design and Construction Contingency (30%)	$ 912,000
Estimated Total Project Cost	$ 4,000,000

Chemical Storage Alternative 2: Construct New Building on WTP Site Present Worth Analysis

Rates

2023 Bond Rate:	1.875%
OMB circ. A-94 Real Discount Rate:	2.00%

Capital Improvement Assumed Depreciation Breakdown:

50 Year (Structures, Buried Piping, etc.):	50%
30 Year (Electrical Cabinets, etc.):	15%
20 Year (Mechanical Equipment):	25%
10 Year (Instrumentation & Controls):	10%

	Financing Expenses				
Year	Assumed Bond Improvements	Estimated Bond Payment	Estimated Bond Interest	Equipment Replacement*	Salvage Value
1	$ 6,300,000.00	$262,530	$118,125		$6,063,750
2	$0	$267,453	$113,203		$5,827,500
3	$0	$272,468	$108,188		$5,591,250
4	$0	$277,576	$103,079		$5,355,000
5	$0	$282,781	$97,874		$5,118,750
6	$0	$288,083	$92,572		$4,882,500
7	$0	$293,485	$87,171		$4,646,250
8	$0	$298,987	$81,668		$4,410,000
9	$0	$304,593	$76,062		$4,173,750
10	$0	$310,304	$70,351		$3,937,500
11	$0	$316,123	$64,533	$630,000	$4,268,250
12	$0	$322,050	$58,605		$3,969,000
13	$0	$328,088	$52,567		$3,669,750
14	$0	$334,240	$46,415		$3,370,500
15	$0	$340,507	$40,148		$3,071,250
16	$0	$346,892	$33,764		$2,772,000
17	$0	$353,396	$27,259		$2,472,750
18	$0	$360,022	$20,633		$2,173,500
19	$0	$366,772	$13,883		$1,874,250
20	$0	$373,649	$7,006		$1,575,000

Present Worth Analysis	
Bond PW	$7,324,798
Salvage PW	$1,059,930
Net Present Worth	$6,264,868

*Replacement cost for Instrumentation & Controls at end of useful life

Chemical Storage Alternative 3: Expand and Modify Existing Filter Building Present Worth Analysis

Rates

2023 Bond Rate:	1.875%
OMB circ. A-94 Real Discount Rate:	2.00%

Capital Improvement Assumed Depreciation Breakdown:

50 Year (Structures, Buried Piping, etc.):	50%
30 Year (Electrical Cabinets, etc.):	15%
20 Year (Mechanical Equipment):	25%
10 Year (Instrumentation & Controls):	10%

	Financing Expenses				
Year	Assumed Bond Improvements	Estimated Bond Payment	Estimated Bond Interest	Equipment Replacement*	Salvage Value
1	$ 4,000,000.00	$166,686	$75,000		$3,850,000
2	$0	$169,811	$71,875		$3,700,000
3	$0	$172,995	$68,691		$3,550,000
4	$0	$176,239	$65,447		$3,400,000
5	$0	$179,543	$62,143		$3,250,000
6	$0	$182,910	$58,776		$3,100,000
7	$0	$186,339	$55,347		$2,950,000
8	$0	$189,833	$51,853		$2,800,000
9	$0	$193,393	$48,293		$2,650,000
10	$0	$197,019	$44,667		$2,500,000
11	$0	$200,713	$40,973	$400,000	$2,710,000
12	$0	$204,476	$37,210		$2,520,000
13	$0	$208,310	$33,376		$2,330,000
14	$0	$212,216	$29,470		$2,140,000
15	$0	$216,195	$25,491		$1,950,000
16	$0	$220,249	$21,437		$1,760,000
17	$0	$224,378	$17,308		$1,570,000
18	$0	$228,585	$13,101		$1,380,000
19	$0	$232,871	$8,815		$1,190,000
20	$0	$237,238	$4,448		$1,000,000

Present Worth Analysis	
Bond PW	$4,650,665
Salvage PW	$672,971
Net Present Worth	$3,977,694

*Replacement cost for Instrumentation & Controls at end of useful life

Chemical Storage Alternative 2: Construct New Building on WTP Site User Cost Calculation

Rates

2023 Bond Rate:	1.875%
OMB circ. A-94 Real Discount Rate:	2.00%

Capital Improvement Assumed Depreciation Breakdown:

50 Year (Structures, Buried Piping, etc.):	50%
30 Year (Electrical Cabinets, etc.):	15%
20 Year (Mechanical Equipment):	25%
10 Year (Instrumentation & Controls):	10%

	Financing Expenses					User Costs	
Year	Assumed Bond Improvements	Estimated Bond Payment	Estimated Bond Interest	Equipment Replacement*	Salvage Value	Additional Cost ($/yr)	Additional User Cost ($/ccf)
1	$ 6,300,000.00	$262,530	$118,125		$6,063,750	$380,655	$0.06
2	$0	$267,453	$113,203		$5,827,500	$380,655	$0.06
3	$0	$272,468	$108,188		$5,591,250	$380,655	$0.06
4	$0	$277,576	$103,079		$5,355,000	$380,655	$0.06
5	$0	$282,781	$97,874		$5,118,750	$380,655	$0.06
6	$0	$288,083	$92,572		$4,882,500	$380,655	$0.06
7	$0	$293,485	$87,171		$4,646,250	$380,655	$0.06
8	$0	$298,987	$81,668		$4,410,000	$380,655	$0.06
9	$0	$304,593	$76,062		$4,173,750	$380,655	$0.06
10	$0	$310,304	$70,351		$3,937,500	$380,655	$0.06
11	$0	$316,123	$64,533	$630,000	$4,268,250	$1,010,655	$0.15
12	$0	$322,050	$58,605		$3,969,000	$380,655	$0.06
13	$0	$328,088	$52,567		$3,669,750	$380,655	$0.06
14	$0	$334,240	$46,415		$3,370,500	$380,655	$0.06
15	$0	$340,507	$40,148		$3,071,250	$380,655	$0.06
16	$0	$346,892	$33,764		$2,772,000	$380,655	$0.06
17	$0	$353,396	$27,259		$2,472,750	$380,655	$0.06
18	$0	$360,022	$20,633		$2,173,500	$380,655	$0.06
19	$0	$366,772	$13,883		$1,874,250	$380,655	$0.06
20	$0	$373,649	$7,006		$1,575,000	$380,655	$0.06
						Avg. Add'l User Cost	**$0.06**

*Replacement cost for Instrumentation & Controls at end of useful life

Chemical Storage Alternative 3: Expand and Modify Existing Filter Building User Cost Calculation

Rates

2023 Bond Rate:	1.875%
OMB circ. A-94 Real Discount Rate:	2.00%

Capital Improvement Assumed Depreciation Breakdown:

50 Year (Structures, Buried Piping, etc.):	50%
30 Year (Electrical Cabinets, etc.):	15%
20 Year (Mechanical Equipment):	25%
10 Year (Instrumentation & Controls):	10%

	Financing Expenses					User Costs	
Year	Assumed Bond Improvements	Estimated Bond Payment	Estimated Bond Interest	Equipment Replacement*	Salvage Value	Additional Cost ($/yr)	Additional User Cost ($/ccf)
1	$ 4,000,000.00	$166,686	$75,000		$3,850,000	$241,686	$0.04
2	$0	$169,811	$71,875		$3,700,000	$241,686	$0.04
3	$0	$172,995	$68,691		$3,550,000	$241,686	$0.04
4	$0	$176,239	$65,447		$3,400,000	$241,686	$0.04
5	$0	$179,543	$62,143		$3,250,000	$241,686	$0.04
6	$0	$182,910	$58,776		$3,100,000	$241,686	$0.04
7	$0	$186,339	$55,347		$2,950,000	$241,686	$0.04
8	$0	$189,833	$51,853		$2,800,000	$241,686	$0.04
9	$0	$193,393	$48,293		$2,650,000	$241,686	$0.04
10	$0	$197,019	$44,667		$2,500,000	$241,686	$0.04
11	$0	$200,713	$40,973	$400,000	$2,710,000	$641,686	$0.09
12	$0	$204,476	$37,210		$2,520,000	$241,686	$0.04
13	$0	$208,310	$33,376		$2,330,000	$241,686	$0.04
14	$0	$212,216	$29,470		$2,140,000	$241,686	$0.04
15	$0	$216,195	$25,491		$1,950,000	$241,686	$0.04
16	$0	$220,249	$21,437		$1,760,000	$241,686	$0.04
17	$0	$224,378	$17,308		$1,570,000	$241,686	$0.04
18	$0	$228,585	$13,101		$1,380,000	$241,686	$0.04
19	$0	$232,871	$8,815		$1,190,000	$241,686	$0.04
20	$0	$237,238	$4,448		$1,000,000	$241,686	$0.04
						Avg. Add'l User Cost	**$0.04**

*Replacement cost for Instrumentation & Controls at end of useful life

LSL Replacement Alternative 1: Trenchless Replacement User Cost

Rates

2023 Bond Rate:	1.875%
OMB circ. A-94 Real Discount Rate:	2.00%

	Financing Expenses			User Costs	
Year	Assumed Bond Improvements	Estimated Bond Payment	Estimated Bond Interest	Additional Cost ($/yr)	Additional User Cost ($/ccf)
1	$ 6,000,000.00	$250,029	$112,500	$362,529	$0.05
2	$0	$254,717	$107,812	$362,529	$0.05
3	$0	$259,493	$103,036	$362,529	$0.05
4	$0	$264,358	$98,171	$362,529	$0.05
5	$0	$269,315	$93,214	$362,529	$0.05
6	$0	$274,365	$88,164	$362,529	$0.05
7	$0	$279,509	$83,020	$362,529	$0.05
8	$0	$284,750	$77,779	$362,529	$0.05
9	$0	$290,089	$72,440	$362,529	$0.05
10	$0	$295,528	$67,001	$362,529	$0.05
11	$0	$301,069	$61,460	$362,529	$0.05
12	$0	$306,714	$55,815	$362,529	$0.05
13	$0	$312,465	$50,064	$362,529	$0.05
14	$0	$318,324	$44,205	$362,529	$0.05
15	$0	$324,292	$38,236	$362,529	$0.05
16	$0	$330,373	$32,156	$362,529	$0.05
17	$0	$336,567	$25,961	$362,529	$0.05
18	$0	$342,878	$19,651	$362,529	$0.05
19	$0	$349,307	$13,222	$362,529	$0.05
20	$0	$355,857	$6,672	$362,529	$0.05
				Avg. Add'l User Cost	**$0.05**

LSL Replacement Alternative 2: Conventional Excavated Replacement User Cost

Rates

2023 Bond Rate:	1.875%
OMB circ. A-94 Real Discount Rate:	2.00%

	Financing Expenses			User Costs	
Year	Assumed Bond Improvements	Estimated Bond Payment	Estimated Bond Interest	Additional Cost ($/yr)	Additional User Cost ($/ccf)
1	$ 10,000,000.00	$416,715	$187,500	$604,215	$0.09
2	$0	$424,528	$179,687	$604,215	$0.09
3	$0	$432,488	$171,727	$604,215	$0.09
4	$0	$440,597	$163,618	$604,215	$0.09
5	$0	$448,858	$155,356	$604,215	$0.09
6	$0	$457,275	$146,940	$604,215	$0.09
7	$0	$465,848	$138,366	$604,215	$0.09
8	$0	$474,583	$129,632	$604,215	$0.09
9	$0	$483,482	$120,733	$604,215	$0.09
10	$0	$492,547	$111,668	$604,215	$0.09
11	$0	$501,782	$102,433	$604,215	$0.09
12	$0	$511,190	$93,024	$604,215	$0.09
13	$0	$520,775	$83,439	$604,215	$0.09
14	$0	$530,540	$73,675	$604,215	$0.09
15	$0	$540,487	$63,727	$604,215	$0.09
16	$0	$550,622	$53,593	$604,215	$0.09
17	$0	$560,946	$43,269	$604,215	$0.09
18	$0	$571,463	$32,751	$604,215	$0.09
19	$0	$582,178	$22,036	$604,215	$0.09
20	$0	$593,094	$11,121	$604,215	$0.09
				Avg. Add'l User Cost	**$0.09**

Useful Life Calculation

ITEM	INITIAL COST ($)	USEFUL LIFE (YRS)	WEIGHTED COST ($)
Sitework			
-Earthwork	*$ 24,000*	*50*	*$ 1,200,000*
-Buildings	*$ 1,303,000*	*50*	*$ 65,150,000*
-Demolition	*$ 123,000*	*-*	*-*
Equipment			
Chemical Storage Tanks	*$ 230,000*	*20*	*$ 4,600,000*
Chemical Feed Equipment	*$ 222,000*	*20*	*$ 4,440,000*
Electrical	*$ 148,000*	*30*	*$ 4,440,000*
I&C	*$ 148,000*	*10*	*$ 1,480,000*
Mechanical	*$ 176,000*	*20*	*$ 3,520,000*
TOTAL	**$ 2,374,000**		**$ 75,390,000**

PROJECT WEIGHTED USEFUL LIFE **31.8**