

CITY COUNCIL REGULAR MEETING AGENDA

*Meetings: First and Third Mondays - 7:00 p.m.
Monday, August 15, 2022*

City Council Chambers ♦ Second Floor ♦ 112 West Cass Street ♦ Albion, MI 49224

PLEASE TURN OFF CELL PHONES DURING MEETING

Page

- I. CALL TO ORDER
- II. MOMENT OF SILENCE TO BE OBSERVED
- III. PLEDGE OF ALLEGIANCE
- IV. ROLL CALL
- V. APPROVAL OF AGENDA
(Includes any proposed additions, deletions or changes to the agenda)
 - A. AGENDA
- VI. PRESENTATIONS AND RECOGNITIONS
- VII. PUBLIC HEARING- OBSOLETE PROPERTY REHABILITATION EXEMPTION CERTIFICATE FOR ERIE STREET APARTMENTS LLC
 - A. APPROVE RESOLUTION # 2022-27, RESOLUTION TO APPROVE THE OBSOLETE PROPERTY REHABILITATION EXEMPTION CERTIFICATE APPLICATION FOR ERIE STREET APARTMENTS LLC
[Resolution 2022-27](#)
[Notice of Public Hearing 112 E Erie OPRA District Application 7-27-22](#)
[112 E Erie - OPRA CERT APPLICATION - 8-9-22](#)
- VIII. PUBLIC COMMENTS
(Persons addressing the City Council shall limit their comments to **agenda items only** and to no more than three (3) minutes. Proper decorum is required.)
- IX. CLOSED SESSION
- X. CONSENT CALENDAR (VV) (ITEMS)
(Items on Consent Calendar are voted on as one unit)

36 - 47

- AUGUST 1, 2022 STUDY SESSION MINUTES
- AUGUST 1, 2022 REGULAR SESSION MINUTES

[CITY COUNCIL STUDY SESSION - 01 Aug 2022 - Minutes - Pdf](#)
[CITY COUNCIL REGULAR MEETING - 01 Aug 2022 - Minutes - Pdf](#)

- XI. ITEMS FOR INDIVIDUAL DISCUSSION
- 48 - 127 A. APPROVE WATER RATE INCREASE
[Output Document \(AIR-22-494\) - Pdf](#)
- 128 - 170 B. APPROVE RICH & ASSOCIATES PARKING CONSULTANTS PROPOSAL FOR DOWNTOWN PARKING MANAGEMENT STUDY
[Output Document \(AIR-22-500\) - Pdf](#)
- 171 - 175 C. APPROVE RESOLUTION #2022-28 A RESOLUTION TO SUPPORT THE REQUESTING OF \$200,000 FROM THE ALBION TRUST TO SUPPORT THE RENOVATION OF MCAULIFFE PARK AND VICTORY PARK
[Output Document \(AIR-22-499\) - Pdf](#)
[Untitled_20220811_041147](#)
- 176 D. APPROVE CLOSURE OF E. ERIE STREET FOR BOSS UP FESTIVAL
[Output Document \(AIR-22-495\) - Pdf](#)
- 177 E. DISCUSSION TRANSPORTATION ASSET MANAGEMENT PLAN
[Output Document \(AIR-22-498\) - Pdf](#)
- 178 F. DISCUSSION SUMMER EMPLOYMENT PROGRAM FOR TEENS
[Output Document \(AIR-22-496\) - Pdf](#)
- 179 G. DISCUSSION PUBLIC SAFETY AD-HOC COMMITTEE
[Output Document \(AIR-22-497\) - Pdf](#)
- 180 - 310 H. DISCUSSION BARNES PARK
[Output Document \(AIR-22-501\) - Pdf](#)
- XII. FUTURE AGENDA ITEMS
- XIII. PUBLIC COMMENTS
(Persons addressing the City Council shall limit their comments to no more than three (3) minutes. Proper decorum is required.)
- XIV. CITY MANAGER REPORT
- 311 - 313 A. [CM Report 8.15.22](#)
- 314 - 327 B. [6-30-2022 Cash Summary \(1\)](#)
[6-30-2022 Rev & Exp \(1\)](#)
- XV. MAYOR AND COUNCIL MEMBER COMMENTS
- XVI. MOTION TO EXCUSE ABSENT COUNCIL MEMBER (S)
- XVII. ROLL CALL
- XVIII. ADJOURN

RESOLUTION #2022-27

**RESOLUTION TO APPROVE THE OBSOLETE PROPERTY REHABILITATION
EXEMPTION CERTIFICATE APPLICATION FOR ERIE STREET
APARTMENTS, L.L.C.**

WHEREAS, pursuant to PA 146 of 2000, the City of Albion is a Qualified Local Governmental Unit eligible to establish one or more Obsolete Property Rehabilitation Districts; and

WHEREAS, the City of Albion legally established the City of Albion – Downtown Development Obsolete Property Rehabilitation District No. 2 on February 3, 2020, after a public hearing held on February 3, 2020; and

WHEREAS, the taxable value of the property proposed to be exempt plus the aggregate taxable value of property already exempt under Public Act 146 of 2000 and under Public Act 198 of 1974 (IFT's) does not exceed 5% of the total taxable value of the City of Albion; and

WHEREAS, the application was approved at a public hearing as provided by section 4(2) of Public Act 146 of 2000 on August 15, 2022; and

WHEREAS, the applicant, Erie Street Apartments, L.L.C., is not delinquent in any taxes related to the facility; and

WHEREAS, the application was approved for less than 12 years and the certificate will not be extended; and

WHEREAS, the application is for obsolete property as defined in section 2(h) of Public Act 146 of 2000; and

WHEREAS, the applicant, Erie Street Apartments, L.L.C., has provided answers to all required questions under the application instructions to the City of Albion; and

WHEREAS, the City of Albion requires that rehabilitation of the facility shall be completed by October 31, 2023; and

WHEREAS, the commencement of the rehabilitation of the facility did not occur before the establishment of the Obsolete Property Rehabilitation District; and

WHEREAS, the application relates to a rehabilitation program that when completed constitutes a rehabilitated facility within the meaning of Public Act 146 of 2000 and that is situated within an Obsolete Property Rehabilitation District established in the City of Albion eligible under Public Act 146 of 2000 to establish such a district; and

WHEREAS, completion of the rehabilitated facility is calculated to, and will at the time of issuance of the certificate, have the reasonable likelihood to create employment, revitalize urban areas, and/or increase the number of residents in the community in which the facility is situated; and

WHEREAS, the rehabilitation includes improvements aggregating 10% or more of the true cash value of the property at commencement of the rehabilitation as provided by section 2(l) of Public Act 146 of 2000.

Council Member _____ moved, supported by Council Member _____, to approve the following resolution

RESOLVED, Erie Street Apartments, L.L.C. is hereby granted an Obsolete Property Rehabilitation Exemption for the real property, excluding land, located in City of Albion – Downtown Development Obsolete Property Rehabilitation District No. 2 at 112 E. Erie Street, Albion, MI 49224, for a period of one (1) year, beginning December 31, 2022, and ending December 30, 2023, pursuant to the provisions of PA 146 of 2000, as amended.

I hereby certify the foregoing resolution was approved by a majority of the members of the City Council by a roll call vote at a regular meeting held on August 15, 2022, in compliance with the Open Meetings Act.

Ayes _____
Nays _____
Absent _____

Jill Domingo, Clerk

August 15, 2022

NOTICE OF PUBLIC HEARING

RE: Public Hearing to consider An Obsolete Property Rehabilitation Exemption Certificate for Ace Investment Properties

A Public Hearing will be held on the matter of granting an Obsolete Property Rehabilitation Exemption Certificate to Ace Investment Properties for 112 E. Erie St., Albion, MI 49224.

Legal Description: ORIGINAL PLAT, BLK 65: E ½ OF LOT 3 AND ENTIRE LOT 4 AND THE w 16.90 FT IF KIT 5 (112 E Erie St)

The Public Hearing is scheduled at the City Council session on Monday, August 15, 2022 at 7:00pm. in the Albion City Council Chambers, 112 West Cass Street, Albion, MI 49224.

This notice is offered under the provisions of Public Act 146 of 2000 and as subsequently amended.

Jill Domingo

City Clerk

City of Albion

Michigan Department of Treasury
3874 (Rev. 12-20)

Application for Obsolete Property Rehabilitation Exemption Certificate

Issued under authority of Public Act 146 of 2000, as amended.

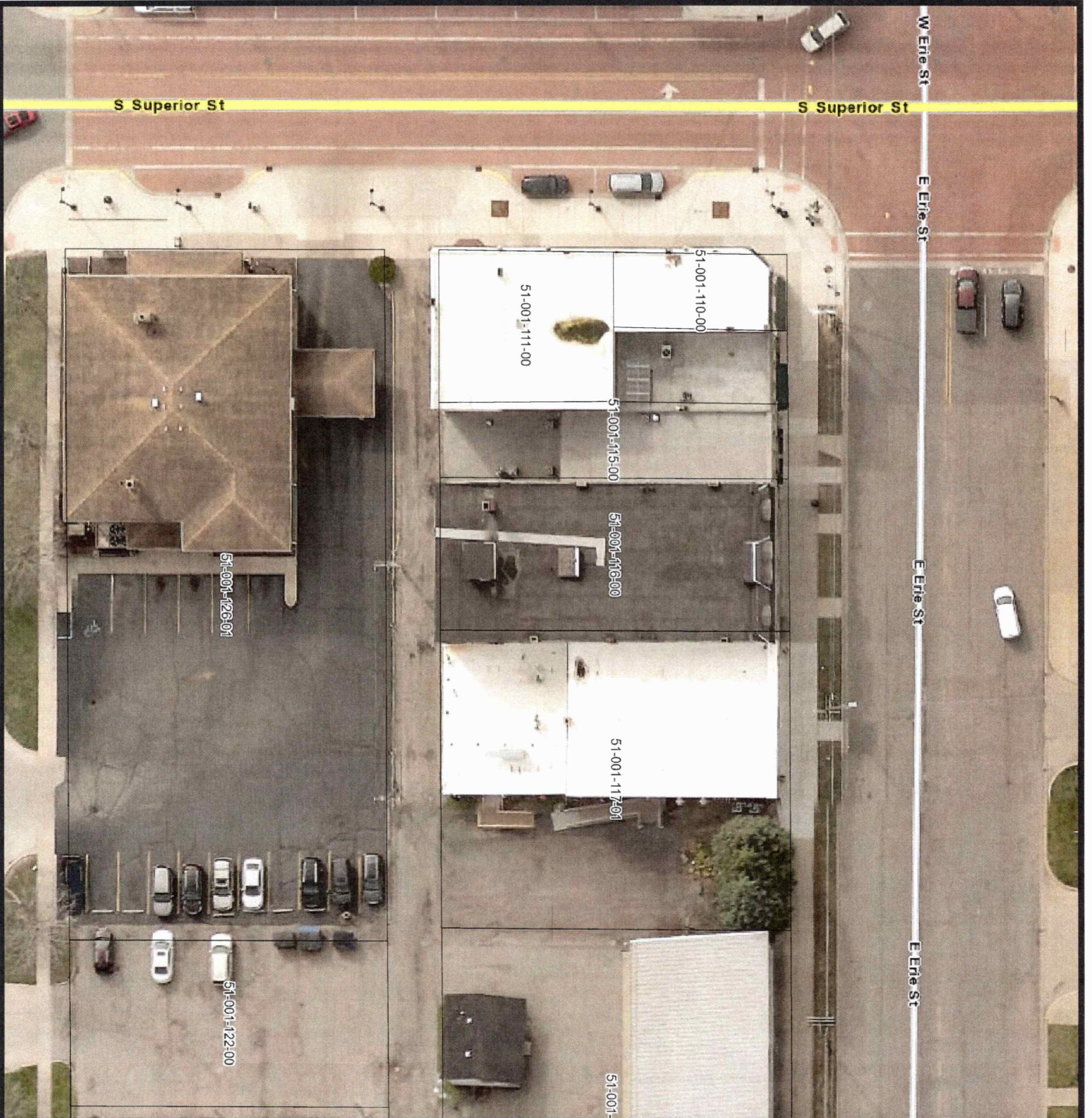
This application should be filed after the district is established. This project will not receive tax benefits until approved by the State Tax Commission. Applications received after October 31 may not be acted upon in the current year. This application is subject to audit by the State Tax Commission.

INSTRUCTIONS: File the completed application and the required attachments with the clerk of the local government unit. (The State Tax Commission requires two copies of the Application and attachments. The original is retained by the clerk.) See State Tax Commission Bulletin 9 of 2000 for more information about the Obsolete Property Rehabilitation Exemption. The following must be provided to the local government unit as attachments to this application: (a) General description of the obsolete facility (year built, original use, most recent use, number of stories, square footage); (b) General description of the proposed use of the rehabilitated facility, (c) Description of the general nature and extent of the rehabilitation to be undertaken, (d) A descriptive list of the fixed building equipment that will be a part of the rehabilitated facility, (e) A time schedule for undertaking and completing the rehabilitation of the facility, (f) A statement of the economic advantages expected from the exemption. A statement from the assessor of the local unit of government, describing the required obsolescence has been met for this building, is required with each application. Rehabilitation may commence after establishment of district.

Applicant (Company) Name (applicant must be the OWNER of the facility) <i>Eric Street Apartments</i>		
Company Mailing Address (Number and Street, P.O. Box, City, State, ZIP Code) <i>16000 W Michigan Ave. Albion, MI 49224</i>		
Location of obsolete facility (Number and Street, City, State, ZIP Code) <i>152 E Eric St, Albion, MI 49224</i>		
City, Township, Village (Indicate which) <i>Albion city</i>	County <i>Calhoun</i>	
Date of Commencement of Rehabilitation (mm/dd/yyyy) <i>03/01/2023</i>	Planned date of Completion of Rehabilitation (mm/dd/yyyy) <i>10/31/2023</i>	School District where facility is located (include school code) <i>Marshall</i>
Estimated Cost of Rehabilitation <i>650,000</i>	Number of years exemption requested	
Attach legal description of obsolete property on separate sheet.		
Expected Project Outcomes (Check all that apply)		
<input type="checkbox"/> Increase commercial activity	<input type="checkbox"/> Retain employment	<input checked="" type="checkbox"/> Revitalize urban areas
<input checked="" type="checkbox"/> Create employment	<input type="checkbox"/> Prevent a loss of employment	<input checked="" type="checkbox"/> Increase number of residents in the community in which the facility is situated
Indicate the number of jobs to be retained or created as a result of rehabilitating the facility, including expected construction employment. _____		
<input type="checkbox"/> Each year, the State Treasurer may approve 25 additional reductions of half the school operating and state education taxes for a period not to exceed six years. Check the box at left if you wish to be considered for this exclusion.		
APPLICANT CERTIFICATION		
The undersigned, authorized officer of the company making this application certifies that, to the best of his/her knowledge, no information contained herein or in the attachments hereto is false in any way and that all of the information is truly descriptive of the property for which this application is being submitted. Further, the undersigned is aware that, if any statement or information provided is untrue, the exemption provided by Public Act 146 of 2000 may be in jeopardy.		
The applicant certifies that this application relates to a rehabilitation program that, when completed, constitutes a rehabilitated facility, as defined by Public Act 146 of 2000, as amended, and that the rehabilitation of the facility would not be undertaken without the applicant's receipt of the exemption certificate.		
It is further certified that the undersigned is familiar with the provisions of Public Act 146 of 2000, as amended, of the Michigan Compiled Laws; and to the best of his/her knowledge and belief, (s)he has complied or will be able to comply with all of the requirements thereof which are prerequisite to the approval of the application by the local unit of government and the issuance of an Obsolete Property Rehabilitation Exemption Certificate by the State Tax Commission.		
Name of Company Officer (No authorized agents) <i>William Dobbins</i>	Telephone Number <i>517-680-0081</i>	Fax Number
Mailing Address <i>16000 W Michigan Ave. Albion, MI 49224</i>	E-mail Address <i>bdobbins@casternconcepts.com</i>	
Signature of Company Officer (no authorized agents) <i>Bill Dobbins</i>	Title <i>Owner</i>	
LOCAL GOVERNMENT UNIT CLERK CERTIFICATION		
The Clerk must also complete Parts 1, 2 and 4 on page 2. Part 3 is to be completed by the Assessor.		
Signature	Date Application Received	
FOR STATE TAX COMMISSION USE		
Application Number	Date Received	LUCI Code

LOCAL GOVERNMENT ACTION		
This section is to be completed by the clerk of the local governing unit before submitting the application to the State Tax Commission. Include a copy of the resolution which approves the application and Instruction items (a) through (f) on page 1, and a separate statement of obsolescence from the assessor of record with the State Assessor's Board. All sections must be completed in order to process.		
PART 1: ACTION TAKEN		
Action Date		
<input type="checkbox"/> Exemption Approved for _____ Years, ending December 30, _____ (not to exceed 12 years) <input type="checkbox"/> Denied		
Date District Established	LUCI Code	School Code
PART 2: RESOLUTIONS (the following statements must be included in resolutions approving)		
<p>A statement that the local unit is a Qualified Local Governmental Unit.</p> <p>A statement that the Obsolete Property Rehabilitation District was legally established including the date established and the date of hearing as provided by section 3 of Public Act 146 of 2000.</p> <p>A statement indicating whether the taxable value of the property proposed to be exempt plus the aggregate taxable value of property already exempt under Public Act 146 of 2000 and under Public Act 198 of 1974 (IFT's) exceeds 5% of the total taxable value of the unit.</p> <p>A statement of the factors, criteria and objectives, if any, necessary for extending the exemption, when the certificate is for less than 12 years.</p> <p>A statement that a public hearing was held on the application as provided by section 4(2) of Public Act 146 of 2000 including the date of the hearing.</p> <p>A statement that the applicant is not delinquent in any taxes related to the facility.</p> <p>If it exceeds 5% (see above), a statement that exceeding 5% will not have the effect of substantially impeding the operation of the Qualified Local Governmental Unit or of impairing the financial soundness of an affected taxing unit.</p> <p>A statement that all of the items described under "Instructions" (a) through (f) of the Application for Obsolete Property Rehabilitation Exemption Certificate have been provided to the Qualified Local Governmental Unit by the applicant.</p>	<p>A statement that the application is for obsolete property as defined in section 2(h) of Public Act 146 of 2000.</p> <p>A statement that the commencement of the rehabilitation of the facility did not occur before the establishment of the Obsolete Property Rehabilitation District.</p> <p>A statement that the application relates to a rehabilitation program that when completed constitutes a rehabilitated facility within the meaning of Public Act 146 of 2000 and that is situated within an Obsolete Property Rehabilitation District established in a Qualified Local Governmental Unit eligible under Public Act 146 of 2000 to establish such a district.</p> <p>A statement that completion of the rehabilitated facility is calculated to, and will at the time of issuance of the certificate, have the reasonable likelihood to, increase commercial activity, create employment, retain employment, prevent a loss of employment, revitalize urban areas, or increase the number of residents in the community in which the facility is situated. The statement should indicate which of these the rehabilitation is likely to result in.</p> <p>A statement that the rehabilitation includes improvements aggregating 10% or more of the true cash value of the property at commencement of the rehabilitation as provided by section 2(l) of Public Act 146 of 2000.</p> <p>A statement of the period of time authorized by the Qualified Local Governmental Unit for completion of the rehabilitation.</p>	
PART 3: ASSESSOR RECOMMENDATIONS		
Provide the Taxable Value and State Equalized Value of the Obsolete Property, as provided in Public Act 146 of 2000, as amended, for the tax year immediately preceding the effective date of the certificate (December 31 of the year approved by the STC)		
Building Taxable Value		Building State Equalized Value
\$		\$
Name of Government Unit	Date of Action Application	Date of Statement of Obsolescence
PART 4: CLERK CERTIFICATION		
The undersigned clerk certifies that, to the best of his/her knowledge, no information contained herein or in the attachments hereto is false in any way. Further, the undersigned is aware that if any information provided is untrue, the exemption provided by Public Act of 2000 may be in jeopardy.		
Name of Clerk		Telephone Number
Clerk Mailing Address		
Mailing Address		
Telephone Number	Fax Number	E-mail Address
Clerk Signature		Date

For faster service, email completed application and attachments to PTE@michigan.gov. An additional submission option is to mail the completed application and attachments to Michigan Department of Treasury, State Tax Commission, PO Box 30471, Lansing, MI 48909. If you have any questions, call 517-335-7491.



Calhoun GIS



Map Publication:
12/13/2021 10:15 AM



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FetchGIS

Disclaimer: This map does not represent a survey or legal document and is provided on an "as is" basis. Calhoun County expresses no warranty for the information displayed on this map document.

City of Albion
RESOLUTION TO ESTABLISH AN OBSOLETE PROPERTY
REHABILITATION DISTRICT

Minutes of a regular meeting of the City Council of the City of Albion, held on February 3, 2020, at 112 W. Cass, Albion, in Council Chambers of City Hall at 7:00 p.m.

PRESENT:

ABSENT:

The following preamble and resolution were offered by Lawler, and supported by Williamson.

Resolution # 2020-02
Establishing an Obsolete Property Rehabilitation (OPRA) District
for Downtown Development OPRA District

WHEREAS, pursuant to PA 146 of 2000, the City of Albion has the authority to establish "Obsolete Property Rehabilitation Districts" within the City of Albion; and

WHEREAS, in order to promote redevelopment, the City of Albion desires to establish an Obsolete Property Rehabilitation District for an area located in the downtown business district, City of Albion, hereinafter described; and

WHEREAS, the City Council of the City of Albion determined that the district meets the requirements set forth in section 3(1) of PA 146 of 2000; and

WHEREAS, written notice has been given by mail to all owners of real property located within the proposed district and to the public by newspaper advertisement in the Recorder and/or by public posting of the hearing on the establishment of the proposed district; and

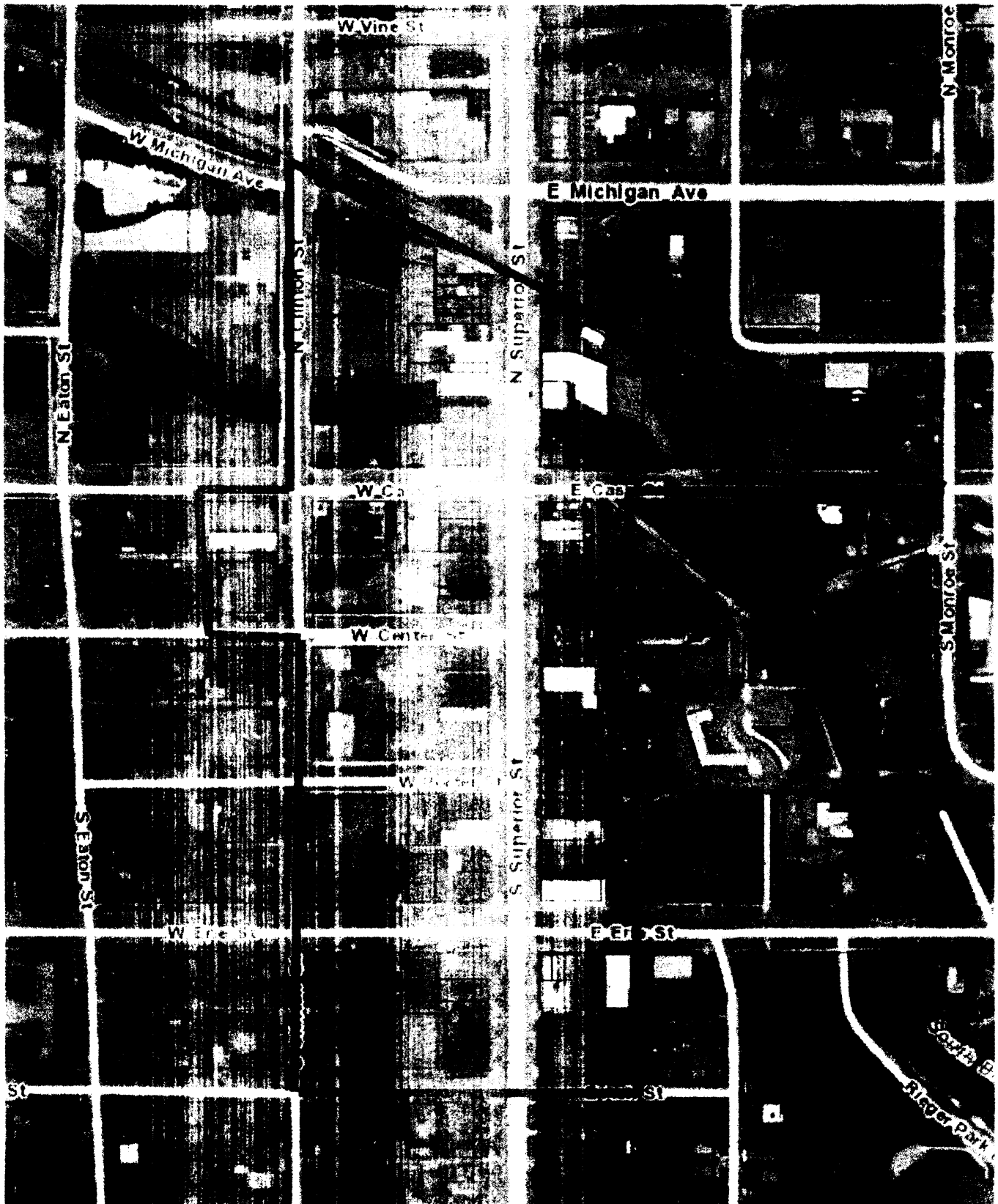
WHEREAS, on February 3, 2020 a public hearing was held, and all residents and taxpayers of the City of Albion were afforded an opportunity to be heard thereon; and

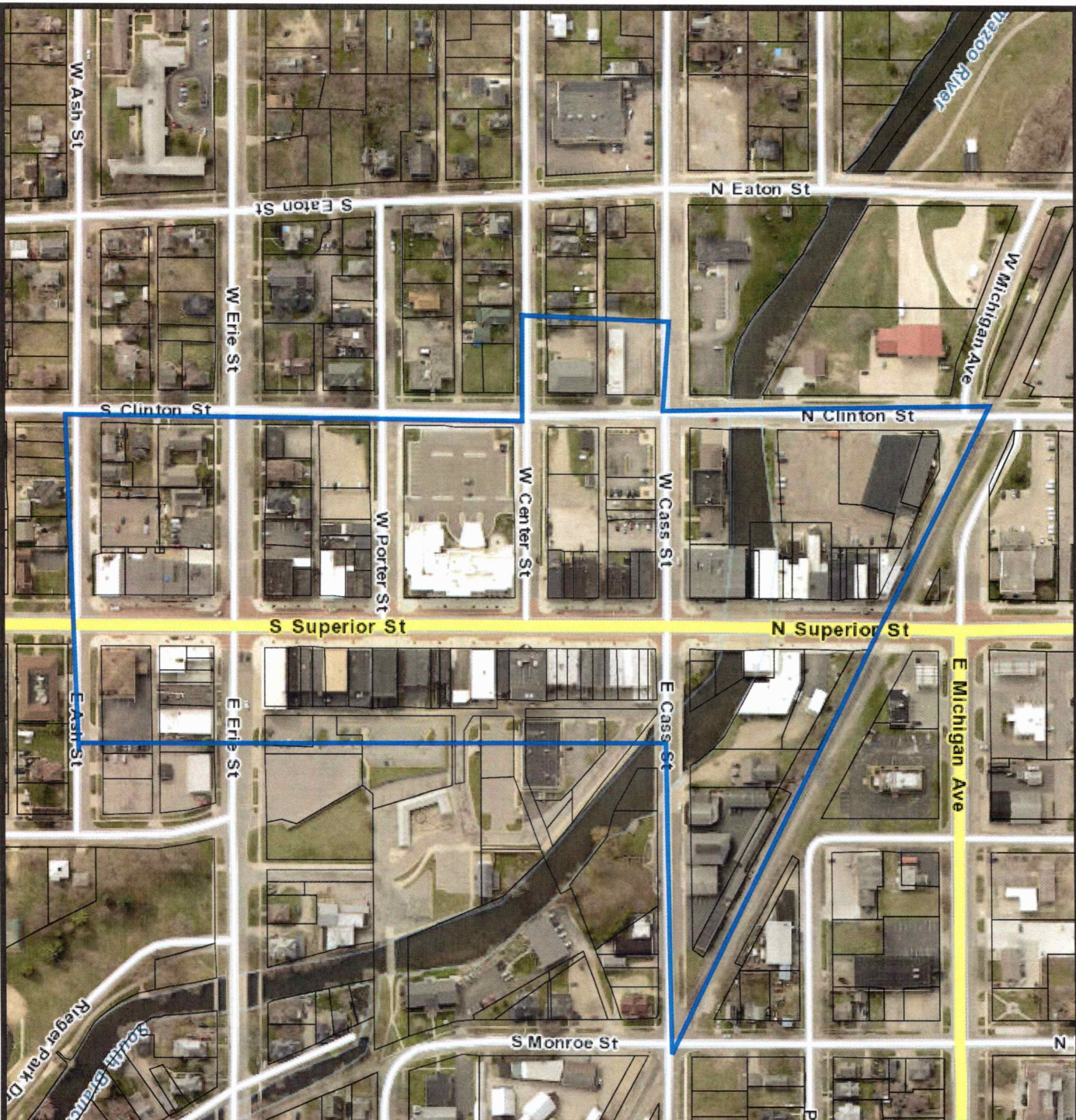
WHEREAS, the City of Albion deems it to be in the public interest of the City of Albion to establish the Obsolete Property Rehabilitation District as proposed.

NOW, THEREFORE, BE IT RESOLVED by the City Council of the City of Albion that the following map of the proposed Downtown OPRA District to wit:

See Attachment A for map of proposed District.

**Attachment A – Proposed District for City of Albion – Downtown Development
Obsolete Property Rehabilitation District No.2**





City of Albion

OPRA District Map



Map Publication:
04/06/2022 6:46 PM



Disclaimer: This map does not represent a survey or legal document and is provided on an "as is" basis. Calhoun County expresses no warranty for the information displayed on this map document.

**SAFE BUILT INC.
INSPECTION REPORT**

PM/OV# 21-ALB-BR00039 JURISDICTION CITY OF ALBION

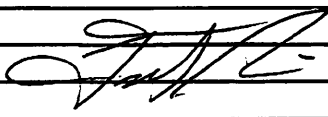
Date of Inspection: 5/19/2021 Inspector: FRITZ PINS Phone No.: (269) 729-9244

Property Address: 112 E Erie St

Joe Verbeke

Owner

Contractor

PROPERTY MAINTENANCE/ORDINANCE VIOLATION INSPECTION	CODE SECTION
THE FOLLOWING VIOLATION(S) WERE FOUND BUT NOT LIMITED TO:	
Site visit to determine the habitability of four apartment units at this address.	
Upon inspection I found that each of the apartments have serious defficiencies that wil not allow occupation.	
Electical - Each unit (4) has an outdated electric service panel and circuits without GFCI protection where required.	
Mechanical - Each apartment unit (4) has an outdated and inefficient gas fired furnace that cannot be deemed safe.	
Plumbing - Each of the bathrooms and kitchens do not have the required Water supply, sinks and or toilets to be deemed habitable.	
None of these apartments are approved for occupation.	
 5-20-21	

PLEASE CONTACT OUR OFFICE NO LATER THAN
TO ADVISE OF YOUR INTENTIONS TO CORRECT THE VIOLATIONS @ (269) 729-9244

PICTURES ON FILE

CC: Ian Arnold
 CC: Nathan Clark
 CC: _____
 CC: _____

(269) 753-8040
cody@drivendesignstudio.com
drivendesignstudio.com
facebook.com/drivendesignbc



Thursday, June 23rd, 2022

Joe Verbeke – ACE Investment Properties
205 E Michigan Avenue
Albion, MI 49224

Dear Mr. Verbeke,

Driven Design Studio welcomes the opportunity to collaborate with you regarding the renovation of the upper levels of 110/112 East Erie Street, Albion, Michigan. This letter outlines the proposed services and serves as our agreement for the project as defined and the services described herein.

Project Description

Based on the site visit and preliminary layouts by Jason Farmer, it is our understanding that ACE Investment Properties is looking to renovate the upper levels of 110/112 East Erie Street in Albion, Michigan into two apartments.

Scope of Services

Driven Design Studio will provide architectural services to provide a permit set of contract documents (drawings) for submittal to the City of Albion. The services do not include any additional site visits to verify existing conditions and discuss the project scope.

Driven Design Studio is to be provided with the following documentation in order to complete our services:

-A site survey (if available)

Driven Design Studio **will not** be providing the following services as part of this agreement:

-Mechanical, electrical, or plumbing engineering (this work is to be done as design/build)

-Bidding or Construction Administration (this work is to be performed hourly at \$150 per hour)

Deliverables

Permit ready set of architectural construction documents shall include:

-Cover Sheet and Code Review

-Architectural Site Plan

-Demolition Sheet

-Architectural floor and reflected ceiling plan sheets

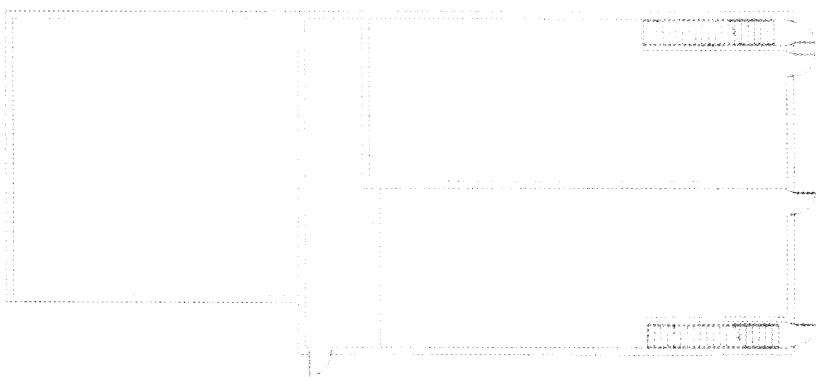
-Plan details sheets

-Finish plan and schedule (see additional services in Exhibit A)

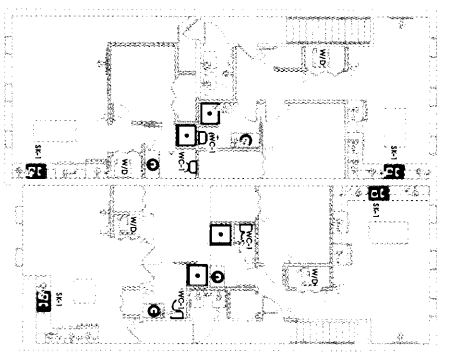
-Renderings depicting the completed project

-Design/Build MEP specifications

1 FIRST FLOOR PLUMBING PLAN



2 SECOND FLOOR PLUMBING PLAN



PLUMBING FIXTURES

1. ALL WORK SHALL BE COMPLETED IN ACCORDANCE WITH ALL APPLICABLE FEDERAL, STATE, AND LOCAL CODES AND LAWS.
 2. RAINWATER AND POTABLE WATER SHALL BE PROVIDED AS REQUIRED.
 3. ALL WORK SHALL BE PERFORMED TO FACILITATE FUTURE MODIFICATIONS TO THE WHOLE PROJECT.
 4. CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ALL NECESSARY PERMITS AND APPROVALS.
 5. THE DRAWINGS ARE FOR INFORMATION ONLY. THE CONTRACTOR SHALL PROVIDE FINAL CHECKS, ETC., AS NECESSARY TO PROTECT CONTRACTOR'S INTERESTS.
 6. HANDED AND RETAIL ALL VARIOUS TYPES OF PLUMBING MATERIALS AND EQUIPMENT TO BE USED IN THIS PROJECT SHALL BE APPROVED BY THE ARCHITECT AND ENGINEER.
 7. ALL PIPING SHALL BE INSTALLED IN ACCORDANCE WITH THE REQUIREMENTS OF THE INTERNATIONAL PLUMBING CODE AND ALL APPLICABLE LOCAL CODES.
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28. ALL PIPING SHALL BE INSTALLED IN ACCORDANCE WITH THE REQUIREMENTS OF THE INTERNATIONAL PLUMBING CODE AND ALL APPLICABLE LOCAL CODES.
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PROJECT INFORMATION

CLIENT: RIVEN DESIGN STUDIO

PROJECT NAME: P102

DATE: 2021.11

DESIGNER: RIVEN DESIGN STUDIO

ARCHITECT: RIVEN DESIGN STUDIO

PLUMBING ENGINEER: RIVEN DESIGN STUDIO

MECHANICAL ENGINEER: RIVEN DESIGN STUDIO

ELECTRICAL ENGINEER: RIVEN DESIGN STUDIO

GENERAL CONTRACTOR: RIVEN DESIGN STUDIO

DATE: 2021.11

PROJECT NAME: P102

ELECTRICAL SPECIFICATIONS

1. PROVIDE COMPLETE AND ACCURATE TEMPORARY POWER AND LIGHTING DURING CONSTRUCTION USING APPROVED LAMP HOLDERS AND GFCI CIRCUITING. MAINTAIN ALL LAMPS AS REQUIRED. REMOVE TEMPORARY AT PROJECT COMPLETION.
2. THE INCLUDES PERMIT, LOAD CALCULATION, INFORMATION, MICHIGAN, TRANSDOMER AND OTHER LOCALITIES AND REQUIREMENTS. VERIFY FOR ELECTRICAL CODES, ELECTRICAL CONTRACTOR.
3. TRACING UNDER FLOOR SHALL BE ACCURATELY LOCATED AND COMPACTED.
4. ALL WIRING TO BE COVERED. ALL WIRING ABOVE FLOOR TO BE IN CONDUIT UNLESS OTHERWISE NOTED. PROVIDE WIRING AND BENDS AND CONDUIT WITH PROPER SUPPORTS.
5. MAKE SURE THAT EXPOSED CABLES ARE PROTECTED FROM MECHANICAL DAMAGE.
6. PROVIDE PROTECTIVE COVERINGS ON ALL PANELS, LABEL ALL DISCONNECTS AND PANELS.
7. PROVIDE PROTECTIVE COVERINGS ON ALL PANELS, LABEL ALL DISCONNECTS AND PANELS.
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33. PROVIDE PROTECTIVE COVERINGS ON ALL PANELS, LABEL ALL DISCONNECTS AND PANELS.
34. PROVIDE PROTECTIVE COVERINGS ON ALL PANELS, LABEL ALL DISCONNECTS AND PANELS.
35. PROVIDE PROTECTIVE COVERINGS ON ALL PANELS, LABEL ALL DISCONNECTS AND PANELS.

MOUNTING HEIGHTS

SYMBOL	DESCRIPTION	HEIGHT
1	RECEPTACLES - STANDARD	42"
2	RECEPTACLES - ABOVE COUNTER	48"
3	RECEPTACLES - MECHANICAL ROOM	48"
4	RECEPTACLES - HORIZONTAL	48"
5	RECEPTACLES - HORIZONTAL	48"
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35	RECEPTACLES - HORIZONTAL	48"

POWER/COMMUNICATION LEGEND

SYMBOL	DESCRIPTION	HEIGHT
1	RECEPTACLES - STANDARD	42"
2	RECEPTACLES - ABOVE COUNTER	48"
3	RECEPTACLES - MECHANICAL ROOM	48"
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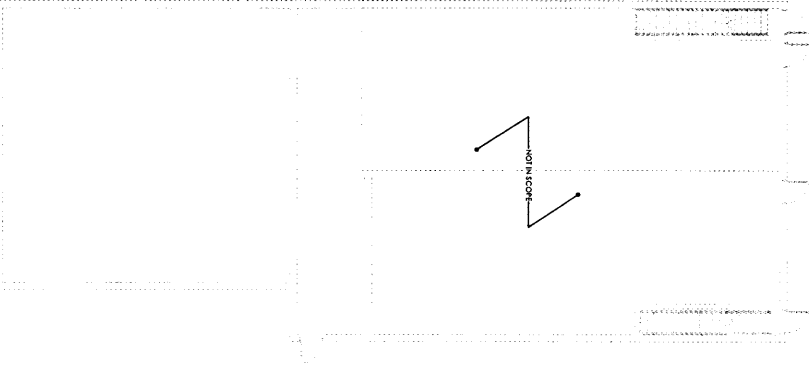
FIRE ALARM LEGEND

SYMBOL	DESCRIPTION	HEIGHT
1	RECEPTACLES - STANDARD	42"
2	RECEPTACLES - ABOVE COUNTER	48"
3	RECEPTACLES - MECHANICAL ROOM	48"
4	RECEPTACLES - HORIZONTAL	48"
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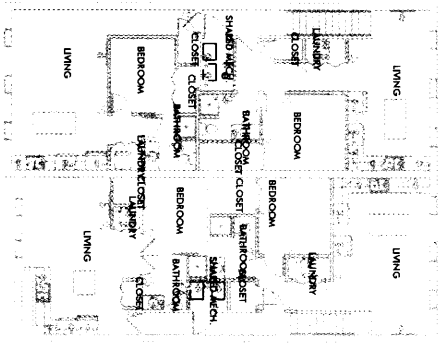
LIGHTING LEGEND

SYMBOL	DESCRIPTION	HEIGHT
1	RECEPTACLES - STANDARD	42"
2	RECEPTACLES - ABOVE COUNTER	48"
3	RECEPTACLES - MECHANICAL ROOM	48"
4	RECEPTACLES - HORIZONTAL	48"
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1 FIRST FLOOR MECHANICAL PLAN



2 SECOND FLOOR MECHANICAL PLAN



GENERAL MECHANICAL NOTES

1. INSTALL ALL UNIFORM FLEXIBLE MANUFACTURING SYSTEMS (FMS) AND ALL AIR CONDITIONING EQUIPMENT TO AVOID VIBRATION AND NOISE. THE FMS SHALL BE INSTALLED OUTSIDE OF THE BUILDING ENVELOPE. INSULATE ALL SECTIONS OF ALL PIPING AND ROOFERS. PROVIDE SOUND DEADENING MATERIALS TO REDUCE SOUND TRANSMISSION FROM OUTSIDE TO INSIDE.
2. PROVIDE SOUND DEADENING MATERIALS TO REDUCE SOUND TRANSMISSION FROM OUTSIDE TO INSIDE.
3. MINIMIZE SOUND TRANSMISSION FROM OUTSIDE TO INSIDE.
4. PROVIDE ALL NECESSARY DUCTWORK AND TRAYWORK FOR A COMPLETE SYSTEM.
5. INSTALL DUCTWORK WITH AIR TIGHT CONNECTIONS.
6. FIELD VERIFY CONDITION OF EXISTING DUCTWORK FOR CHANGE AS NECESSARY TO PROVIDE REQUIRED CAPACITY.
7. ALL WORK SHALL BE COMPLETED IN ACCORDANCE WITH ALL APPLICABLE FEDERAL, STATE AND LOCAL CODES AND LAWS.
8. ADVANCE AND PAY FOR ALL PERMITS AND INSPECTIONS AS REQUIRED.
9. ALL WORK SHALL BE FIELD-BALANCED AND GUARANTEED. PROVIDE REPORT TO ARCHITECT AND OWNER ON THESE RECORDS.
10. ANY MECHANICAL UNIT OR SYSTEM SHOWN ARE FOR INFORMATION ONLY. THE CONTRACTOR SHALL PROVIDE FIELD VERIFICATION, FIELD-BALANCE AND REPORT TO ARCHITECT AND OWNER FOR REVIEW AT PROJECT CLOSEOUT.
11. INITIAL LOCATION OF ALL EQUIPMENT SHALL BE COORDINATED WITH ALL TRADES.
12. MECHANICAL CONTRACTOR TO FIELD VERIFY ALL EXISTING CONDITIONS.
13. PROVIDE APPROPRIATE BRIDGING MATERIALS WHERE FIRE-RATED ASSEMBLIES ARE PENETRATED.
14. ALL WORK AND MATERIALS SHALL BE GUARANTEED BY WRITING FOR ONE YEAR FROM THE PROJECT COMPLETION.
15. ANY MODEL, MANUFACTURER OR MANUFACTURING METHOD IDENTIFIED THROUGHOUT THE DRAWINGS ARE A BASIS OF DESIGN. THE CONTRACTOR MAY AT HIS OPTION PROVIDE AN ALTERNATE MANUFACTURER OR METHOD OF PRODUCT PROVIDED THE ALTERNATE MANUFACTURER OR METHOD OF PRODUCT IS APPROVED BY THE ARCHITECT AND OWNER. ALL EQUIPMENT SHALL BE FIELD-BALANCED AND REPORT TO ARCHITECT AND OWNER FOR REVIEW AT PROJECT CLOSEOUT.
16. ALL GAS PIPING SHALL BE SCHEDULE 40 BLACK IRON. BRASS BALL VALVES OR BALL VALVES IN WALL WHERE APPLICABLE SHALL MATCH THESE SPECIFICATIONS.
17. PROVIDE GAS SHUTOFF VALVE COMPLETE WITH ORIENTED AT EACH PIECE OF GAS PIPING EQUIPMENT.
18. THE HEATING AND COOLING SYSTEMS ARE TO BE A DESIGN BUILD SYSTEM. IT IS TO BE DESIGNED, PROVIDED AND INSTALLED BY THE CONTRACTOR. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE DESIGN OF THE SYSTEMS TO BE PROVIDED TO ALL APPLICABLE APPLICABLE MECHANICAL CODES IN EFFECT AT THE TIME OF PROJECT CLOSEOUT. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE DESIGN OF THE SYSTEMS TO BE PROVIDED TO ALL APPLICABLE APPLICABLE MECHANICAL CODES IN EFFECT AT THE TIME OF PROJECT CLOSEOUT. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE DESIGN OF THE SYSTEMS TO BE PROVIDED TO ALL APPLICABLE APPLICABLE MECHANICAL CODES IN EFFECT AT THE TIME OF PROJECT CLOSEOUT.
19. A CHIMNEY SHALL BE PROVIDED WITH A TYPICAL OUTLOOK WHEN ANY VENT FOR MECHANICAL EQUIPMENT.

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THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE DESIGN OF THE SYSTEMS TO BE PROVIDED TO ALL APPLICABLE APPLICABLE MECHANICAL CODES IN EFFECT AT THE TIME OF PROJECT CLOSEOUT. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE DESIGN OF THE SYSTEMS TO BE PROVIDED TO ALL APPLICABLE APPLICABLE MECHANICAL CODES IN EFFECT AT THE TIME OF PROJECT CLOSEOUT.

PROJECT	DRIVEN DESIGN
CLIENT	DRIVEN DESIGN
DATE	11/17/2021
LOCATION	117 WEST MICHIGAN AVENUE, BATTLE CREEK, MI 49017
DESIGNER	DRIVEN DESIGN
DATE	11/17/2021
PROJECT	DRIVEN DESIGN
CLIENT	DRIVEN DESIGN
DATE	11/17/2021
LOCATION	117 WEST MICHIGAN AVENUE, BATTLE CREEK, MI 49017
DESIGNER	DRIVEN DESIGN
DATE	11/17/2021
PROJECT	DRIVEN DESIGN
CLIENT	DRIVEN DESIGN
DATE	11/17/2021
LOCATION	117 WEST MICHIGAN AVENUE, BATTLE CREEK, MI 49017
DESIGNER	DRIVEN DESIGN
DATE	11/17/2021



MATCH EXISTING DAMAGED FROM WORK AS REQUIRED TO MATCH EXISTING
 MATCH EXISTING MASONRY SHALL AS REQUIRED

MATCH EXISTING DOOR

MATCH EXISTING DOOR

MASONRY NOTES

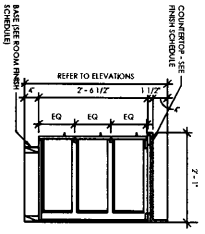
1. MASONRY IS REQUIRED ON ALL THREE FACADES. MASONRY IS TO BE SET VERTICALLY. CONSTRUCTION.
2. MASONRY RESTORATION CONTRACTOR SHALL PROVIDE ALL LABOR, MATERIALS, EQUIPMENT, AND TOOLS. THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ALL NECESSARY PERMITS, SCHEDULING, JOB TRAFFIC, ETC.
3. THE MASONRY RESTORATION SHALL MEET THE REQUIREMENTS OF THE INTERIOR STANDARDS FOR RESTORATION OF HISTORIC PROPERTIES AND INCLUDE ANY WORK REQUIRED TO PRESERVE OR RESTORE THE ORIGINAL CHARACTER OF THE BUILDING. THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ALL NECESSARY PERMITS, SCHEDULING, JOB TRAFFIC, ETC.
4. THE MASONRY RESTORATION SHALL BE DONE IN ACCORDANCE WITH THE CURRENT CODES AND STANDARDS FOR MASONRY. THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ALL NECESSARY PERMITS, SCHEDULING, JOB TRAFFIC, ETC.
5. THE MASONRY RESTORATION SHALL BE DONE IN ACCORDANCE WITH THE CURRENT CODES AND STANDARDS FOR MASONRY. THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ALL NECESSARY PERMITS, SCHEDULING, JOB TRAFFIC, ETC.
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8. THE MASONRY RESTORATION SHALL BE DONE IN ACCORDANCE WITH THE CURRENT CODES AND STANDARDS FOR MASONRY. THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ALL NECESSARY PERMITS, SCHEDULING, JOB TRAFFIC, ETC.
9. THE MASONRY RESTORATION SHALL BE DONE IN ACCORDANCE WITH THE CURRENT CODES AND STANDARDS FOR MASONRY. THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ALL NECESSARY PERMITS, SCHEDULING, JOB TRAFFIC, ETC.
10. THE MASONRY RESTORATION SHALL BE DONE IN ACCORDANCE WITH THE CURRENT CODES AND STANDARDS FOR MASONRY. THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ALL NECESSARY PERMITS, SCHEDULING, JOB TRAFFIC, ETC.

1. MATCHING THE WORK SHALL COVER ON THE MAJOR MATCHING AREAS WHERE MASONRY MATCHING THROUGH THE BUILDING WILL BE TAKING PLACE AND/OR THERE ARE MATCHING AREAS.
2. ALL MASONRY JOINTS THAT HAVE BECOME DAMAGED SHALL BE FULLY REPAIRED AND MATCH THE ORIGINAL FACE AND FINISH. ALL MASONRY JOINTS WITH MATCHING JOINTS OR JOINTS THAT CAN BE REPAIRED SHALL BE REPAIRED. THE FOLLOWING STEPS FOR REPAIRING ARE LISTED AS FOLLOWS:
 - A. REMOVE THE DAMAGED JOINT.
 - B. FOLLOWED BY A DRY BRUSH VIBRATED BY THE MATCHING FREQUENCY TO REMOVE ALL MASONRY FROM THE JOINT.
 - C. COMPRESSIVE STRENGTH AS THE MAXIMUM COMPRESSIVE STRENGTH OF TWO TIMES THE MORTAR JOINTS. ALL PROCEDURES ARE TO FOLLOW THE CURRENT CODES STANDARDS FOR MASONRY.
 - D. BRUSH VACUUM OR WATER BLAST TO REMOVE DEBRIS IN THE JOINT.
 - E. JOINT AND SURROUNDING AREA.
 - F. REMOVE THE JOINT AS REQUIRED.
 - G. WATERWASH THE BRICK TO REMOVE DEBRIS IN THE JOINT.
 - H. WATERWASH THE BRICK TO REMOVE DEBRIS IN THE JOINT.
 - I. ABOUT TO BE REPAIRED.
 - J. THE JOINT FINISH WITH THE OTHER SURFACE OF THE MASONRY.
 - K. STRENGTH TO MATCH THE EXISTING MORTAR JOINT.
 - L. THE JOINT FINISH WITH THE OTHER SURFACE OF THE MASONRY.
 - M. THE JOINT FINISH WITH THE OTHER SURFACE OF THE MASONRY.
 - N. THE JOINT FINISH WITH THE OTHER SURFACE OF THE MASONRY.
 - O. THE JOINT FINISH WITH THE OTHER SURFACE OF THE MASONRY.
 - P. THE JOINT FINISH WITH THE OTHER SURFACE OF THE MASONRY.

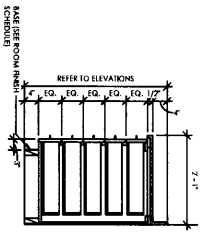
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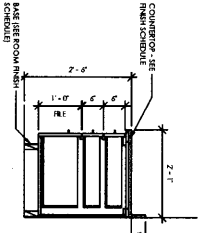
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 TIME: 11:00 AM
 PROJECT: 117 WEST MICHIGAN
 SHEET: 22 OF 22
 A400



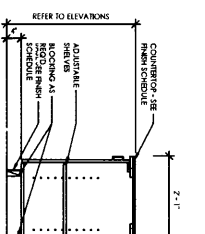
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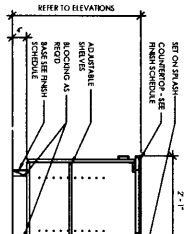
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3/4" = 1'-0"



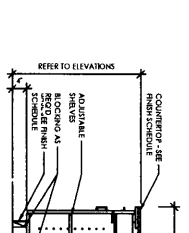
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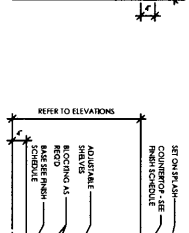
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3/4" = 1'-0"



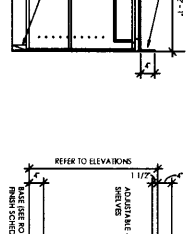
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3/4" = 1'-0"



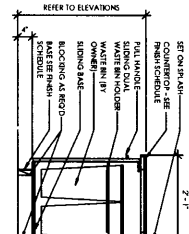
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3/4" = 1'-0"



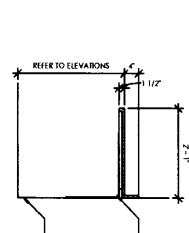
1310 BASE - DOOR/DRAWER - SS TOP
3/4" = 1'-0"



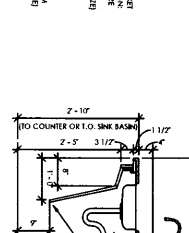
1310 BASE CABINET SECTION
3/4" = 1'-0"



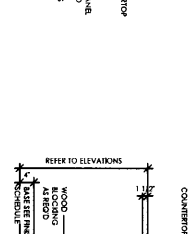
1310 BASE - TRASH
3/4" = 1'-0"



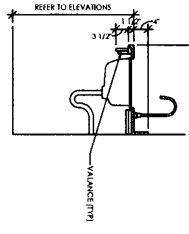
1310 COUNTER SECTION
3/4" = 1'-0"



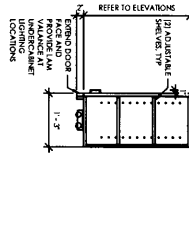
1310 COUNTER WITH SINK
3/4" = 1'-0"



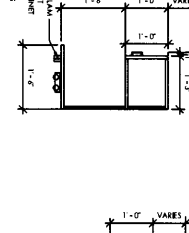
1310 SINK - BASE
3/4" = 1'-0"



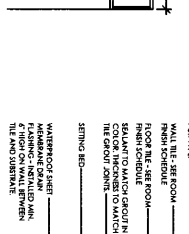
1310 SINK - COUNTER
3/4" = 1'-0"



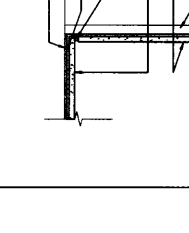
1310 UPPER CABINET
3/4" = 1'-0"



1310 UPPER CABINET
3/4" = 1'-0"



1310 UPPER CABINET
3/4" = 1'-0"



1310 CERAMIC TILE BASE
3/4" = 1'-0"

GENERAL NOTES

1. ALL BASE CABINET TOPS TO BE 2" AFF TO OUTSIDE DOOR FACE (UNLESS NOTED OTHERWISE)
2. ALL WALL CABINET TOPS TO BE 1" AFF TO DOOR FACE (UNLESS NOTED OTHERWISE)
3. ALL COUNTERTOP TOPS TO BE 2" AFF TO TOP OF CABINET UNLESS NOTED OTHERWISE
4. END EDGE OF ALL WORK UNLESS NOTED OTHERWISE
5. REFER TO FINISH ELEVATIONS FOR DIMENSIONS OF ALL CABINETS
6. REFER TO FINISH SCHEDULE FOR ALL WORK FINISH
7. REFER TO FINISH SCHEDULE FOR COUNTERTOP MATERIAL AND FINISH
8. ALL WALL CABINETS TO HAVE A FINISH SCHEDULE UNLESS NOTED OTHERWISE
9. ALL WALL CABINETS TO HAVE A SINGLE SHELF, AND OTHER THAN 2" AFF TO TOP OF CABINET UNLESS NOTED OTHERWISE
10. REFER TO FINISH SCHEDULE FOR DIMENSIONS OF LOCAL CABINETS
11. REFER TO FINISH ELEVATIONS FOR DOOR DIMENSIONS
12. ALL WALL CABINETS TO BE AFF TO TOP OF CABINET UNLESS NOTED OTHERWISE
13. DOOR HANDLE FALLS ARE SHOWN FOR GRAPHICAL REFERENCE ONLY. REFER TO ROOM FINISH SCHEDULE
14. ALL BASE DRAWERS, UNLESS NOTED OTHERWISE
15. ALL DRAWERS ARE 1" UNLESS NOTED OTHERWISE
16. ALL EXPOSED EXTERIOR SURFACES OF CABINETS TO BE FINISHED TO MATCH THE COUNTER

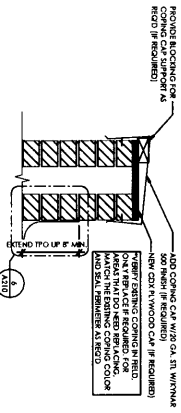
DRIVEN DESIGN

DRIVEN DESIGN
DRIVEN DESIGN STUDIO PLLC
117 WEST MICHIGAN AVENUE
BIRMINGHAM, AL 35207
COD@DRIVENDSIGNSTUDIO.COM

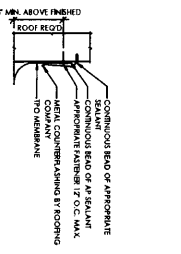
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PROJECT: 2021.17
SHEET: 23 OF 23
DATE: 04/20/21 10:52:33 AM
DRAWN BY: A310
CHECKED BY: A310

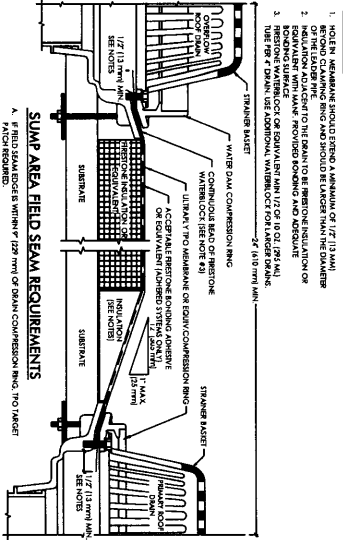
2021.17
A310



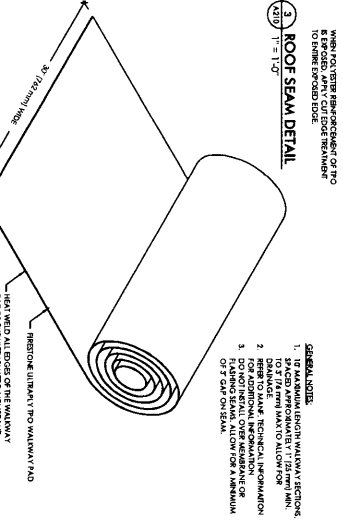
5 COPING CAP SECTION AT EXISTING PARAPET
 1/12" = 1'-0"



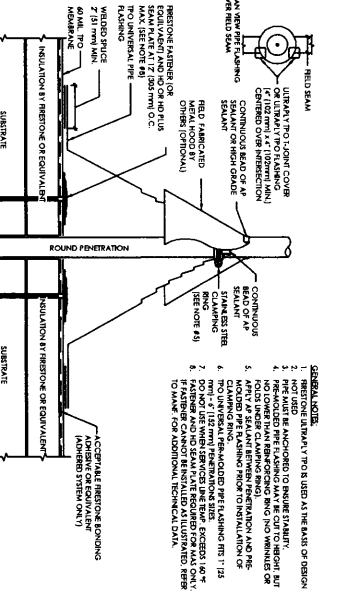
6 TERMINATION WITH REGLET COUNTERFLASHING
 1/12" = 1'-0"



1 ROOF DRAIN WITH OVERFLOW DETAIL
 8'-1-1/2" = 1'-0"



2 WALKWAY PAD
 8'-1-1/2" = 1'-0"



7 PIPE PENETRATION FLASHING DETAIL
 8'-1-1/2" = 1'-0"

NOTES:
 1. SEE AS MANUFACTURER OF COMPRESSION RING AND SEALANT RECOMMENDATIONS.
 2. FORMED WITH REBAR AND COVER EDGE RECOMMENDATIONS.
 3. RECOMMENDATIONS FOR COMPRESSION RING AND SEALANT.
 4. MASONRY AND CONCRETE WALLS SHALL BE RECOMMENDED TO BE MOUNTED TO THE SURFACE.

GENERAL NOTES:
 1. WHEN NOT OTHERWISE SPECIFIED, ALL MATERIALS SHALL BE TO PERFORM EXPOSED EDGE.

GENERAL NOTES:
 1. IF MAXIMUM LENGTH WALKWAY SECTION IS EXCEED APPROXIMATELY 1'-11.5\"/>

GENERAL NOTES:
 1. BRISTLE BRUSHING (PRO) IS USED AT THE BASE OF ROOF.
 2. THE LAST IS ANCHORED TO EXISTING STRAINERS AND IS NOT LOWER THAN BRISTLE BRUSHING RING AND WINDSTOP OR ACCEPTABLE BRISTLE BRUSHING ADHESIVE OR EQUIVALENT.
 3. ACCEPTABLE BRISTLE BRUSHING ADHESIVE OR EQUIVALENT (SEE NOTE #1).
 4. THE ULTIMATE PRO MEMBRANE IS TO BE EXCEED 1.66\"/>

GENERAL NOTES

1. EXISTING ROOFING TO REMAIN. FLASH AS REQUIRED AND PROVIDE NEW PENETRATION FLASHING AS NOTED.

DRIVEN DESIGN

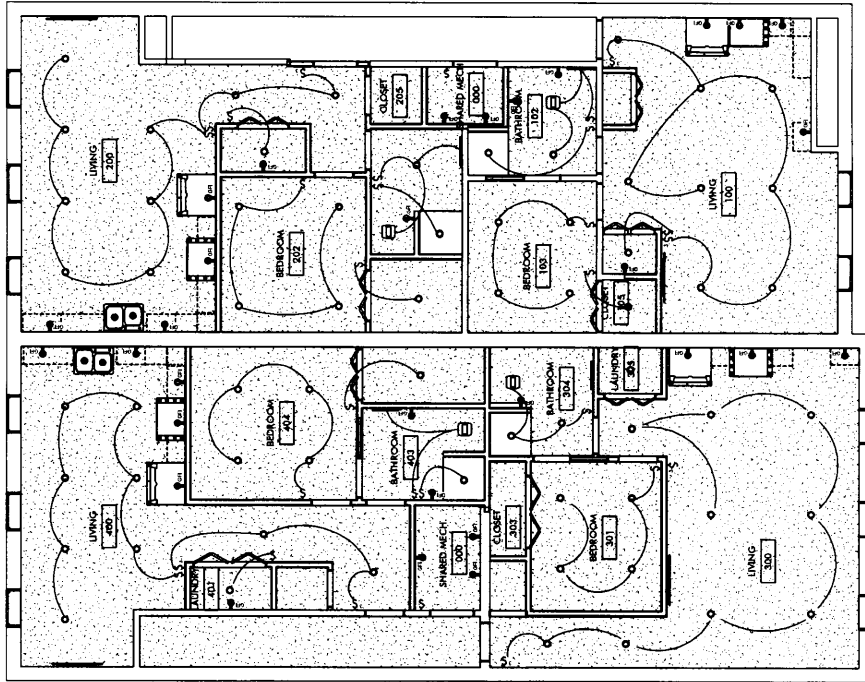
ARCHITECT
 Driven Design Studio PLLC
 1100 North 17th Street
 Suite C-060, Arlington, VA 22209
 (703) 753-8600
 cdd@drivendesignstudio.com

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DATE	2021.11.17
PROJECT	110 AND 112 EMBEL BL, ALBANY, NY
CLIENT	ACE INVESTMENT PROPERTIES
DESIGNER	DRIVEN DESIGN
SCALE	AS SHOWN
DATE	2021.11.17
PROJECT	110 AND 112 EMBEL BL, ALBANY, NY
CLIENT	ACE INVESTMENT PROPERTIES
DESIGNER	DRIVEN DESIGN
SCALE	AS SHOWN
DATE	2021.11.17

GENERAL NOTES

1. ALL LIGHT SWITCHES SHALL BE NEST TYPE, 20 AMP, WHITE COLOR WITH WHITE COVERS/PLATES.
2. ALL NEW LIGHT FIXTURES TO BE LED, FINURES AND LAYOUT ARE SHOWN SCHEMATICALLY.
3. ALL CEILING HEIGHTS TO BE EXISTING UNLESS NOTED OTHERWISE.
4. IF CEILING HEIGHTS ARE NOT CALLED OUT, THEN THE CEILING IS EXISTING OR SHALL BE EXPOSED TO THE EXISTING STRUCTURE ABOVE. COORDINATE WITH ARCHITECT.
5. COORDINATE LIGHT FIXTURE, MECHANICAL, PLUMBING, ALONG WITH ANY OTHER SYSTEMS AS REQUIRED TO NOT INTERFERE WITH ONE ANOTHER.
6. ALL LIGHT FIXTURES SHALL BE CEILING MOUNTED UNLESS NOTED OTHERWISE. 2x2 CEILING GRID. CLOUDS OR BETWEEN OTHER ELEMENTS OR FINALLY PLACED AS NOTED OTHERWISE.
7. SEE MEMO'S FOR ADDITIONAL MECHANICAL, ELECTRICAL, AND PLUMBING NOTE.



SECOND FLOOR REFLECTED CEILING PLAN
1/4" = 1'-0"

ELECTRICAL SYMBOLS

SYMBOL	MANUFACTURE AND DESCRIPTION	MODEL # QUANTITY
[Symbol]	MECHANICAL EXHAUST FAN WITH LED LIGHT 110 CFM	AS201 100CL https://www.amazon.com/dp/B08V786374 with LED LIGHT / BLAN / 100CL
[Symbol]	UPHOMA LED FLAT PANEL LIGHT 18" WIDE (2'0" OR 2'4")	CPYLED FLAT PANEL https://www.uphoma.com/products/cpy-led-flat-panel-light select color and finish from the dropdown menu for more information visit www.uphoma.com or contact your nearest lighting retailer.
[Symbol]	UPHOMA CYLINDER LIGHT	LDNA CYLINDER SERIES https://www.uphoma.com/products/ldna-cylinder-series choose finish and color from dropdown menu for more information visit www.uphoma.com or contact your nearest lighting retailer.
[Symbol]	4" LINEAR STRIP LIGHT	CDIC LED STRIP LIGHT https://www.cdic.com/products/led-strip-light select color and finish from the dropdown menu for more information visit www.cdic.com or contact your nearest lighting retailer.
[Symbol]	UPHOMA RECESSED LED LIGHT 4" SQUARE	LDNA ROUND SERIES https://www.uphoma.com/products/ldna-round-series choose finish and color from dropdown menu for more information visit www.uphoma.com or contact your nearest lighting retailer.
[Symbol]	REG. 48" FAN HANDLE / CEILING FAN	HANDLE IN BLACK, 48" OR 60" LIGHT W/ 4" HANDLE https://www.amazon.com/dp/B08V786374 for more information visit www.amazon.com or contact your nearest lighting retailer.
[Symbol]	GOOSENECK BARN LIGHT	RECESSED LIGHTING BY OCEANAN DESIGN BLACK FINISH 12" SQUARE https://www.oceanan.com/products/recessed-gooseneck-barn-light-black for more information visit www.oceanan.com or contact your nearest lighting retailer.
[Symbol]	UPHOMA 2 LIGHT PLASTIC LED WHITE EMERGENCY COMBO 18" WIDE / 18" DEEP / 18" HIGH LIGHTING UNIT	UPHOMA LED PAK https://www.uphoma.com/products/uphoma-led-pak select color and finish from the dropdown menu for more information visit www.uphoma.com or contact your nearest lighting retailer.
[Symbol]	THREWAY SWITCH	THREWAY SWITCH
[Symbol]	SWITCH	SWITCH
[Symbol]	GROUNDING FAULT INTERCEPTOR OUTLET	GROUNDING FAULT INTERCEPTOR OUTLET
[Symbol]	QUADRUPEL OUTLET	QUADRUPEL OUTLET
[Symbol]	DUPLEX OUTLET	DUPLEX OUTLET

ARCHITECT
Driven Design Studio PLLC
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Bottle Creek, MI 48017
cody@drivendesignstudio.com

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DATE	2021.04.17
PROJECT	117 WEST MICHIGAN AVENUE
CLIENT	DRIVEN DESIGN
DESIGNER	CODY L. HARRIS
CHECKER	CODY L. HARRIS
DATE	2021.04.17
SCALE	1/4" = 1'-0"
PROJECT	117 WEST MICHIGAN AVENUE
CLIENT	DRIVEN DESIGN
DESIGNER	CODY L. HARRIS
CHECKER	CODY L. HARRIS
DATE	2021.04.17
SCALE	1/4" = 1'-0"

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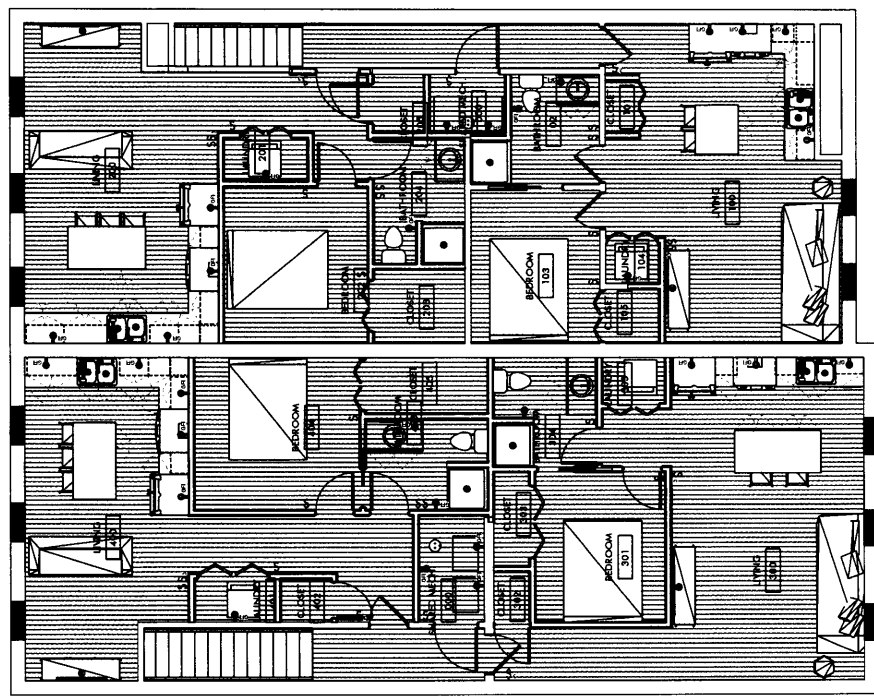
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 PROJECT ADDRESS: [REDACTED]
 PROJECT NUMBER: [REDACTED]
 DATE: 11/12/2021
 SCALE: 1/4" = 1'-0"

CONSTRUCTION DOCUMENTS

DATE: 11/12/2021
 TIME: 10:30 AM
 SCALE: 1/4" = 1'-0"

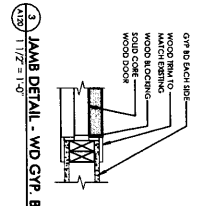
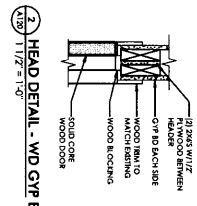
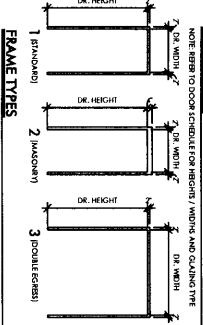
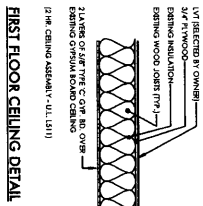
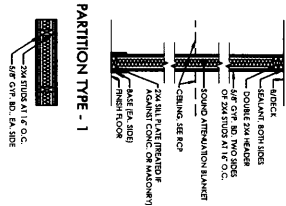
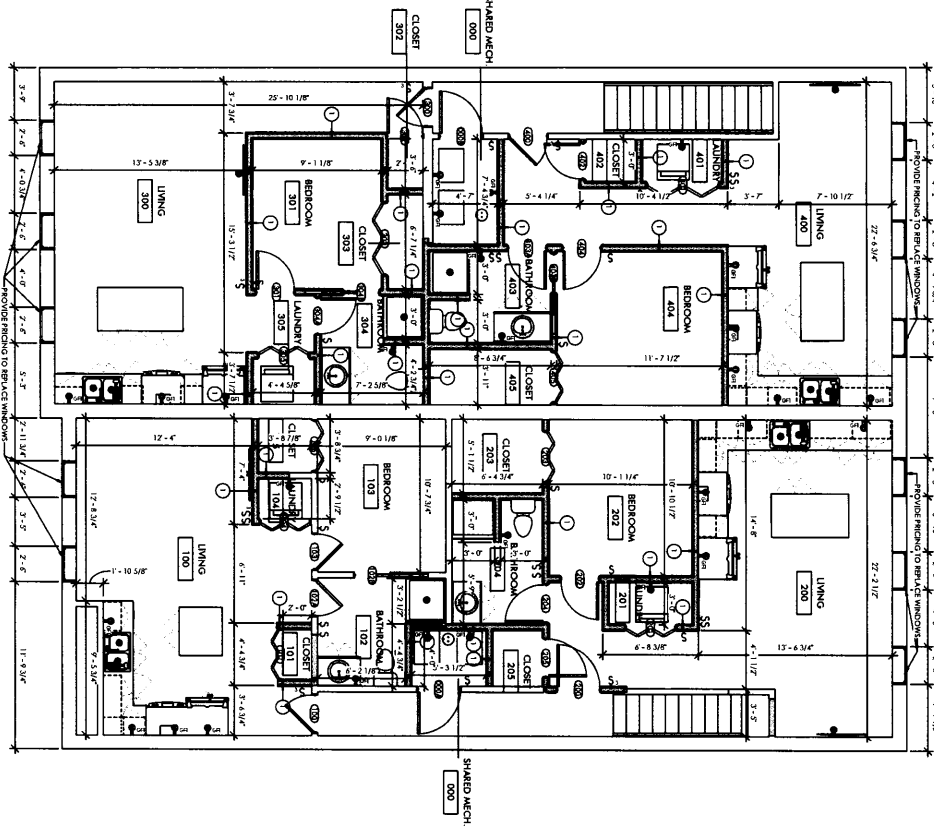
GENERAL NOTES

1. ALL FINISHES SHOWN FOR REFERENCE AND SCALE ONLY. ALL FINAL FINISH SELECTIONS TO BE BY OWNER.
2. PRIME AND PAINT ALL SURFACES WITH A MINIMUM (2) FINISH COATS.
3. ALL BATHROOM WET WALLS ARE TO BE PORCELAIN TILE FROM FLOOR TO CEILING. PROVIDE CHAIR BACKEBOARD BEHIND ALL PORCELAIN TILE WALL.
4. ALL FINISHES ARE TO BE SELECTED BY OWNER.
5. AFTER REMOVING EXISTING FLOORING, PROVIDE FLOORING OR LEVELING TO PROVIDE A LEVEL SURFACE.
6. CENTER ALL FLOORING TRANSITIONS UNDER DOOR OR AT THE CENTER OF OPENINGS U.N.O.
7. USE LEVELING COMPOUND TO FINISH FLOOR UP TO APPROPRIATE HEIGHT TO INSURE THAT TRANSITIONS FIT TOGETHER WITH ADJACENT FLOORING MATERIAL.
8. ALL ELECTRICAL SWITCHES, SWITCHES AND COMPONENTS TO BE SELECTED BY OWNER.
9. ALL INTERIOR WOODWORK TO HAVE MITERED SQUARE EDGES WITH MATCHING FLAME EDGE AND MATCHING GRAIN DIRECTION.
10. ALL FLOOR SURFACE CORNERS/ROTS AND BACKPLACES TO HAVE MITERED, FINISHED SAVED EDGES.
11. ALL FLOORING MATERIALS TO BE 4MM HARDWARE CIRCULAR CONCENTRIC BRACKETS IN APPROPRIATE MAKE OF DESIGN.
12. COT WALL TILE TO BATH, SWITCHES AND OUTLET.



SECOND FLOOR FINISH PLAN
 1/4" = 1'-0"

SECOND FLOOR PLAN
1/8" = 1'-0"

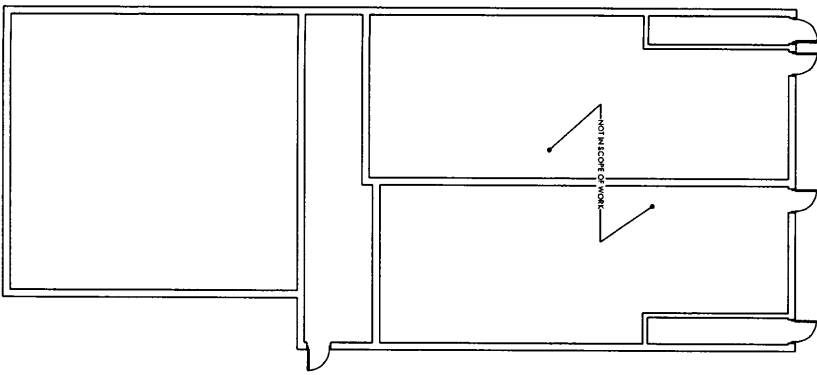


DOOR SCHEDULE

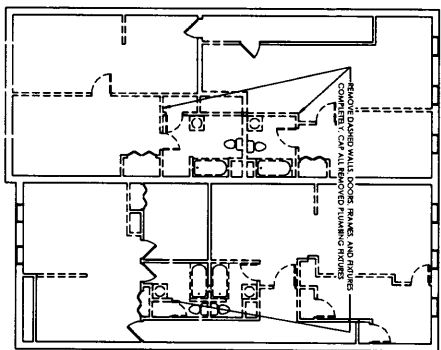
NO.	TYPE	FINISH	HEIGHT	WIDTH	GLASS	GLASS TYPE	GLASS AREA	COMMENTS
100	WOOD	NEW	7'-0"	3'-0"	1/2"	WOOD	0.00	
101	WOOD	NEW	7'-0"	3'-0"	1/2"	WOOD	0.00	
102	WOOD	NEW	7'-0"	3'-0"	1/2"	WOOD	0.00	
103	WOOD	NEW	7'-0"	3'-0"	1/2"	WOOD	0.00	
104	WOOD	NEW	7'-0"	3'-0"	1/2"	WOOD	0.00	
105	WOOD	NEW	7'-0"	3'-0"	1/2"	WOOD	0.00	
106	WOOD	NEW	7'-0"	3'-0"	1/2"	WOOD	0.00	
107	WOOD	NEW	7'-0"	3'-0"	1/2"	WOOD	0.00	
108	WOOD	NEW	7'-0"	3'-0"	1/2"	WOOD	0.00	
109	WOOD	NEW	7'-0"	3'-0"	1/2"	WOOD	0.00	
110	WOOD	NEW	7'-0"	3'-0"	1/2"	WOOD	0.00	
111	WOOD	NEW	7'-0"	3'-0"	1/2"	WOOD	0.00	
112	WOOD	NEW	7'-0"	3'-0"	1/2"	WOOD	0.00	
113	WOOD	NEW	7'-0"	3'-0"	1/2"	WOOD	0.00	
114	WOOD	NEW	7'-0"	3'-0"	1/2"	WOOD	0.00	
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119	WOOD	NEW	7'-0"	3'-0"	1/2"	WOOD	0.00	
120	WOOD	NEW	7'-0"	3'-0"	1/2"	WOOD	0.00	

ABBREVIATIONS
WOOD - WOOD VENEER ON CHLAD CORE WOOD DOOR
H.H. - HOLLOW METAL
H.M. - HOLLOW METAL
E.B.T. - EXTERIOR BRASS
A.C. - ALUMINUM
A.C. - ALUMINUM

GENERAL NOTES
1. REFER TO DOOR SCHEDULE FOR HEIGHT, WIDTH AND GLASS TYPE.
2. REFER TO DOOR SCHEDULE FOR FINISH AND GLASS TYPE.
3. REFER TO DOOR SCHEDULE FOR FRAME MATERIAL AND GLASS TYPE.
4. REFER TO DOOR SCHEDULE FOR FRAME MATERIAL AND GLASS TYPE.
5. REFER TO DOOR SCHEDULE FOR FRAME MATERIAL AND GLASS TYPE.



1 FIRST FLOOR DEMOLITION PLAN
1/8" = 1'-0"



2 SECOND FLOOR DEMOLITION PLAN
1/8" = 1'-0"

DEMOLITION NOTES

1. REMOVE ALL EXISTING WALLS, WINDOWS, AND DOORS COMPLETELY.
2. PATCH AND FILL ANY HOLES IN THE WALL CAUSED BY THE REMOVAL OF DOORS, WINDOWS, OR WALLS TO MATCH EXISTING WORK.
3. CONTRACTOR IS RESPONSIBLE FOR PROTECTING ALL SURFACE MATERIALS REMOVED IN THE PROJECT AREA FROM DAMAGE. CONTRACTOR SHALL RETURN THE AREA DAMAGED AS REQUIRED FOR ACCESS TO THE EXISTING CONSTRUCTION.
4. HAZARDOUS MATERIALS ARE TO BE REMOVED BY A LICENSED PROFESSIONAL IN THE STATE OF MICHIGAN.
5. ALL SAFETY ISSUES RELATED TO DEMOLITION ARE THE RESPONSIBILITY OF THE CONTRACTOR AND MUST BE COORDINATED WITH ALL STATE LOCAL, ENVIRONMENTAL AND LABOR LAWS DURING THE CONSTRUCTION OF THE PROJECT.
6. CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ALL NECESSARY PERMITS AND APPROVALS FROM ALL AFFECTED AGENCIES AND AGENCIES PRIOR TO COMMENCING DEMOLITION WORK.
7. ALTERATIONS TO CONTRACT ARE NECESSARY TO AVOID CONFLICT.

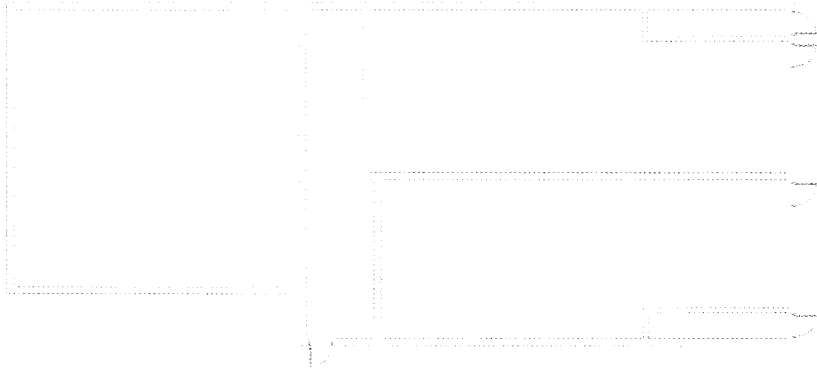
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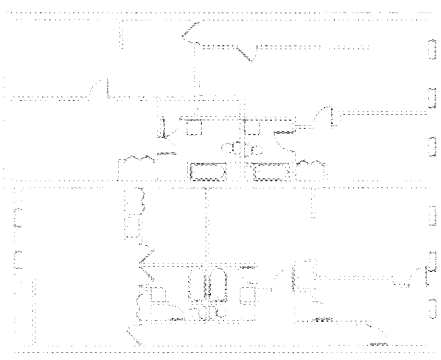
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PROJECT NAME	DRIVEN DESIGN STUDIO
PROJECT ADDRESS	117 WEST MICHIGAN AVENUE, ANN ARBOR, MI 48107
DATE	10/20/2021
SCALE	1/8" = 1'-0"
DESIGNER	DRIVEN DESIGN STUDIO
DATE	10/20/2021
PROJECT NUMBER	DD-2021-01
PROJECT NAME	DRIVEN DESIGN STUDIO
PROJECT ADDRESS	117 WEST MICHIGAN AVENUE, ANN ARBOR, MI 48107
DATE	10/20/2021
SCALE	1/8" = 1'-0"
DESIGNER	DRIVEN DESIGN STUDIO
DATE	10/20/2021
PROJECT NUMBER	DD-2021-01

↑ 100 1/8" = 1'-0"
FIRST FLOOR EXISTING PLAN



↑ 100 1/8" = 1'-0"
SECOND FLOOR EXISTING PLAN



GENERAL NOTES

EXISTING PLAN ARE SHOWN FOR REFERENCE ONLY.

DRIVEN DESIGN
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PROJECT INFORMATION
 PROJECT NAME: 100 AND 112 69th ST, ALBION, MI
 PROJECT ADDRESS: 100 AND 112 69th ST, ALBION, MI
 PROJECT TYPE: ACCEMENTMENT PROJECTS

CONSTRUCTION DOCUMENTS

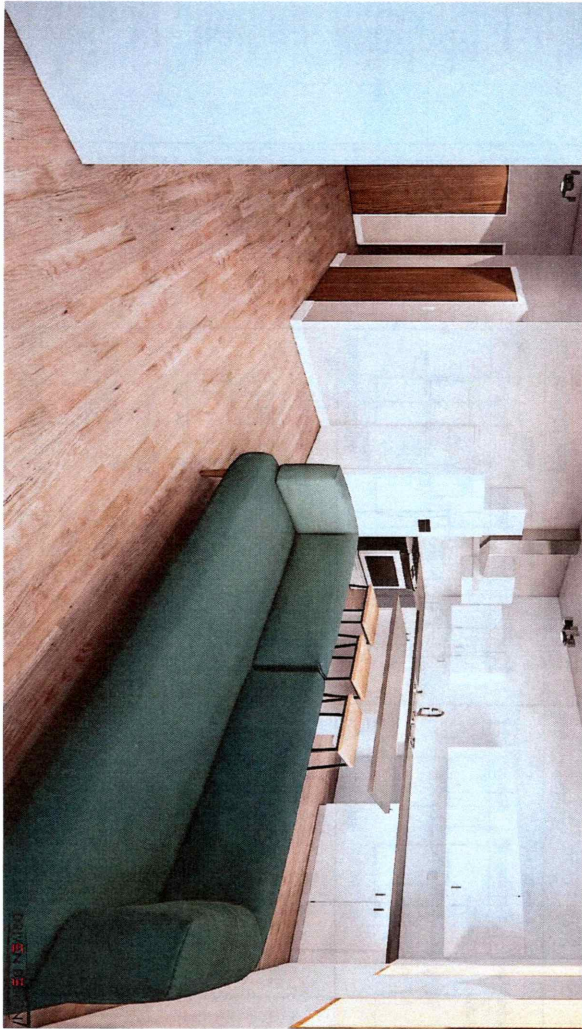
DATE
 2021.17

PROJECT NUMBER
 2021.17
DRIVEN DESIGN
A000

ERIE ST APARTMENTS

110 AND 112 ERIE ST., ALBION, MI

RENDERING - FOR REFERENCE ONLY



EXISTING PHOTOS - FOR REFERENCE ONLY

PROJECT NOTES

- CONTRACTOR MUST COMPLY WITH ALL NATIONAL, STATE AND LOCAL BUILDING CODES.
- DO NOT SCALE DRAWINGS. MOMENT DIMENSIONS ARE SHOWN. REFER TO DETAILS, WORK SPECIFICATIONS AND MATERIALS FOR INFORMATION ON CONTACT ANCHORAGE IF APPLICABLE.
- EXISTING BUILDING INFORMATION WAS OBTAINED FROM THE OWNER AND NATIONAL FIELD CONDITION REPORT TO COMPLEMENTARY WORK. DRAWINGS MAY CONTAIN ALL INFORMATION, INCLUDING OCCUPANCY, USE, CODED BUILDING ALTERNATIVE AND OTHER INFORMATION. ALWAYS VERIFY FIELD CONDITIONS BEFORE COMMENCING WORK AND NOTIFY ARCHITECT IF FIELD CONDITIONS DIFFER SIGNIFICANTLY FROM RECORDED WORK.
- INSTRUCTIONS FOR BUILDING CONSTRUCTION MAY BE LOCATED IN ANY PART OF THE CONTRACTORS AND SUPPLIERS TO BE INFORMED IN ANY PART OF THE CONTRACT DOCUMENTS WILL NOT BE A VALID REASON FOR BEING A CHANGE ORDER.
- ALL ISOLS DERIVED FROM MANUFACTURED CONCRETE BLOCK, ETC., WHICH ARE DIVULGED, ARE TO BE FIELD AND TO MATCH SURFACE.
- PATCH AND REPAIR ALL EXISTING WALL SURFACES ADJACENT TO NEW WORK AS REQUIRED TO ACHIEVE UNIFORMED SURFACE APPEARANCE FROM AND TO MATCH EXISTING SURFACE.
- CONTRACTOR SHALL BE RESPONSIBLE FOR ALL SPACING REQUIRED TO EXIST WORK. ARCHITECT AND OWNER TO ADVISE A MINIMUM AMOUNT OF REINFORCEMENT WITH THE OWNER'S APPROVAL.
- IF THE PROJECT IS A REWORK, THE CONTRACTOR IS RESPONSIBLE FOR PROVIDING ALL MATERIALS AND LABOR TO BE INSTALLED AND TO BE REMOVED. THE CONTRACTOR MUST RETURN THE AREA ORDERED AS REQUIRED FOR ACCESS TO RE-BUILDING CONDITION.
- THE CONTRACTOR AND ALL SUB-CONTRACTORS SHALL BE RESPONSIBLE TO OBTAIN AND PAY FOR ALL NECESSARY PERMITS AND APPROVALS FROM THE APPLICABLE LOCAL, STATE AND FEDERAL AGENCIES.
- ALL MATERIALS AND LABOR TO BE USED SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR AND MUST COMPLY WITH ALL APPLICABLE LOCAL, STATE AND FEDERAL LAWS DURING THE CONSTRUCTION OF THIS PROJECT.
- ALL MATERIALS AND LABOR TO BE USED SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR AND MUST COMPLY WITH ALL APPLICABLE LOCAL, STATE AND FEDERAL LAWS DURING THE CONSTRUCTION OF THIS PROJECT.
- ALL MATERIALS AND LABOR TO BE USED SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR AND MUST COMPLY WITH ALL APPLICABLE LOCAL, STATE AND FEDERAL LAWS DURING THE CONSTRUCTION OF THIS PROJECT.
- SET TOOLS FOR ADDITIONAL PROJECT NOTES, MARKING, MEASURING, AND STRIKES.
- DO NOT USE AND ENGAGE IN THE USE AND HANDLING OF FLammable AND EXPLOSIVE ONLY. VERIFY ALL CONSTRUCTION DETAILS THROUGHOUT THE ENTIRE SET OF DOCUMENTS.
- THE PROJECT SHALL COMPLY TO UNDERPINNERS' LIABILITY FROM THE REBIDDER/OWNER AND BUILDING MATERIALS DIRECTOR.
- ANY MATERIAL SUBSTITUTION TO A LISTED DESIGN NUMBER SHALL BE APPROVED BY THE ARCHITECT AND OWNER. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ALL THE FIRST MATERIAL AND METHOD INSPECTION AND APPROVAL BEFORE ANY ACCEPTANCE.
- FOR ANY CHANGE OF DESIGN NUMBER, OR ANY CHANGE IN MATERIALS, IN ALL DESIGN RELATED MATERIALS OR ASSEMBLIES INFERRED BY THE CHANGE OF MATERIAL OR DESIGN NUMBER, ASSEMBLY.
- PROVIDE COMPLETE APPROVED THROUGH-PENETRATION PRECAST SYSTEMS AT ALL EXISTING PENETRATIONS.
- PROVIDE COMPLETE APPROVED AT ALL CHANGES FOR PLUMBING, CONCRETE, DUCTWORK, ETC. AT THE RATED ASSEMBLY.
- REFER TO THE FLOOR PLAN FOR DIMENSIONS OF ALL PER AND SHOCK-RESISTANT PARTITION.

PROJECT DESCRIPTION

THE COMMERCIAL DISTRICT FOR USE B1 TO REPAIR AND THE UPPER LEVEL APARTMENTS ARE TO BE REBUILT.

DRAWING LIST

NO.	DATE	TITLE	ISSUED FOR PERMIT
01	5/4/2021	PERMIT	X
02		FOUNDATION	X
03		FOUNDATION	X
04		FOUNDATION	X
05		FOUNDATION	X
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100		FOUNDATION	X

DRIVEN DESIGN
 ARCHITECT
 Driven Design Studio PLLC
 11000 E Erie St, Albion, MI 48017
 (269) 735-9040
 cody@drivendesignstudio.com

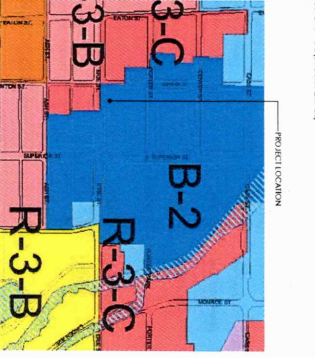
NOT FOR CONSTRUCTION

THIS DOCUMENT IS THE EXCLUSIVE PROPERTY OF DRIVEN DESIGN. THE CONTRACTOR SHALL NOT BE REPRODUCED OR TRANSMITTED IN ANY FORM OR BY ANY MEANS, ELECTRONIC OR MECHANICAL, INCLUDING PHOTOCOPYING, RECORDING, OR BY ANY INFORMATION STORAGE AND RETRIEVAL SYSTEM, WITHOUT THE EXPRESS WRITTEN PERMISSION OF DRIVEN DESIGN.

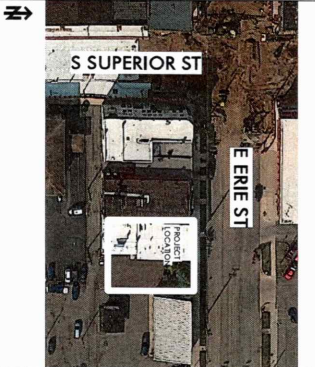
DATE: 5/4/2021 10:52:21 AM
 DRAWN BY: JLD
 CHECKED BY: JLD
 SCALE: 1/8" = 1'-0"

PROJECT: 110 AND 112 ERIE ST. ALBION, MI
 SHEET: 32 OF 37

1000



ZONING MAP



AREA MAP

Real Estate Summary Sheet

Information herein deemed reliable but not guaranteed

Page 33 of 327
08/03/2022 12:59 PM

Parcel: 51-001-117-01
Owner's Name: ERIE STREET APARTMENTS LLC
Property Address: 112 E ERIE ST
ALBION, MI 49224
Liber/Page: 4516/0404
Split: // **Created:** // **Active:** Active
Public Impr.: Paved Road, Storm Sewer, Sewer, Gas, Curb
Topography: None

Current Class: 201.COMMERCIAL-IMPROVED
Previous Class: 201.COMMERCIAL-IMPROVED
Taxable Status: TAXABLE
Prev. Taxable Stat: EXEMPT (211.7M)
Gov. Unit: 51 ALBION CITY
MAP#:
School: 13010 MARSHALL SD (ALBION DEBT)
Neighborhood: 103 103-COMMERCIAL CBD

Mailing Address:

ERIE STREET APARTMENTS LLC
16000 E MICHIGAN AVE
ALBION MI 49224

Description:

ORIGINAL PLAT, BLK 65: E 1/2 OF LOT 3 AND ENTIRE LOT 4 AND THE W 16.90 FT OF LOT 5 (112 E ERIE ST)

Most Recent Sale Information

Sold on 03/16/2021 for 0 by ACE INVESTMENT PROPERTIES LLC.

Terms of Sale: 21-NOT USED/OTHER

Liber/Page: 4516/0404

Most Recent Permit Information

Permit P132-2018 on 09/12/2018 for \$0 category COMMERCIAL, ADD/ALTER/REPAIR.

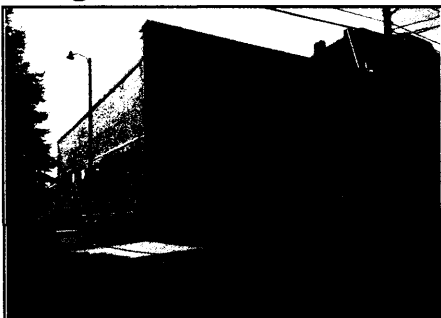
Physical Property Characteristics

2022 S.E.V.:	90,100	2022 Taxable:	90,100	Lot Dimensions:	
2021 S.E.V.:	0	2021 Taxable:	0	Acreage:	0.21
Zoning:	B2	Land Value:	2,938	Frontage:	0.0
PRE:	0.000	Land Impr. Value:	7,364	Average Depth:	0.0

Improvement Data

of Commercial Buildings: 2
Type: Shopping Centers - Mixed w/Residential Units
Desc: BRICK / B
Class: C
Quality: Low Cost
Built: 1880 Remodeled: 2015
Overall Building Height: 12
Floor Area: 7,209
Sale Price/Floor Area: 0.00
Estimated TCV: 169,940
Cmts:

Image



V&V Assessing LLC

1225 Holiday Ln

Portage MI 49024

Phone (269) 720-1928

Monday, April 4, 2022

To: City of Albion, Other Concerned Parties

Re: Obsolete Property – 114 E Erie Street, Albion MI 49224

Date of Site Visit: March 24th, 2022Subject Property: Mixed Use Downtown Commercial/Residential - 2 Story
Focus on the 2nd Floor Residential Housing

As requested, I have inspected, and reviewed data related to the aforementioned property in an effort to determine the functional obsolescence of the property involved. Functionally obsolete property is property that is *"unable to be used to adequately perform the function for which it was intended due to a substantial loss in value resulting from factors such as overcapacity, changes in technology, deficiencies of super inadequacies in design, or other similar factors that affect the property itself or the property's relationship with other surrounding property."*

This property has significant functional obsolescence issues, and these are my findings.

1. Electrical system and wiring removed in some areas and insufficient or outdated for today's demand requirements. Repair/replacement/upgrade in lighting must be completed. Wiring for technology is needed.
2. The second floor is unusable in its present condition, there is significant structural damage, deteriorated flooring, missing and/or falling plaster/drywall on walls and ceilings.
3. Interior walls damaged in many areas needing removal/replacement.
4. Heating and cooling system needs complete replacement. Roof replacement is likely to secure new HVAC.
5. All plumbing fixtures will need to be replaced and/or are missing.
6. Dis-repair to most stairs, handrails, landings, and doors causing unsafe conditions.
7. Windows are old, deteriorating, and will need to be replaced.

It is my opinion, as a MMAO, Level IV Assessor, the property referenced above to suffers from functional obsolescence greater than 50% of the building value.

If you have any further questions, please feel free to contact me at (269) 720-1928.

Sincerely,



Edward K. VanderVries, MMAO IV, PPE
V&V Assessing LLC
CEO, Assessor, & Equalization Director



STATE OF MICHIGAN - CALHOUN COUNTY
RECORDED
03/17/2021 02:01:33 PM
KIMBERLY A. HINKLEY, CLERK/REGISTER

RECEIPT #: 105621
\$30.00 QUIT CLAIM
\$0.00 Tax Certificate Fee



LIBER 4516

PAGE 0404

QUIT-CLAIM DEED

ACE INVESTMENT PROPERTIES, L.L.C., a Michigan limited liability company, 15901 E. Michigan Ave., Albion, Michigan 49224

quit-claims to

ERIE STREET APARTMENTS, L.L.C., a Michigan limited liability company, 16000 E. Michigan Ave., Albion, Michigan 49224

premises in the City of Albion, Calhoun County, Michigan, described as:

ORIGINAL PLAT, BLK 65: E 1/2 OF LOT 3 AND ENTIRE LOT 4 AND THE W 16.90 FT OF LOT 5.
Commonly known as 112 E. Erie Street, Albion, MI 49224

Tax parcel No. 13-51-001-117-01

for a consideration of less than One Hundred (\$100.00) Dollars.

CONVEYANCE EXEMPT FROM COUNTY AND STATE TRANSFER TAX: Consideration less than \$100.00. MCLA 207.505 (a), MCLA 207.526 (a).

ACE INVESTMENT PROPERTIES, L.L.C.

Date:

By: William H. Dobbins, manager

STATE OF MICHIGAN)
) SS
COUNTY OF CALHOUN)

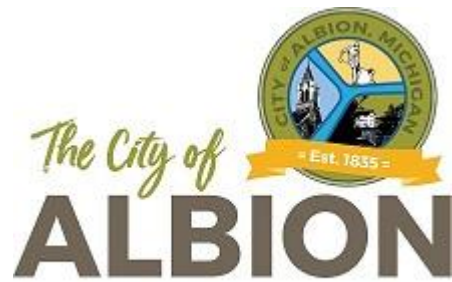
The foregoing instrument was acknowledged before me this 16 day of March, 2021, by William H. Dobbins, on behalf of the company.

DIANNE OTTO, Notary Public
Jackson Calhoun County, Michigan
My commission expires: 01/13/2022

This instrument prepared by:
Mark W. Garrison
1005 Locust Lane
Albion, Michigan 49224

DIANNE OTTO
Notary Public, State of Michigan
County of Jackson
My Commission Expires Jan, 13, 2022
Acting in the County of Calhoun

o/c



MINUTES
CITY COUNCIL STUDY SESSION
Monday, August 1, 2022 @ 6:00 PM
City Council Chambers

I. CALL TO ORDER

Mayor Snyder called the meeting to order at 6:00 p.m.

II. PLEDGE OF ALLEGIANCE

III. ROLL CALL

PRESENT: Donovan Williams (1) ; Lenn Reid (2); Nora Jackson (3);
Vivian Davis (5); Andrew French (6) and Mayor Victoria Snyder

ABSENT: Marcola Lawler (4)

ADMINISTRATION: Haley Snyder, City Manager; Yvonne Ridge,
Assistant City Manager; Cullen Harkness, City Attorney; Jill Domingo,
City Clerk; Scott Kipp, Chief Public Safety; Nicole Hathcock, Deputy
Clerk/Treasurer; Tom Mead, Finance Director and Ian Arnold, Director
of Planning & Building

IV. ITEMS FOR INDIVIDUAL DISCUSSION

A. CITY OF ALBION SURPLUS PROPERTY SALES PRESENTATION

Ian Arnold, Director of Planning & Building provided an overview of the process in which to buy City of Albion property. He stated that excluding parks, the City owns 100 acres of developable land which include the following properties:

- East Mulberry:
 - Precinct 2
 - .5 acres (CCLBS .3 acres)
 - Zoned MU
 - Long term plans with CCLBA on cooperative development
 - Adjacency to Union Steel site, could be included or developed separately
- 307 E. Cass St:
 - Precinct 2
 - 5300 sq. ft.
 - Zoned R-2
 - CCLBA working with City and MSHDA
 - Adjacent to Albion College property (MU)
 - Phase 1 environmental shows potential contaminants
 - Phase II environmental has been requested, will show additional information on contaminants
 - Working closely with CCLBA & MSHDA to move this project forward
- Urban Renewal:
 - Precinct 2
 - 9.83 acres
 - Zoned R-2
 - Substantial environmental work needed
 - AEDC has been working with developer; environmental contaminants
- 611 Austin Avenue:
 - RRC Priority Site
 - Precinct 2
 - 19,000 sq. ft.
 - Zoned MU
 - Opportunity to redevelop Austin Corridor
 - AEDC has been working towards marketing this site
 - Across North Albion St. from McAuliffe Park and Albion River Trail
- Dalrymple School:
 - RRC Priority Site
 - Precinct 3
 - 10.9 acres
 - Zoned R-2
 - Substantial environmental contaminants present, extensive work needed
- Union Steel:
 - RRC Priority Site
 - Precinct 4
 - 8.0 acres (1.8 CCLBA)

- Zoned R-2
- Working towards incremental development on smaller parcels to attract transformative development in Dog Park
- Planning and Building Recommendation:
 - Make no sale of City Owned Surplus Property that does not guarantee:
 - The mitigation of environmental risk to residents
 - By certifying that the City has remediated, or the owner will remediate any environmental contaminants prior to development
 - That the property will be developed, and not sit vacant
 - By requiring Zoning Approval of development project prior to sale
 - That the City is following the process outlined in the Code of Ordinances
 - By working closely with City Administration

Comments were received from Council Members Davis, Reid, Jackson, French and Williams; Mayor Snyder and City Manager Snyder;

B. AUGUST 1, 2022 COUNCIL AGENDA ITEMS:

- APPROVE 2022-2026 COMPREHENSIVE MASTER PLAN
- APPROVE 2022-2026 ALBION ECONOMIC DEVELOPMENT STRATEGIC PLAN
- APPROVE AMENDMENT TO CALHOUN COUNTY DISPATCH AUTHORITY (CCDA) INTERLOCAL AGREEMENT
- APPROVE CITY OF ALBION PARK RULES
- APPROVE RESOLUTION # 2022-26, A RESOLUTION TO SUPPORT THE REQUESTING OF \$200,000 FROM THE ALBION TRUST TO SUPPORT THE VICTORY PARK ICE ARENA AND KETCHUM FIELD IMPROVEMENTS

Comments were received from Council Members Williams; Jackson; French and Reid; Mayor Snyder; City Manager Snyder; City Attorney Harkness; Chief Scott Kipp and Finance Director Tom Mead

V. PUBLIC COMMENTS

(Persons addressing the City Council shall limit their comments to no more than three (3) minutes. Proper decorum is required.)

Comments were received from Scott Avery, 24177 F Drive S; City Manager Snyder and Council Member Reid

** Finance Director Mead introduced new Deputy Clerk/Treasurer
Nicole Hathcock

VI. CITY MANAGER REPORT- None

VII. MAYOR AND COUNCIL MEMBER COMMENTS

No Mayor and Council comments were received

VIII. ADJOURN

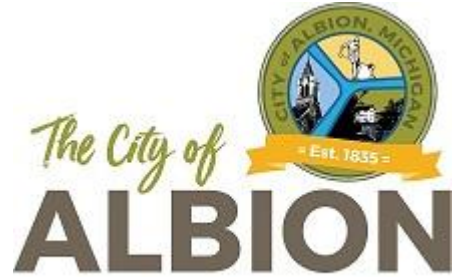
Moved by (6) French, seconded by (5) Davis

Adjourn Study Session

Mayor Snyder adjourned the Study Session at 6:54 p.m.

Carried

Jill A. Domingo, City Clerk



MINUTES
CITY COUNCIL REGULAR MEETING
Monday, August 1, 2022 @ 7:00 PM
City Council Chambers

I CALL TO ORDER

Mayor Snyder called the regular meeting to order at 7:00 p.m.

II MOMENT OF SILENCE TO BE OBSERVED

III PLEDGE OF ALLEGIANCE

IV ROLL CALL

PRESENT: Donovan Williams (1) ; Lenn Reid (2); Nora Jackson (3);
Vivian Davis (5); Andrew French (6) and Mayor Victoria Snyder

ABSENT: Marcola Lawler (4)

ADMINISTRATION: Haley Snyder, City Manager; Yvonne Ridge,
Assistant City Manager; Cullen Harkness, City Attorney; Jill Domingo,
City Clerk; Scott Kipp, Chief Public Safety; Tom Mead, Finance Director;
Patrick Miller, Director of Public Services and Ian Arnold, Director of
Building and Planning

V APPROVAL OF AGENDA

(Includes any proposed additions, deletions or changes to the agenda)

A. AGENDA

Moved by (3) Jackson, seconded by (6) French

To approve agenda as presented

CITY COUNCIL REGULAR MEETING
August 1, 2022

	For	Against	Abstained	Absent
Snyder Mayor	x			
Williams (1)	x			
Reid (2)	x			
Jackson (3)	x			
Lawler (4)				x
Davis (5)	x			
French (6)	x			
	6	0	0	1

Carried

VI PRESENTATIONS AND RECOGNITIONS- None

VII PUBLIC HEARING- None

VIII PUBLIC COMMENTS

(Persons addressing the City Council shall limit their comments to **agenda items only** and to no more than three (3) minutes. Proper decorum is required.)

No public comments were received

IX CLOSED SESSION- None

X CONSENT CALENDAR (VV) (items)

(Items on Consent Calendar are voted on as one unit)

- A. • JULY 18, 2022 STUDY SESSION MINUTES
 • JULY 18, 2022 REGULAR SESSION MINUTES

Moved by (3) Jackson, seconded by (6) French

Approve Consent Calendar as presented

	For	Against	Abstained	Absent
Snyder Mayor	x			
Williams (1)	x			
Reid (2)	x			
Jackson (3)	x			
Lawler (4)				x
Davis (5)	x			

French (6)	x			
	6	0	0	1

Carried

XI ITEMS FOR INDIVIDUAL DISCUSSION

A. APPROVE 2022-2026 COMPREHENSIVE MASTER PLAN

AIR-22-490

Comments were received from Council Member Davis, City Manager Snyder and Ian Arnold, Planning & Building Director

Moved by (6) French, seconded by (3) Jackson

Approve 2022-2026 Comprehensive Master Plan

	For	Against	Abstained	Absent
Snyder Mayor	x			
Williams (1)	x			
Reid (2)	x			
Jackson (3)	x			
Lawler (4)				x
Davis (5)	x			
French (6)	x			
	6	0	0	1

Carried

B. APPROVE 2022-2026 ALBION ECONOMIC DEVELOPMENT STRATEGIC PLAN

AIR-22-489

Comments were received from Council Member Reid and Amy Deprez, President & CEO Albion Economic Development Corporation

Moved by (3) Jackson, seconded by (5) Davis

Approve 2022-2026 Albion Economic Development Strategic Plan

	For	Against	Abstained	Absent
Snyder Mayor	x			
Williams (1)	x			

CITY COUNCIL REGULAR MEETING
August 1, 2022

Reid (2)	x			
Jackson (3)	x			
Lawler (4)				x
Davis (5)	x			
French (6)	x			
	6	0	0	1

Carried

C. APPROVE AMENDMENT TO CALHOUN COUNTY CONSOLIDATED DISPATCH AUTHORITY (CCFDA) INTERLOCAL AGREEMENT

AIR-22-491

Comments were received from City Manager Snyder

Moved by (3) Jackson, seconded by (6) French

Approve Amendment to Calhoun County Consolidated Dispatch Authority (CCFDA) Interlocal Agreement

	For	Against	Abstained	Absent
Snyder Mayor	x			
Williams (1)	x			
Reid (2)	x			
Jackson (3)	x			
Lawler (4)				x
Davis (5)	x			
French (6)	x			
	6	0	0	1

Carried

D. APPROVE CITY OF ALBION PARK RULES

AIR-22-492

Comments were received from Council Members French and Davis; City Manager Snyder and City Attorney Harkness

Moved by (6) French, seconded by (3) Jackson

Approve City of Albion Park Rules

	For	Against	Abstained	Absent

Snyder Mayor	x			
Williams (1)	x			
Reid (2)	x			
Jackson (3)	x			
Lawler (4)				x
Davis (5)	x			
French (6)	x			
	6	0	0	1

Carried

- E. APPROVE RESOLUTION #2022-26 A RESOLUTION TO SUPPORT THE REQUESTING OF \$200,000 FROM THE ALBION TRUST TO SUPPORT THE VICTORY PARK ICE ARENA AND KETCHUM FIELD IMPROVEMENTS

AIR-22-493

Comments were received from Council Members French and Reid; Mayor Snyder and City Manager Snyder

Moved by (3) Jackson, seconded by (6) French

Approve Resolution #2022-26 A Resolution to support the requesting of \$200,000 from the Albion Trust to support the Victory Park Ice Arena and Ketchum Field Improvements

	For	Against	Abstained	Absent
Snyder Mayor	x			
Williams (1)		x		
Reid (2)		x		
Jackson (3)		x		
Lawler (4)				x
Davis (5)	x			
French (6)	x			
	3	3	0	1

DEFEATED.

XII FUTURE AGENDA ITEMS

The following items were requested as Future Agenda Items:

- Discussion Lily Pads at Barnes Park (Council Member Jackson)

- Discussion-Create Ad-hoc Committee to do a Crime Study (Council Member Davis)
- Discussion-Teen Employment for the Summer (Council Member Williams)

XIII PUBLIC COMMENTS

(Persons addressing the City Council shall limit their comments to no more than three (3) minutes. Proper decorum is required.)

Comments were received from Tracy Peters; Council Members Reid and Williams and City Manager Snyder

XIV CITY MANAGER REPORT

- **Calhoun County Land Bank** – Director Arnold and I met with the Calhoun County Land Bank on Tuesday, July 19th for our monthly check-in meeting.
- **2022 MME Summer Workshop** – I attended the 2022 MME Summer Workshop in Holland, MI on July 19th-22nd. It was a great conference with very interesting topics.
- **Stoffer Plaza Site Master Plan** - The DDA established a subcommittee to work with Wightman & Associates to develop a site master plan for Stoffer Plaza. The kick-off meeting was held on Monday, July 25th .
- **Albion Dams Feasibility Study Meeting** – The public open house meeting for the Albion Dams Feasibility Study project was held on Tuesday, July 26th at Victory Park. The meeting was well attended by Albion residents. The final report from the feasibility study will be presented to the City Council within the next few months.
- **Albion College** – I met with the search firm of Russell Reynolds Associates regarding the search for a new president for Albion College on Wednesday, July 27th .
- **Albion Economic Development Corporation**– I attended the special EDC meeting on Thursday, July 28th .
- **August Primary Election** – The August Primary election will be held on Tuesday, August 2nd. The proposed road millage in the amount of 6 mils over 3 years will be on the ballot.
- **National Night Out** – The Albion Department of Public Safety will hold their annual National Night Event on Tuesday, August 2nd from 6p-8p in McIntosh Park. Flyer attached for your reference.
- **Senior Services** – Follow up to requested information at the July 18 th meeting - Handy Helper provides simple home maintenance to seniors' homes. Income limits do apply. Senior residents can

contact Milestone Senior Services to request additional information and see if they qualify for the available services – Milestone Senior Services (866) 200-8877 or <https://milestoneseniorservices.org>. The Forks Senior Center exists to improve and maintain the physical, mental, and social well-being of the area’s senior citizens. The Forks Senior Center is located within the Calhoun County Human Services Building located at 101 N. Albion Street. Many services are available for senior residents through the

- **Calhoun County Senior Millage** – Senior Millage Funded Services (seniors age 60 and over) Calhoun County, MI (calhouncountymi.gov).
- **Lead Safe Programs** – The City of Battle Creek works with local partners to implement lead programs throughout Calhoun County. The Lead Safe Program (LSP) is a lead-abatement grant funded program funded by Michigan’s Children’s Health Insurance Program (CHIP) administered in partnership with Community Action Agency of South Central Michigan. The Lead Hazard Control Program is funded by the Department of Housing and Urban Development (HUD) and is administered in partnership with Neighborhoods Inc. of Battle Creek. More information about Calhoun County-wide lead programming can be found by visiting - Home - Get The Lead Out OR contact Shawna Gamble, Lead Grant Coordinator at (269) 966-3465 or srgamble@battlecreekmi.gov

Comments were received from Council Members Davis, Jackson, Reid and French

XV MAYOR AND COUNCIL MEMBER COMMENTS

Comments were received from Council Members Reid; Jackson and French; Mayor Snyder; City Manager Snyder; City Attorney Harkness and Gary Tompkins, Calhoun County Commissioner

XVI MOTION TO EXCUSE ABSENT COUNCIL MEMBER (S)

Moved by (6) French, seconded by (3) Jackson

Excuse Council Member Lawler

	For	Against	Abstained	Absent
Snyder Mayor	x			
Williams (1)	x			
Reid (2)	x			

Jackson (3)	x			
Lawler (4)				x
Davis (5)	x			
French (6)	x			
	6	0	0	1

Carried

XVII ROLL CALL

PRESENT: Donivan Williams (1) ; Lenn Reid (2); Nora Jackson (3); Vivian Davis (5); Andrew French (6) and Mayor Victoria Snyder

ABSENT: Marcola Lawler (4)

ADMINISTRATION: Haley Snyder, City Manager; Yvonne Ridge, Assistant City Manager; Cullen Harkness, City Attorney; Jill Domingo, City Clerk; Scott Kipp, Chief Public Safety; Tom Mead, Finance Director; Patrick Miller, Director of Public Services and Ian Arnold, Director of Building and Planning

XVIII ADJOURN

Moved by (3) Jackson, seconded by (6) French

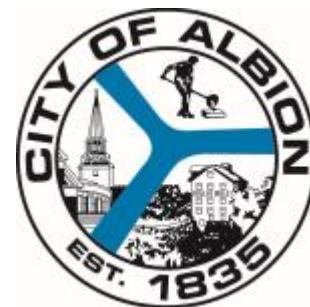
Adjourn regular meeting

Mayor Snyder adjourned the regular meeting at 8:05 p.m.

Carried

Jill A. Domingo, City Clerk

CITY COUNCIL REGULAR MEETING AGENDA ITEM REPORT



To: City Council
Subject: APPROVE WATER RATE INCREASE
Meeting: CITY COUNCIL REGULAR MEETING - 15 Aug 2022
Department: City Manager
Staff Contact: Haley Snyder, City Manager

BACKGROUND INFORMATION:

The City of Albion's water revenues is dwindling while expenses continue to increase due to the aging infrastructure and stringent regulations from the State. City water rates have not increased since 2014, and the current rates are too low to maintain the City's water system and equipment properly. Based on a 2018 state-wide study, the City of Albion's water rates were ranked the lowest - 45th out of 52 municipalities.

Wightman & Associates has prepared a draft Preliminary Engineering Report (PER) for Water System Improvements Projects throughout the City of Albion. The PER assesses the condition of the existing City water treatment, storage, distribution systems, population, and future growth over the next 20 years. A severe need for many repairs and improvements has been identified within the PER. To complete these necessary repairs and improvements to the City's water system, the City will need to acquire funding through the USDA-RD or other funding sources. Water rates must be increased to qualify for funding opportunities and maintain the City's water system. The Albion City Council held a study session to discuss the water rate study provided by Wightman & Associates on April 18, 2022.

The proposed rate structure reflects a 50% rate structure increase and a 120% commodity charge increase. Please note that the offered rate does not consider the State's new lead and copper rules. The new State requirements will increase the funding needed to operate and replace all lead and copper lines throughout the City. The water rates will need to be increased further; however, the proposed increase is a minimum requirement.

FINANCIAL IMPACT:

Current Commodity Charge: \$1.42 and Proposed Commodity Charge: \$3.12

Quarterly Water Demand Charge:

5/8 Inch - \$24.00 and Proposed Rate \$36.00
 3/4 Inch - \$36.00 and Proposed Rate \$54.00
 1 Inch - \$60.00 and Proposed Rate \$90.00
 1 1/2 Inch - \$120.00 and Proposed Rate \$180.00
 2 Inch - \$192.00 and Proposed Rate \$288.00
 3 Inch - \$384.00 and Proposed Rate \$576.00
 4 Inch - \$600.00 and Proposed Rate \$900.00

6 Inch - \$1,200.00 and Proposed Rate \$1,800.00

ATTACHMENTS:

[Water Rate Proposal 2022](#)

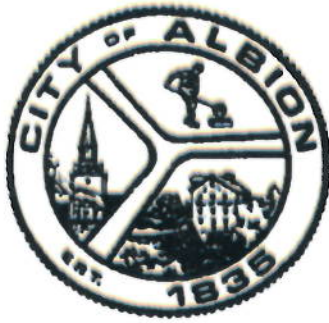
[Utility Rates Proposed 2022](#)

[Water Rates 2022](#)

[2021.06.07 PER Albion Water](#)

[Water Fund Historic Trends - 8-08-2022](#)

[Copy of Water Fund Historic Trends - Chart](#)



City of Albion

William L. Rieger Municipal Building
 112 West Cass Street • Albion, Michigan 49224
 (517) 629-5535 • Fax (517) 629-4168

City Manager Snyder,

As you are well aware, our water revenues are dwindling while our expenses are ever increasing due to the aging infrastructure and more stringent regulations from the state. This is making it harder and harder to run the department effectively. With this in mind, the city has been working towards a water system upgrade, much like the wastewater system upgrades that we are currently working through. Wightman has drafted a preliminary engineering report for these water system upgrades. Within that, they have identified a serious need for many repairs and improvements. In order to do these repairs and improvements to our system, we will need to acquire a USDA loan, like we are doing with the wastewater system. In order to repay that loan and maintain our water system, we must increase our water rates. Below are the minimum proposed rates identified through the study done with the PER. These proposed rates don't take in account the new lead and copper rules from the state. That will surely increase the amount needed to operate. So, these rates will no doubt increase again while we are finalizing the project, but we know this is a minimum requirement.

	Existing Rate Structure	Proposed Rate Structure
% Water Demand Increase Required		50%
Quarterly Water Demand Charge		
5/8 inch	\$ 24.00	\$ 36.00
3/4 inch	\$ 36.00	\$ 54.00
1 inch	\$ 60.00	\$ 90.00
1 1/2 inch	\$ 120.00	\$ 180.00
2 inch	\$ 192.00	\$ 288.00
3 inch	\$ 384.00	\$ 576.00
4 inch	\$ 600.00	\$ 900.00
6 inch	\$ 1,200.00	\$ 1,800.00
% Commodity Charge increase		120%
Commodity Charge (per 100 CF)	\$ 1.42	\$ 3.12

I highly recommend that we pursue increasing the water rates as soon as possible. We are already struggling with our current financial situation at the water department, and we must continue increase our revenue if we want to maintain high quality, safe drinking water. Water rates have not increased since 2014 and our rates are simply too low to properly maintain our system and equipment. Based on a study from 2018, our water rates are ranked 45th lowest out of 52 municipalities surveyed. If you have any questions or would like more information, please let me know. Thank you.



4/6/22

Patrick Miller
 Director of Public Services

Current 2022 Utility Billing Breakdown

1-Person Home (typical 7-10 usage units per person)

\$1.42 per unit of **water** X 10 units + \$24 base rate for water = \$38.20 water charge per quarter

\$2.66 per unit of **sewer** X 10 units + \$37.30 base rate for sewer = \$63.90 sewer charge/quarter

Total 2022 Utility Bill - \$102.10 per quarter for water and sewer service

2-Person Home (typical 7-10 usage units per person)

\$1.42 per unit of **water** X 20 units + \$24 base rate for water = \$52.40 water charge per quarter

\$2.66 per unit of **sewer** X 20 units + \$37.30 base rate for sewer = \$90.50 sewer charge/quarter

Total 2022 Utility Bill - \$142.90 per quarter for water and sewer service

3-Person Home (typical 7-10 usage units per person)

\$1.42 per unit of **water** X 30 units + \$24 base rate for water = \$66.60 water charge per quarter

\$2.66 per unit of **sewer** X 30 units + \$37.30 base rate for sewer = \$117.10 sewer charge/quarter

Total 2022 Utility Bill - \$183.70 per quarter for water and sewer service

4-Person Home (typical 7-10 usage units per person)

\$1.42 per unit of **water** X 40 units + \$24 base rate for water = \$80.80 water charge per quarter

\$2.66 per unit of **sewer** X 40 units + \$37.30 base rate for sewer = \$143.70 sewer charge/quarter

Total 2022 Utility Bill - \$224.50 per quarter for water and sewer service

Proposed 2023 Utility Billing Breakdown

1-Person Home (typical 7-10 usage units per person)

\$3.12 per unit of **water** X 10 units + \$36 base rate for water = \$67.20 water charge per quarter

\$2.78 per unit of **sewer** X 10 units + \$42.55 base rate for sewer = \$70.35 sewer charge/quarter

Total 2023 Utility Bill - \$137.55 per quarter for water and sewer service

2-Person Home (typical 7-10 usage units per person)

\$3.12 per unit of **water** X 20 units + \$36 base rate for water = \$98.40 water charge per quarter

\$2.78 per unit of **sewer** X 20 units + \$42.55 base rate for sewer = \$98.15 sewer charge/quarter

Total 2023 Utility Bill - \$196.55 per quarter for water and sewer service

3-Person Home (typical 7-10 usage units per person)

\$3.12 per unit of **water** X 30 units + \$36 base rate for water = \$129.60 water charge per quarter

\$2.78 per unit of **sewer** X 30 units + \$42.55 base rate for sewer = \$125.95 sewer charge/quarter

Total 2023 Utility Bill - \$255.55 per quarter for water and sewer service

4-Person Home (typical 7-10 usage units per person)

\$3.12 per unit of **water** X 40 units + \$36 base rate for water = \$160.80 water charge per quarter

\$2.78 per unit of **sewer** X 40 units + \$42.55 base rate for sewer = \$153.75 sewer charge/quarter

Total 2023 Utility Bill - \$314.55 per quarter for water and sewer service

Current 2022 Water Base Rates

5/8 inch	\$	24.00
3/4 inch	\$	36.00
1 inch	\$	60.00
1 1/4 inch	\$	84.00
1 1/2 inch	\$	120.00
2 inch	\$	192.00
3 inch	\$	384.00
4 inch	\$	600.00
6 inch	\$	1,200.00
8 inch	\$	1,920.00
10 inch	\$	2,760.00

Proposed 2023 Water Base Rates

5/8 inch	\$	36.00
3/4 inch	\$	54.00
1 inch	\$	90.00
1 1/4 inch	\$	126.00
1 1/2 inch	\$	180.00
2 inch	\$	288.00
3 inch	\$	576.00
4 inch	\$	900.00
6 inch	\$	1,800.00
8 inch	\$	2,880.00
10 inch	\$	4,140.00

Current 2022 Water Rate (per unit)

All Sizes	\$	1.42
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Proposed 2023 Water Rate (per unit)

All Sizes	\$	3.12
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**PRELIMINARY ENGINEERING
REPORT
FOR THE**

DRAFT

CITY OF ALBION

**WATER SYSTEM IMPROVEMENTS
PROJECT**

June 2021



CITY OF ALBION, MICHIGAN

**WATER SYSTEM IMPROVEMENTS PROJECT
PRELIMINARY ENGINEERING REPORT**

DRAFT

City of Albion
Water System Improvements Project
USDA Preliminary Engineering Report

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- D. PER Summary Tables
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 - c. Present Worth Analysis
 - d. Bond Schedule
 - e. Total Project Cost
- E. Rate Analysis
- F. Individual Project Breakdown of Costs

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**City of Albion
Water System Improvements Project
USDA Preliminary Engineering Report**

I. Purpose And Scope

The City of Albion (City) has authorized the preparation of an application to the United States Department of Agriculture (USDA) Rural Development Utilities Service Program for funding of a water system improvement project. The primary needs to be addressed by this project include the installation of a new storage tank, improvements to the existing filtration plant, and replacement of several undersized water mains nearing the end of their useful life.

The purpose of this report is as follows:

- Analyze the project planning area and existing water system infrastructure.
- Determine necessary improvements to the existing water treatment, storage, and distribution systems.
- Discuss alternative solutions to meet the system needs.
- Develop a potential rate structure to pay for the improvements.
- Provide a recommended alternative and improvements to be included in a funding application.

This preliminary engineering report assesses the condition of the existing City water treatment, storage, and distribution systems; existing population; and future growth over the next 20 years. The proposed rates necessary to pay the operation, maintenance, replacement, and debt retirement costs were calculated assuming a 100% USDA Rural Development loan utilizing a 1.75% interest rate for a 40-year period.

II. Project Planning Area

A. Location

The project planning area includes the areas within the City limits and small portions of nearby townships which are currently served by the City water system made up by the Starr well field, the Clark Street emergency well field, the iron filtration plant (IFP), the existing 0.5-million-gallon elevated storage tank, and nearly 70 miles of existing water main. The City is located on the eastern side of Calhoun County in southern Michigan, along the Kalamazoo River. The project planning area is shown on the maps in Appendix A.

B. Environmental Resources Present

The environmental resources within the project planning area include some areas of prime farmland. There are no protected wetlands and no coastal zones. The North Branch and the South Branch Kalamazoo River pass through different proposed project locations within the planning area which are also the habitat of endangered species including the Indiana Bat and the Copperbelly Water Snake.

A search of Michigan Historic Sites determined that there are four known historic sites within the planning area: Cass Avenue Bridge, Gardner House, Eugene P. Robertson House, and Superior Street Commercial Historic District. None of the historic sites will be impacted by the proposed project.

Refer to the Environmental Report for additional information concerning environmental resources.

C. Population Trends

Over the past 50 years, the City has experienced an average growth rate of -7.5% per decade. Minimal growth and no water system expansion is expected over the 20-year planning period.

City of Albion Historical Population and Future Projections

<u>Year</u>	<u>Population</u>	<u>% Change</u>
1960	12749	--
1970	12112	-5.0%
1980	11059	-8.7%
1990	10222	-7.6%
2000	9157	-10.4%
2010	8616	-5.9%
2020 ¹	8702	1.0%
2030 ¹	8789	1.0%

Population Data from US Census Bureau.

¹Population estimated assuming 1.00% growth per decade.

**City of Albion
Water System Improvements Project
USDA Preliminary Engineering Report**

D. Community Engagement

The City has discussed the anticipated costs and benefits of this project with representatives of the planning area during regular bi-monthly council meetings and have issued notification of the commencement to secure funding in the local newspaper, prior to authorizing the funding application. Additional public meetings will be held, as necessary.

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III. Existing Facilities

A. Location Map

The existing City water system is shown in the set of maps provided by Jones and Henry Engineers, Ltd. as part of the City's Water Reliability Study in 2015. This map set is included in Appendix A. Additionally, the proposed improvement locations are provided on a map in Appendix B.

B. History

There are a total of two active well fields that the City uses as part of its water supply infrastructure. The Starr Well Field is the only field that is in daily operation, while the Clark Street Well Field is on standby. The Brownswood Well Field is no longer in use by the City. The Brownswood wells were capped in 2007 due to threat of contamination. The Starr Well Field has sufficient capacity to supply average daily, maximum daily and peak hour demands to the service area.

Construction on the City's water filtration plant was completed in 2001. The City's water distribution system pumps water from the Starr Well Field to the central water filtration plant where chlorine, potassium permanganate, polyphosphate and fluoride are added and is then pumped into the distribution system.

Built in 1961, the existing 0.5-million-gallon elevated storage tank provides storage capacity for peak demand and fire flows. The tank moderates the system from pressure swings due to increases and decreases in demand.

A majority of the City's distribution system is cast iron pipe installed more than 60 years ago. Since the early 1970's, system improvements have been made with ductile iron pipe. Over the last decade, the City has replaced water main in conjunction with other infrastructure projects within the same corridors. It is estimated approximately 75% of the distribution mains are the original cast iron pipe, while 25% has been upgraded to ductile iron. The system has experienced increasing main breaks over the last eight years due to the aged water mains. It has also experienced challenges in system hydraulics due to the change in well field location from the Clark Street Well Field in the northeast to the Starr Well Field in the northwest, undersized distribution mains, and mains running parallel that are not interconnected.

C. Conditions of Existing Facilities

The existing water distribution system is in fair condition. The water system service area is generally bounded by the City limits, but also includes limited areas in adjacent townships to the west, north, and east..

Wells providing water to the City's water system include the Starr Well Field and, in emergency situations, the Clark Street Well Field. Well maintenance work has included replacing or rebuilding pump motors, chemical cleaning and performing flow tests after work completion. The Starr wells last maintenance and inspection were completed in 2020 and reported to be in good condition.

Many assets within the filtration plant have aged and are at the end of their typical useful lives. The plant is due for upgrades including replacement of the high service pumps, chemical pumps,

City of Albion
Water System Improvements Project
USDA Preliminary Engineering Report

chemical pump enclosures, valves, building structural and electrical repairs, and filter media replacement.

The interior and exterior of the City's existing 0.5-million-gallon elevated storage tank were cleaned and repainted in August 2018 as well as various other improvement recommendations. While the tank is in good condition, the total storage capacity does not meet the recommendation of the Michigan Department of Environment, Great Lakes, and Energy (EGLE) that the City should have the storage capacity equal to one full day's demand (1.25 million gallons).

Water service customers receive water via the nearly 70-mile water main network, a large portion of which is undersized and at the end of its typical useful life. Recommendations by the 10 States Standards 8.2.2 and AWWA M31 suggest that the minimum pipe diameter should be 6-inch in loops and 8-inch at dead ends to help maintain available fire flow capacity. There are several locations in which the system does not meet this requirement and needs resizing at the time of replacement. During recent hydraulic studies, additional mains have been identified as undersized as well due to either non-connected parallel mains, or undersized mains causing bottlenecks from the direction of the well field out to the rest of the distribution system.

The City believes that there are water services within the system which are lead or partial lead. Based on the latest EGLE guidelines, services identified as lead or partial lead cannot be partially replaced during water main construction. Lead services must be replaced entirely from the connection at the main, into the building. Two of the proposed project locations are suspected to contain lead services. The City plans to complete full water service replacements concurrently with the water main replacement in accordance with the Lead and Copper Rule. Because USDA funding cannot be used for this type of work, the City plans to finance service replacement beyond the public ROW through customer rates.

D. Financial Status of Existing Facilities

The current rate schedule for the City's customers is based on two parameters including a quarterly ready-to-serve (RTS) charge determined by the customer's meter size, and a quarterly commodity charge per 100 cubic feet (CF). The following illustrates the fee breakdown:

Quarterly Base Charge	
Meter Size (inch)	Quarterly RTS Charge
5/8	\$24.00
3/4	\$36.00
1	\$60.00
1 1/4	\$84.00
1 1/2	\$120.00
2	\$192.00
3	\$384.00
4	\$600.00
6	\$1,200.00
8	\$1,920.00
10	\$2,760.00

City of Albion
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Fee Structure	Quarterly Rate
Water RTS Charge	From Table
Commodity Charge	\$1.42 per 100 CF

E. Local Investment to Water System

The City understands the need for investment into its aging water infrastructure and has been proactive in seeking for opportunities to partner with agencies offering financial assistance for infrastructure improvements.

In 2018, the City secured two grants administered by the Michigan Economic Development Corporation to assist with investment in the water system. First, the City painted the interior and exterior of the existing elevated storage tank at a total project cost of \$550,000; \$500,000 of the cost was covered by the grant, while the remaining \$50,000 was paid by the water fund. Second, the City replaced approximately 6,200 feet of undersized water main with 12-inch main as well as reconstructed Irwin Avenue at a total project cost of \$2.45 million. The grant paid for \$2 million of the project, while the remaining \$450,000 was funded through a combination of the City's general fund, streets fund, and water fund.

In 2020, the City secured a grant through MDOT Category B funding to repave five local streets. As a part of this project, the City is also replacing the aged and undersized water mains under 1st Street, 2nd Street, 3rd Street, Wild Street, and Hartwell Street. The total cost of this project is \$1.75 million, \$250,000 of which will be paid for by the grant, while the remaining cost will be funded through a combination of the City's street fund and water fund. As a result of these investments, the total amount of this USDA funding application was reduced by more than \$2 million.

IV. Need For Project

A. Health, Sanitation and Security

The three primary needs to be addressed by this project include the replacement of filtration plant equipment and treatment facility repairs, upsizing existing water main, and construction of additional water storage. The water filtration plant was constructed in 2001 and many of the assets within the plant have reached the end of their typical useful lives. In order to continue to provide safe, reliable drinking water to the service area, the recommended improvements are necessary.

To comply with the 10 States Standards 8.2.2 and AWWA M31 recommendations, water main should have a minimum size of 6-inch in loops and 8-inch at dead ends to provide fire protection. The city contains many 4- and 6-inch water mains that are nearing the end of their useful life and do not comply with these standards. The increased sizing of these water mains is necessary to eliminate bottlenecks and provide better overall transmission of water to the community for both potable use and fire protection.

In addition to upsizing sections of water main, the construction of additional water storage will increase available fire flow in the northeastern quadrant of the City.

B. Aging Infrastructure

The 20-year-old IFP consists of a pair of gravity aeration filtration systems, chemical feed and storage systems, radio telemetry controls, high service pumps and backup power. The typical useful life of much of this equipment is 15 – 20 years. While the City has completed regular maintenance of the treatment equipment, several assets are nearing the end of their useful lives and require replacement in order to continue satisfactory operation of the filtration plant.

Portions of the City of Albion water system were constructed more than 60 years ago. Based on current guidelines and recommendations many of these pipes are undersized for providing recommended fire protection. There are existing bottlenecks within the system which have been created by organic expansion of the system over time. This includes both undersized 4- and 6-inch mains as well as water mains running parallel which are not interconnected. The mains recommended for replacement are nearing the end of their useful life and should be replaced to avoid breaks, maintain water quality, and improve system hydraulics and capacity.

C. Increasing Storage

EGLE recommends that water storage should have a capacity equal to a single day's demand. That amount in the City is 1.25 million gallons. The existing tank holds less than half that capacity. Adding a second storage tank to the existing system will provide several benefits including providing the recommended capacity and allowing for redundancy, which would give the City the ability to shut down one tank in order to perform maintenance on the other.

D. Reasonable Growth

It is expected that the City of Albion will experience little to no population growth over the 20-year planning period; but because the proposed improvements will provide more capacity, the City will have the ability to serve a greater area including redevelopment of abandoned industrial sites and areas to the northwest or northeast into neighboring townships.

V. ALTERNATIVES CONSIDERED

The alternatives available to address the needs for the project are limited to either take no action and operate on the system on a reactionary basis, or to implement the necessary system improvements and operate the system on a proactive basis. There are three areas in the water system which require attention and they are broken down into three categories: IFP Improvements, storage improvements, and water main replacements. Each category maintains a no action alternative as well as a proposed project. The following section describes these alternative options which can be combined to address the cumulative needs of the water system:

A. IFP Improvements

1. No Action

i. Description

The no action alternative would mean that nothing would be constructed. The existing IFP continue to function as is, experiencing the same operational issues mentioned in Section III C, without any improvements.

ii. Environmental Impacts

Since nothing would be built, there would be no adverse environmental impacts from construction. Some of the equipment in the plant, such as the chemical pumps and enclosures, have reached the end of their typical useful lives. Without improvement, failure of these assets is possible, which could lead to unintended release of the treatment chemicals.

iii. Potential Construction Problems

There would be no construction problems for the no action alternative. However, additional planning and construction coordination would be required in order to maintain operation of the water system while the replacing any equipment that fails in the future due to the age of the assets.

iv. Sustainability Considerations

The City treats its water in order to provide safe, reliable, potable flow throughout the City water system. The no action alternative could lead to eventual failure of the aged equipment, resulting in an inability for the City to guarantee safe water to its customers. This alternative is not sustainable.

v. Cost Estimates

There would be no direct costs associated with this alternative. However, additional costs to repair or replace failing treatment equipment and structures should be budgeted for. Emergency reactionary repairs would be more expensive than planned repairs that can be procured through competitive bids.

City of Albion
Water System Improvements Project
USDA Preliminary Engineering Report

2. IFP Improvements

i. Description

This alternative would include replacement of high service pumps, chemical pumps, chemical pump enclosures, valves, filter media removal and replacement, and building HVAC and electrical repairs. The improvements would ensure the plant continues to operate such that water quality parameters are met and the City is able to provide safe, reliable, potable water to its customers.

ii. Design Criteria

Replacement of equipment such as pumps, chemical feed equipment and valves will be designed based on existing and projected demands and meet water quality parameters according to EGLE, AWWA, and 10 States Standards.

iii. Map

The IFP will remain in its current location, no changes will be made to the system service area.

iv. Environmental Impacts

Since all construction would be contained within the existing building, there would be no adverse environmental impacts from construction. However, proper disposal of chemical pumps and equipment will be required to ensure there are no offsite environmental impacts.

v. Land Requirements

All proposed improvements would be contained within the existing building and, therefore, this alternative will not require any additional land.

vi. Potential Construction Problems

Replacements would be staged to keep the IFP in service at all times. Because the improvements would be contained within the existing building, and all equipment needing replacement is redundant, there would be no construction problems for this alternative.

vii. Sustainability Considerations

The City treats its water in order to provide safe, reliable, potable flow throughout the City water system. This alternative would allow the City to continue to provide safe water to its customers, and avoid emergency repairs or unintended chemical release.

viii. Cost Estimates

Implementation of the IFP improvements results in an estimated cost of \$859,000. The detailed cost estimate of this alternative can be found in Appendix C.

**City of Albion
Water System Improvements Project
USDA Preliminary Engineering Report**

B. Storage Improvements

1. No Action

i. Description

The no action alternative would mean that nothing would be constructed. The existing elevated storage tank would continue to function as is, experiencing the same operational issues mentioned in Section III C, without any improvements.

ii. Environmental Impacts

Since nothing would be built, there would be no adverse environmental impacts from construction.

iii. Potential Construction Problems

There would be no construction problems for the no action alternative. However future maintenance to the existing elevated storage tower would require additional planning and construction coordination in order to maintain operation of the water system while the tower is offline for cleaning and maintenance. Emergency reactionary repairs would be more expensive than planned repairs that can be procured through competitive bids.

iv. Sustainability Considerations

It is recommended that the City maintain a storage of one full day's demand which the current tank does not meet. This tank also does not maintain the necessary system capacity to sustain recommended fire flow levels in many areas. This alternative is not sustainable.

v. Cost Estimates

There would be no direct costs associated with this alternative.

2. Construction of New 1-million-gallon Elevated Storage Tank

i. Description

A new 1-million-gallon storage tank to be utilized in conjunction with the existing 0.5-million-gallon tank. This option meets the EGLE recommendation to maintain one full day's use in storage and it would provide additional storage for meeting extended fire flow demands. Two tanks provide redundancy in order to allow for temporary service shut off between the new and existing tanks for maintenance, and if placed in the northeast part of the service area, this tank may be visible from highway I-94 providing identity for the City.

ii. Design Criteria

The tank will be designed in accordance with appropriate specifications in AWWA D107. High- and low-water elevations will be set to match existing system hydraulics to ensure both tanks operate in coordination.

City of Albion
Water System Improvements Project
USDA Preliminary Engineering Report

iii. Map

The proposed new storage tank location is the northeast sector of the service area. This can be found on the Proposed Improvements Location Map in Appendix B.

iv. Environmental Impacts

The proposed new tank site is located within prime farmland.

v. Land Requirements

It is recommended for the new storage tank to be built to the northeast of the service area. This location is approximately 2,000 feet northeast of the Clark Street-North Street intersection, which can be accessed through an existing utility easement. The land for this alternative still needs to be acquired as the specific site is determined. The space required for the tank is estimated to be 1 acre.

vi. Potential Construction Problems

The proposed new tower location has good soils and the tower height and distance will not interfere as an airway obstruction. The only existing access to the proposed new tower site is from Brooks Road, a privately-owned drive extending from Michigan Avenue. The City has an existing utility easement along this road. Typical construction impacts such as noise and construction equipment traffic can be expected. A temporary construction easement may be required to store materials during construction.

vii. Sustainability Considerations

This alternative satisfies the EGLE recommended one full day's demand of storage and it provides additional storage for meeting extended fire flow demands. If this option is selected, both tank levels must be monitored to ensure the desired minimum reserve capacity is met. The redundancy in tanks allows one tank to be taken out of service for maintenance. If the future demand should decline over time, the existing tank can be removed from service. In addition to this, the increased amount of water stored in an elevated tank will improve water pressure regulation across the system without additional pumping. This alternative would also allow the City to expand its service area to the northeast or northwest as future demand requires.

viii. Cost Estimates

Installation of a new 1-million-gallon tank results in an estimated cost of \$3,127,000, which includes approximately 4,400 ft of 12-inch transmission main to the new location. The acquisition of 1 acre of land for the tower site is estimated to cost approximately \$30,000. The detailed estimate of this alternative can be found in Appendix C.

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C. Water Main Improvements

1. No Action

i. Description

The no action alternative would mean that nothing would be constructed. The existing water main would continue to function as it is, experiencing the same operational issues mentioned in Section III C, without any improvements. Additionally, if no action is taken, the existing mains will likely begin to experience more frequent breaks.

ii. Environmental Impacts

Since nothing would be built, there would be no adverse environmental impacts during construction.

iii. Potential Construction Problems

There would be no construction problems for the no action alternative. However, due to the age of the mains and existing reports of main breaks, it can be expected that if the mains are not replaced, breaks will continue to occur and there will be more frequent interruptions to traffic and water service in order to make emergency repairs.

iv. Sustainability Considerations

With no action, additional breaks in the main are anticipated. This will require further repairs to be made, inconveniencing customers and may include potential property damage. This alternative is not sustainable.

v. Cost Estimates

There would be no direct costs associated with this alternative. Additional costs for emergency repairs and/or property damage would need to be budgeted for. Emergency reactionary repairs would be more expensive than planned repairs that can be procured through competitive bids.

2. Replacement of Water Mains

i. Description

The existing distribution network is made up of nearly 70 miles of water main. 100,000 feet of this network is comprised of 4-inch main and 100,000 feet of 6-inch water main, a large portion of which is undersized causing bottlenecks in the system and is aging rapidly. There are also some areas with two undersized mains running parallel, which do not connect, causing low available fire flows and poor hydraulic performance.

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ii. Design Criteria

Proposed pipe sizes are selected based on fire flow recommendations set forth by the 10 States Standards 8.2.2 and by AWWA M31. Piping design and installation will be required to follow all EGLE guidelines.

iii. Map

The proposed improvements are established on the Proposed Improvements Location Map found in Appendix B.

iv. Environmental Impacts

All proposed water main replacements will be in existing roadway corridors or previously disturbed land, either under the road, in the tree lawn or in a cleared utility easement. Two of the main replacements are within 500 feet of the Kalamazoo River. Soil erosion control best practices will be required during construction to minimize environmental impacts.

v. Land Requirements

The water main replacements are all planned to be in City right-of-way (ROW) or existing utility easements, so no additional land is required.

vi. Potential Construction Problems

Typical construction impacts can be expected. Temporary road closures will be required and detour routes set forth during construction activities. Additionally, construction equipment will cause more noise than what is typical within the City as well as possible dust disturbance. These issues will be a temporary disturbance to the community; however, they are unavoidable.

vii. Sustainability Considerations

The system has existing bottlenecks in some areas. The water main is aged and nearing the end of its useful life. There are some areas in which the fire flow demands are not currently met at the desired levels. The proposed improvements would resolve all three of these sustainability issues.

viii. Cost Estimates

This alternative is estimated to be \$4,933,000. For a detailed breakdown of costs, see the full estimate in Appendix C and supplemental preliminary estimates for each location in Appendix E.

VI. SELECTION OF AN ALTERNATIVE

Of the alternatives reviewed in Section V, the no action alternative does not meet any of the needs listed in Section IV and will not be considered any further in this study. The alternatives for the IFP improvements, new 1-million-gallon storage tank, and water main replacements will be discussed here.

1. Life Cycle Cost Analysis

A present worth analysis compares the capital costs less the present worth of any salvage value plus the present worth of the operation, maintenance, and replacement (OM&R) costs for each alternative. The analysis will be performed for a 20-year planning period at an interest rate equal to the federal discount rate from Appendix C of OMB Circular A-94 which for 2021 is 1.5%. Sunk costs are not included in the analysis. Sunk costs include any investments or financial commitments made before or during the project planning. These costs include the cost of the existing facilities, land, outstanding bond indebtedness and costs associated with planning. The total present worth, demonstrated below, is the sum of the initial capital cost, plus the present worth of OM&R costs.

Due to the nature of the improvements, it is not anticipated that either alternative will require significant additions to the current OM&R. Water tower repainting has been included in the assessment for short lived assets discussed later in this report. It is expected that because of the improvements to the IFP and the water main replacements, OM&R expenses will not increase for these components.

OM&R Costs for All Alternatives	
Salaries and Wages	\$249,620
Fringe Benefits	\$148,625
Contractual Services	\$69,700
Supplies	\$172,200
Utilities	\$133,250
Insurance and Bonds	\$15,375
Administrative Services	\$120,950
Building and Equipment Rental	\$29,725
Other	\$18,270
Total Water System OM&R Costs	\$957,715

The following table presents the estimated useful life of the various components considered within this evaluation.

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Item	Useful Life (Years)
High Service Pumps	15
Chemical Pumps and Equipment	15
Filtration Plant Valves	20
Filtration Plant HVAC and Electrical	20
Filter Media	20
Land and Easements	Permanent
Water Tower	100
Water Main, Valves, and Fittings (Cast Iron)	75
Water Main, Valves, and Fittings (Ductile Iron)	100
Hydrants	50

The following table includes the estimated salvage costs for each alternative. The estimates are based upon the estimated useful life in the previous table. Sunk costs are not included. The estimated salvage value of each alternative is included in Appendix D.c. The total present worth is the sum of the initial capital cost, plus the present worth of OM&R costs, minus the present worth of the salvage value at the end of the 20-year planning period. Because the Alternatives presented in Section V are additive, the present worth of the combined projects is calculated below:

Present Worth Analysis	
IFP Capital Cost	\$ 859,000
Water Tower Capital Cost	+ \$ 3,127,000
Distribution System Capital Cost	+ \$ 4,933,000
Present Worth of Salvage Value of Alternative A	- \$ 160,475
Present Worth of Salvage Value of Alternative B	- \$ 1,898,939
Present Worth of Salvage Value of Alternative C	- \$ 2,995,671
Present Worth of OM&R	+ \$ 16,442,654
Total Present Worth Value	\$ 20,306,569

2. Non-Monetary Factors

As previously mentioned, the No Action alternative does not meet any of the needs established for the service area and therefore, is not considered a viable alternative. By implementing all three proposed alternatives, all of the needs of for the improvements listed in Section IV will be met. This includes meeting regulatory rules and recommendations, continuing to provide safe, reliable drinking water for water system customers, and reducing needs for emergency repairs. Additionally, implementing the recommended repairs to the IFP will extend the useful life of the plant with minimal disturbance to the City.

VII. RECOMMENDED ALTERNATIVE

The selected alternative for the City of Albion Water System Improvements Project is the implementation of the Water Filtration Plan Improvements, construction of a new 1-million-gallon elevated storage tank, and the proposed water main replacements. This option provides the most benefit to the community. Following is a detailed description of the components and basis of design for this system.

A. Preliminary Project Design

1. Treatment System

Several assets within the IFP have reached the end of their typical useful life. Improvements at the plant include replacement of high service pumps, chemical pumps and enclosures, valves, filter media removal and replacement, bolt replacements, and building HVAC and electrical repairs. In order to continue to provide safe, reliable potable water to water system customers, it is recommended that these assets are replaced. All improvements will be designed in accordance with EGLE, AWWA, and 10 States Standards.

2. Storage

The existing 0.5-million-gallon storage tank no longer provides the recommended capacity required by the City. In order to best serve the community, it is recommended that an additional 1-million-gallon elevated storage tank be implemented in the northeast region of the service area. This improvement would increase the City's total water storage to 1.5 million gallons which slightly exceeds the recommendation of one full day's use. These improvements would include the acquisition of land for the new tank, the tank itself and all required controls, and two new extensions of watermain through existing easements to connect the new tower to the existing system. All improvements will be designed in accordance with EGLE, AWWA, and 10 States Standards requirements.

3. Distribution System

The City's current system has many aged and undersized water mains in need of replacement. It is recommended that the proposed main replacements are made in order to best serve the community by avoiding bottlenecks, providing recommended available fire flows and reducing future emergency repairs. A list of the exact replacement locations is provided in the Proposed Improvements Location Map in Appendix B and in the Individual Project Breakdown of Costs in Appendix F. All improvements will be designed in accordance with EGLE, AWWA, and 10 States Standards requirements.

City of Albion
Water System Improvements Project
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B. Project Schedule

It is proposed that this project be constructed beginning in the spring of 2023, should sufficient USDA Rural Development grant/loan funding be received. To meet this schedule, the following target dates would need to be met.

Receive USDA-RD Letter of Conditions (Grant/Loan offer)	October 1, 2021
Authorize preparation of plans and specifications	October 1, 2021
50% Plan Review Meeting with City	February 15, 2022
80% Plan Review Meeting with City	May 18, 2022
Completion of plans and specifications	July 15, 2022
Obtain RD approval of plans and specifications	August 15, 2022
Obtain all required permits	October 3, 2022
Advertise for bids	November 1, 2022
Open construction bids	December 15, 2022
Contract Award	January 2, 2023
Loan closing	March 1, 2023
Contract Award	April 25, 2022
Start of construction	April 1, 2023
Substantial completion	October 15, 2023
Final completion	November 15, 2023

C. Permit Requirements

This project will require permits as follows:

- Michigan Department of Transportation Right-of-Way permit
- Calhoun County Soil Erosion and Sedimentation Control permit
- Act 399 EGLE Permit for Water Supply
- Norfolk Southern Railroad Permit

D. Sustainability Considerations

The filtration plant improvements would ensure that the existing water treatment plant continues to operate as designed. The repairs would address aging infrastructure and prevent the need for future emergency repairs, ensuring system reliability.

The combination of the existing 0.5-million-gallon tank and a new 1-million-gallon tank slightly exceeds the EGLE minimum recommendation of one full day of storage and it provides additional capacity for meeting extended fire flow demands. The redundancy in tanks allows one tank to be temporarily taken out of service for maintenance. In addition to this, the increased amount of water stored in an elevated tank will improve the consistency of water pressure without the need for additional pumps. In choosing this option, the City would also have the capacity to extend its service area to the northeast in the event that growth in this area occurs. Or, if the future demand should decline over time, the existing tank can be removed from service and the City can continue to provide a high level of service by utilizing the new 1-million-gallon tank.

The existing distribution system is creating bottlenecks in some area, the water main is aged and at the end of its typical useful life, and there are some areas in which the available fire flow

City of Albion
Water System Improvements Project
USDA Preliminary Engineering Report

requirements cannot currently be met. The proposed improvements would address all three of these issues and help to counteract the need for future emergency repairs due to breaks.

E. Total Project Cost Estimate

See the Total Project Cost Estimate in Appendix C. The following is a summary of the project cost estimate.

Total Project Cost Estimate	
Total Estimated Construction Cost	\$8,920,000
Construction Contingency (10% +/-)	\$892,000
Engineering (Basic Services)	\$888,000
Other Engineering Services (Additional Services)	\$134,000
Project Inspection Fees (RPR)	\$500,000
Legal, Fiscal, and Administrative	\$150,000
Land, Structures, Easements, ROW, etc.	\$30,000
TOTAL ESTIMATED PROJECT COST	\$11,514,000

F. Annual Operating Budget

1. Income

All the capital costs for the water system and the OM&R costs for this project will be paid for through the user rate system. As shown in the Rate Analysis in Appendix E, a rate increase will be required. The amount of the rate increase will depend upon the percentage of grant funds, if any, received for the project. The rate structure required for a 100% loan are shown below:

	Existing Rate Structure	Proposed Rate Structure
% RTS Increase Required		50%
Quarterly RTS Charge		
5/8-inch	\$24.00	\$36.00
3/4-inch	\$36.00	\$54.00
1-inch	\$60.00	\$90.00
1 1/2-inch	\$120.00	\$180.00
2-inch	\$192.00	\$288.00
3-inch	\$384.00	\$576.00
4-inch	\$600.00	\$900.00
6-inch	\$1,200.00	\$1,800.00
% Commodity Charge increase		120%
Commodity Charge (per 100 CF)	\$1.42	\$3.12

2. Annual Operation and Maintenance Costs

The estimated operation, maintenance, and replacement costs are shown in detail in Appendix D.b. The estimated OM&R expenses for the water system of \$957,715 are based upon the current operating costs and future projections.

City of Albion
Water System Improvements Project
USDA Preliminary Engineering Report

3. Debt Repayment

The City has two existing debt obligations which are itemized as transfers to the wastewater fund. One of the City's existing debts will be fully repaid by July 2023 and the other will be fully repaid by December 2024.

The total debt for this project is estimated to be \$11,322,000 less any grant amounts obtained. All of the debt for this project will be paid for through increased user rates as described in Section VII.F.1. above, and as shown in the PER Summary Tables in Appendix D.

4. Reserves

A debt service reserve is required for a revenue bond issue. This debt reserve, in the amount of 10% of the average annual loan payment, has been included in the rate calculations for the various funding options for this project as shown in the PER Summary Tables in Appendix D.

A short-lived asset reserve or Repair, Replacement, and Improvement (RRI) fund is also required for the proposed water system improvements. A calculation of the annual requirement for the RRI is included in the PER Summary Tables in Appendix D and is in the amount of \$65,330.

VIII. CONCLUSION AND RECOMMENDATIONS

This Preliminary Engineering Report was prepared in accordance with United States Department of Agriculture Rural Utilities Service Bulletin 1780-2, dated April 4, 2013, for water facilities to fulfill the planning requirements for funding from the USDA.

To finance the needed improvements as identified in this Preliminary Engineering Report, our recommendations to the City are the following:

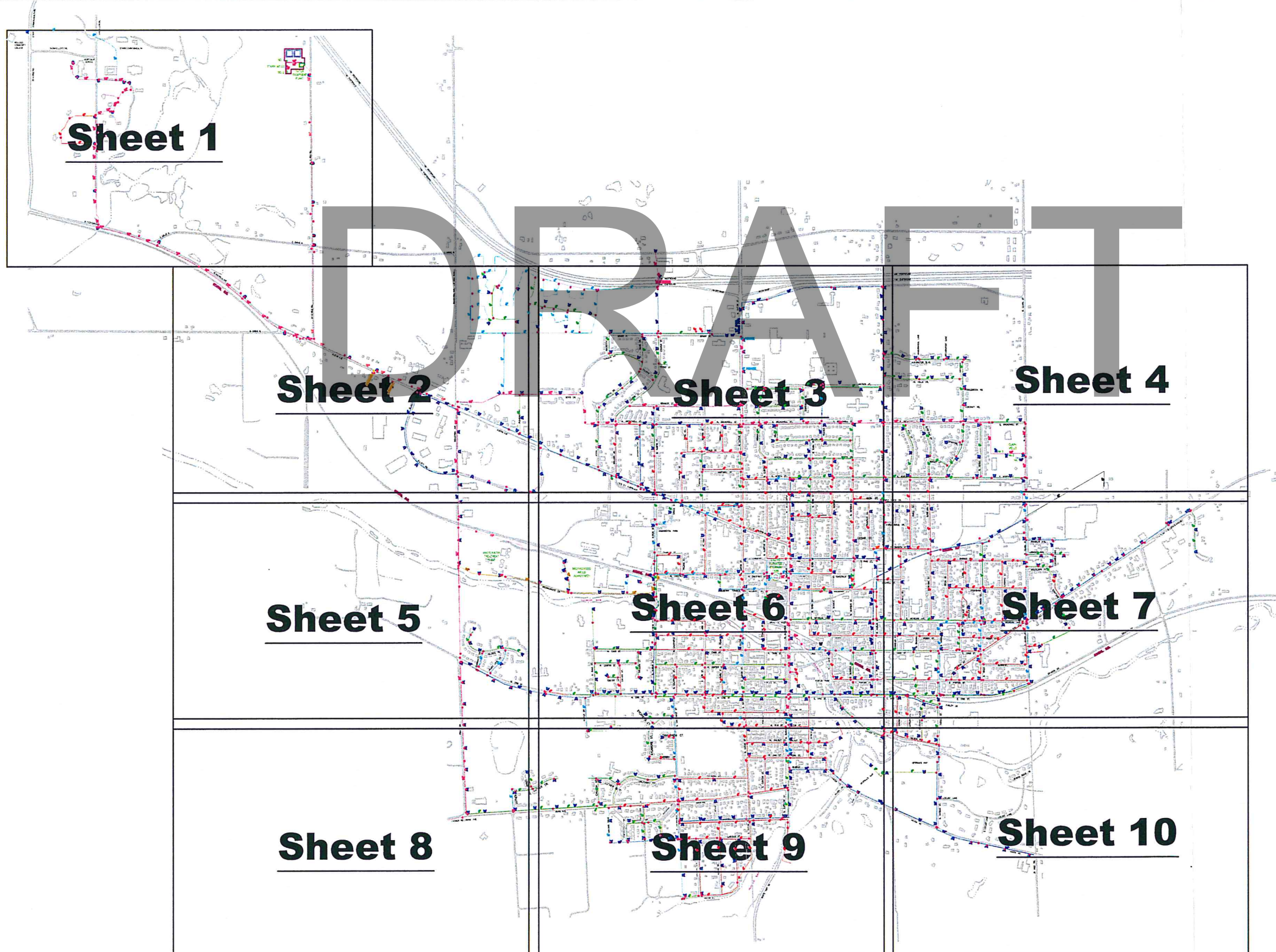
- Submit a full application and supporting documents along with copies of this Preliminary Engineering Report to the United States Department of Agriculture, Rural Development Division via RDApply for consideration for funding of this project.
- Upon receipt of the Final Rural Development Grant/Loan offer, the City should engage a bond attorney, authorize design of the proposed project, take construction bids, and close the Rural Development Loan.
- After the loan is closed, construction of the proposed project should begin.

Wightman will work with the City to ensure all requirements are met within the milestone schedule provided by the USDA.

APPENDIX A

WATER SYSTEM MAPS

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Sheet 1

Sheet 2

Sheet 3

Sheet 4

Sheet 5

Sheet 6

Sheet 7

Sheet 8

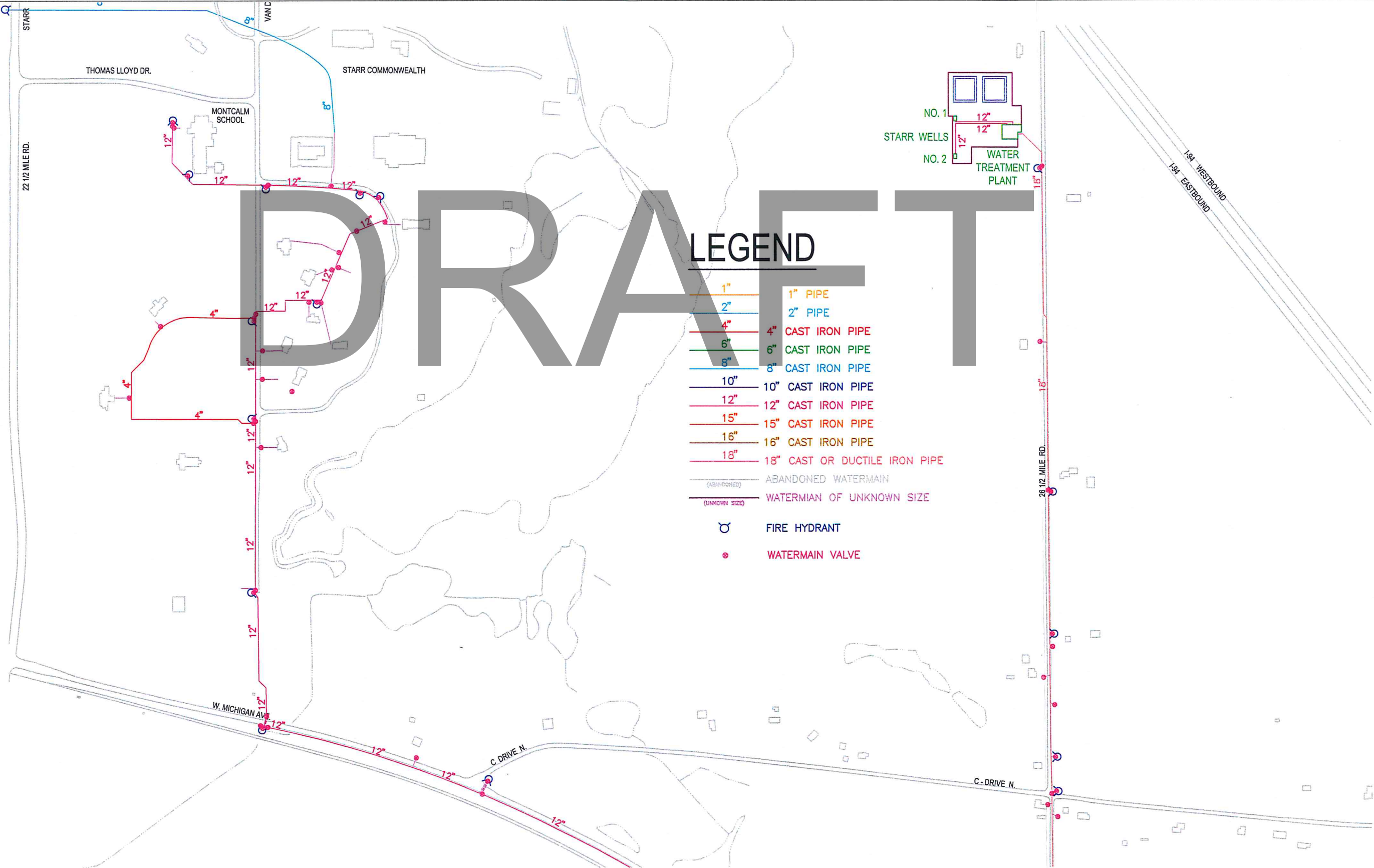
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Sheet 10



ALBION, MICHIGAN
WATER SYTEM RELIABILITY STUDY
**MAP OF WATER SYSTEM
INDEX SHEET
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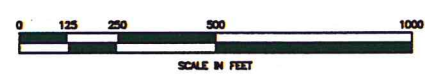
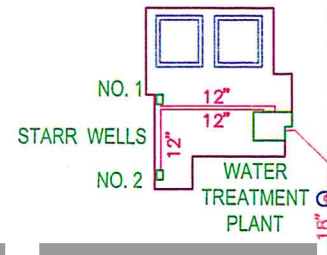




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LEGEND

- 1" PIPE
- 2" PIPE
- 4" CAST IRON PIPE
- 6" CAST IRON PIPE
- 8" CAST IRON PIPE
- 10" CAST IRON PIPE
- 12" CAST IRON PIPE
- 15" CAST IRON PIPE
- 16" CAST IRON PIPE
- 18" CAST OR DUCTILE IRON PIPE
- (ABANDONED) ABANDONED WATERMAIN
- (UNKNOWN SIZE) WATERMAIN OF UNKNOWN SIZE
- FIRE HYDRANT
- WATERMAIN VALVE

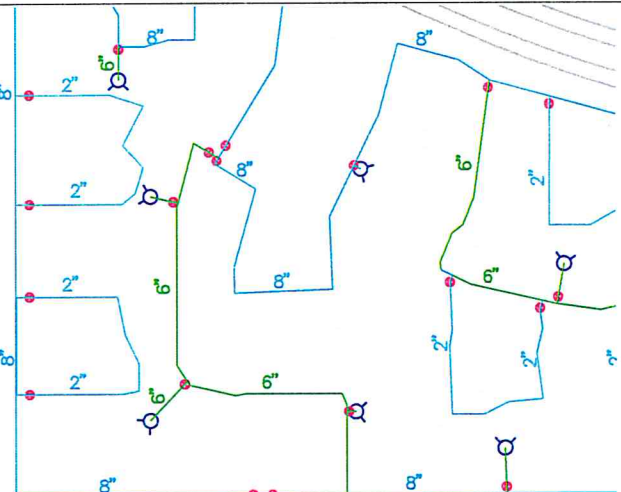
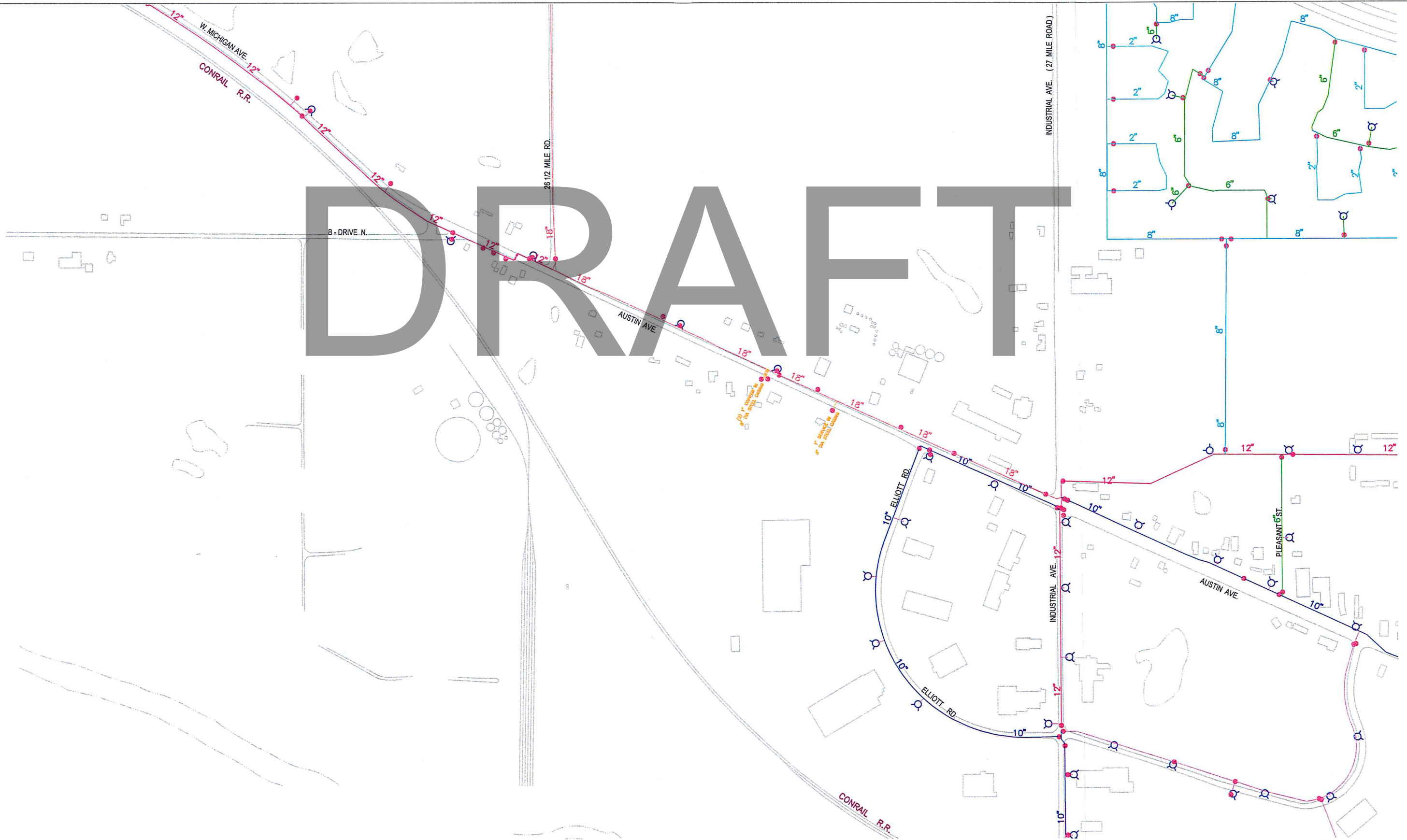


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**MAP OF WATER SYSTEM
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 2015**

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FIGURE 1 OF 10

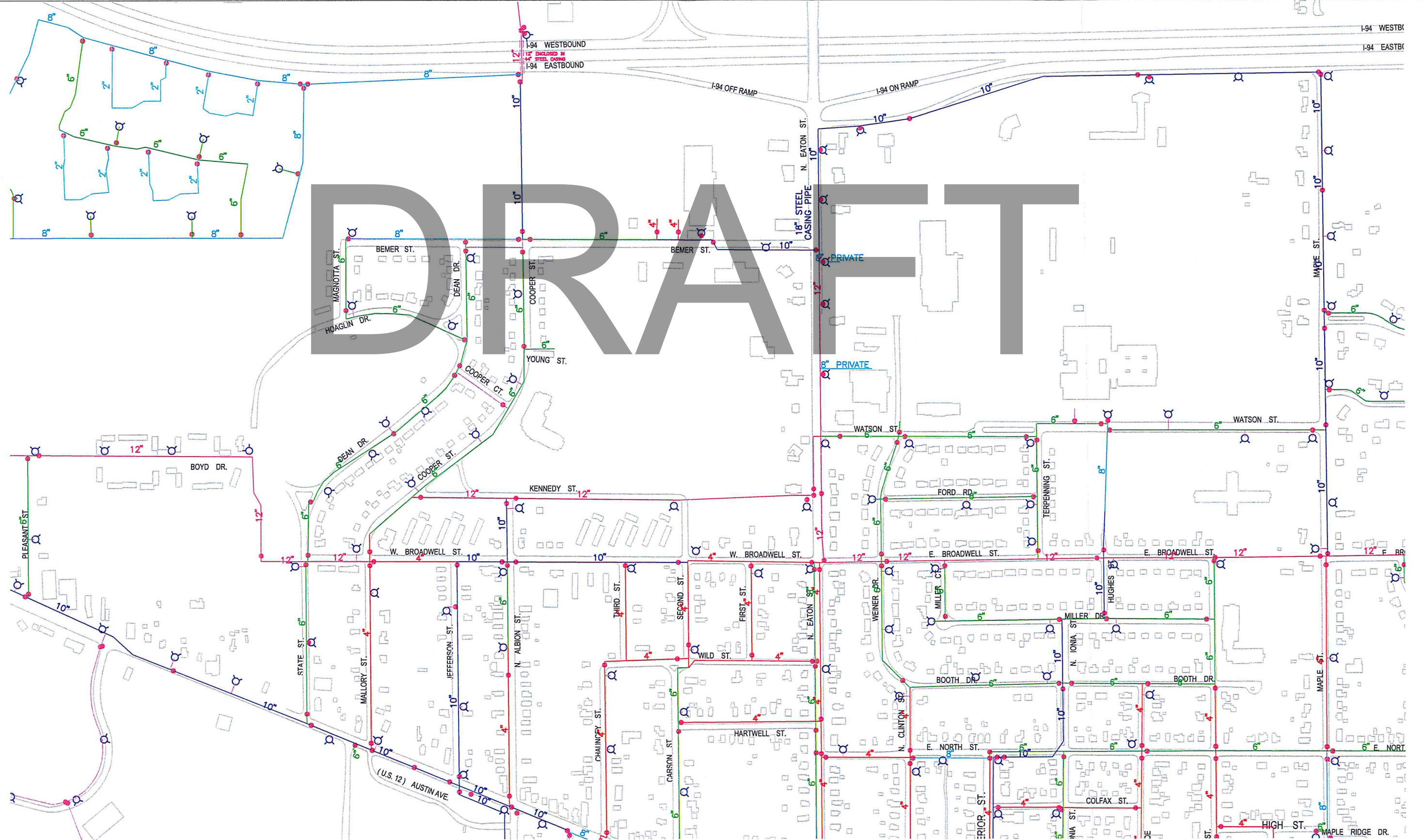
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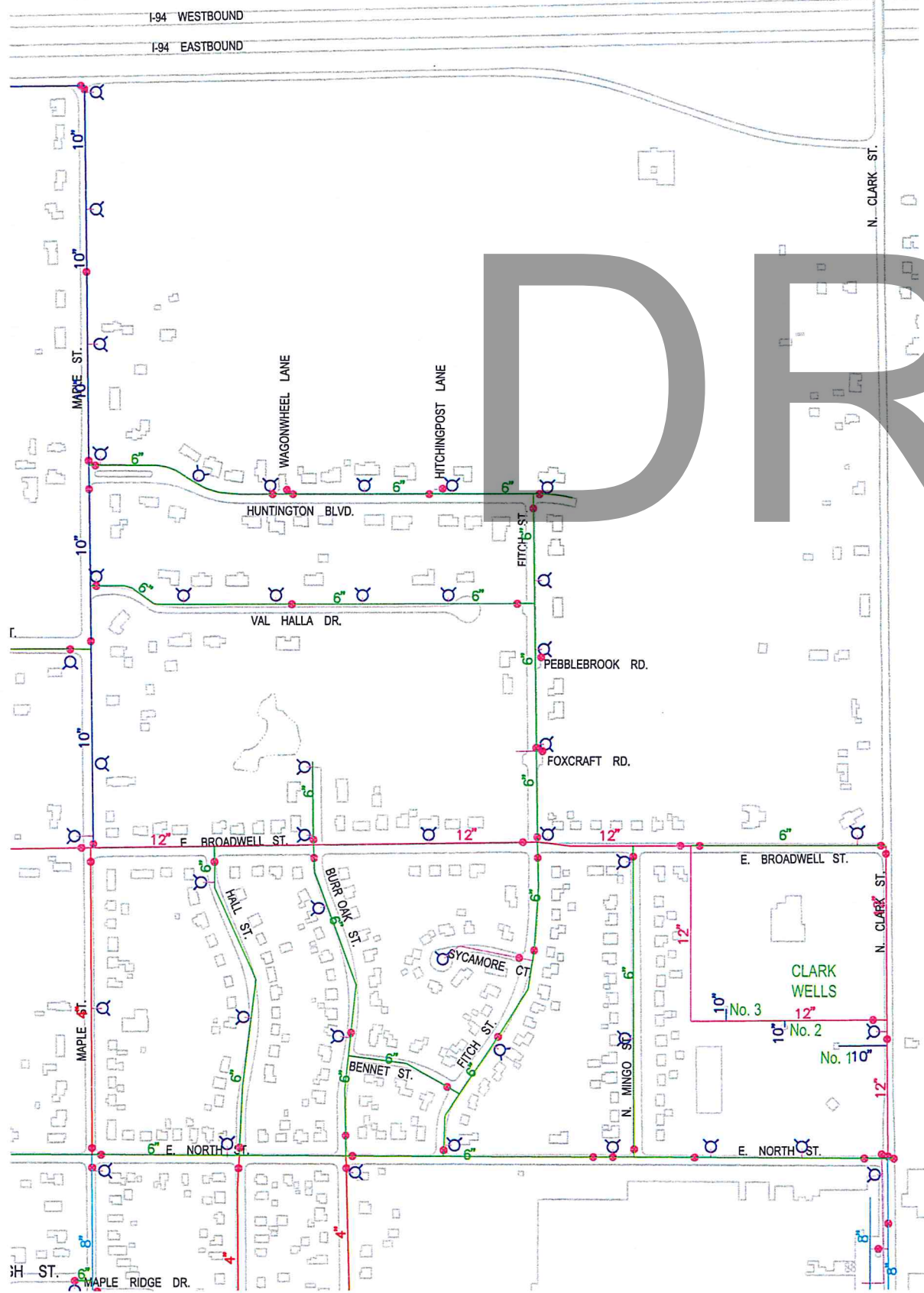
FIGURE 2 OF 10



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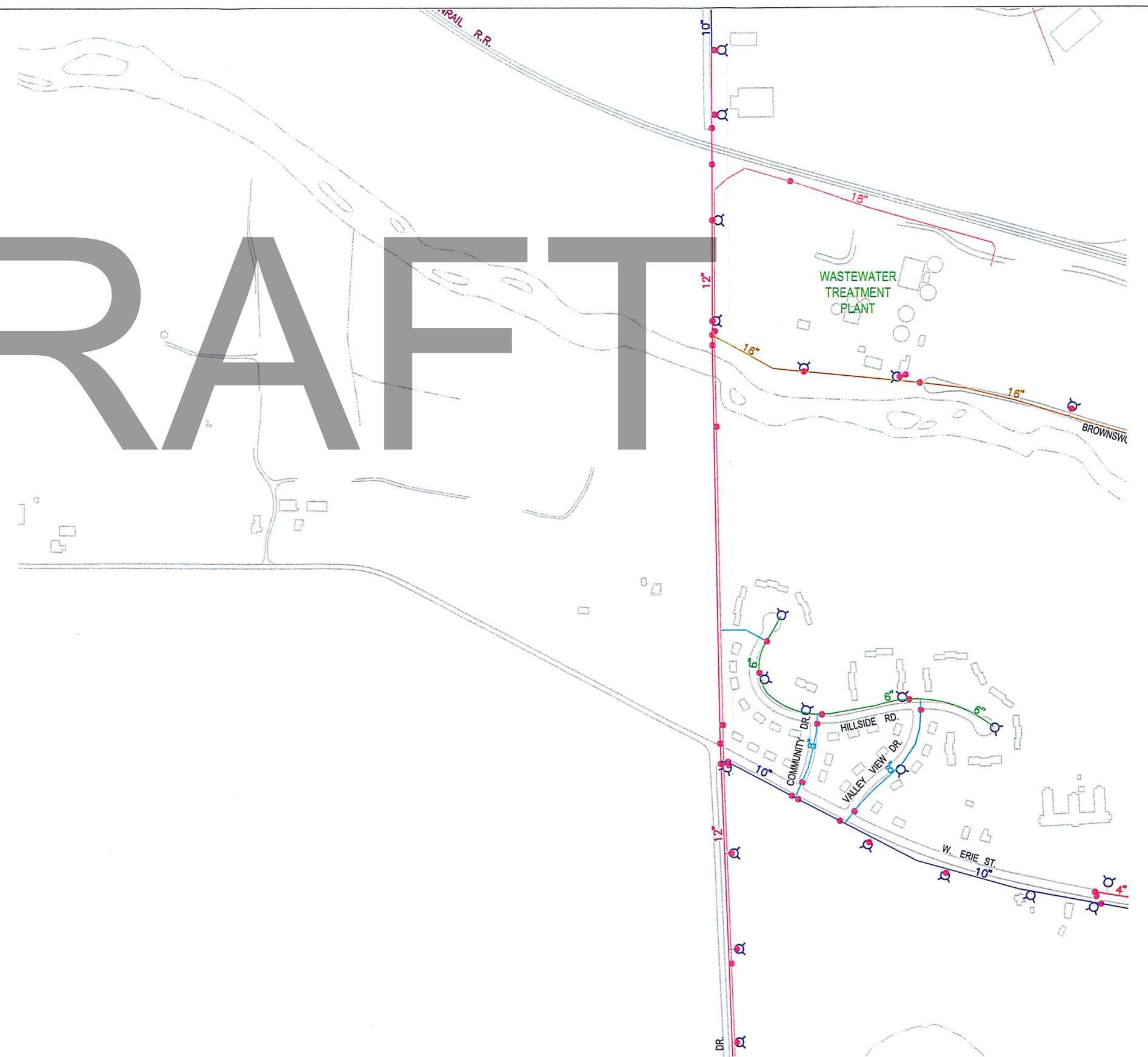


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FIGURE 4 OF 10

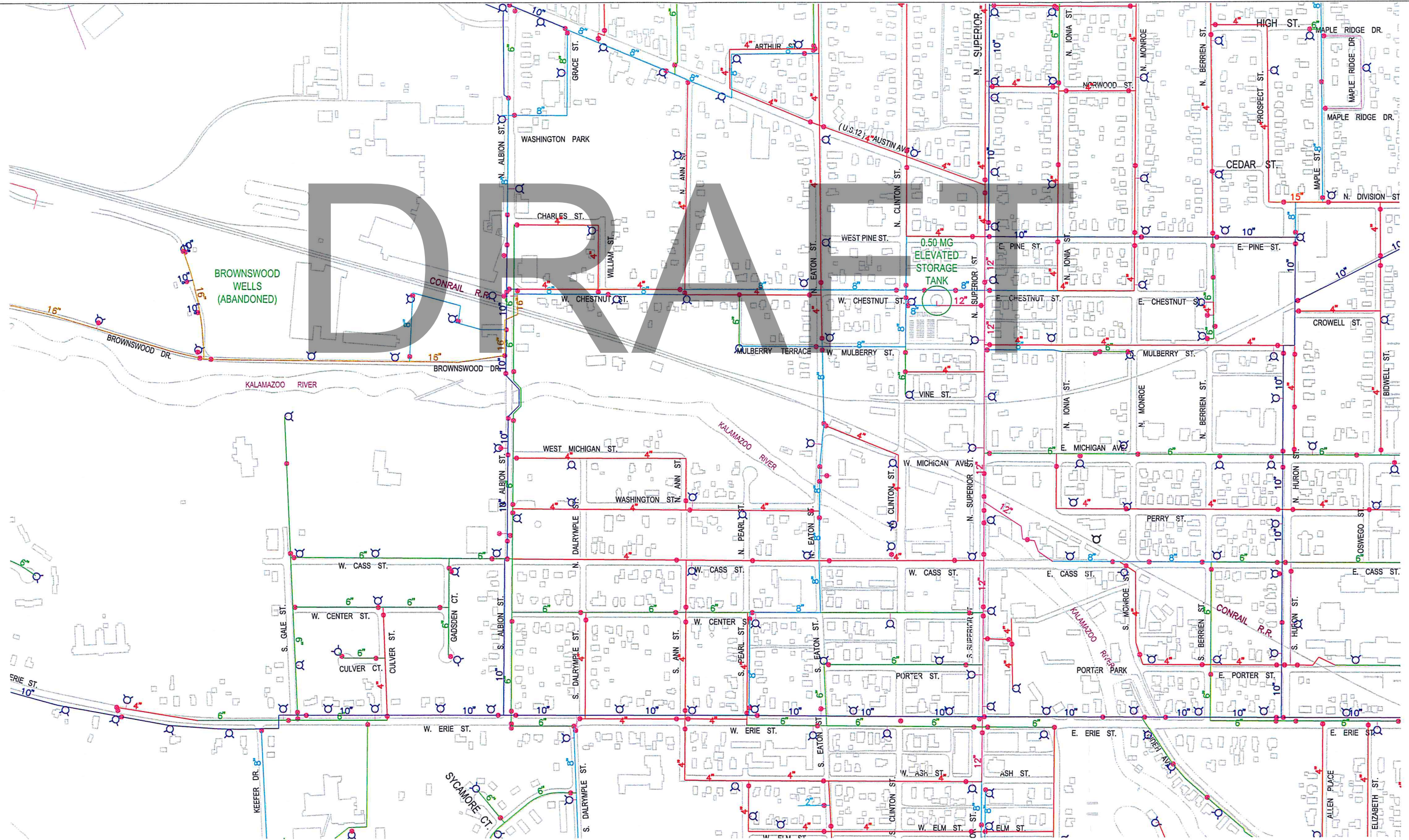
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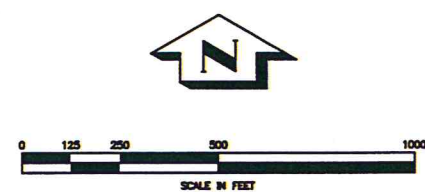
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FIGURE 5 OF 10

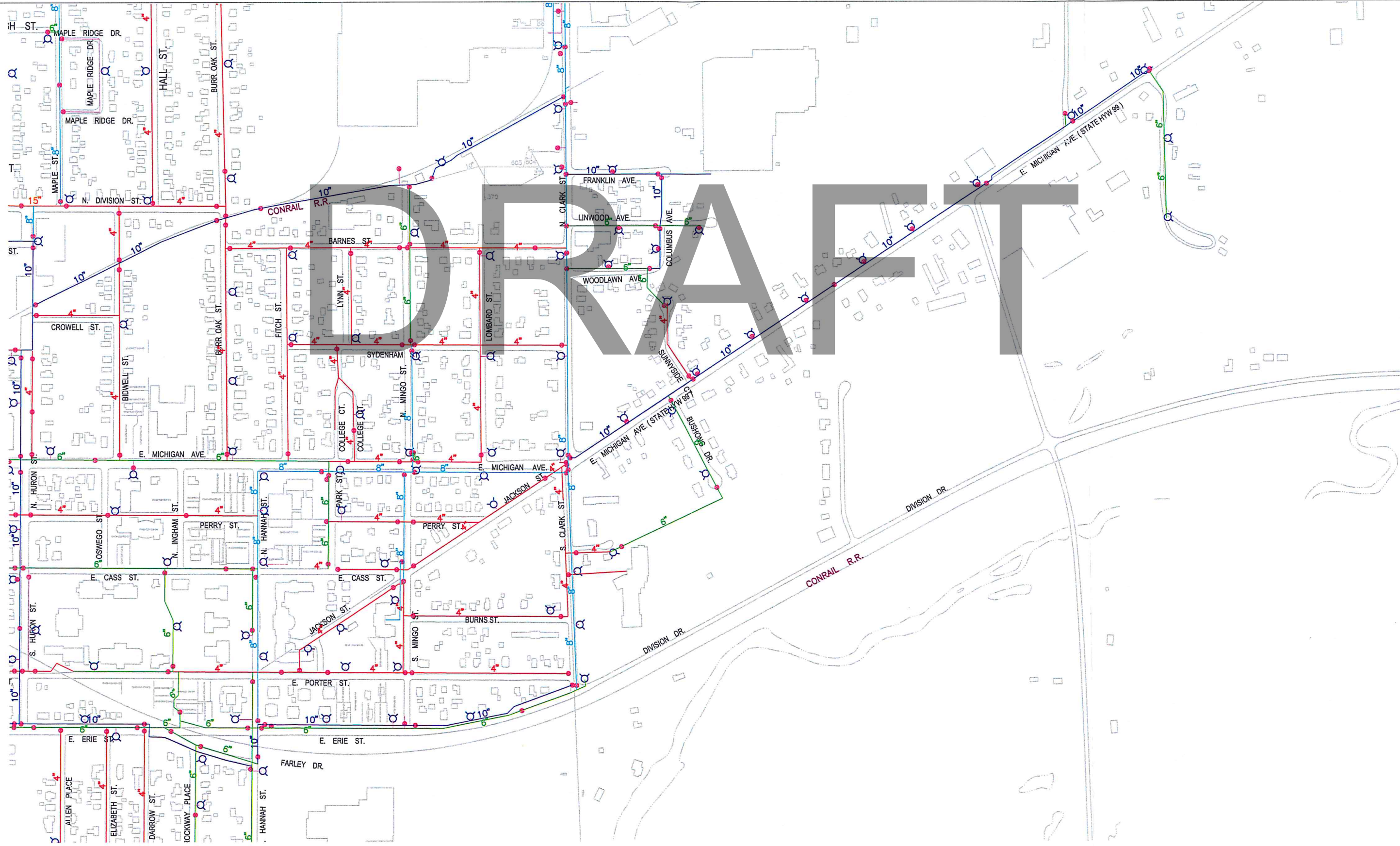


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 WATER SYTEM RELIABILITY STUDY
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FIGURE 6 OF 10

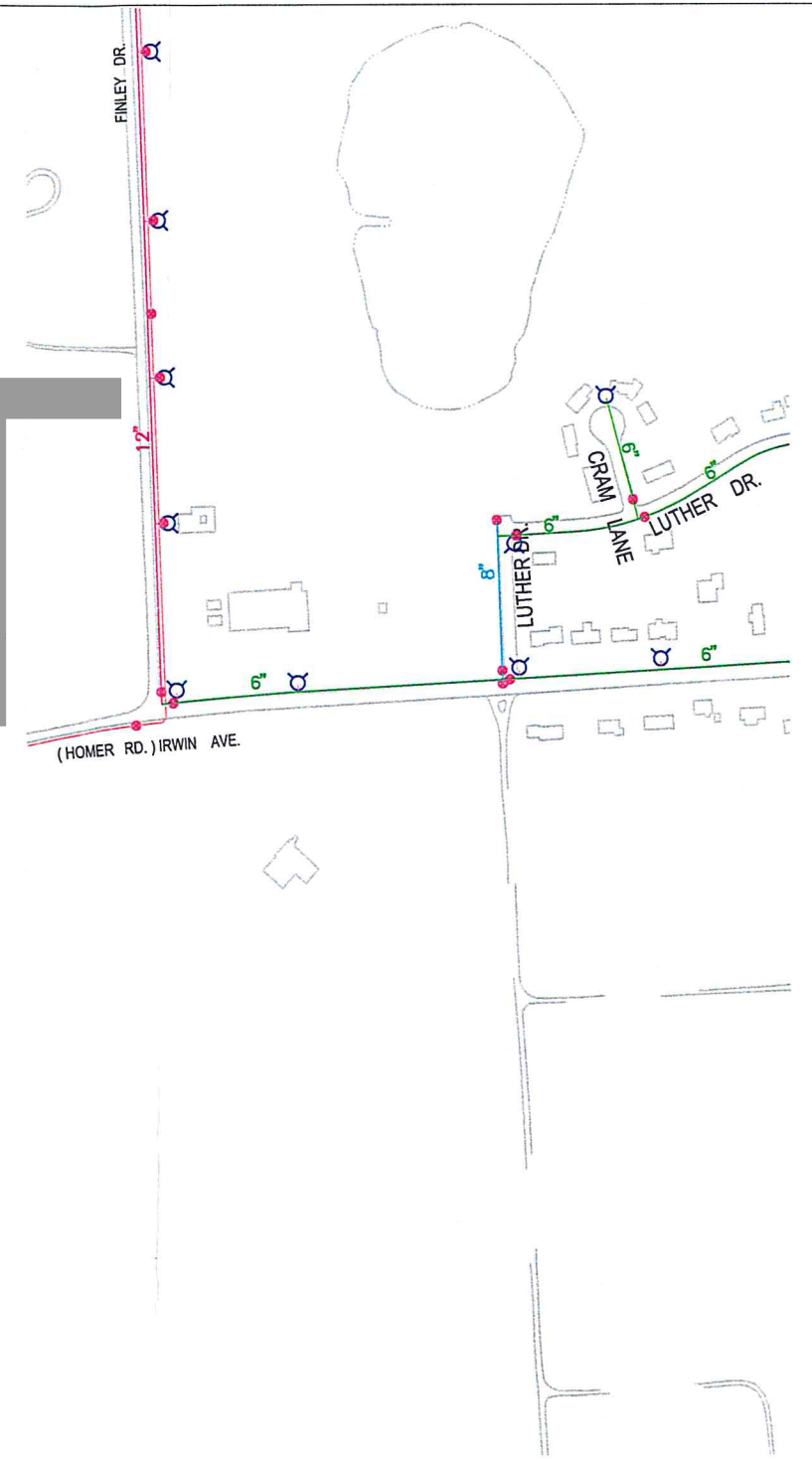


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FIGURE 7 OF 10

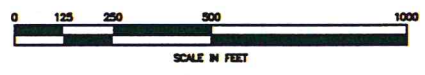
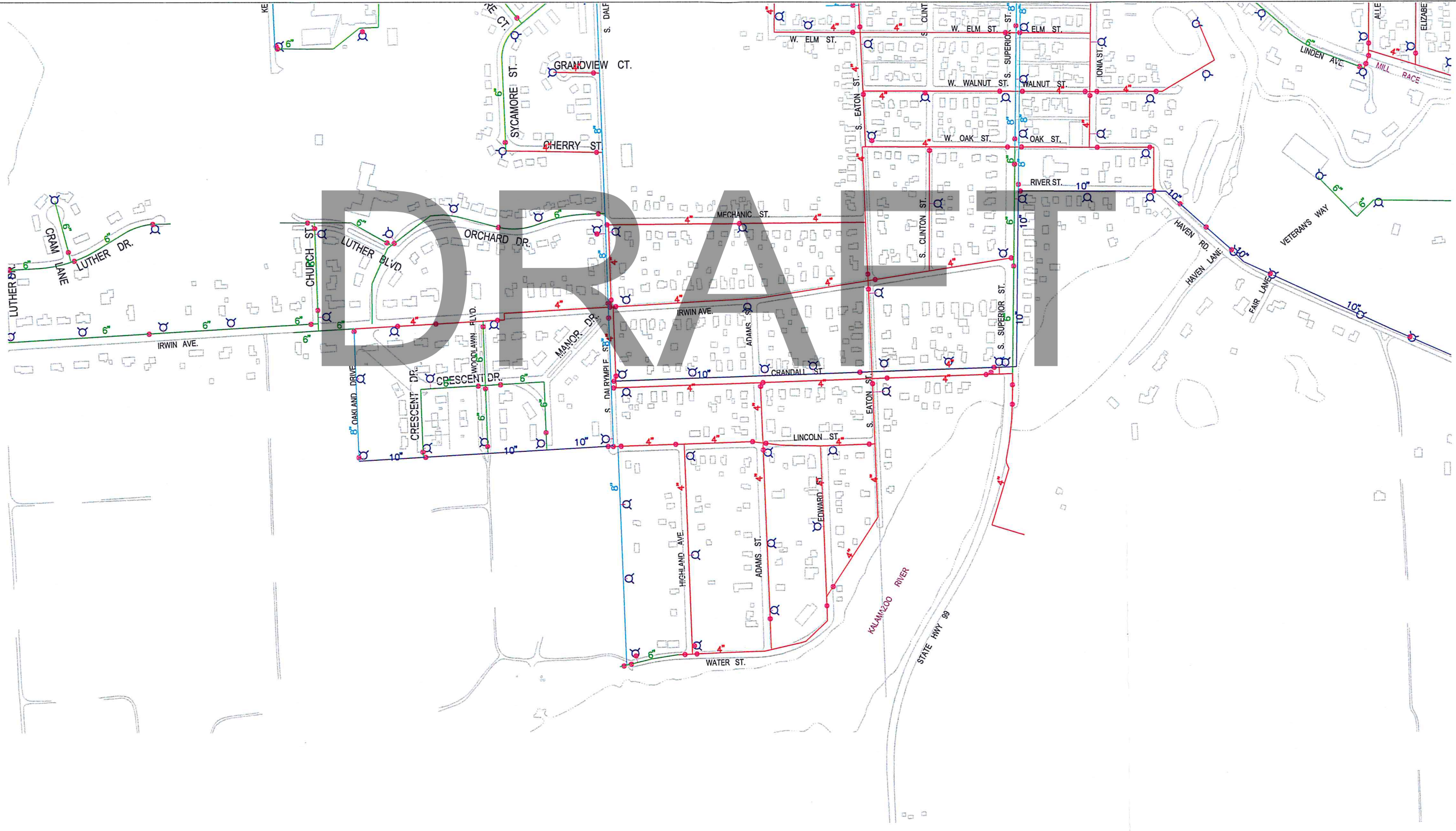
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FIGURE 8 OF 10

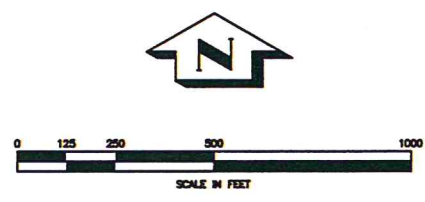
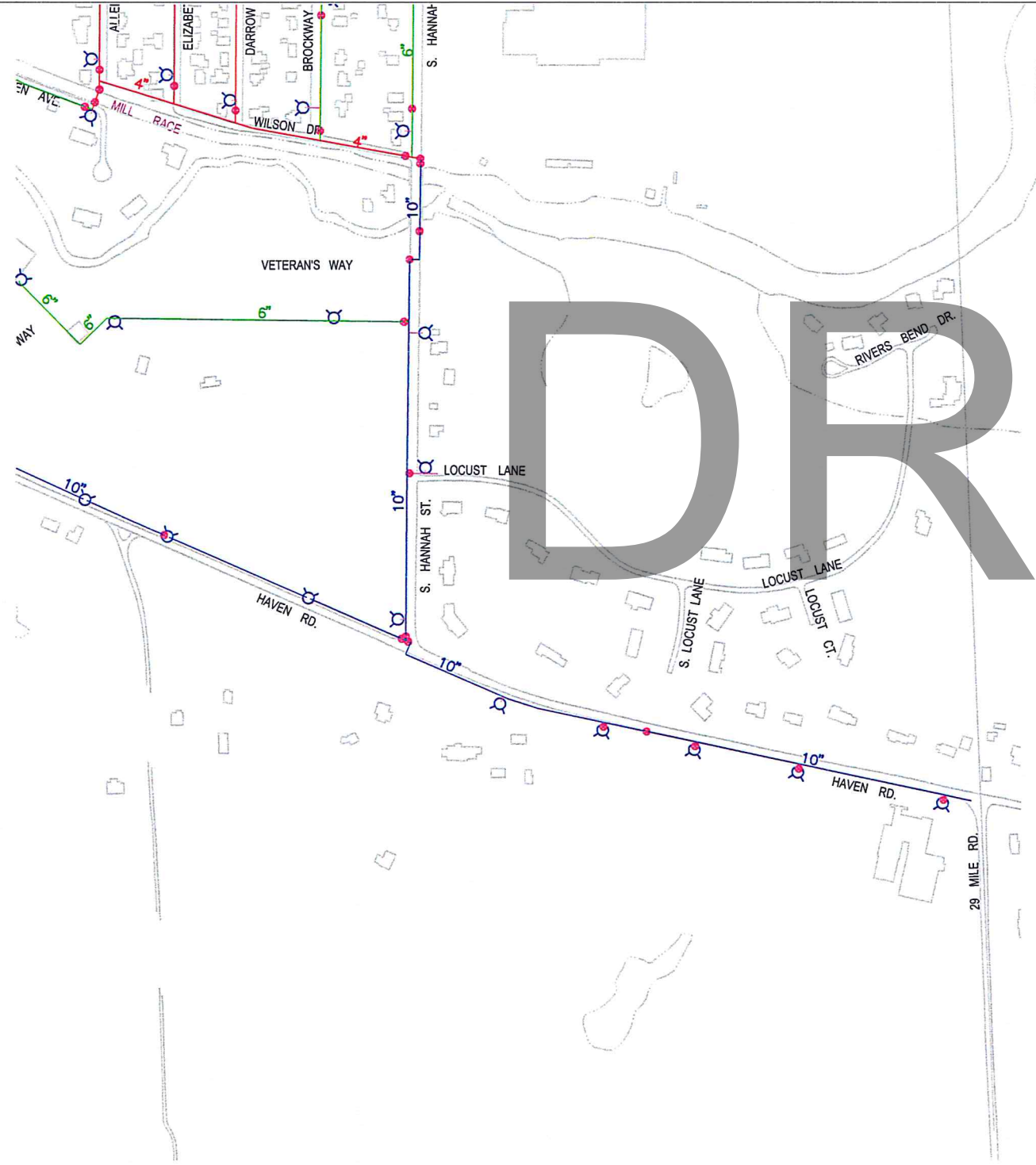


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 MAP OF WATER SYSTEM
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FIGURE 9 OF 10

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WATER SYTEM RELIABILITY STUDY
MAP OF WATER SYSTEM
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FIGURE 10 OF 10

APPENDIX B

PROPOSED IMPROVEMENTS LOCATION MAP

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WIGHTMAN

BENTON HARBOR

269.927.0100

KALAMAZOO

269.327.3532

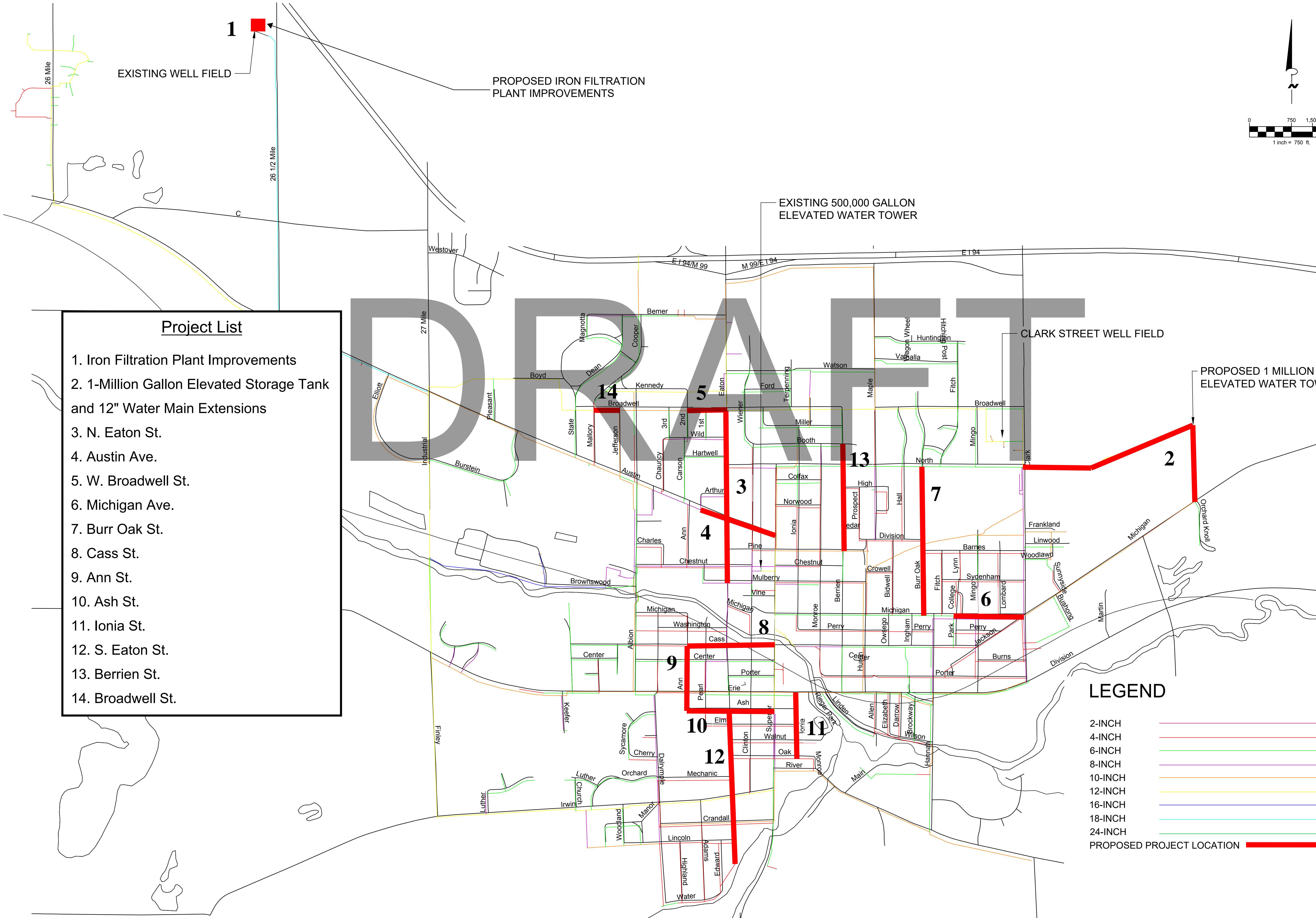
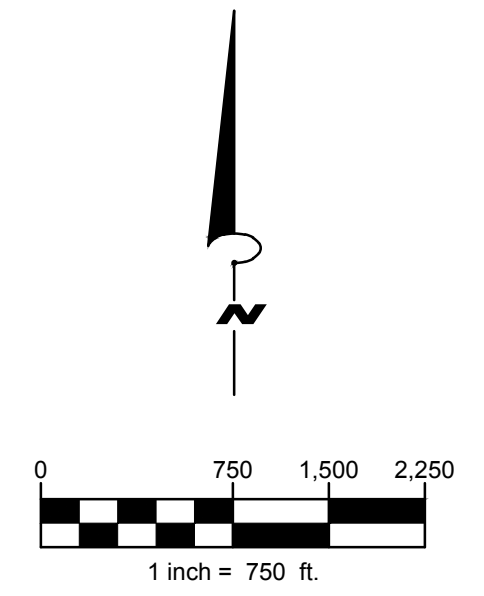
ALLEGAN

269.673.8465

ROYAL OAK

248.791.1371

www.gowightman.com



Project List

1. Iron Filtration Plant Improvements
2. 1-Million Gallon Elevated Storage Tank and 12" Water Main Extensions
3. N. Eaton St.
4. Austin Ave.
5. W. Broadwell St.
6. Michigan Ave.
7. Burr Oak St.
8. Cass St.
9. Ann St.
10. Ash St.
11. Ionia St.
12. S. Eaton St.
13. Berrien St.
14. Broadwell St.

LEGEND

- 2-INCH
- 4-INCH
- 6-INCH
- 8-INCH
- 10-INCH
- 12-INCH
- 16-INCH
- 18-INCH
- 24-INCH
- PROPOSED PROJECT LOCATION

PROJECT NAME:
WATER MAIN REPLACEMENT PROJECT
PROPOSED LOCATIONS MAP

CITY OF ALBION
112 W. CASS STREET
ALBION, MI 49224

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DATE: OCTOBER 2020
SCALE: 1" = 750'

PROJECT LOCATION MAP

JOB No. 162162
ALBION

APPENDIX C

DETAILED COST ESTIMATE

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CITY OF ALBION
WATER SYSTEM IMPROVEMENTS PROJECT
DETAILED CONSTRUCTION AND PROJECT COST ESTIMATE
MARCH 2021

The following project cost estimate includes upgrades to the City of Albion Water System. The costs for the Iron Filtration Plant improvements, construction of a new 1-million-gallon water tower, and water main replacements are included in this estimate.

Iron Filtration Plant

Item	Qty	Units	Unit Price	Total
High Service Pumps	2	EA @	\$160,000	\$320,000.00
Bolt Replacement	1	LS @	\$6,000	\$6,000.00
Chemical Pumps	8	EA @	\$6,000	\$48,000.00
Potassium Pump	1	EA @	\$14,000	\$14,000.00
Pump Enclosure	1	LS @	\$40,000	\$40,000.00
Air Release Valve	1	EA @	\$4,000	\$4,000.00
Line Valves	3	EA @	\$9,000	\$27,000.00
Filter Media Replacement	1	LS @	\$300,000	\$300,000.00
Building HVAC and Electrical	1	LS @	\$100,000	\$100,000.00
Subtotal Estimated Construction Cost - Iron Filtration Plant				\$859,000.00

1-Million-Gallon Elevated Storage Tank

Item	Qty	Units	Unit Price	Total
Composite Tank and 12" Water Main	1	LS @	\$3,126,525	\$3,126,525.00
Land Acquisition	1	AC @	\$30,000	\$30,000.00
Subtotal Estimated Construction Cost - Elevated Storage Tank				\$3,157,000.00

Water Main Replacements*

Item	Qty	Units	Unit Price	Total
N. Eaton Street	1	LS @	\$849,900	\$849,900.00
Austin Avenue	1	LS @	\$367,600	\$367,600.00
W. Broadwell Street	1	LS @	\$174,100	\$174,100.00
Michigan Avenue	1	LS @	\$333,400	\$333,400.00
Burr Oak Street	1	LS @	\$687,900	\$687,900.00
Cass Street	1	LS @	\$335,200	\$335,200.00
Ann Street	1	LS @	\$293,100	\$293,100.00
Ash Street	1	LS @	\$304,000	\$304,000.00
Ionia Street	1	LS @	\$285,600	\$285,600.00
S. Eaton Street	1	LS @	\$667,900	\$667,900.00
Berrien Street	1	LS @	\$471,700	\$471,700.00
Broadwell Street	1	LS @	\$162,400	\$162,400.00
Subtotal Estimated Construction Cost - Water Main Replacement				\$4,933,000.00

*See CIP for individual detailed estimates.

Total Estimated Construction Cost				\$8,950,000.00
Construction Contingency	10%			\$895,000.00
Engineering (Basic Services)				\$888,000.00
Other Engineering Fees (Additional Services)				\$134,000.00
Project Inspection Fees (RPR)				\$500,000.00
Legal/Fiscal/Administrative				\$150,000.00
Total Estimated Project Cost				\$11,517,000.00

Funded by City or other Grant/Loan Program Investment

Lead Service Line Replacement from ROW to Building				\$165,000.00
Construction Contingency	10%			\$16,500.00
Engineering/Inspection				\$10,000.00
Total Estimated Non-RD Funds				\$191,500.00

USDA Application Amount **\$11,325,500.00**

APPENDIX D

PER SUMMARY TABLES

- a. **WATER SUMMARY**
- b. **OPERATING BUDGET**
- c. **PRESENT WORTH ANALYSIS**
- d. **BOND SCHEDULE**
- e. **TOTAL PROJECT COST**

DRAFT

APPENDIX D. a

WATER SUMMARY

DRAFT

Existing Water System Summary

Community Name: City of Albion

EGLE Water Supply Number (WSSN): 00100

Well	Rated Capacity (gpm)	Date of Last Maint.	Depth	Water Quality
			98.0	
Starr 1	1,500	2020	95.0	Meets State Requirements
Starr 2	1,500	2020	76.5	Meets State Requirements
Clark 1	1,200		51.0	Backup for Fire Protection Only
Clark 2	1,000		76.0	Backup for Fire Protection Only
Clark 3	1,500			Backup for Fire Protection Only

Water Demand (MGD)

Firm Capacity:	7.5 MGD
Avg. Day Demand:	1.3 MGD
Max Day Demand:	2.02 MGD
Avg Monthly Billing	21 MG
Avg Monthly Pumpage	MG

Distribution System:

	Material	Footage	Age
2" watermain	cast/ductile	4,918	60+
4" watermain	cast/ductile	104,670	60+
6" watermain	cast/ductile	95,782	60+
8" watermain	cast/ductile	47,350	Unknown
10" watermain	cast/ductile	59,258	Unknown
12" watermain	cast/ductile	32,293	Unknown
16" watermain	cast/ductile	4,885	Unknown
18" watermain	cast/ductile	8,161	Unknown
24" watermain	cast/ductile	120	Unknown

Storage

Elevated Tank or Ground Storage	
Volume:	500,000
Construction:	Steel
Const Date:	1961
Last paint:	2018
Low Service Pumps	N/A (gpm, ea.)
High Service Pumps	1,400 (gpm, ea.)

Number of Hydrants	Brand
510	Unknown

Number of Valves: 800

Water Customer Information:

	No. of Existing Customers	Monthly Usage (gallons)	No. of Users after Project	Projected Total Usage
Commercial	220	12,916,615	220	12,916,615
Residential	2653	8,216,058	2653	8,216,058
Total	2873	21,132,673	2873	21,132,673

Existing Rate Structure:

Ready-to-Serve (billed quarterly)

5/8-inch	\$ 24.00
3/4-inch	\$ 36.00
1-inch	\$ 60.00
1 1/2-inch	\$ 120.00
2-inch	\$ 192.00
3-inch	\$ 384.00
4-inch	\$ 600.00
6-inch	\$ 1,200.00
Usage Rate per 100 cf	\$ 1.24

Average Monthly Billing at Current Rates (all customers)

\$ 73,198.18

Annual OM&R Cost Before: \$ 935,550.00

Yearly O&M Cost After: \$ 957,714.50

***APPENDIX D. b
OPERATING BUDGET***

DRAFT

Operating Budget For First Full Year After Construction

Community Name: City of Albion **County:** Calhoun

Address: 112 West Cass Street
Albion, MI 49224

A. Applicant Fiscal Year: **From:** Jan-22 **To:** Dec-22

B. Operating Income:	From Water Sales Rates & Charges:	\$1,449,000
	Other (e.g. hydrant rentals, etc)	\$36,000
	Total Operating Income:	\$1,485,000

C. Operating Expenses:		
Salaries and Wages		\$249,620
Fringe Benefits		\$148,625
Contractual Services		\$69,700
Supplies		\$172,200
Utilities		\$133,250
Insurance and Bonds		\$15,375
Administrative Services		\$120,950
Building and Equipment Rental		\$29,725
Other		\$18,270
	Total Operating Expenses:	\$957,715

D.	Net Operating Income:	\$527,286
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E. Non Operating Income:		
Interest:		\$15,000
Other:		-\$4,000
	Total Non Operating Income:	\$11,000

F.	Net Income	\$538,286
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G. Expenditures/Transfers		
Repair, Replacement & Improvement Fund		\$65,330
Bond Reserve		\$39,608
Payment to USDA Loan		\$396,076
Payment to Other Loans		\$11,150
	Total Expenditures/Transfers:	\$512,164

	Excess/Deficit over net income:	\$26,121
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APPENDIX D. c

PRESENT WORTH ANALYSIS

DRAFT

Present Worth Analysis & Short Lived Depreciation

DRAFT

Community Name:

City of Albion

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

0.015
20 years

Iron Filtration Plant Improvements	Construction of 1-Million-Gallon Tower	Water Main Replacements
Initial Capital Costs = \$859,000	Initial Capital Costs = \$3,127,000	Initial Capital Costs = \$4,933,000
Annual Operations & Maintenance Costs = \$957,715	Annual Operations & Maintenance Costs = \$957,715	Annual Operations & Maintenance Costs = \$957,715
Future Salvage Value = \$216,137	Future Salvage Value = \$2,557,595	Future Salvage Value = \$4,034,735
Present Worth of 20 years of O & M = \$16,442,654	Present Worth of 20 years of O & M = \$16,442,654	Present Worth of 20 years of O & M = \$16,442,654
$PW = \frac{\text{Annual OM} \times (1+i)^n - 1}{i \times (1+i)^n}$		
Present Worth of 20 yr Salvage Value = \$160,475	Present Worth of 20 yr Salvage Value = \$1,898,939	Present Worth of 20 yr Salvage Value = \$2,995,671
$PW = FSV \times \frac{1}{(1+i)^n}$		
Alternate 1 Total Present Worth = \$17,141,179	Alternative 2 Total Present Worth = \$17,670,716	Alternative 3 Total Present Worth = \$18,379,983

Short Lived Depreciated Assets

Item	Years of Life Expectancy	Number of Units	Replacement Cost	Funds to Set Aside Yearly
Well pump and Controls	15	5	\$ 82,000	\$ 27,333
Chem Feed Equipment	15	9	\$ 10,000	\$ 6,000
Elevated Tank Painting	15	2	\$ 240,000	\$ 32,000
			\$ 332,000	\$ 65,333

Note:

This is not intended to include every piece of equipment in the system. It is to itemize the critical equipment or maintenance items that money should be set aside for via rates and charges.
No short lived assets > 15 years of life expectancy

Future Salvage Value

S = P(1-d)^y d = depreciation rate (1/asset life)
P = initial cost y = years

Iron Filtration Plant Improvements

S = \$859,000 x (1 - (1/15))²⁰
S = \$216,137

1-Million Gallon Tower

S = \$3,127,000 x (1 - (1/100))²⁰
S = \$2,557,595

Water Main Replacements

S = \$4,933,000 x (1 - (1/100))²⁰
S = \$4,034,735

APPENDIX D. d

BOND SCHEDULE

DRAFT

Bond Schedule**Date:** 03/10/21

Borrower Name: City of Albion **Type of Bond:** 100% USDA Loan
Interest Rate: 1.750%
Yrs Deferred Principle: 0
Principal: \$11,325,500 (round to nearest \$1000)
Ammort. Factor:
Ammortized Payment: \$396,076

Year	1st Interest	2nd Interest	Principal Paid	Total Year Payment	Loan Balance
					11,325,500
1	99,098	99,098	198,000	396,196	11,127,500
2	97,366	97,366	201,000	395,731	10,926,500
3	95,607	95,607	205,000	396,214	10,721,500
4	93,813	93,813	208,000	395,626	10,513,500
5	91,993	91,993	212,000	395,986	10,301,500
6	90,138	90,138	216,000	396,276	10,085,500
7	88,248	88,248	220,000	396,496	9,865,500
8	86,323	86,323	223,000	395,646	9,642,500
9	84,372	84,372	227,000	395,744	9,415,500
10	82,386	82,386	231,000	395,771	9,184,500
11	80,364	80,364	235,000	395,729	8,949,500
12	78,308	78,308	239,000	395,616	8,710,500
13	76,217	76,217	244,000	396,434	8,466,500
14	74,082	74,082	248,000	396,164	8,218,500
15	71,912	71,912	252,000	395,824	7,966,500
16	69,707	69,707	257,000	396,414	7,709,500
17	67,458	67,458	261,000	395,916	7,448,500
18	65,174	65,174	266,000	396,349	7,182,500
19	62,847	62,847	270,000	395,694	6,912,500
20	60,484	60,484	275,000	395,969	6,637,500
21	58,078	58,078	280,000	396,156	6,357,500
22	55,628	55,628	285,000	396,256	6,072,500
23	53,134	53,134	290,000	396,269	5,782,500
24	50,597	50,597	295,000	396,194	5,487,500
25	48,016	48,016	300,000	396,031	5,187,500
26	45,391	45,391	305,000	395,781	4,882,500
27	42,722	42,722	311,000	396,444	4,571,500
28	40,001	40,001	316,000	396,001	4,255,500
29	37,236	37,236	322,000	396,471	3,933,500
30	34,418	34,418	327,000	395,836	3,606,500
31	31,557	31,557	333,000	396,114	3,273,500
32	28,643	28,643	339,000	396,286	2,934,500
33	25,677	25,677	345,000	396,354	2,589,500
34	22,658	22,658	351,000	396,316	2,238,500
35	19,587	19,587	357,000	396,174	1,881,500
36	16,463	16,463	363,000	395,926	1,518,500
37	13,287	13,287	370,000	396,574	1,148,500
38	10,049	10,049	376,000	396,099	772,500
39	6,759	6,759	383,000	396,519	389,500
40	3,408	3,408	389,500	396,316	0

APPENDIX D. e

TOTAL PROJECT COST

DRAFT

Total Project Costs			
	RD Funds	Non RD funds	Total
1. Administrative/Legal Expenses	\$150,000.00	\$0.00	\$150,000.00
2. Land, Structures, Easements, ROW, etc	\$30,000.00	\$0.00	\$30,000.00
3. Relocation Expenses & Payments	\$0.00	\$0.00	\$0.00
4. Engineering Fees (Basic Services)	\$884,000.00	\$4,000.00	\$888,000.00
5. Other Engineering Fees (Additional Services)	\$134,000.00	\$0.00	\$134,000.00
6. Project Inspection Fees (RPR)	\$494,000.00	\$6,000.00	\$500,000.00
7. Construction Costs (see note below)	\$8,755,000.00	\$165,000.00	\$8,920,000.00
8. Equipment	\$0.00	\$0.00	\$0.00
9. Miscellaneous	\$0.00	\$0.00	\$0.00
10. Contingencies (typically 10% of Const Costs above)	\$878,500.00	\$16,500.00	\$895,000.00
TOTAL:	\$11,325,500.00	\$191,500.00	\$11,517,000.00

Notes:

This Table should match SF424

Construction Costs are further detailed with Engineer's Opinion of Probable Construction Costs attached.

Round figures to the nearest \$1000!

APPENDIX E

RATE ANALYSIS

DRAFT

City of Albion Water System Improvements Project		USDA - RD 100% LOAN	
Estimated Interest Rate			1.750%
Length of Bond Issue (Years)			40
Total Estimated Project Cost to be Funded		\$11,322,000.00	
Less Estimated Grant Amount		\$0.00	
Total Estimated Bond Amount		\$11,322,000.00	
Total Current Albion Equivalent Dwelling Units			4,340
Total Annual Use Billed by Albion (100s of cubic feet)			339,027
Number of Ready-to-Serve Charges Billed per Quarter			
	5/8-inch		2,612
	3/4-inch		70
	1-inch		62
	1 1/2-inch		64
	2-inch		33
	3-inch		19
	4-inch		9
	6-inch		3
Current Income from Rates			
Current Ready-to-Serve Charge (billed quarterly)			
	5/8-inch	\$	24.00
	3/4-inch	\$	36.00
	1-inch	\$	60.00
	1 1/2-inch	\$	120.00
	2-inch	\$	192.00
	3-inch	\$	384.00
	4-inch	\$	600.00
	6-inch	\$	1,200.00
Current Usage Rate per 100 cubic feet		\$	1.42
Annual Income from Ready to Serve Charge		\$	396,960
Annual Income from Usage Rate		\$	481,418
Other Revenue (hydrant rental, late fees, etc.)		\$	36,000
Total Annual Income from Existing City Rate Structure		\$	914,378
Estimated Annual System Costs (OM&R Plus Debt)			
Transfers to Other Govt Funds (debt repayment)		\$	11,150
Annual Cost of Water System Bond Issue - Debt		\$	395,955
Annual Debt Reserve Required - Debt		\$	39,596
Annual Estimated OM&R Costs		\$	957,715
Repair, Replace and Improvements Reserve		\$	65,330
Estimated Cash Funded Preventative Maintenance		\$	200,000
Less Non-Rate Income (Interest & Penalties)		\$	11,000
Total Estimated Annual Cost		\$	1,680,746
Required Increase in System Income		\$	766,367
Required Increase in RTS as a Percentage			50%
Required Increase in Commodity as a Percentage			120%
Proposed Rate Structure			
Ready-to-Serve Charge (billed quarterly)			
	5/8-inch	\$	36.00
	3/4-inch	\$	54.00
	1-inch	\$	90.00
	1 1/2-inch	\$	180.00
	2-inch	\$	288.00
	3-inch	\$	576.00
	4-inch	\$	900.00
	6-inch	\$	1,800.00
Usage Rate per 100 cubic feet		\$	3.12
Revised Income from Rate Structure			
Annual Income from Revised Ready to Serve Charge		\$	595,440
Annual Income from Revised Usage Rate		\$	1,059,120
Other Revenue (hydrant rental, late fees, etc.)		\$	36,000
Total Annual Income from Revised City Rate Structure		\$	1,690,560

APPENDIX F

INDIVIDUAL PROJECT BREAKDOWN OF COSTS

DRAFT

PRELIMINARY CONSTRUCTION ESTIMATE

PROJECT: **Water System Improvements Project**
 CLIENT: **City of Albion**
 DATE: **March 10, 2021**

This is a total construction estimate for all of the improvements broken down in the following individual projects.

Quantity	Unit	Item	Unit Price	Subtotal
5,150	LFT	Water Main 12-inch	@ \$ 75	\$ 387,000
19,050	LFT	Water Main 8-inch	@ \$ 70	\$ 1,334,000
200	LFT	Water Main 8-inch, Directional Drill	@ \$ 725	\$ 145,000
100	LFT	Water Main 8-inch, Bore and Jack	@ \$ 500	\$ 50,000
100	LFT	Water Main Casing, 16-inch	@ \$ 100	\$ 10,000
58	EA	Hydrant Assembly, 6-inch	@ \$ 5,500	\$ 319,000
49	EA	Hydrant Removal	@ \$ 500	\$ 25,000
7	EA	Gate Valve and Box, 12-inch	@ \$ 2,500	\$ 18,000
57	EA	Gate Valve and Box, 8-inch	@ \$ 2,000	\$ 114,000
2	EA	Wet Tap, 12-inch	@ \$ 8,000	\$ 16,000
3	EA	Wet Tap, 10-inch	@ \$ 7,500	\$ 23,000
2	EA	Wet Tap, 8-inch	@ \$ 8,200	\$ 17,000
3	EA	Wet Tap, 6-inch	@ \$ 6,000	\$ 18,000
2	EA	Insertion Valve, 12-inch	@ \$ 19,000	\$ 38,000
7	EA	Insertion Valve, 10-inch	@ \$ 18,000	\$ 126,000
12	EA	Insertion Valve, 8-inch	@ \$ 9,200	\$ 111,000
10	EA	Insertion Valve, 6-inch	@ \$ 8,200	\$ 82,000
34	EA	Insertion Valve, 4-inch	@ \$ 7,800	\$ 266,000
1	LS	Abandon Parallel 4-inch Main	@ \$ 10,000	\$ 10,000
301	EA	Water Service Reconnection, 1-inch	@ \$ 3,000	\$ 903,000
38	EA	Lead Water Service Replacement, 1-inch	@ \$ 3,500	\$ 133,000
5,373	TON	HMA, 3-inch	@ \$ 75	\$ 403,000
35,710	SYD	Aggregate Base, 8-inch	@ \$ 10	\$ 358,000
19,500	LFT	Curb and Gutter	@ \$ 20	\$ 390,000
10,920	SYD	Landscape Restoration	@ \$ 5	\$ 55,000
1	EA	1 MG Composite Water Tower, 140 Ft Tall	@ \$ 2,625,000	\$ 2,625,000
1	EA	HSP 1	@ \$ 160,000	\$ 160,000
1	EA	HSP 2	@ \$ 160,000	\$ 160,000
1	EA	SS Bolt Changeout	@ \$ 6,000	\$ 6,000
8	EA	Chem Pumps	@ \$ 6,000	\$ 48,000
1	EA	Potassium Pump	@ \$ 14,000	\$ 14,000
1	EA	CP-Pump Enclosure	@ \$ 40,000	\$ 40,000
1	EA	Air Release Valve	@ \$ 4,000	\$ 4,000
3	EA	Line Valves	@ \$ 9,000	\$ 27,000
1	EA	HVAC Items, ductwork and rust repair	@ \$ 50,000	\$ 50,000
1	LS	Media Removal, Disposal and Replacement	@ \$ 300,000	\$ 300,000
1	LS	General Electrical	@ \$ 25,000	\$ 25,000
1	LS	General HVAC	@ \$ 25,000	\$ 25,000

PRELIMINARY CONSTRUCTION ESTIMATE

Quantity	Unit	Item	Unit Price	Subtotal
13	LS	Traffic Control	@ \$ 5,000	\$ 65,000
1	LS	Railroad Permit	@ \$ 20,000	\$ 20,000
<i>ESTIMATED CONSTRUCTION COST</i>				\$ 8,920,000

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PRELIMINARY ESTIMATE

PROJECT: **Iron Filtration Plant Improvements**
 CLIENT: **City of Albion**
 DATE: **March 10, 2021**

This project includes upgrades of equipment and infrastructure within the Iron Filtration Plant. The following equipment was identified during the City's Asset Management Program assessment to be at or nearing the end of its useful life and in need of replacement.

Quantity	Unit	Item	Unit Price	Subtotal
1	EA	HSP 1	@ \$ 160,000	\$ 160,000
1	EA	HSP 2	@ \$ 160,000	\$ 160,000
1	EA	SS Bolt Changeout	@ \$ 6,000	\$ 6,000
8	EA	Chem Pumps	@ \$ 6,000	\$ 48,000
1	EA	Potassium Pump	@ \$ 14,000	\$ 14,000
1	EA	CP-Pump Enclosure	@ \$ 40,000	\$ 40,000
1	EA	Air Release Valve	@ \$ 4,000	\$ 4,000
3	EA	Line Valves	@ \$ 9,000	\$ 27,000
1	EA	HVAC Items, ductwork and rust repair	@ \$ 50,000	\$ 50,000
1	EA	Media Removal, Disposal and Replacement	@ \$ 300,000	\$ 300,000
1	EA	General Electrical	@ \$ 25,000	\$ 25,000
1	EA	General HVAC	@ \$ 25,000	\$ 25,000
ESTIMATED CONSTRUCTION COST				\$ 859,000

PRELIMINARY ESTIMATE

PROJECT: **Water Tower and Water Main Extensions**
 CLIENT: **City of Albion**
 DATE: **March 10, 2021**

This project includes construction of a new 1-million-gallon composite water tower, approximately 140 feet. Acquisition of land for the new tower is included in other project costs. Also included are two 12-inch water main extensions; one extension will connect to existing 10-inch main in Michigan Ave at Brooks Dr and run north approximately 1,900 feet to the proposed tower location. This extension would include pavement replacement at the connection at Michigan Ave and Brooks Dr. The second water main extension would connect to existing 8-inch water main on N. Clark St. at North St and run east and northeast through an existing utility easement. The cost of fittings is included in water main item. This project will include pavement replacement at the intersection of N. Clark St. and North St, and brush-clearing and landscape restoration through the utility easement.

Quantity	Unit	Item	Unit Price	Subtotal
4,700	LFT	Water Main 12-inch	@ \$ 75	\$ 352,500
9	EA	Hydrant Assembly, 6-inch	@ \$ 5,500	\$ 49,500
5	EA	Gate Valve and Box, 12-inch	@ \$ 2,500	\$ 12,500
1	EA	Wet Tap, 10-inch	@ \$ 7,500	\$ 7,500
1	EA	Insertion Valve, 8-inch	@ \$ 9,200	\$ 9,200
1	EA	Insertion Valve, 6-inch	@ \$ 6,000	\$ 6,000
4	TON	HMA, 3-inch	@ \$ 75	\$ 275
3,170	SYD	Aggregate Base, 8-inch	@ \$ 10	\$ 31,700
1,670	SYD	Landscape Restoration	@ \$ 5	\$ 8,350
1	LS	Traffic Control	@ \$ 5,000	\$ 5,000
1	LS	1 MG Composite Water Tower, 140 Ft Tall	@ \$ 2,625,000	\$ 2,625,000
1	EA	Insertion Valve, 12-inch	@ \$ 19,000	\$ 19,000
ESTIMATED CONSTRUCTION COST				\$ 3,127,000

PRELIMINARY ESTIMATE

PROJECT: **N. Eaton from Mulberry to W. Broadwell**
 CLIENT: **City of Albion**
 DATE: **March 10, 2021**

This project includes replacement of water main in N. Eaton St from Mulberry to W. Broadwell. The cost of fittings is included in water main item. Replacement includes restoration of one lane of roadway and curb and gutter. Lead services are suspected through the northern most portion of this project and should be planned for full replacement.

Quantity	Unit	Item	Unit Price	Subtotal
2,900	LFT	Water Main 8-inch	@ \$ 70	\$ 203,000
200	LFT	Water Main 8-inch, Directional Drill	@ \$ 725	\$ 145,000
7	EA	Hydrant Assembly, 6-inch	@ \$ 5,500	\$ 38,500
7	EA	Hydrant Removal	@ \$ 500	\$ 3,500
10	EA	Gate Valve and Box, 8-inch	@ \$ 2,000	\$ 20,000
1	EA	Insertion Valve, 12-inch	@ \$ 19,000	\$ 19,000
6	EA	Insertion Valve, 8-inch	@ \$ 8,200	\$ 49,200
3	EA	Insertion Valve, 4-inch	@ \$ 7,800	\$ 23,400
28	EA	Water Service Reconnection, 1-inch	@ \$ 3,000	\$ 84,000
799	SYD	HMA, 3-inch	@ \$ 75	\$ 59,895
4,840	SYD	Aggregate Base, 8-inch	@ \$ 10	\$ 48,400
2,900	LFT	Curb and Gutter	@ \$ 20	\$ 58,000
28	EA	Lead Water Service Replacement, 1-inch	@ \$ 3,500	\$ 98,000
ESTIMATED CONSTRUCTION COST				\$ 849,900

PRELIMINARY ESTIMATE

PROJECT: **Austin Ave. from Arthur to N. Superior**
 CLIENT: **City of Albion**
 DATE: **March 10, 2021**

The project would replace a section of 4-inch water main with 8-inch water main in Austin Ave from Arthur St to N. Superior St and abandon the 4-inch dual main connection in Arthur Ave, leaving only the existing 8-inch main on Arthur St. The 4-inch main on Arthur Ave will be abandoned at the connection on Eaton St as part of the previous project. All services connected to the 4-inch main will be reconnected to the existing 8-inch main on Arthur Ave as part of this project. The cost of fittings is included in water main item. One lane of pavement replacement and curb and gutter on both Austin Ave and Arthur Ave are included in this project.

Quantity	Unit	Item	Unit Price	Subtotal
1,450	LFT	Water Main 8-inch	@ \$ 70	\$ 101,500
3	EA	Hydrant Assembly, 6-inch	@ \$ 5,500	\$ 16,500
3	EA	Hydrant Removal	@ \$ 500	\$ 1,500
5	EA	Gate Valve and Box, 8-inch	@ \$ 2,000	\$ 10,000
1	EA	Wet Tap, 10-inch	@ \$ 7,500	\$ 7,500
1	EA	Insertion Valve, 8-inch	@ \$ 18,000	\$ 18,000
3	EA	Insertion Valve, 4-inch	@ \$ 7,800	\$ 23,400
1	LS	Abandon Existing 4-inch Water Main	@ \$ 10,000	\$ 10,000
29	EA	Water Service Reconnection, 1-inch	@ \$ 3,000	\$ 87,000
399	TON	HMA, 3-inch	@ \$ 75	\$ 29,948
2,420	SYD	Aggregate Base, 8-inch	@ \$ 10	\$ 24,200
1,450	LFT	Curb and Gutter	@ \$ 20	\$ 29,000
810	SYD	Landscape Restoration	@ \$ 5	\$ 4,050
1	LS	Traffic Control	@ \$ 5,000	\$ 5,000
ESTIMATED CONSTRUCTION COST				\$ 367,600

PRELIMINARY ESTIMATE

PROJECT: **W. Broadwell from Second to N. Eaton**
 CLIENT: **City of Albion**
 DATE: **March 10, 2021**

The project would replace a section of 4-inch water main with 8-inch water main in W. Broadwell St. between Second St. and N. Eaton St. The cost of fittings is included in water main item. One lane of pavement replacement and curb and gutter are included.

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Quantity	Unit	Item	Unit Price	Subtotal
700	LFT	Water Main 8-inch	@ \$ 70	\$ 49,000
2	EA	Hydrant Assembly, 6-inch	@ \$ 5,500	\$ 11,000
2	EA	Hydrant Removal	@ \$ 500	\$ 1,000
3	EA	Gate Valve and Box, 8-inch	@ \$ 2,000	\$ 6,000
1	EA	Insertion Valve, 10-inch	@ \$ 7,500	\$ 7,500
2	EA	Insertion Valve, 6-inch	@ \$ 8,200	\$ 16,400
12	EA	Water Service Reconnection, 1-inch	@ \$ 3,000	\$ 36,000
193	TON	HMA, 3-inch	@ \$ 75	\$ 14,479
1,170	SYD	Aggregate Base, 8-inch	@ \$ 10	\$ 11,700
700	LFT	Curb and Gutter	@ \$ 20	\$ 14,000
390	SYD	Landscape Restoration	@ \$ 5	\$ 1,950
1	LS	Traffic Control	@ \$ 5,000	\$ 5,000
ESTIMATED CONSTRUCTION COST				\$ 174,100

PRELIMINARY ESTIMATE

PROJECT: **Michigan Ave. from Park to Clark**
 CLIENT: **City of Albion**
 DATE: **March 10, 2021**

The project would replace a section of 4-inch water main with 8-inch water main including connections to the parallel 8-inch main on Michigan Ave. from Park St. to Clark St. The cost for fittings has been included in the water main item. Replacement of one lane of roadway and curb and gutter are included in this project. Lead services are suspected through the northern most portion of this project and should be planned for full replacement.

Quantity	Unit	Item	Unit Price	Subtotal
1,250	LFT	Water Main 8-inch	@ \$ 70	\$ 87,500
4	EA	Hydrant Assembly, 6-inch	@ \$ 5,500	\$ 22,000
4	EA	Hydrant Removal	@ \$ 500	\$ 2,000
6	EA	Gate Valve and Box, 8-inch	@ \$ 2,000	\$ 12,000
2	EA	Wet Tap, 8-inch	@ \$ 8,200	\$ 16,400
1	EA	Wet Tap, 6-inch	@ \$ 6,000	\$ 6,000
2	EA	Insertion Valve, 8-inch	@ \$ 9,200	\$ 18,400
1	EA	Insertion Valve, 6-inch	@ \$ 8,200	\$ 8,200
2	EA	Insertion Valve, 4-inch	@ \$ 7,800	\$ 15,600
10	EA	Water Service Reconnection, 1-inch	@ \$ 3,000	\$ 30,000
345	TON	HMA, 3-inch	@ \$ 75	\$ 25,864
2,090	SYD	Aggregate Base, 8-inch	@ \$ 10	\$ 20,900
1,250	LFT	Curb and Gutter	@ \$ 20	\$ 25,000
700	SYD	Landscape Restoration	@ \$ 5	\$ 3,500
1	LS	Traffic Control	@ \$ 5,000	\$ 5,000
10	EA	Lead Water Service Replacement, 1-inch	@ \$ 3,500	\$ 35,000
ESTIMATED CONSTRUCTION COST				\$ 333,400

PRELIMINARY ESTIMATE

PROJECT: **Burr Oak from E. Michigan to E. North**
 CLIENT: **City of Albion**
 DATE: **March 10, 2021**

The project would replace a section of 4-inch water main with 8-inch water main in Burr Oak Street between E. Michigan Ave and E. North St. The cost of fittings is included in water main item. At the railroad crossing, a 100 foot section of 8-inch water main shall be bored and jacked to minimize disruption of the railroad. One lane of roadway and curb and gutter are included in the project costs.

Quantity	Unit	Item	Unit Price	Subtotal
2,500	LFT	Water Main 8-inch	@ \$ 70	\$ 175,000
100	LFT	Water Main, 8-inch, Bore and Jack	@ \$ 500	\$ 50,000
100	LFT	Water Main Casing Pipe, 16-inch	@ \$ 100	\$ 10,000
6	EA	Hydrant Assembly, 6-inch	@ \$ 5,500	\$ 33,000
6	EA	Hydrant Removal	@ \$ 500	\$ 3,000
5	EA	Gate Valve and Box, 8-inch	@ \$ 2,000	\$ 10,000
2	EA	Wet Tap, 6-inch	@ \$ 6,000	\$ 12,000
2	EA	Insertion Valve, 4-inch	@ \$ 7,800	\$ 15,600
68	EA	Water Service Reconnection, 1-inch	@ \$ 3,000	\$ 204,000
688	TON	HMA, 3-inch	@ \$ 75	\$ 51,604
4,170	SYD	Aggregate Base	@ \$ 10	\$ 41,700
2,500	LFT	Curb and Gutter	@ \$ 20	\$ 50,000
1,390	SYD	Landscape Restoration	@ \$ 5	\$ 6,950
1	LS	Traffic Control	@ \$ 5,000	\$ 5,000
1	LS	Railroad Permit	@ \$ 20,000	\$ 20,000
ESTIMATED CONSTRUCTION COST				\$ 687,900

PRELIMINARY ESTIMATE

PROJECT: **W. Cass from Ann to S. Superior**
 CLIENT: **City of Albion**
 DATE: **March 10, 2021**

The project would replace a section of 4-inch water main with 8-inch water main in W. Cass St. from Ann St. to S. Superior St. The cost of fittings has been included in water main item. One roadway lane and curb and gutter are included in this project.

DRAFT

Quantity	Unit	Item	Unit Price	Subtotal
1,600	LFT	Water Main 8-inch	@ \$ 70	\$ 112,000
4	EA	Hydrant Assembly, 6-inch	@ \$ 5,500	\$ 22,000
4	EA	Hydrant Removal	@ \$ 500	\$ 2,000
4	EA	Gate Valve and Box, 8-inch	@ \$ 2,000	\$ 8,000
1	EA	Wet Tap, 12-inch	@ \$ 8,000	\$ 8,000
2	EA	Insertion Valve, 8-inch	@ \$ 9,200	\$ 18,400
2	EA	Insertion Valve, 4-inch	@ \$ 7,800	\$ 15,600
16	EA	Water Service Reconnection, 1-inch	@ \$ 3,000	\$ 48,000
441	TON	HMA, 3-inch	@ \$ 75	\$ 33,041
2,670	SYD	Aggregate Base, 8-inch	@ \$ 10	\$ 26,700
1,600	LFT	Curb and Gutter	@ \$ 20	\$ 32,000
890	SYD	Landscape Restoration	@ \$ 5	\$ 4,450
1	LS	Traffic Control	@ \$ 5,000	\$ 5,000
ESTIMATED CONSTRUCTION COST				\$ 335,200

PRELIMINARY ESTIMATE

PROJECT: **Ann from Ash to W. Cass**
 CLIENT: **City of Albion**
 DATE: **March 10, 2021**

The project would replace a section of 4-inch water main with 8-inch water main in Ann St. from Ash St. to W. Cass St. The cost of fittings has been included in water main item. One lane of roadway and curb and gutter replacement are included in this project.

DRAFT

Quantity	Unit	Item	Unit Price	Subtotal
1,200	LFT	Water Main 8-inch	@ \$ 70	\$ 84,000
3	EA	Hydrant Assembly, 6-inch	@ \$ 5,500	\$ 16,500
3	EA	Hydrant Removal	@ \$ 500	\$ 1,500
5	EA	Gate Valve and Box, 8-inch	@ \$ 2,000	\$ 10,000
2	EA	Insertion Valve, 10-inch	@ \$ 18,000	\$ 36,000
2	EA	Insertion Valve, 6-inch	@ \$ 8,200	\$ 16,400
2	EA	Insertion Valve, 4-inch	@ \$ 7,800	\$ 15,600
12	EA	Water Service Reconnection, 1-inch	@ \$ 3,000	\$ 36,000
330	TON	HMA, 3-inch	@ \$ 75	\$ 24,750
2,000	SYD	Aggregate Base, 8-inch	@ \$ 10	\$ 20,000
1,200	LFT	Curb and Gutter	@ \$ 20	\$ 24,000
670	SYD	Landscape Restoration	@ \$ 5	\$ 3,350
1	LS	Traffic Control	@ \$ 5,000	\$ 5,000
ESTIMATED CONSTRUCTION COST				\$ 293,100

PRELIMINARY ESTIMATE

PROJECT: **Ash from Ann to S. Superior**
 CLIENT: **City of Albion**
 DATE: **March 10, 2021**

The project would replace a section of 4-inch water main with 8-inch water main in Ash St. from Ann St. to S. Superior St. The cost of fittings is included in the water main item. One roadway lane and curb and gutter are included in this project.

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Quantity	Unit	Item	Unit Price	Subtotal
1,600	LFT	Water Main 8-inch	@ \$ 70	\$ 112,000
4	EA	Hydrant Assembly, 6-inch	@ \$ 5,500	\$ 22,000
4	EA	Hydrant Removal	@ \$ 500	\$ 2,000
3	EA	Gate Valve and Box, 8-inch	@ \$ 2,000	\$ 6,000
1	EA	Wet Tap, 12-inch	@ \$ 8,000	\$ 8,000
1	EA	Insertion Valve, 4-inch	@ \$ 7,800	\$ 7,800
15	EA	Water Service Reconnection, 1-inch	@ \$ 3,000	\$ 45,000
441	TON	HMA, 3-inch	@ \$ 75	\$ 33,041
2,670	SYD	Aggregate Base, 8-inch	@ \$ 10	\$ 26,700
1,600	LFT	Curb and Gutter	@ \$ 20	\$ 32,000
890	SYD	Landscape Restoration	@ \$ 5	\$ 4,450
1	LS	Traffic Control	@ \$ 5,000	\$ 5,000
ESTIMATED CONSTRUCTION COST				\$ 304,000

PRELIMINARY ESTIMATE

PROJECT: **Ionia from Oak to E. Erie**
 CLIENT: **City of Albion**
 DATE: **March 10, 2021**

The project would replace a section of 4-inch water main with 8-inch water main in Ionia St. from Oak St. to E. Erie St. The cost of fittings is included in the water main item. One lane of roadway and curb and gutter are included in this project.

Quantity	Unit	Item	Unit Price	Subtotal
1,200	LFT	Water Main 8-inch	@ \$ 70	\$ 84,000
4	EA	Hydrant Assembly, 6-inch	@ \$ 5,500	\$ 22,000
4	EA	Hydrant Removal	@ \$ 500	\$ 2,000
4	EA	Gate Valve and Box, 8-inch	@ \$ 2,000	\$ 8,000
1	EA	Wet Tap, 10-inch	@ \$ 7,500	\$ 7,500
1	EA	Insertion Valve, 6-inch	@ \$ 8,200	\$ 8,200
6	EA	Insertion Valve, 4-inch	@ \$ 7,800	\$ 46,800
10	EA	Water Service Reconnection, 1-inch	@ \$ 3,000	\$ 30,000
330	TON	HMA, 3-inch	@ \$ 75	\$ 24,750
2,000	SYD	Aggregate Base, 8-inch	@ \$ 10	\$ 20,000
1,200	LFT	Curb and Gutter	@ \$ 20	\$ 24,000
670	SYD	Landscape Restoration	@ \$ 5	\$ 3,350
1	LS	Traffic Control	@ \$ 5,000	\$ 5,000
ESTIMATED CONSTRUCTION COST				\$ 285,600

PRELIMINARY ESTIMATE

PROJECT: **S. Eaton from Ash south to Dead End**
 CLIENT: **City of Albion**
 DATE: **March 10, 2021**

The project would replace a section of 4-inch water main with 8-inch water main in S. Eaton St. from Ash St. to the dead end south of Lincoln St. The cost for fittings is included in the water main item. One lane of roadway and curb and gutter are included in this project.

Quantity	Unit	Item	Unit Price	Subtotal
2,750	LFT	Water Main 8-inch	@ \$ 70	\$ 192,500
7	EA	Hydrant Assembly, 6-inch	@ \$ 5,500	\$ 38,500
7	EA	Hydrant Removal	@ \$ 500	\$ 3,500
10	EA	Gate Valve and Box, 8-inch	@ \$ 2,000	\$ 20,000
10	EA	Insertion Valve, 4-inch	@ \$ 7,800	\$ 78,000
55	EA	Water Service Reconnection, 1-inch	@ \$ 3,000	\$ 165,000
757	TON	HMA, 3-inch	@ \$ 75	\$ 56,801
4,590	SYD	Aggregate Base, 8-inch	@ \$ 10	\$ 45,900
2,750	LFT	Curb and Gutter	@ \$ 20	\$ 55,000
1,530	SYD	Landscape Restoration	@ \$ 5	\$ 7,650
1	LS	Traffic Control	@ \$ 5,000	\$ 5,000
ESTIMATED CONSTRUCTION COST				\$ 667,900

PRELIMINARY ESTIMATE

PROJECT: **Berrien from Booth to Pine**
 CLIENT: **City of Albion**
 DATE: **March 10, 2021**

The project would replace a section of 4-inch water main with 8-inch water main in Berrien Stt from Booth St to Pine St. The cost of fittings is included in the water main item. One lane of roadway and curb and gutter are included in this project.

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Quantity	Unit	Item	Unit Price	Subtotal
1,900	LFT	Water Main 8-inch	@ \$ 70	\$ 133,000
3	EA	Hydrant Assembly, 6-inch	@ \$ 5,500	\$ 16,500
3	EA	Hydrant Removal	@ \$ 500	\$ 1,500
2	EA	Gate Valve and Box, 8-inch	@ \$ 2,000	\$ 4,000
2	EA	Insertion Valve, 10-inch	@ \$ 18,000	\$ 36,000
3	EA	Insertion Valve, 6-inch	@ \$ 8,200	\$ 24,600
1	EA	Insertion Valve, 4-inch	@ \$ 7,800	\$ 7,800
43	EA	Water Service Reconnection, 1-inch	@ \$ 3,000	\$ 129,000
523	TON	HMA, 3-inch	@ \$ 75	\$ 39,229
3,170	SYD	Aggregate Base, 8-inch	@ \$ 10	\$ 31,700
1,900	LFT	Curb and Gutter	@ \$ 20	\$ 38,000
1,060	SYD	Landscape Restoration	@ \$ 5	\$ 5,300
1	LS	Traffic Control	@ \$ 5,000	\$ 5,000
ESTIMATED CONSTRUCTION COST				\$ 471,700

PRELIMINARY ESTIMATE

PROJECT: **W. Broadwell from Mallory to Jefferson**
 CLIENT: **City of Albion**
 DATE: **March 10, 2021**

The project would replace a section of 4-inch water main with 12-inch water main in W. Broadwell St from Mallory St to Jefferson St. The cost for fittings is included in the water main item. One lane of roadway and curb and gutter are included in this project.

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Quantity	Unit	Item	Unit Price	Subtotal
450	LFT	Water Main 12-inch	@ \$ 75	\$ 33,750
2	EA	Hydrant Assembly, 6-inch	@ \$ 5,500	\$ 11,000
2	EA	Hydrant Removal	@ \$ 500	\$ 1,000
2	EA	Gate Valve and Box, 12-inch	@ \$ 2,500	\$ 5,000
1	EA	Insertion Valve, 12-inch	@ \$ 19,000	\$ 19,000
2	EA	Insertion Valve, 10-inch	@ \$ 18,000	\$ 36,000
2	EA	Insertion Valve, 4-inch	@ \$ 7,800	\$ 15,600
3	EA	Water Service Reconnection, 1-inch	@ \$ 3,000	\$ 9,000
124	TON	HMA, 3-inch	@ \$ 75	\$ 9,281
750	SYD	Aggregate Base, 8-inch	@ \$ 10	\$ 7,500
450	LFT	Curb and Gutter	@ \$ 20	\$ 9,000
250	SYD	Landscape Restoration	@ \$ 5	\$ 1,250
1	LS	Traffic Control	@ \$ 5,000	\$ 5,000
ESTIMATED CONSTRUCTION COST				\$ 162,400

DRAFT



ALLEGAN

▲ 1670 LINCOLN RD. (M-40)
ALLEGAN, MI 49010
○ 269.673.8465

BENTON HARBOR

▲ 2303 PIPESTONE RD.
BENTON HARBOR, MI 49022
○ 269.927.0100

KALAMAZOO

▲ 433 E. RANSOM ST.
KALAMAZOO, MI 49007
○ 269.327.3532

ROYAL OAK

▲ 306 S. WASHINGTON AVE., SUITE 200
ROYAL OAK, MI 48067
○ 248.791.1371

Fund: 591 WATER FUND

Calculations as of 07/31/2022

GL NUMBER	DESCRIPTION	2017 ACTIVITY	2018 ACTIVITY	2019 ACTIVITY	2020 ACTIVITY	2021 ACTIVITY	2022 ACTIVITY THRU 07/31/22
Dept 000 - GENERAL							
ESTIMATED REVENUES							
591-000-607.00	CHARGES FOR SERVICES-FEES	1,594	0	1,580	70	17,441	11,883
591-000-626.00	CHARGES FOR SERVICES RENDERED	2,059	763	3,972	120	2,273	593
591-000-633.00	UB CHRGS FOR SRVC - CITY	906,658	897,472	905,898	875,670	898,912	519,057
591-000-660.00	LATE FEES/ON-OFF CHARGES	20,629	21,897	21,752	8,483	15,687	13,845
591-000-664.03	UNREALIZED GAIN ON INVESTMENT	(569)	(14)	509	(920)	(2,831)	(132)
591-000-665.00	INTEREST	10,153	15,652	17,174	7,519	3,144	1,481
591-000-671.00	OTHER REVENUES	17,744	15,799	30,761	9,127	21,012	16,510
591-000-673.00	SALE OF FIXED ASSETS	0	0	0	6,250	200	0
591-000-676.00	REIMBURSEMENTS & RESTITUTIONS	1,604	1,083	11,807	1,823	870	2,757
TOTAL ESTIMATED REVENUES		959,872	952,652	993,453	908,142	956,708	565,994
NET OF REVENUES/APPROPRIATIONS - 000 - GENERAL							
		959,872	952,652	993,453	908,142	956,708	565,994
Dept 536 - WATER UTILITY OPERATIONS							
APPROPRIATIONS							
591-536-702.00	SALARIES AND WAGES	200,019	207,030	165,829	183,361	214,057	133,984
591-536-702.01	LEAVE BANK PAYOUTS AND/OR BONUSES	178	7,145	804	6,453	12,244	1,753
591-536-702.03	SALARY & WAGES - COVID-19 RELATED	0	0	0	5,454	700	4,200
591-536-703.00	PART TIME WAGES	0	0	10,848	284	39	2,093
591-536-704.00	OVERTIME	20,438	20,706	20,482	15,526	22,676	12,073
591-536-706.00	LICENSING INCENTIVE	2,750	3,250	6,000	6,000	3,000	0
591-536-707.00	ON CALL PAY	1,120	1,575	1,613	2,312	1,400	1,275
591-536-714.00	MEDICARE	3,131	3,470	2,793	3,066	3,521	2,195
591-536-715.00	FICA	13,391	14,627	11,944	13,110	15,056	9,388
591-536-716.00	HOSPITALIZATION INSURANCE	99,302	99,999	83,697	78,511	73,198	41,704
591-536-717.00	LIFE INSURANCE	649	628	515	489	564	369
591-536-718.00	DISABILITY INSURANCE	259	64	0	0	0	0
591-536-719.00	PENSION CONTRIBUTION	4,990	5,093	3,191	5,171	8,677	7,285
591-536-719.01	MERS DB CONTRIBUTION	13,793	17,676	16,639	18,970	18,668	9,702
591-536-719.02	EMPLOYER CONT.- MERS FORFIETURE AI	0	0	0	0	(5,699)	(403)
591-536-720.00	WORKERS COMPENSATION	4,900	8,355	9,472	9,631	3,642	2,456
591-536-721.00	UNEMPLOYMENT INSURANCE	28	31	27	29	35	28
591-536-723.00	RETIREE HEALTH SAVINGS CONTRIB	4,126	4,533	3,623	3,614	4,049	2,750
591-536-724.00	VEHICLE ALLOWANCE	632	188	0	194	1,178	611
591-536-726.00	OFFICE SUPPLY	599	1,510	2,054	715	1,270	116
591-536-727.00	OFFICE EQUIPMENT	0	100	230	472	693	55
591-536-728.00	DUES, BOOKS, PERIODICAL	102	147	95	0	0	0
591-536-741.00	UNIFORMS	1,696	2,095	2,419	2,906	6,257	2,845
591-536-744.00	POSTAGE	4,400	3,835	5,425	4,242	4,318	2,880
591-536-746.00	TOOLS AND EQUIPMENT	1,867	1,711	624	413	10,275	14,821
591-536-750.00	SAFETY MATERIALS (OSHA)	639	239	187	5,150	2,881	905
591-536-776.00	MATERIALS AND SUPPLIES	9,247	12,125	10,969	6,814	20,745	40,481
591-536-777.00	CHEMICALS	41,992	36,148	56,507	38,760	46,178	50,988
591-536-778.00	GASOLINE	12,366	15,559	8,254	3,389	8,247	6,400
591-536-780.00	VEHICLE & EQUIP MAINT SUPPLIES	8,478	3,091	4,350	5,033	9,309	2,631
591-536-781.00	MAINTENANCE OF PUMP EQUIPMENT	18,274	1,575	14,680	28,819	16,795	2,870
591-536-782.00	NEW SERVICES	0	0	0	7,420	2,900	0
591-536-783.00	DISTRIBUTION MAINTENANCE SUPPL	47,577	32,287	59,264	49,444	59,594	2,421
591-536-785.00	BUILDING & GROUNDS REPAIR & MA	553	1,805	1,754	578	2,531	0
591-536-801.00	PROFESSIONAL SERVICES	5,680	4,078	30,913	55,222	6,515	0
591-536-802.00	CONTRACTUAL SERVICES	38,570	59,028	78,126	48,458	115,344	63,782
591-536-804.00	PRINTING AND COPYING	258	0	0	192	0	0
591-536-819.00	CONFERENCE COSTS	105	338	1,465	0	0	568
591-536-840.00	ADMINISTRATION FEES	41,050	44,228	112,663	118,000	118,000	70,292
591-536-851.00	TELEPHONE	5,507	6,323	6,619	7,291	9,175	4,189
591-536-885.00	TRAINING	720	1,024	3,046	430	814	928
591-536-921.00	GAS	6,086	6,136	10,104	9,408	11,663	12,152
591-536-922.00	ELECTRICITY	83,740	108,408	104,239	87,218	76,522	62,426
591-536-941.00	BUILDING RENTAL	6,675	6,675	6,675	6,675	6,675	3,894
591-536-943.00	EQUIPMENT RENTAL	12,686	27,819	16,825	14,552	20,284	17,394
591-536-950.00	INSURANCE AND BONDS	9,961	10,209	10,876	13,099	15,307	9,110
591-536-955.00	MISCELLANEOUS	2,563	958	4,368	240	542	54

Calculations as of 07/31/2022

GL NUMBER	DESCRIPTION	2017 ACTIVITY	2018 ACTIVITY	2019 ACTIVITY	2020 ACTIVITY	2021 ACTIVITY	2022 ACTIVITY THRU 07/31/22
Dept 536 - WATER UTILITY OPERATIONS							
APPROPRIATIONS							
591-536-968.00	DEPRECIATION	213,706	266,154	268,376	272,158	271,034	0
TOTAL APPROPRIATIONS		944,803	1,047,975	1,158,584	1,139,273	1,220,873	603,665
NET OF REVENUES/APPROPRIATIONS - 536 - WATER UTILITY		(944,803)	(1,047,975)	(1,158,584)	(1,139,273)	(1,220,873)	(603,665)
ESTIMATED REVENUES - FUND 591							
APPROPRIATIONS - FUND 591							
NET OF REVENUES/APPROPRIATIONS - FUND 591		15,069	(95,323)	(165,131)	(231,131)	(264,165)	(37,671)

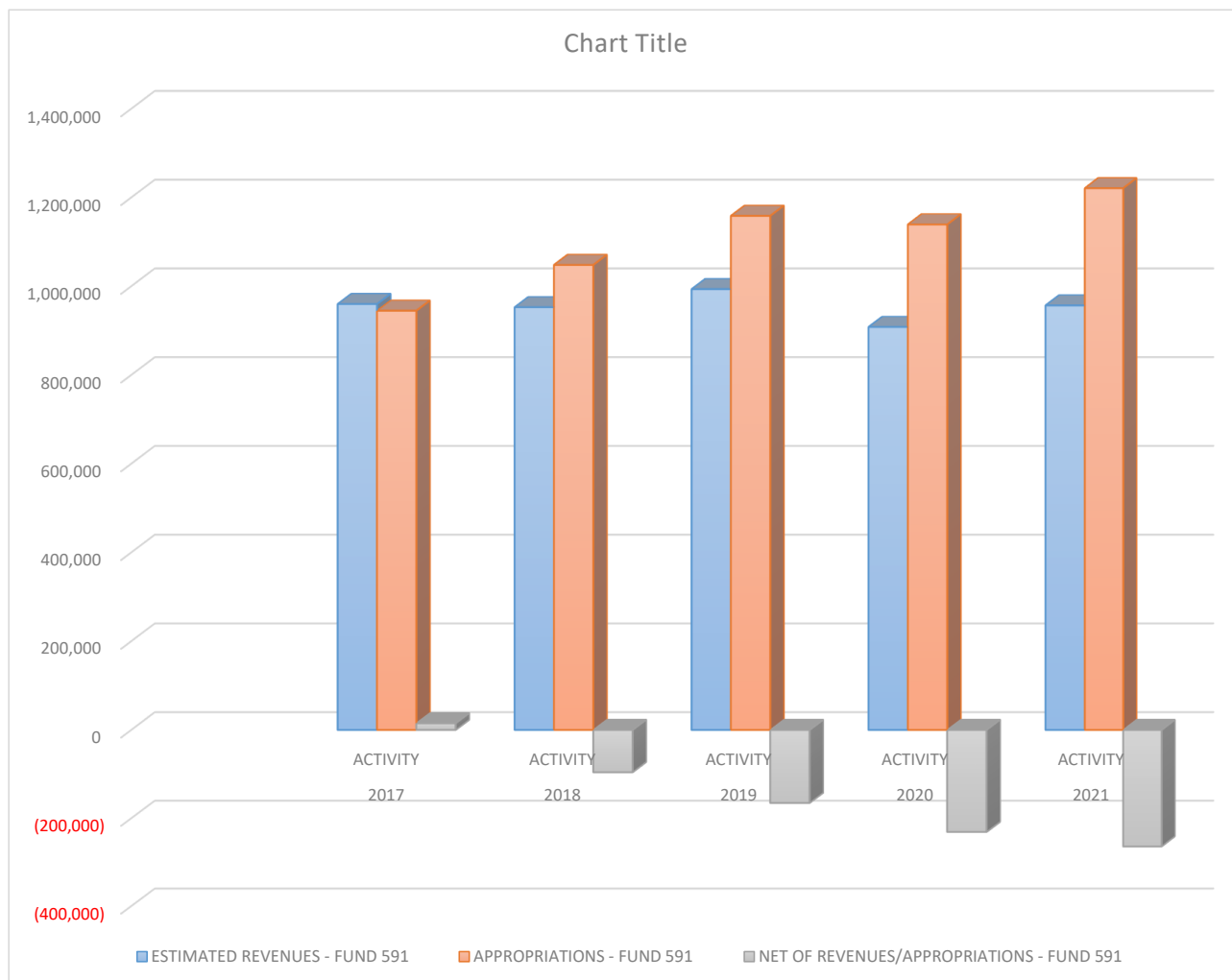
Revenues have remained relatively constant while appropriations reflect a sizable increasing trend.

The result is Fund losses which are increasing at an alarming rate.

08/08/2022

BUDGET REPORT FOR CITY OF ALBION
Calculations as of 07/31/2022

	2017	2018	2019	2020	2021
	ACTIVITY	ACTIVITY	ACTIVITY	ACTIVITY	ACTIVITY
ESTIMATED REVENUES - FUND	959,872	952,652	993,453	908,142	956,708
APPROPRIATIONS - FUND 591	944,803	1,047,975	1,158,584	1,139,273	1,220,873
NET OF REVENUES/APPROPRIA	15,069	(95,323)	(165,131)	(231,131)	(264,165)



CITY COUNCIL REGULAR MEETING AGENDA ITEM REPORT



To: City Council
Subject: APPROVE RICH & ASSOCIATES PARKING CONSULTANTS PROPOSAL FOR DOWNTOWN PARKING MANAGEMENT STUDY
Meeting: CITY COUNCIL REGULAR MEETING - 15 Aug 2022
Department: City Manager
Staff Contact: Haley Snyder, City Manager

BACKGROUND INFORMATION:

The Downtown Development Authority (DDA) had a downtown parking study completed in 2006. The DDA has had a recent discussion regarding updating the parking study. To facilitate this process, an RFP was published by the city requesting proposals for a third-party consultant. Hiring a third party to assist with this update will provide the city with increased capacity and an opportunity for analysis from an outside professional perspective. The city received three (3) proposals in response to the RFP.

City Administration recommends selecting Rich & Associates Parking Consultants for updating the downtown parking management study. After reviewing the three submitted proposals, Rich & Associates demonstrated an understanding of the scope of work that put them ahead of the competing proposals.

The proposal provided by Rich & Associates demonstrated the completion of similar studies for other communities in Michigan. The short timeframe under which we operate means that whoever we select will have to be ready to complete the work immediately; Rich & Associates demonstrated an understanding of our objectives. The qualifications and experience held by Rich & Associates give City Administration confidence in their ability to complete the work outlined and do so within the time and budget constraints.

The DDA approved the recommendation to award the downtown parking study to Rich & Associates at their August 10th meeting. The DDA approved a request to the City Council to grant the downtown parking study to Rich & Associates and split the costs with the City of Albion.

FINANCIAL IMPACT:

Bid Amount - not to exceed \$22,550.00

DDA commitment - \$11,275.00

City of Albion commitment - \$11,275.00

ATTACHMENTS:

[0923p-Albion Parking Study Proposal - Rich & Associates](#)

Proposal



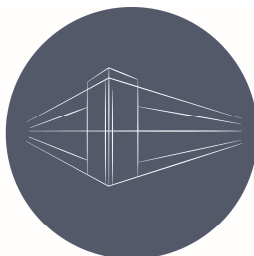
City of Albion, Michigan

Downtown Parking Management Study

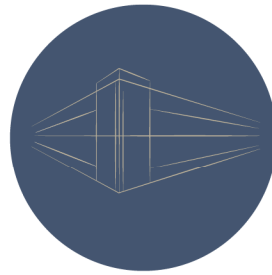


July 22, 2022

Submitted By



RICH & ASSOCIATES
PARKING CONSULTANTS



RICH & ASSOCIATES
PARKING CONSULTANTS

July 22, 2022

City of Albion
C/O City Clerk
112 W. Cass Street
Albion, MI. 49224

RE: Downtown Parking Management Study Proposal (RA#0923p)

Dear Sir / Madam:

On behalf of Rich & Associates, I am pleased to present to you our proposal to complete a Downtown Parking Management Study for the City of Albion.

Since 1963, Rich & Associates has been focused exclusively on the study, planning and design of parking. During this time, we have successfully completed more than 300 similar downtown parking studies for municipalities throughout the country. Over the past 20 years our firm and our key personnel have successfully completed similar parking studies for many cities across the state of Michigan, including studies for;

City of Plymouth
City of Detroit
Village of Ada
City of Ferndale
Village of Holly
City of Adrian

City of Brighton
City of Rochester
City of Walker
City of Howell
City of Flint
City of Ypsilanti

City of Bay City
City of Rockford
City of Royal Oak
City of Dearborn
City of Jackson
City of Saline

Thank you very much for the opportunity. If you have any questions regarding our proposal or if you need additional information, please contact me at 248.353.5080 or dnrich@richassoc.com

Sincerely,

RICH & ASSOCIATES, INC.
PARKING CONSULTANTS

David N. Rich
Vice President

Downtown Parking Management Study Proposal
City of Albion, Michigan

July 22, 2022

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FIRM'S EXPERIENCE

02

KEY PERSONNEL

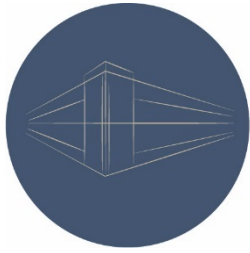
03

PROJECT APPROACH

04

COST PROPOSAL

Section 1 – Firm’s Experience



RICH & ASSOCIATES

PARKING CONSULTANTS

RICH & ASSOCIATES (R&A) is a full-service parking consultant providing customized solutions to downtown parking needs.

Since 1963 we have been responsible for the completion of more than 300 municipal parking studies throughout the Country. We have developed innovative solutions to meet the specific challenges of municipalities and a diverse resume of other public and private clients. Not only do we have experience assessing current and future parking needs, we also have extensive experience assessing the financial health and management of parking systems.

Our parking planners have experience in the operational assessment of existing parking systems through our experience in more than 300 cities. This experience allows us to develop realistic and implementable solutions affording long-term parking improvements. Our studies and analyses result in a high level of accuracy due to the customized approach we developed considering parking and traffic characteristics unique to your study area and not on national or industry averages. This comprehensive approach includes extensive field research and data collection to gather these unique characteristics.

We have experience in the development and implementation of marketing and public relation programs for downtown parking systems. Upgrades to signage, improving accessibility to parking areas, park and shop programs, and upgrades to existing facilities involving technology to make them more user friendly, all go into our analysis of marketing parking systems.

The fast pace evolution of mobility and consumer preferences, is changing the way we plan and program parking. Parking systems planned to meet today's demands may not serve the same needs in the future. Next Use programing is how we begin the process of every parking project. Understanding our client's long-term goals and needs, asking questions about the future and how it may impact their parking system parking, and contemplating what next. Opportunities studied during the process include future convertibility to other uses, layouts and striping plans that be easily modified to accommodate smaller stalls sizes, integration of mobility options into the downtown parking system, as well as connectivity and electrical vehicle charging infrastructure.

The following page includes a list of references from recent past clients for whom our team has completed similar parking studies. Descriptions of these and other similar studies can also be found in this section.

Downtown Parking Management Study ProposalAlbion, Michigan

Section 1 – Firm's Experience**CITY OF ROYAL OAK, MICHIGAN****Mr. Tim Thwing**

Director of Community Development

211 Williams Street, 3rd Floor

Royal Oak, MI. 48067

(248) 246-3260**CITY OF PLYMOUTH, MICHIGAN****Mr. Tony Bruscato**

Director Plymouth Downtown Development Authority

831 Penniman

Plymouth, MI. 48170

(734) 891-6485**CITY OF ROCKFORD, MICHIGAN****Mr. Thad Beard**

City Manager

7 South Monroe Street

Rockford MI 49341

(616) 866-1537**CITY OF SALINE, MICHIGAN****Brian Marl**

Mayor

100 N. Harris Street

Saline, MI 48176

(734) 429-4907 Ext 2213**CITY OF YPSILANTI, MICHIGAN****Ms. Bonnie Wessler, AICP**

City Planner

One South Huron St.

Ypsilanti, MI 48197

(734) 483-9646**CITY OF BRIGHTON, MICHIGAN****Nate Geinzer**

City Manager

200 N. First St

Brighton, MI 48116

(810) 225-8022

Downtown Parking Management Study Proposal

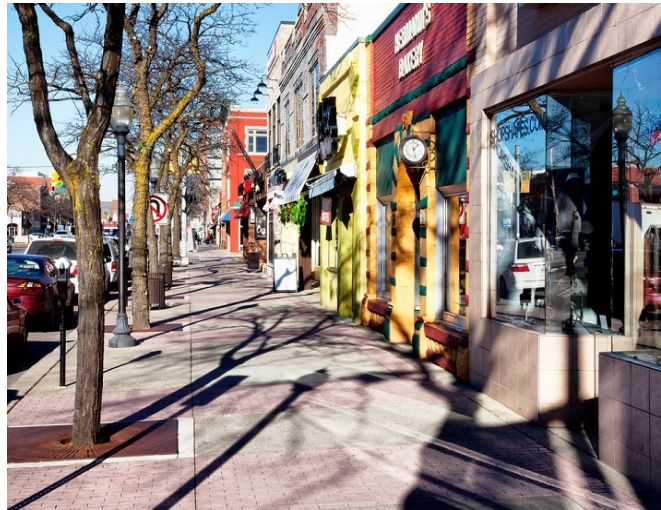
Albion, Michigan

Section 1 – Firm’s Experience

CITY OF ROYAL OAK, MICHIGAN

Rich & Associates has served as parking planning and design consultants to the City of Royal Oak and the Royal Oak DDA since 1995.

1995 - Rich & Associates was hired by the City to complete a Downtown Parking Study and Master plan. The scope of the project included analysis of a 30 block area of the downtown. The purpose of the study was to assess the current and long-term parking needs, determine what adjustments were needed to the current parking rate structure to improve utilization, turnover and revenue. Rich & Associates reviewed traffic patterns and flows, and downtown signage and wayfinding. We reviewed existing operations and made recommendation on enforcement and overall management, including a complete review of parking technologies.



Upon analysis of the entire parking system it was determined that the City needed at least 650 additional spaces in the near term. However, in order to finance the project, an implementation plan was put in place that included several changes within the parking operations. It was determined that, for the implementation plan to be successful, the first goal was to establish a more autonomous parking system, leading to a more self-sufficient parking operation. With this goal in mind, the parking system recommendations included; transfer authority over the parking operations to a parking manager; transfer parking enforcement responsibilities to the Parking System and increase the overall level of enforcement; and update parking systems for better revenue collection, record keeping, and utilization analysis.

2005 & 2010 - The City hired Rich & Associates to update the parking study, analyze the impact of residential growth downtown and make recommendations on how to accommodate this new use, while balancing the needs of other downtown user groups.

2011 - Rich & Associates was contracted by the City and the DDA to take the previous parking demand models the firm created from past studies and convert the information into GIS. The conversion into GIS gives the City the ability to review spatial representation of parking demand on each block downtown and to easily update the data to account for any new demand, new parking or lost parking in the system.

2018 - The City and DDA recently retained Rich & Associates to analyze the on-street parking in “high demand areas” downtown and make recommendations on time limits and allocation, applications of on-street technologies, on-street pricing strategies and how the parkmobile system should be deployed in order to efficiently operate the parking system while providing a convenient and friendly system to the customers

Downtown Parking Management Study Proposal

Albion, Michigan

Section 1 – Firm’s Experience



CITY OF PLYMOUTH DDA, MICHIGAN

Rich & Associates has served as parking planning consultants to the City of Plymouth and the Plymouth DDA since 2003.

2003 & 2004 - Rich & Associates was hired by the Plymouth Downtown Development Authority to complete a downtown parking management and strategy study. Phase 1 of the study involved the assessment of current parking conditions. Phase 2 provided projections of future parking needs. Phase 3 included the feasibility of both capital and operational parking improvements in the downtown central business district. The goal of the study was to determine the feasibility of three new parking supply alternatives:

2007 – Rich & Associates was retained by the City to analyze the design and economic feasibility of a new downtown parking deck. The alternatives studied included;

- Repair and expand existing downtown Central Parking Deck
- Demolish and replace existing downtown Central Parking Deck
- Build a new parking deck adjacent to the downtown library

In addition to studying the design feasibility, Rich & Associates also completed a life cycle cost analysis of the various options and a structural system analysis.

2017 – As the economic growth continues in the downtown, the City retained Rich & Associates to study alternatives to transitioning from a free public parking system to a paid parking system. Our work included benchmarking other similar communities, meeting with several public officials and private stakeholders, defining the goals and objectives of paid parking, as well as best practices.

2018 – Rich & Associates consulted with the City and DDA to assess approaches to funding the much needed replacement to the existing downtown Central Parking Deck.

Downtown Parking Management Study Proposal

Albion, Michigan

Section 1 – Firm’s Experience

CITY OF SALINE, MICHIGAN



The City of Saline solicited for a comprehensive parking study because of a growing restaurant scene within the downtown which was straining the existing parking resources. The City was also concerned with how some proposed development plans would further impact this need. The report quantified and qualified existing and anticipated future needs and assessed opportunities for maximizing the use of the existing parking supply. Maximizing the use of the existing supply first was the major element of Rich’s proposal compared to competing proposals and was favored by City Council when the proposal was discussed with them prior to beginning the engagement. Multiple elements were included in the completion of this analysis

- Kickoff meeting with City-formed Steering Committee
- Inventory of on and off-street parking supply
- Inventory of existing land uses
- Two days of turnover and occupancy analysis (Thursday, May 31, 2018 and Friday, June 1, 2018) conducted between 8:00 am and 9:00 pm
- Individual meetings with key stakeholders over two days
- Public Meeting to review the study process and address questions
- On-line surveys of customers/visitors, downtown business owners and downtown employees.

In addition to demonstrating current and future parking needs, Rich reviewed with the City how to accommodate parking needs during the heavy evening restaurant traffic hours. Additionally, Rich made a number of recommendations regarding the overall parking system going forward including signage, on-street stall striping, shared parking arrangements, enforcement and time limits, marketing of parking and maintenance of the parking system. While one element was to investigate the possibility to partner with a local bank holding a key parcel to develop a lot that would benefit both the City and bank, should this be unable to be accomplished, Rich did provide data on the cost of structured parking.

Saline Main Street endorsed and are in the process of implementing recommendations: Wayfinding/signage, maintenance (properly striping parking spaces to improve efficiency), parking enforcement, shared use (public/private partnering) and initiate both short and long-term planning strategies.

Downtown Parking Management Study Proposal

Albion, Michigan

Section 1 – Firm’s Experience



CITY OF ROCKFORD, MICHIGAN

In the Spring of 2019, the City of Rockford commissioned Rich & Associates to perform a comprehensive evaluation of the current parking availability and demand. All parking within the downtown is free with 62 percent of the downtown parking supply being publicly available as opposed to privately controlled. The primary purpose for conducting the study was to understand the parking needs in light of moving forward with a developer for the construction of a new downtown hotel with an on-site restaurant and bar on the site of an existing public lot. The City was interested in understanding the implications that such a development would have on nearby public and private parking. Rich quantified and qualified the existing and projected daytime and evening parking needs.

The data collection for this study included:

- Parking space inventory
- Land use review
- Turnover and Occupancy study
- Review of signage
- Catalogue of handicap (ADA) parking availability vs. government requirements

The study concluded that although there would be a deficit of parking on the block with the hotel, particularly during the evening hours, there would still be an overall surplus of parking and by making arrangements with other private businesses for use of their spaces during the evening hours, this could help address some of the parking deficiency. Rich also recommended improvements in parking signage for several public lots and how best to accommodate storage of cars towing trailers using the popular river access and bike trails in the City.

Downtown Parking Management Study Proposal

Albion, Michigan

Section 1 – Firm's Experience

VILLAGE OF ADA, MICHIGAN

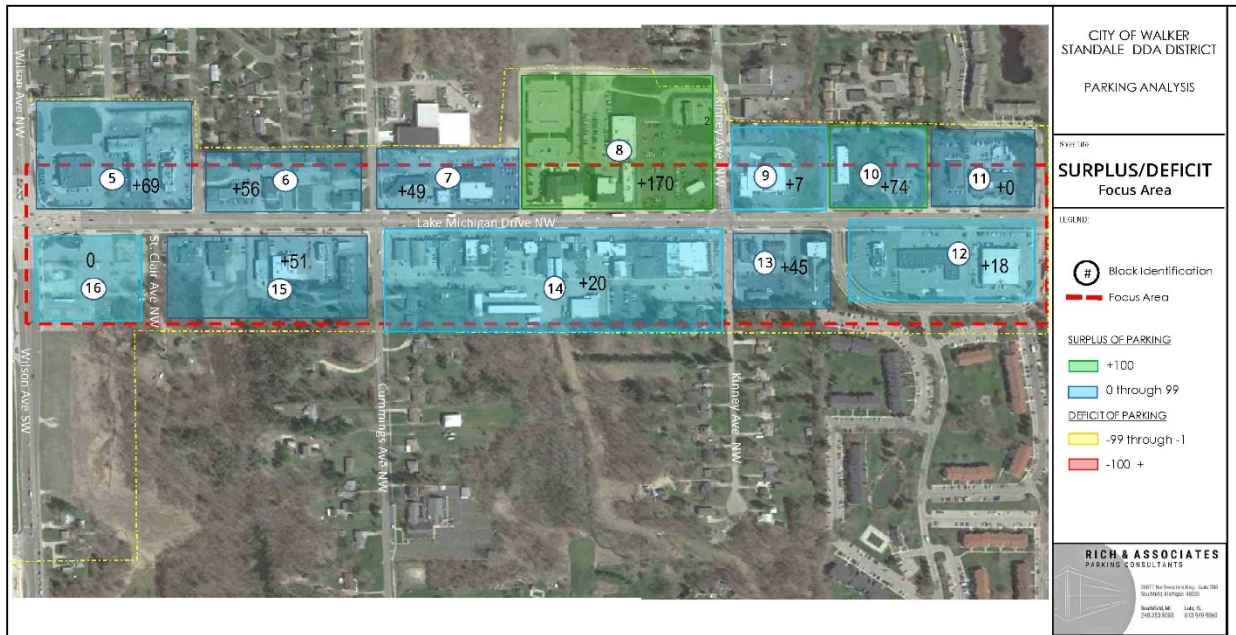
The Village of Ada is like many growing communities in the midst of realizing an interest in developing their downtowns. In the case of Ada, this led to a new master plan with a new large re-development opportunity. Such changes can present challenges to the existing parking infrastructure to satisfy the needs of the new commercial and residential growth, and visitors in a sufficient, appropriate manner.

In Ada, it is the desire that the parking supply should foster a walkable and pedestrian friendly environment with sufficient parking provided to support diverse land uses with housing and retail as well as creating a hub for arts and entertainment. The challenge was to create a pleasant experience for people who live and work in the area, and can walk to downtown destinations, while ensuring that there is adequate parking for residents and visitors who drive downtown.



Within the study area the relative mix of land-uses and businesses all have unique parking needs and periods of time where additional parking is needed. Because of the unique nature of the downtown, a careful analysis of shared-use opportunities was important to forecast the long-term needs of the downtown. The parking and background data that was collected and analyzed helped determine by block the current and future needs by land-use type.

It was found that in order for the new development and re-development that was planned a parking structure would need to be built in the core downtown area. Recommendations were given to keep the downtown pedestrian friendly and encourage residential growth in the downtown. The purpose of this study was to prepare a parking plan that is consistent with the Village and associated stakeholders goals and visions for the downtown.



CITY OF WALKER, MICHIGAN

In general, Walker is endeavoring to draw development and growth to its DDA core that is consistent with a vision of a traditional town that is bisected with a highway. This vision emphasizes a diversity of uses, as well as the facilities and amenities that promote vehicular, bus rapid transit, pedestrian, bicycle and potential other future transportation forms.

Parking is by nature a great determiner of how development occurs. Typically at odds are the aspects of a desire on the part of developers to maximize the property available with occupied space against the need to provide adequate parking to serve the building. The report presented options available to the City that allow for shared parking between buildings to reduce the overall amount of parking needed to serve any one individual building.

There were several recommendations provided in the report to help guide the City/DDA in making parking decisions for the system with new growth in the downtown. Rich & Associates looked at how all modes of transportation available in Walker affect the parking system including bicycles, walking, public transit, and personal automobiles. The analysis included a detailed review of parking procedures, management, operating and marketing practices along with determining the current and future demand of parking.

Pedestrian activity is currently impeded in the DDA district due to a lack of sidewalk connectivity, disjointed building fronts and large breaks between buildings. Parking is located both in front of and behind buildings without clear distinctions of ownership along with an overall lack of public parking. This area tends to work more as a destination strip mall than a downtown. Pedestrian activity also requires that the principal elements of a downtown streetscape, including sidewalk design be adhered to. Additional consideration is given to bicycle activity within the downtown in order to examine how the community can address and continue to promote multiple forms of transportation, an important element of a livable community.

Downtown Parking Management Study Proposal

Albion, Michigan

Section 1 – Firm’s Experience

CITY OF YPSILANTI, MICHIGAN

The Michigan Municipal League and the Michigan Economic Development Corporation contracted with the team of Rich & Associates on behalf of the City of Ypsilanti to prepare a Downtown Parking Study. Rich & Associates conducted a comprehensive assessment of the downtown parking system serving three (3) Downtown Development Authority Districts encompassing 43 blocks. While the three districts experience unique parking needs, all three suffer from common deficiencies in how the parking system is managed. Inconsistencies in management, operational policies and parking control systems make it difficult for patrons as they move about and visit different areas of the City.



In addition to quantifying the parking needs for each of the three areas, our team implemented a Public Participation and Outreach program to engage the Ypsilanti community. This included preparing digital open house flyers and social media graphics for the City to post on social media channels. We conducted a 2-hour open house after the initial analysis and preliminary findings, and a focus group meeting with between 15 and 20 stakeholders the day of the open house to allow for more in-depth discussions.

The study includes a series of recommendations geared to:

- management / operations, user experience, maintenance,
- ADA requirements,
- enforcement and future capacity.

Recently presented to the City, is a long-term, sustainable parking strategy. The results of this study include a supply and demand assessment; recommendations to develop, deploy, coordinate or support alternate modes of transportation, combined with zoning strategies, and a financing and implementation strategy. The recommendations are intended to facilitate access to downtown for all users of the parking system including visitors, students, employees and downtown residents.

Downtown Parking Management Study Proposal

Albion, Michigan

Section 1 – Firm’s Experience

CITY OF SAULT STE MARIE, MICHIGAN

The City of Sault Ste. Marie is the oldest City in Michigan and has been known as “The Gathering Place” for hundreds of years. Located on the eastern shore of Lake Superior along the banks of the St. Mary’s River, Sault Ste. Marie has long been the number one tourist destination in the U.P., rich in maritime history. Rich & Associates was hired by the City to develop a parking master plan and to analyze the current and future parking needs based on levels of



growth and development in the downtown, re-occupancy of vacant space and steady growth in tourism.

In order to determine specific changes in the study area, the City of Sault Ste. Marie provided Rich & Associates with updated building and parking data. This data consisted of occupancy and use information that was used to assess parking demand within the study area. Parking inventories were also updated from the to assess changes both in the number of stalls and parking rate information.

Three important points about the findings of the study are: 1) that new or additional parking is needed, 2) that parking should be located off of Governor Osborne Boulevard across from War Memorial Hospital behind the Community Action Agency building, and 3) that there needs to be approximately 421 parking stalls built to accommodate lost parking on site, existing parking demand and future parking demand from planned developments.

Additional, work on the project included a series of meetings with various stakeholders including the C-L-M Community Action Agency, The Sault Tribes of Chippewa Indians, and Sault Ste. Marie City Staff. The input of the stakeholder groups was very valuable in determining who would use new parking and in developing consensus on potential partnerships in financing the facility.

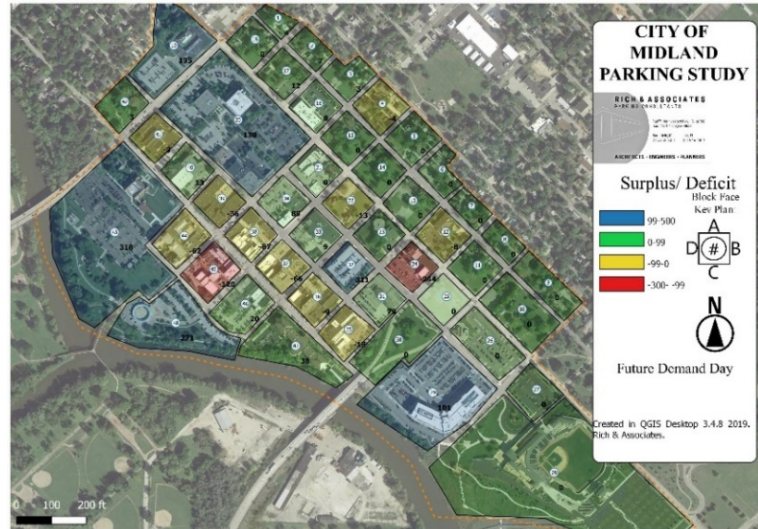
Downtown Parking Management Study Proposal

Albion, Michigan

Section 1 – Firm’s Experience

CITY OF MIDLAND, MICHIGAN

The City of Midland contracted with Rich & Associates to complete a comprehensive assessment of a 48-block area of the downtown parking needs. Downtown Midland is a walkable community with retail establishments, restaurants, churches, City and County Governmental office buildings, hotel and residential communities, as well as waterfront activities. These uses coupled with the new Delta College development and future development interest within the downtown have the potential to place additional pressure on the current parking system.



This analysis quantified and qualified existing and near-term (3-years) conditions to demonstrate the impact from the planned development of a Delta College facility within the downtown. The analysis considered the many diverse types of land uses within the downtown that contribute to the vibrant, active downtown experienced.

In order to complete the analysis, Rich staff collected on-site parking supply data and building inventory information noting the address and type of use of each building. This data, supported with square footage information provided by the City in conjunction with one day of on-site utilization counts, allowed Rich to quantify the parking needs by time of day for both the existing conditions and to project the near future parking requirements. This data was supported with a series of on-line surveys completed by downtown customers and visitors, downtown business owners and their staff. Public meetings were held at various stages of the study process to engage with the community to discuss parking related issues and solicit input on potential solutions. Additional outreach included on-line surveys of downtown businesses and employees, customers and visitors, as well as faculty staff and students of Delta College.

This parking study, prepared for the City of Midland, serves to examine the existing parking system from both a qualitative and quantitative standpoint and assessed whether the current parking supply could be more efficiently managed and utilized or if additional parking strategies are needed to meet the current and future development demands. A primary goal of the parking analysis was to determine if new parking will be required based on recent and anticipated future developments.

Downtown Parking Management Study Proposal

Albion, Michigan

Section 1 – Firm’s Experience

CITY OF ADRIAN, MICHIGAN



Rich & Associates recently completed a comprehensive parking study for a 21-block area in downtown Adrian, Michigan. The study was designed to quantify and qualify the parking needs for the downtown district and determine if additional parking is needed and if so, the magnitude of the additional need. It was also intended to review operational aspects of the parking system including enforcement, signage, on-street parking stall lengths, downtown resident parking and a review of available parking particularly during large events hosted and how best to accommodate these needs.

The level of existing activity downtown and the potential for even more business activity from new development has necessitated a thorough review of the parking system. As such, the study undertaken in Adrian employed a methodology pioneered by Rich & Associates which considers the existing and future land uses and quantifies the parking demand as it exists currently and as it can be expected to exist with new development and greater occupancy of existing real estate. This then can provide the community with the necessary information to make an informed decision on the best course of action to pursue.

Rich & Associates met with the City, members of the parking committee and the DDA to discuss current and future parking needs. The results of the analysis were presented both in a morning DDA meeting, as well as an evening meeting where the public was invited.

Signage and wayfinding recommendations are in the process of being implemented. Currently under consideration are the 2-hour limit on the prime on-street spaces, the shared use (public/private partnering) concept during events and the recommendations for enforcement.

Downtown Parking Management Study Proposal

Albion, Michigan

Section 1 – Firm's Experience**CITY OF TRAVERSE CITY DDA, MICHIGAN**

Rich & Associates has served as parking planning consultants to the City of Traverse City DDA since 2008.

2008 – The Traverser City DDA retained Rich & Associates to study the feasibility of constructing a new multi-level parking deck in the Old Town District. The need for additional parking was being generated by the large expansion of a major downtown employer. Upon completion of the initial analysis, the firm provide final design and engineering of a 522 space parking deck. The deck features PV solar arrays and other sustainable design features and was certified by the USGBC as LEED Silver.

2011 – Rich & Associates was again retained by the City to study the feasibility of parking needed to support a large mixd-use residential and retail development. Our work included determining the capacity of the proposed new parking considering the demand generated from the new development and public parking needs within the district.

2017 – Rch & Associates' engineering team conducted a conditions assessment of two downtown parking decks. Upon completion of the initial conditions assessment, the DDA contracted our firm to complete repair drawing, specification and bid documents for the recommended repairs. The repairs are currently underway.

2018 – The DDA awarded Rich & Associates a contract to provide concept planning, design and engineering of a new downtown parking deck. The new 400 space parking deck will provide much needed public parking in the district of West Front Streets and Pine Street, and capacity to support a proposed mixed-use residential and retail development. The project is currently in the schematic design phase. Construction is expected to commence in the spring of 2019.

Downtown Parking Management Study Proposal

Albion, Michigan

Section 1 – Firm's Experience

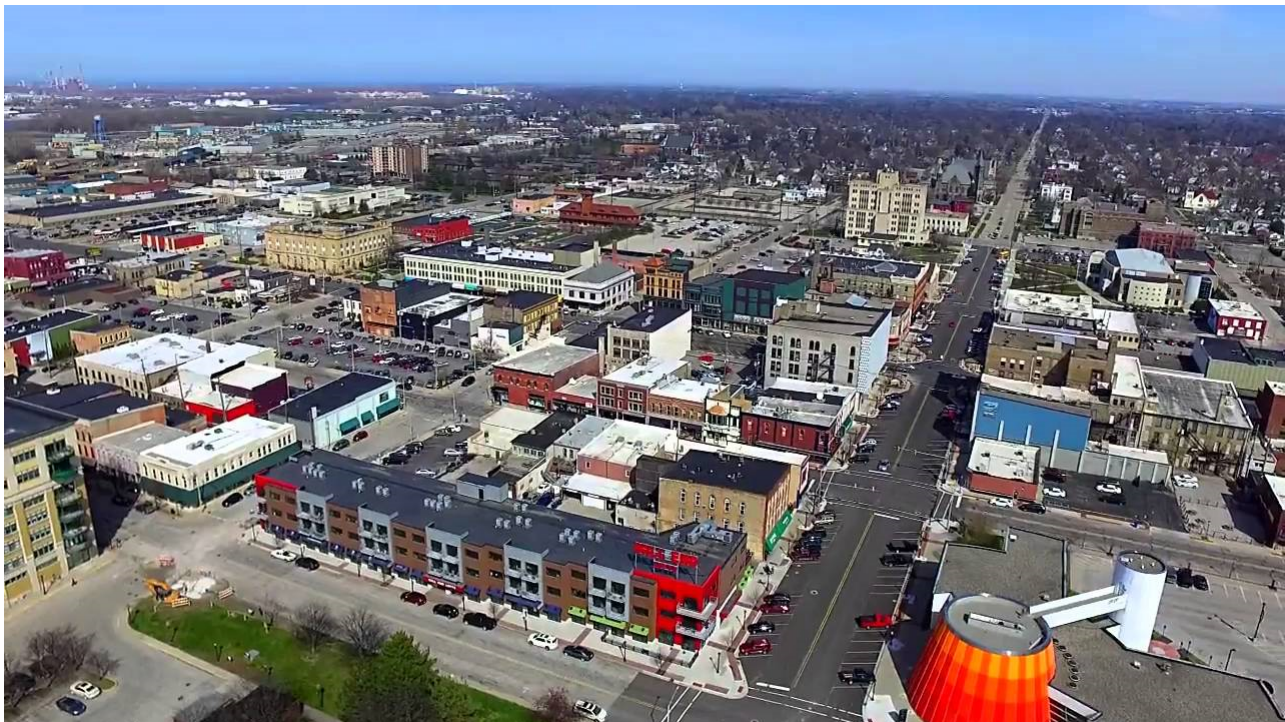
CITY OF BAY CITY, MICHIGAN

The Bay City Downtown Development Authority contracted Rich & Associates to examine the downtown's existing parking system from both a qualitative and quantitative standpoint.

Bay City DDA commissioned the study due downtown revitalization involving many new developments. There were several new mixed-use developments including residential condos and a new District Library in the core of the downtown. With the new shift of residential units being built in the downtown there was a need to examine the residential parking needs, and their effects on area businesses.

The main purpose of the study was to assess the overall condition and adequacy of parking in the study area. We reviewed the allocation of parking to achieve a proper balance between long-term and short-term parking and determined whether or not there is a sufficient capacity for peak and seasonal customer parking needs as well as employee needs. We also determined what parking improvements best suited Bay City's needs, when to implement the improvements, and how to finance the proposed parking improvements.

Rich & Associates recommended shifting much of the long-term parking to a central location within the downtown and creating pedestrian gateways leading people to the library and the downtown. Some of the other recommendations included connecting the bike trails in the area to the downtown, traffic calming measures, short term on-street parking, multi-spaced meters in long term lots, and creating outlying special event/commuter lots.



Downtown Parking Management Study Proposal

Albion, Michigan

Section 1 – Firm’s Experience

CITY OF BRIGHTON DDA, MICHIGAN

Rich & Associates has been providing parking consulting and planning services to the City of Brighton Downtown Development Authority since 2008.

2008 - The Brighton Downtown Development Authority (DDA) hired Rich & Associates to examine the existing and potential future parking needs within the downtown area. Brighton was endeavoring to draw development and growth to the downtown core. The study included a comprehensive examination of parking needs and operations. It was found that the parking system was currently meeting the needs of the downtown businesses, though it would be beneficial for the City to obtain additional public parking since the majority of parking in the downtown is private and does not allow shared use.



Rich & Associates developed a set of recommendations designed to help the current parking system function more efficiently. The recommendations for Brighton were comprehensive, including increasing parking enforcement, shared-use arrangements with private parking, striping all on-street parking, developing a valet parking ordinance, adding additional lighting to lots, marketing parking to employees and customers, and adding additional bicycle racks to the downtown.

2011 – Due to increased re-occupancy of existing land-uses and new interests in new development, the DDA retained Rich & Associates to update the 2008 parking analysis to ensure that the parking system was positioned properly to accommodate the growing demand. It was determined that with some allocation and organizational changes to existing parking resources, the system could accommodate the increased demand.

2015 – The Brighton DDA retained Rich & Associates to update the 2008 and 2011 parking demand model by re-examining the utilization of the existing public and private parking downtown. The updated utilization data was input into the demand model. It was determined that utilization rates had risen to the level that the City needed to consider opportunities to increase supply through new surface or structured parking options.

2017 – Rich & Associates worked with the DDA and City to study a number of sites downtown that were appropriate for either additional surface or structured parking opportunities. Our team prepared concept studies, elevation studies and cost estimates of each option.

Downtown Parking Management Study Proposal

Albion, Michigan

Section 1 – Firm's Experience

CITY OF JACKSON, MICHIGAN

Rich & Associates has been providing parking consulting services to the City of Jackson since 1973. Over the past 20 years we have completed the following parking related projects for the City.

1998 - Rich & Associates completed a downtown parking demand and economic feasibility study for the City of Jackson. One issue was of particular importance to the City and that was providing more convenient parking downtown to retain the areas larger employers. At the time of the study Consumers Energy Corporation was studying several sites to relocate their regional offices, and one site was in the heart of downtown Jackson.

Rich & Associates assisted the City in developing a long term parking plan that addressed Consumer Energy's parking needs if they located their new office building in the downtown. Shortly following the study, Consumers announced downtown Jackson as their location for there new office building.

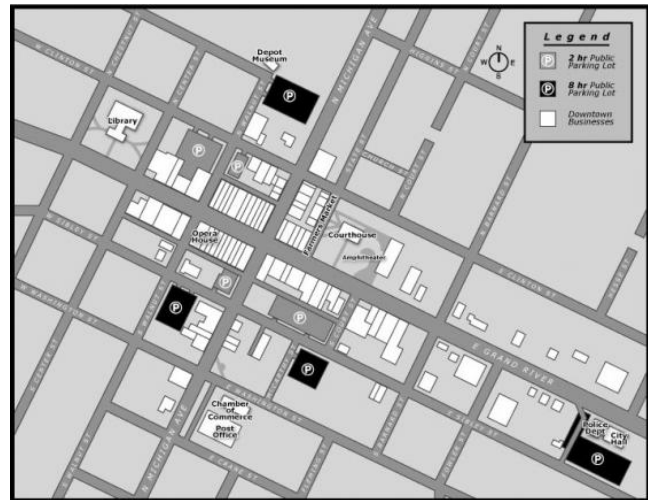
2002 - Subsequent to this, the City selected Rich & Associates to head a multi-disciplined team to design two new downtown parking structures. Completed in 2003 these two new structures provide a total of 1,000 new spaces in downtown Jackson, to support the parking needs of Consumers Energy Headquarters and the general public.

2017 – Due to increased development of mixed-use retail and residential development and the announced plans of a corporation moving its headquarters downtown, the City hired Rich & Associates to study the feasibility of constructing a new 500 space parking garage to support both the new developments as well as current businesses downtown.



CITY OF HOWELL, MICHIGAN

The Howell downtown parking study was undertaken to analyze the parking needs unique to the City and the activities that have created those needs. The purpose of this project was to determine the adequacy of the existing parking resources to meet current and future demand, determine approaches to mitigating future demand and the feasibility of creating new parking through public private joint venture with mixed-use developments.



The City of Howell has a vibrant community that is experiencing considerable residential growth within the Howell Library Service Area (See Exhibit A – page 2-2). The residential growth can be attributed to the availability of land in the community for community. By examining existing parking operations, current situations and quantifying future needs, we prepared a set of recommendations that will translate into a successful parking plan.

- Parking Regulations - Increase enforcement efforts.
- New Parking – build new parking structure on municipal lot combined with private mixed-use commercial and residential development.
- Signage - Re-do downtown parking signs including introduction signs, informational and directional signs and wayfinding.
- Marketing - Develop a parking map of the available parking in the downtown area for distribution at downtown businesses identifying all available parking areas and who should use which area.

Table 2D:
Downtown Parking Study Surplus/Deficit Summary

Study Area Time Period	Study Area
Supply	615 spaces
Demand (Current)	971 spaces
Demand (Evening)	1,017 spaces
Surplus/Deficit (Current)	-356 spaces
Surplus/Deficit (Evening)	-402 spaces

Downtown Parking Management Study Proposal

Albion, Michigan

Section 1 – Firm’s Experience

HOLLY DOWNTOWN DEVELOPMENT AUTHORITY, HOLLY, MICHIGAN

Main Street Oakland County contracted Rich & Associates to prepare a parking planning study for the Holly DDA. The study involved a parking and building inventory and review the existing parking, how it is currently being used and potential future changes to the downtown area. A number of issues were examined including operations, current parking demand, development scenarios, and future parking needs.

Currently Holly has enough parking supply in the downtown. The study focused on recommendations to market the parking and help make the parking more efficient and user friendly. Rich & Associates created a parking information flyer for Holly to use as a marketing tool. The flyer contained a map of the public parking areas, durations of parking and included a map with directions to the downtown.

The parking study was intended to be used as a tool for future growth and development in the downtown. The Village now has tools to determine how much parking new developments will require and when new parking will be necessary.



Downtown Parking Management Study Proposal

Albion, Michigan

Section 1 – Firm's Experience

CITY OF ROCHESTER, MICHIGAN

Rich & Associates has been providing parking consulting services to the City of Rochester since 1986. Most recently the firm provided the following services;

2003 – Rich & Associates was retained by the City to update the downtown parking study previously completed by the firm in 1992 and 1986.

2014 – Rich & Associates was commissioned by the City to lead a team in the design and engineering of two downtown parking structures (Platforms). The projects were built on an accelerated timetable in an effort to have the additional parking spaces in place by the 2015 holiday shopping season. Each structure provides parking to businesses on both sides of Main Street and are designed to complement surrounding buildings.

The **East Parking Platform** completed in June 2015, provides parking for 233 vehicles and is grade plus one level. This structure was designed to support community events on the roof level. Because the structure is partially below grade, the design incorporated a light well to provide natural light and ventilation.

The **West Parking Platform**, completed in November 2015, provides parking for 297 vehicles and is grade plus two levels. There are pedestrian paths on the north and south side of the deck and adjacent alley improvements provide a more inviting path to the businesses along Main Street.



Section 2 – Key Personnel



Introduction

Rich & Associates' parking planning professionals can accurately and completely assess the parking needs and develop appropriate solutions that will be in the best interest of your community. Combining and leveraging the collective experience in parking analysis, management and operations, transit and mobility, our team will take a holistic approach to parking planning for the City of Albion. Our team, working with the City and community stakeholders, will accurately assess current and future conditions of the parking system, and develop appropriate near-term and long-term solutions.

Resumes of our key personnel are provided on the following pages.

Downtown Parking Management Study Proposal

Albion, Michigan

Section 2 - Key Personnel

Dave W. Burr

Rich & Associates, Inc.

Role: Project Director / Senior Parking Planner

Education: B.A. – Michigan State University

Years with Firm: 42 years

Dave brings 42 years of parking planning experience, successfully implementing long term parking management improvements in downtowns nationwide. Dave will be responsible for overseeing all aspects of the study.

PARKING PLANNING EXPERIENCE

- **Parking Demand Assessment;** Multiple Communities – conducted detailed parking need assessments for many large and small communities. Many analyses were to assess the need for development of parking facilities or to seek alternatives to constructing additional parking through solutions to improve parking availability.
- **Public Event Parking Analysis:** Dave performed the parking demand analysis and developed the revenue models used by Olympia Development in the determination of these parking needs. Dave also performed the Detroit Cultural Center analysis and the Cobo Center (TCF) parking analysis.
- **Rate & System Integration;** Works on detailed financial analysis of parking systems, evaluating revenues and expenses and comparing rates and revenues to competing communities. Provides detailed recommendations for schedule of rate changes under alternative development scenarios and evaluating impact from alternative management and operational strategies.
- **Operations Practices & Strategies;** Review current parking operations and management practices along with all ordinances related to the parking system. Dave has provided recommendations for the system including a comprehensive view of allocation along with permit operations, fees, enforcement, signage and the overall walkability of the downtown.
- **Community Engagement;** As part of the assessment of parking needs, Dave works with the client and has collaborated with a wide range of stakeholders, including clients, staff, community and general public, including conducting multiple meetings regarding preliminary data, recommendations and final report. Community engagement is extremely important at Rich & Associates and is necessary to providing an understanding of the community.

Dave's parking study planning experience includes:

- City of La Crosse, Wisconsin*
- City of Adrian, Michigan
- City of Saline, Michigan
- City of Temple, Texas
- Village of Arlington Heights, Illinois *
- City of Detroit, Michigan*
- City of Ypsilanti, Michigan
- City of Urbana, Illinois
- City of Gainesville, Florida
- City of Dublin, Ohio
- City of Rochester, Michigan
- City of Jefferson City, Missouri*
- City of Midland, Michigan
- City of Flagstaff, Arizona*
- Village of Downers Grove, Illinois
- City of Brighton, Michigan
- East Village, Des Moines, Iowa *
- City of Hudson, Wisconsin
- City of Fort Lauderdale, Florida*
- City of South Bend, Indiana
- City of Hagerstown, Maryland
- City of Rockford, Michigan

* indicates repeat clients

Downtown Parking Management Study Proposal

Albion, Michigan

Section 2 - Key Personnel

David N. Rich

Rich & Associates, Inc.

Role: Principal Parking Consultant
Education: Bachelor Business Administration – Wayne State University
Years with Firm: 35 years

David Rich will serve as Principal Parking Consultant. He will provide overall project oversight. David brings to the project more than 35 years of experience in the parking industry as both a parking consultant and in the development, management and operations of parking. He has participated in the management of many large-scale parking developments including \$150 million multiple parking structure development for a large mixed-use sports entertainment center development and a \$45 million parking garage and office building development project for the US Department of Veteran Affairs.

His experience includes the completion of more than 200 parking planning studies and the site analysis and concept design of more than 100 parking structures.

PARKING PLANNING EXPERIENCE

- City of Plymouth, MI
- City of Crystal Lake, IL
- City of Jefferson City, MO
- City of Libertyville, IL
- City of La Crosse, WI
- City of Bellingham, WA
- City of Charlottesville, VA
- City of Appleton, WI
- City of Prescott, AZ
- Oakland County Service Center, MI
- City of Fenton, MI
- City of Boyne City, MI
- City of Norwalk, CT
- City of Grand Rapids, MI
- City of Parkersburg, WV
- City of Davenport, IA
- City of Ferndale, MI
- City of Des Moines, IA
- Village of Ada, MI
- City of Dearborn, MI
- City of Adrian, MI
- City of Highland Park, IL
- City of Detroit, MI
- Village of Arlington Heights, IL
- City of Royal Oak, MI
- City of Altoona, PA
- City of Scranton, PA
- City of Charleston, WV
- City of Phoenix, AZ
- City of Mt. Lebanon, PA
- City of Howell, MI
- City of Battle Creek, MI
- City of Ypsilanti, MI
- City of Bay City, MI
- City of Wilkinsburg, PA
- City of Gainesville, FL
- City of Rochester, MI
- City of Rockford, MI
- City of Jackson, MI
- City of Grosse Pointe, MI

Downtown Parking Management Study Proposal

Albion, Michigan

Section 2 - Key Personnel

Richard W. Kinnell, AIA, NCARB

Rich & Associates, Inc.

Role: Principal Parking Designer

Education: Bachelor of Architecture, B.S. Architecture – Lawrence Technological University

Years with Firm: 35 years

Education: *Bachelor of Architecture, B.S. – Architecture, Lawrence Technological University*

Rick Kinnell is Vice President of Rich & Associates and specializes in the functional and architectural design of parking projects. Since joining the firm in 1981, Rick has become one of the firm’s most experienced parking designers. His experience includes the design of more than 600 free-standing, mixed-use and multi-modal parking garage projects throughout the country ranging in size from as small as 100 spaces to as large and complex as 11,500 spaces. Rick strives to develop functional parking plans that are efficient, cost effective and result in a safe, positive user experience.

Designing for Future Use; - In recent years Rick has been working with our clients addressing approaches to planning and designing parking garages with the future in mind. The rapidly changing environment of mobility will have future impacts on parking garages built today. Rick works closely with our clients studying options for future convertibility to other uses, flexibility to change parking space geometry, IT infrastructure and connectivity, and EV charging.

- City of Traverse City Old Town Deck, MI -
- City of Royal Oak 2nd & Center Street Garage, MI. – 520 spaces
- City of Dearborn West Garage, MI- 330 spaces
- City of Dearborn Wagner Place Garage, MI – 373 spaces
- City of Rochester East Garage, MI – 257 spaces
- City of Rochester West Garage, MI – 298 spaces
- City of Detroit Book Cadillac Garage, MI – 520 spaces
- City of Terre Haute Cherry St. Garage, IN – 626 spaces
- City of Huntsville Council Courts Garage, AL – 700 spaces
- City of Charlottesville Water St. Garage, VA – 624 spaces
- City of Iowa City Chauncey Plaza Garage, IA – 492 spaces
- City of Iowa City Iowa Avenue Garage, IA – 566 spaces
- Macomb County Administration Center Garage, Mt. Clemens, MI – 520 spaces
- City of Grosse Pointe Kercheval Garage, MI – 241 spaces
- City of Jackson Cooper Street Garage, MI – 420 spaces
- City of Jackson Francis Street Garage, MI – 480 spaces
- City of Royal Oak 5th & Lafayette Garage, MI. – 480 spaces
- City of Warren City Hall Garage, MI – 500 spaces
- City of Dearborn East Garage, MI – 330 spaces
- City of Ann Arbor Fourth & Washington Garage, MI. – 277 spaces
- City of Sault Ste. Marie Osborn St. Garage, MI. – 500 spaces
- City of New Orleans Erato Terminal Garage, LA 1,100 spaces
- City of Orlando Courthouse Garage, FL. – 750 spaces
- City of Orlando Jefferson Street Garage, FL. – 900 spaces
- City of Huntsville Lincoln Holmes Garage, AL – 450 spaces

Downtown Parking Management Study Proposal

Albion, Michigan

Section 2 - Key Personnel**Sally A. Rich**

Rich & Associates, Inc.

Role: Field Tech*Years with Firm:* 42 years

Sally has been working with Rich & Associates since 1979. She has assisted on numerous municipal studies and will assist the Project Manager in field research and survey data collection. Sally works with our planning and design team on the preparation of specifications for new parking garages, as well as coordinating and preparing fieldwork materials for the planning department.

PARKING PLANNING EXPERIENCE

Sally has recently worked on the following parking studies:

- Village of Arlington Heights, Illinois
- City of Jefferson City, Missouri
- City of La Crosse, Wisconsin
- City of Mandan, North Dakota
- City of Midland, Michigan
- City of Flagstaff, Arizona
- City of Detroit, Michigan
- City of Downers Grove, Illinois
- City of Brighton, Michigan
- City of Ypsilanti, Michigan
- City of Royal Oak, Michigan
- City of Rochester, Michigan
- City of Fenton, Michigan
- City of Grosse Pointe, Michigan
- City of Ferndale, Michigan
- City of Plymouth, Michigan
- City of Rockford, Michigan
- City of Lake Bluff, Illinois
- Village of Lake Orion, Michigan

Section 3 – Project Approach

Introduction

Parking is an important component to the stability and relative growth of Albion. This is evidenced by the changes that have occurred and are occurring. As an important tool for economic development, parking must be properly planned and managed. As the City, DDA and the community look to improve current conditions and evaluate economic development opportunities, it is critical to consider the parking challenges. It is important to be proactive in planning for the projected parking needs created by changes in land use, increased residential occupancies downtown and potential economic development opportunities. This also involves parking policies and management working together to improve parking accessibility.

Because of the unique nature of the downtown a careful analysis of shared use opportunities is important to accurately assess the long-term needs of the study area. The parking and background data that is collected and analyzed will help determine, by block, the current and future needs by land-use type. The study Rich & Associates' team is proposing to undertake will seek answers vital questions about the parking system including, but not limited to the following:

- *What is the nature and magnitude of the present parking situation in the study area and individual blocks?*
- *What factors are influencing current parking trends?*
- *In what areas is there insufficient capacity to satisfy peak needs currently and in the future?*
- *What model can be used to assess needs on an on-going basis based on the fieldwork and parking generation rates developed in this study?*
- *What are the perceptions and what are actual problems with parking, and how can the stakeholders be better informed?*
- *Do the parking requirements in the zoning code need to be modified?*
- *What role does private parking currently play and how can it play a role in the future especially as it may relate to shared use and the overall parking plan?*
- *What changes in parking policies, regulations and requirements can positively influence economic development / redevelopment opportunities?*
- *Is it possible to more effectively manage the supply of public and private parking so that the needs of the different user groups are better accommodated?*
- *What mitigation strategies can help better manage parking demand and how can alternative forms of mobility play a key role supporting a park once strategy?*
- *How do events affect parking downtown and surrounding residential blocks?*
- *Will proposed new developments create additional pressures on the public parking system and how?*
- *Is additional parking needed and if so in what form and where?*
- *How can improvements, both capital and operational, be financed?*
- *What are the potentials for public/private partnerships?*

The goal of this study is to provide the City, DDA and stakeholders with answers to these and other questions and, in so doing, prepare a viable parking plan. We recognize that models and strategies that we have developed successfully for other cities will only succeed in Albion if they are tailored to respond to the unique characteristics of the City.

Scope of Work

Phase 1 - Study of Current and Future Parking Demand

Our approach, collecting and using unique data gathered in the subject area has proven to be a more realistic and accurate means of projecting current and future parking demand

Task 1 – Initial Meetings

1.1 Kick-Off Meeting

The goals and objectives of the study will be reviewed during a kick-off meeting. At the kick-off meeting we will review the overall work program, discuss significant issues and the survey instruments, distribution methodology, and dates for the utilization analysis. We will also review the boundaries of the study area to ensure that all major demand generators and supply providers are accounted for in our analysis. Prior to the kick-off meeting our team will request specific information and documentation. This information could include, but would not be limited to:

- current and past planning, parking, and/or traffic studies,
- existing parking counts,
- land use square footage by block,
- legal information pertaining to financing, special assessment, TIF, etc.
- current/future development and expansion plans,
- current zoning information, and
- a list of appropriate individuals to contact during the study.

1.2 Public Meetings

We recommend that public meetings be held. Our team will work with the City to determine the appropriate number of meetings and the timing. Our experience is that the more involved stakeholders are in the process and the more they feel that their thoughts and concerns are being considered, the more receptive they are to the recommendations even though they might not agree with all of them.

During the first public meeting we will meet with members of the community and present to them the purpose and goals of the study, the process, and a preliminary schedule. The goal is to introduce the community to the study process and answer any questions that they may have. We find by doing this prior to the survey and other data collection tasks that we get better response rates on our surveys.



Task 2 - Field Research and Data Collection

In this task various inventories and surveys will be completed to update current parking and land-use data that the City may already have. This information is vital to quantifying available parking and establishing parking characteristics unique to the study area.

2.1 Parking Space Inventory

We will review previous studies and current counts and inventories completed by the City. The current parking will be categorized by:

- on or off-street parking, ownership of parking and if leased by whom
- use restrictions and hours of operation
- parking mix - long term vs. short term, residential, commuter, etc.
- for on-street - the loading zones, ADA accessible spaces will be identified
- availability of parking - waiting lists for permit parking
- characteristics of the parking area such as lighting, circulation, access, surface conditions, signage, landscaping etc.

Parking inventory will be shown on tables and maps to further analyze the needs, demands, and locations of parking. The information about each parking area will be included on an electronic spreadsheet that will be given to the City so that you can easily update the information after the study as conditions change.

2.2 Land Use Review

All of the land use in the study area will be analyzed. Rich & Associates will review and verify the land-use data received from the City. To accurately assess both current and future parking needs, planned projects in the area will also be reviewed for their potential impact on the parking system. This will include an inventory of vacant space in existing buildings. The land use data base forms the basis for projecting current and future demand on each block in the study area.

2.3 Parking Utilization Analysis

The utilization analysis is used to determine how on and off-street parking is operating. This task provides the average hourly occupancy figures and turnover rates in selected areas. This data supports the demand projections and identify which, if any, parking areas are currently underutilized, at peak utilization and where parking allocation may need to be changed. Through this analysis we are also able to track if vehicles are being issued citations for violations. This allows us to track and evaluate enforcement. Using computer software written by Rich & Associates, we will illustrate the geographic distribution of usage among public and private parking areas. We will compare with any existing occupancy data, and data from the previous studies.

2.4 Business and Community Surveys

A key scope of work element is the on-line surveys conducted of businesses, their employees, customers and visitors to the downtown. The purpose of these surveys is to collect data specific to the parking experiences for each user group. These surveys are designed to collect specific data regarding land use types (parking demand generators) and the parking and modal characteristics from the business owners / operators, employees, institutions, patrons and residents. This data is used to develop a parking demand model and parking generation requirements specific to Albion for the comparison of City codes to national and industry standards.

2.5 Stakeholders Interviews

We will develop with the City a list of candidates for potential interviews. These could include but not be limited to key stakeholder groups such as the Albion Reinvestment Corporation (ARC), residents, business groups, City staff and City Council, and business leaders. These interviews will focus on identifying parking issues and needs, development and redevelopment plans and opportunities, and parking policies. The information from the public participation and stakeholder meetings is vital as it gives us a true sense of the parking issues and sustaining economic development / redevelopment.

2.6 Parking Operations & Management

An important part of a viable long-term parking plan is to make improvements to the existing parking system. Our scope of work includes an examination of the current parking operations including the following.

2.6.1 Existing Organization: As part of this process, we will review the organization or management structure overseeing the parking operations. The purpose of this review is to understand the roles and responsibilities of the person(s) involved in the daily management of the parking system, how assets are managed, how policies are created and enforced, etc.

2.6.2 Existing Facilities: Each of the public parking lots will be reviewed for current conditions. This is completed to project the maintenance costs of existing parking, and measure the attractiveness of each area, including lighting, security, cleanliness, etc. The lots will be reviewed in terms of ease of vehicle ingress and egress, circulation, pedestrian ingress and egress, and if there is the potential of adding additional spaces by redesign.

2.6.3 Parking Policy: In order to develop recommendations concerning parking operations and management, a review of the policies will be necessary. This review includes policies related to long term and short-term space allocation, permits, space turnover, in lieu parking payments if any, seasonal and special event parking, peripheral parking, and enforcement.

2.6.4 Special Use Policies: In order to function effectively, the system should be able to consistently apply policies regarding special needs by businesses. One manifestation of this type of consideration is short-term, loading access spaces that a business may need. Consistently providing short-term or loading spaces, such as one or two on the ends of blocks, can limit the need to place them in front of every such type of business. We will help the City develop the necessary policies for consistent application to accommodate special needs.

2.6.5 Parking Signage and Wayfinding: We will review the signage and wayfinding around the study area. The purpose is to assess the effectiveness of the signage at directing visitors to available parking, to the appropriate parking space, communication of policies and other pertinent information. To complete this task, we will complete a drive through of the study area with a video camera that is mounted in a vehicle at driver-eye level. The camera records what the driver sees from the vehicle with respect to signs and in general blocks out other visual cues.

2.6.6 Enforcement: The enforcement of policies will be reviewed along with the number of tickets written and the collection rate. The ticket history for the past five years will be requested for use in this analysis. We will also review current staffing, routes and methods of issuing tickets. Recommendations will be developed to enhance enforcement productivity and customer service. We will interview enforcement staff to get their first-hand observations on parking and enforcement in the downtown.

Downtown Parking Management Study Proposal

Albion, Michigan

Section 3 – Project Approach

Task 3 - Parking Demand Projections

The data collected during the fieldwork will be compiled and analyzed. The unique characteristics of the different user groups in the area will be defined and charted for comparison. We will compare parking demand generation factors calculated from the study to the Institute of Transportation Engineers (ITE) and City code. A computer analysis will be used at this point to review existing demand and supply. Future parking demand will then be factored into the analysis.

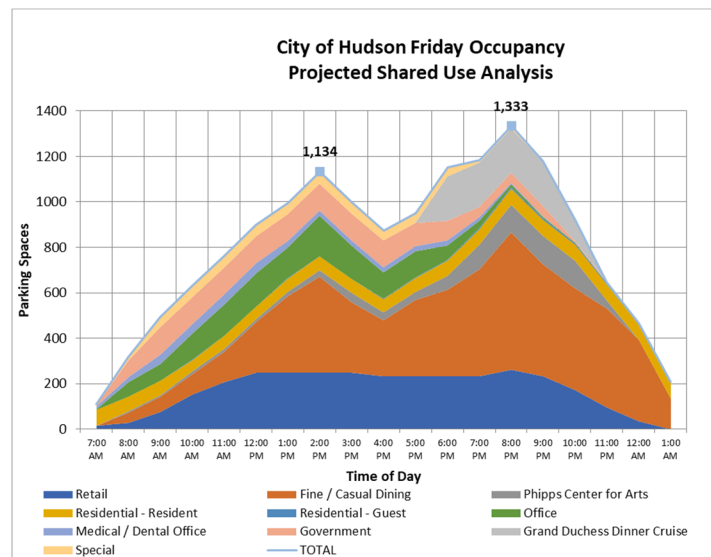
3.1 Current Demand

1. Summarize parking characteristics by land use and needs by block.
2. Project short term (ST), long term (LT) and any residential parking needs for both day and night.
3. Compare parking demand projections to utilization study results for those corresponding times to calibrate analysis.
4. Identify shared use parking impacts and opportunities.
5. In tabular and graphic form, show current parking supply and demand by block and block face.
6. Identify area of vacant parking spaces and how that availability impacts the surrounding blocks.
7. Where appropriate, divide the study area into blocks, neighborhoods or zones (Effective Block Parking Radius).
8. Identify surplus or deficit conditions by block, block face and zone.

3.2 Future Parking Demand

Future parking demand within the study area will be based on re-occupancy and infill of vacant space, new construction, changes in land use and in traffic patterns, alternative development scenarios identified in Task 1 and changes in parking operation. We will project future supply and demand by block. From this we can analyze areas of parking surplus or deficits.

Next, we will analyze different development/re-occupancy scenarios and forecast changes in parking demand on near term, mid-term and long-term basis. The results will compare and contrast the demand by block and study area as compared to the available supply for the same blocks. Parking needs will be separated into short-term or customer based, and long-term or employee-based needs using each of the various generation factors.



3.3 Review of Current and Future Parking

Parking demand will be projected for periods covering the short term (six months to 18 months), near term (18 months to five years), mid term (five to 10 years), and finally long term (10 to 15 years). We will review this information with the committee identifying blocks of current and future deficits or surpluses, as well as issues such as the need for additional parking, the related timing and costs, and how underutilized supply may be used more efficiently.

Task 4 - Preliminary Report Meeting

At this point a meeting will be held with the City and parking committee to review the preliminary report. This report will contain data compiled from the counts and surveys, analysis of the parking system, current and future demand projections, and an assessment of future downtown parking system needs. This meeting is designed to be a working session to review all aspects of the preliminary findings.

Based on the results of the preliminary report meeting, our analysis of the parking needs, and of the current financial conditions, we will begin the process of recommending the necessary improvements to contribute to the long-term economic vitality of the downtown. The elements of this parking improvement program will address all aspects of the system including;

- operational and management strategies,
- parking policy such as time limits, permits, fees and fines,
- parking allocation for customer/visitors, employees, and residents,
- new parking initiatives,
- loading zones, ADA spaces, and
- financing and capital improvements.

4.1 Public Meeting

Following the preliminary report meeting, we are proposing to conduct a second public meeting. The purpose of this meeting is to discuss the results of the parking demand analysis and open up a dialogue with the community about their issues and ideas on how to meet current and future parking needs. Based on the results of the preliminary report meeting, our analysis of the parking needs, and of the current financial conditions, we will begin the process of recommending the necessary improvements to contribute to the long-term economic vitality of the downtown.

Phase 2 – Recommendations

Task 5 - Parking Recommendations

Task 5 is the preparation of preliminary recommendations and implementation strategies for short and long term improvements combining parking system and management improvements, with capital improvements. The recommendations will provide a “tool box” of actions that can be used not only to improve management and operations but to address conditions as they change in the area.

5.1 Parking Management Strategies

Based on the results of the preliminary report meeting, our analysis of the parking needs, and of the current financial conditions, we will begin the process of recommending parking improvements to contribute to the long-term economic vitality of the downtown. The elements of this parking improvement program will address all aspects of the parking system including;

- operational and management strategies,
- public/private opportunities,
- incorporation private parking assets for shared use potential,
- review of City staff assignments and responsibilities for parking and how that could be more efficient,
- parking policy such as time limits, permits, fees and fines,

Downtown Parking Management Study Proposal

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Section 3 – Project Approach

- parking allocation for customer/visitors, employees, and residents,
- loading zones, handicap accessible spaces, and
- financing and capital improvements in the form of new parking, repairs to existing areas, signage, etc.

5.2 Use of Existing Parking Assets

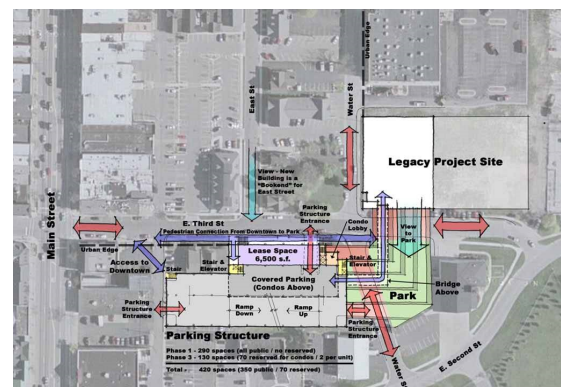
Based on the parking needs and our previous review of existing parking lots, we will evaluate each public lot to determine the feasibility of reconfiguring the parking to increase capacity and improve traffic flow. Often time's parking lots are perceived as being full if they are poorly configured, difficult to circulate through or difficult to access. This will include the following;

- potential for re-striping or re-layout to increase efficiency
- potential to add spaces by expanding the existing lot
- potential to combine public and private surface lots for greater efficiency
- review on-street parking and the ability to add additional spaces
- potential to improve vehicle ingress/egress and to improve pedestrian connections to their destinations.

5.3 New Parking Analysis

Based on our analysis and projections of parking demand within the study area, we will complete a site and feasibility study for the construction of new parking. Much of the information gathered in the previous tasks, particularly the demand projections by block and the analysis of future developments, will be used in this analysis.

5.3.1 Preliminary Program: Following the Phase One Report Meeting, the next step in the process is to review with the City a preliminary program for proposed new parking. This preliminary program will serve as a basis for analyzing site options. The program will address user requirements, mixed-use opportunities, revenue generation potential, traffic flow and circulation, pedestrian safety and connectivity to the downtown, transit and micro mobility opportunities, sustainable design strategies, etc.



5.3.2 Site Analysis: Based on the preliminary program developed in Task 5.3.1, we will evaluate potential site for new parking (lots and/or structure). This will include an analysis of:

- site proximity to generators, potential to maximize shared-use opportunities, and maximize revenue,
- sites that can promote or attract new development, re-occupancy of existing buildings,
- site - dimensions, topography, utilities, etc.,
- existing traffic flow and patterns to and from site,
- pedestrian flows from site to the various demand generators,
- access from surrounding streets,
- any environmental and historic site impacts,
- net add to the parking supply (account for any site that is an existing surface lot).

5.3.3 Concept Development: Following the site analysis, we will prepare concepts for new parking alternatives, including surface parking lots and multi-level parking facilities. This will include site plans and floor plans. We will include an estimate of probable construction costs. This information will be used in analyzing funding options and preparing revenue / expense pro forma.

5.3.4 Timing for New Parking: Parking development will be coordinated with demand to ensure that as new buildings are built and/or proposed the City will have the ability to decide if the new parking is needed. A development threshold model is a planning tool for the City to use when considering the timing for new parking. Rich & Associates will prepare a model that identifies what events will trigger the need for additional parking. An example of this is presented below.

5.4 Funding Strategies

Based on the various elements of the recommendations funding strategies will be investigated and recommendations made. The funding strategies will consider not only the capital costs but also the on-going operational and maintenance costs. The funding strategies will consider any existing revenue stream from existing parking operations, existing expenses, and changes proposed as part of this report.

We will consider possibilities for funding such as parking rates, funding from stakeholders such as assessments, possible grants or low interest loans, and public/private partnerships. Another strategy to be considered will be the timing of recommendations and the possibility of setting up a reserve fund that would be set aside for planned future projects/ improvements.

5.5 Revenue and Pro Forma Analysis

This task encompasses the body of work necessary to measure the economic stability of the parking system, the feasibility of recommended parking improvements, the financial impact of operational or system improvements, and the feasibility of capital improvements.

5.5.1 Operation Cost Analysis: Operating expenses will be projected based on historical increases and changes discussed with the City for the next 10 years. The operating expenses will also include routine maintenance, repair and replacement items. Any new parking areas or changes to the parking system will also be factored into the projected operating expenses. The operating costs will also include any non parking type operations.

5.5.2 Revenue Analysis and Projections: Preliminary revenue projections will be prepared using current utilization statistics of the existing system and potential parking pricing strategies. Additional revenue sources will be identified and projected if available. The following will be reviewed and recommended:

- parking rates and how they compare to market.
- operational methods and how recommendations will impact expenses and revenue.
- determine hours of operation for existing and proposed new parking and use this information to project revenue for existing system and proposed new parking.
- prepare sensitivity analysis to determine the impact on parking utilization and revenue based on different parking rates strategies.

Task 6 - Reports

6.1 Draft Final Report

A draft final report will be prepared and submitted to the City and parking committee for review and comment. Comments will be incorporated into the final report.

6.2 Draft Report Meeting

Rich & Associates will hold a draft report meeting which will be the third formal meeting between our team, and the City. The focus of this meeting will be to review the draft report and draft recommendations.

6.3 Final Report

Based on data obtained during the draft report meeting, We will make necessary changes to the report. The modified draft final report on the secure project FTP site for review by City. The final report will be prepared containing study results and appropriate maps, charts, and narratives to fully document the project work effort and results. The final report will include recommendations with implementation schedules, costs and benefits.

Near-Term Recommendations

1. Improve perception of parking i.e. signage, security, maintenance, marketing and promotional activities.
2. Increase parking supply through improved efficiency in existing areas.
3. Modify parking system space allocation.
4. Changes to parking ordinances, zoning, etc...
5. Consider new sites for parking.
6. Parking system management / operations improvements, policies, regulations, procedures, enforcement, etc.
7. Parking mitigation strategies.
8. Implementation (timing, sources, costs, funding).

Mid-Term Improvements

1. Identify need for new parking based on needs and development activities.
2. Consider land banking - surface parking now - structured parking in the future.
3. Financial impact, financing alternatives.
4. Vehicle and pedestrian traffic concerns.
5. Implementation (timing, sources, costs, funding).

Long-Term Improvements

1. Identify new parking to be implemented based on revised supply / demand analysis.
2. Site concerns for surface and structured parking options.
3. Parking mitigation measures (shuttle remote parking, vanpool, etc.).
4. Financial impact, financing alternatives.
5. Implementation (timing, sources, costs, funding)

Section 4 – Cost Proposal

Downtown Parking Management Study Proposal

Albion, Michigan

Section 4 – Cost Proposal

Costs

Our fee to complete the parking study is Twenty-Two Thousand Five Hundred & Fifty Dollars (**\$22,550**). This fee is based on our understanding of the project and proposed approach detailed in this section 3. The total fee breakdown is as follows.

Professional Fee	\$21,150
Expenses	<u>\$ 1,400</u>
Total Fee	<u>\$22,550</u>

Billing Rates

The following is a list of billing rates of the key personnel assigned to your project.

Richard W. Kinnell, AIA - Principal Parking Designer	\$165
David N. Rich – Principal Parking Consultant	\$145
Dave W. Burr – Project Manager	\$135
Sally Rich – Planner	\$70
Support Staff	\$55

CITY COUNCIL REGULAR MEETING AGENDA ITEM REPORT



To: City Council
Subject: APPROVE RESOLUTION #2022-28 A RESOLUTION TO SUPPORT THE REQUESTING OF \$250,000 FROM THE ALBION TRUST TO SUPPORT THE VICTORY PARK ICE ARENA AND KETCHUM FIELD IMPROVEMENTS
Meeting: CITY COUNCIL REGULAR MEETING - 15 Aug 2022
Department: Council
Staff Contact: Andrew French, (6)

ATTACHMENTS:

[Resolution 2022-28 Albion Trust Request](#)

Resolution #2022-28

A resolution to support the requesting of \$200,000 from the Albion Trust to support the Renovation of McAuliffe Park and Victory Park

Whereas, The Albion Community Foundation is making historic investments in city infrastructure and parks and recreation through the \$4 Million in projects outlined in the Blueprint for a Better Albion; and

Whereas, The Albion Trust specifically states that only the Albion City Council can request dollars to support infrastructure projects within the city and generally distributions may only be made to the City; and

Whereas, McAuliffe Park has a tremendous history and a major family entertainment site for residents on the west side of the Albion community that is adjacent to the Albion Malleable Iron Company (Harvard Industries); and

Whereas, The Albion City Council believes a vibrant park system is essential to maintain a strong sense of community engagement and attract economic development in the city; and

Whereas, McAuliffe Park is located on a main corridor that connects the rich industrial base to the Albion community. It features 10 acres with a baseball field, a basketball court, a picnic area, a playground, a flower garden, bathrooms, and is a part of the Albion River Trail running along the Kalamazoo River that can be used for walking, running, Biking, rollerblading, or skateboarding; and

Whereas, The Albion Community Foundation is in the last leg of raising the remaining \$700,000 to complete all 13 projects in the Blueprint for a Better Albion and has garnered over \$3 million in outside investment into the City of Albion, Michigan.

Council Member _____ moved, supported by Council Member _____, to approve the following resolution.

Now Therefore Be It Resolved, The Albion City Council officially requests that the Albion Trust Board consider a request for \$200,000 to be paid to the City of Albion to support specifically the McAuliffe Park improvements and the improvements to Victory Park. The City of Albion will, in conjunction with the Albion Community Foundation, pay said funds to the appropriate contractors performing improvements to the parks.

I hereby certify that the above resolution was adopted on August 15, 2022 at a regular session of the Albion City Council, and this is a true copy of that resolution.

Ayes _____

Nays _____

Absent _____

Jill Domingo, City Clerk

From: Council woman Lenn Reid, Pct. 2

To: CM Haley Snyder, Mayor V. Snyder, City Council Persons

Re: Monies being requested for projects

In our last council meeting the request for \$200,000 was requested for repairs to Ketchum Field and Victory Park but was voted down. Victory Park and McAuliff Park was suggested as more appropriate parks for T Ball since T Ball was once played there and they are more accessible and open as well as upkeep has been maintained on the grounds. I went to look at all three parks and came up with a suggestion as to what would be needed to make McAuliffe a positive place for families and community to come together for fun and T Ball.

McAuliff Park

Park Name Sign

Upgrade field area (markings for baseball diamond)

Bleachers (for those attending games to sit)

Repair of dugout for players

Scoreboard sign

McAuliff Park area

Either a Gazebo or small pavilion with tables for picnics and gatherings

2 BBQ pits in the park

Play Area Improvements (so children can play while adults watch the T Ball game)

Playground pieces (Swing set, baby, and bigger child swings) slide, climber,

Small bleachers by basketball courts

Benches by walking trail area

Bathroom

At this time the bathrooms in all the parks except Holland are not operational, but I have been told by CM Snyder that they will be in the near future.

Victory Park Large Pavilion

The large pavilion at Victory Park needs repair and I have spoken to Mr. Milton Barnes, since Playwright uses it, to find out what would be useful there for the youth he works with. I know roof, siding and floor repair is needed but what else in the makings?

Future Consideration

I would also like to inquire into improvements at The Joe McCrackin Ice Skating Rink in Reiger Park since parks are under consideration.

CITY COUNCIL REGULAR MEETING AGENDA ITEM REPORT



To: City Council
Subject: APPROVE CLOSURE OF E. ERIE STREET FOR BOSS UP FESTIVAL
Meeting: CITY COUNCIL REGULAR MEETING - 15 Aug 2022
Department: City Manager
Staff Contact: Haley Snyder, City Manager

BACKGROUND INFORMATION:

Mocara Ortiz has requested the closure of E. Erie Street down towards the Farmers Market and Rieger Park on Saturday, August 20th, for the Boss Up Festival.

CITY COUNCIL REGULAR MEETING AGENDA ITEM REPORT



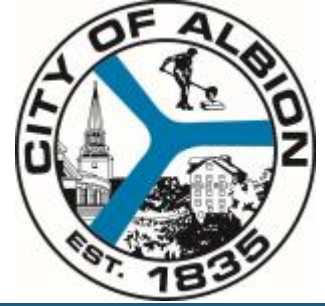
To: City Council
Subject: DISCUSSION TRANSPORTATION ASSET MANAGEMENT PLAN
Meeting: CITY COUNCIL REGULAR MEETING - 15 Aug 2022
Department: City Manager
Staff Contact: Haley Snyder, City Manager

BACKGROUND INFORMATION:

Although it appears the road millage passed based on the number of approved voters, the millage required a 2/3 majority approval. The millage required 60% approval, and there was only 57% approval by the voters. Unfortunately, the millage did not pass.

City Administration seeks direction from the council on how to proceed – work with Wightman to develop a street repair plan based on the city's current level of funding (3 mils) to complete the Transportation Asset Management Plan (TAMP) or pursue an additional millage.

CITY COUNCIL REGULAR MEETING AGENDA ITEM REPORT



To: City Council
Subject: DISCUSSION SUMMER EMPLOYMENT PROGRAM FOR TEENS
Meeting: CITY COUNCIL REGULAR MEETING - 15 Aug 2022
Department: Council
Staff Contact: Donivan Williams, (1)

BACKGROUND INFORMATION:

City Manager Snyder contacted surrounding communities to inquire about summer teen employment programs. Many communities do not have a formal program; however, teens are hired to fill seasonal positions throughout the summer. The City of Albion currently has three (3) seasonal positions for the summer months.

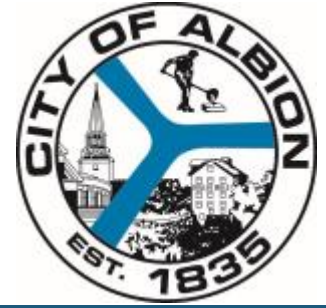
The City of Battle Creek does have a couple of teen programs - Recreation hires teens for the water park and summer kids camps. The Battle Creek Police Department hires teens as Cadets.

CITY COUNCIL REGULAR MEETING AGENDA ITEM REPORT



To: City Council
Subject: DISCUSSION PUBLIC SAFETY AD-HOC COMMITTEE
Meeting: CITY COUNCIL REGULAR MEETING - 15 Aug 2022
Department: Council
Staff Contact: Vivian Davis, (5)

CITY COUNCIL REGULAR MEETING AGENDA ITEM REPORT



To: CITY COUNCIL
Subject: DISCUSSION BARNES PARK
Meeting: CITY COUNCIL REGULAR MEETING - 15 Aug 2022
Department: Council
Staff Contact: Nora Jackson, (3)

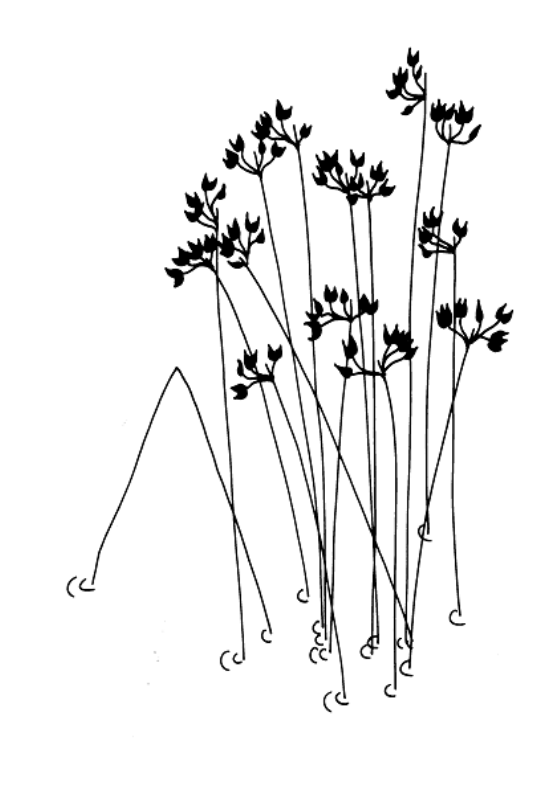
ATTACHMENTS:

[management-aquatic-plants \(1\)](#)

[CommonRootedAqPlants-MSUE-WQ-55 \(1\)](#)

[common-aquatic-plants-michigan \(2\)](#)

Management of Aquatic Plants



Management of Aquatic Plants

Introduction

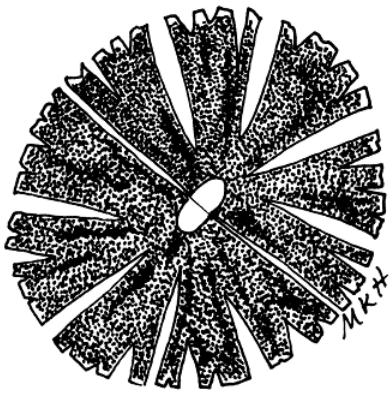
Aquatic plants are a vital part of any lake or pond. They convert sunlight and chemical elements into living plant tissue. Fish, waterfowl, insects, mammals, and microscopic animals use the plants for food. Plants also replenish the aquatic environment with oxygen, which is essential to aquatic animals. Additionally, rooted plants create a varied aquatic environment in which fish food organisms reside. They also provide cover for spawning fish, nesting waterfowl, shoreline mammals, and their young.

Although they are important to the aquatic environment, plants frequently conflict with recreational and economic interests. A need, therefore, exists for proper aquatic plant management to ensure that the natural environment and human interests are mutually protected. The Michigan Department of Environment, Great Lakes, and Energy (EGLE), Aquatic Nuisance Control (ANC) Program has developed this bulletin as a primer for those seeking information on aquatic plant management.

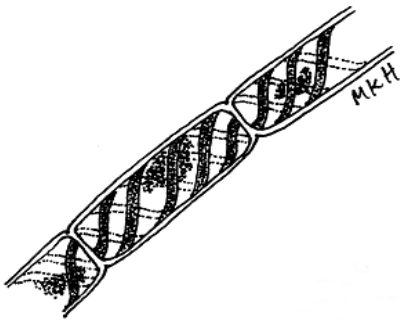
Aquatic Plant Types

The first step in any lake or pond management program should be to identify the aquatic plants present in that particular waterbody. The proper management of aquatic vegetation requires knowledge of the various plants that grow in lakes and ponds and their importance to the aquatic ecosystem. Although aquatic plants may be divided into many categories, a simple classification according to life forms and growth patterns divided them into only two categories: the algae and the macrophytes (rooted aquatic plants).

ALGAE



Algae are divided basically into planktonic, filamentous and macroalgae forms. Planktonic forms are microscopic, free floating plants often referred to as “water bloom”. In large numbers, these algae can cause water to appear green, brown, yellow or even red, depending upon the species present.



Filamentous algae, commonly called “pond scum”, can form raft-like masses over the water surface, but since they are vulnerable to winds and currents, they are generally restricted to bays, bayous and sheltered shorelines. Filamentous algae can also grow attached to the lake bottom, the macrophytes, or piers and docks. The filamentous algae will frequently detach from the substrate and form floating mats.



The macroalgae include two groups of native species, referred to as Chara and Nitella, and one non-native species, *Nitellopsis obtusa* (starry stonewort). These macroalgae are large and can resemble macrophytes.

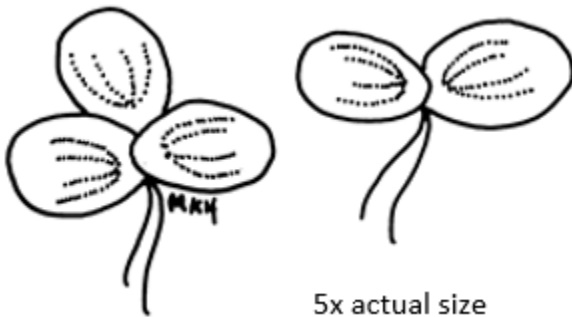
MACROPHYTES



The macrophytes are the rooted plants found in a lake or pond. They are usually large, easily seen plants; however, some are small enough that dozens of plants can be held in an individual's hand. The macrophytes may be divided into three basic forms: submergent, emergent, and free-floating. Submergent macrophytes usually grow rooted to the bottom with stems and leaves below the water surface, except for some plants which may produce a few small floating or aerial leaves. Submergent plants provide food and cover for fish, waterfowl, and other aquatic life.



Emergent plants grow in shallow water, with most of the plant protruding above the water surface. Cattails, waterlilies, arrowhead, rushes, and reeds are examples of emergent plants and, like the submerged plants, are important as food and cover for fish, waterfowl and other shoreline animals.



The free-floating macrophytes in Michigan are the duckweeds. These tiny plants are not attached to any substrate but float freely upon the water. They are subject to current and wind action which will concentrate them in certain portions of a lake. Some waterfowl utilize duckweed as food.

For additional help in identification of plants refer to the bulletin "Common Aquatic Plants of Michigan." County extension agents, chemical companies dealing in aquatic herbicides, universities, and EGLE district offices may also provide assistance.

What Makes Aquatic Plants Grow?

The distribution and abundance of aquatic plants in a lake is dependent upon the lake's chemical and physical properties including:

1. the amount of light available,
2. water levels,
3. water temperatures,
4. type of lake bottom sediments,
5. current or wave action, and
6. the concentration of dissolved gases and nutrients.

In lakes, nutrients and light availability are most often the factors which limit plant growth. Nutrients are the chemicals such as nitrogen, phosphorus, carbon, potassium, etc., which plants require for their growth. These nutrients originate in the rocks and soils surrounding the lake. Natural processes at work within the lake's watershed continually carry some of these nutrients into the lake. A lake's watershed is the land around the lake from which water drains to the lake (Figure 1). Lake watersheds vary greatly in size, topographic relief and the means by which water moves through the watershed (stream flow, groundwater movement, surface runoff, etc.). The natural movement of nutrients to lakes is, therefore, dependent upon the characteristics of the watershed.

Figure 1. This diagram represents a lake and its watershed. The broken line represents the drainage divide of the watershed. The arrows depict the pattern of overland flow.



As nutrients enter lakes from the watersheds, lakes respond by producing aquatic plants and algae. Limnologists (lake scientists) have for many years grouped lakes by a classification system based upon their productivity or ability to produce plants. Lakes that are low in productivity are called oligotrophic, while lakes high in productivity are called eutrophic.

Oligotrophic lakes usually:

1. are deep
2. have high oxygen concentrations in the deeper water
3. are very clear
4. have sparse populations of aquatic plants
5. are populated with cold water fishes such as trout and whitefish

Eutrophic lakes usually:

1. are shallow
2. have little oxygen in waters deeper than 30 feet
3. have murky water
4. have substantial growths of aquatic plants
5. are populated with warm water fishes such as bass, pike and bluegills

The term mesotrophic is often used to describe a lake with characteristics between oligotrophic and eutrophic.

All lakes will become more productive or “age” with time. This aging process, commonly referred to as “eutrophication” is dependent upon the lake’s physical characteristics and upon the quantity of sediments and nutrients washed into the lake from its watershed. Without human influence, the natural aging process is extremely slow often taking thousands of years to result in any noticeable changes in lakes. Human activity on the watershed, however, may greatly accelerate the aging process by increasing the quantity of sediments and nutrients entering the lake. This fact emphasized the importance of proper watershed management, especially at the shoreline of lakes and streams. Figure 2 illustrates a preferred watershed management plan vs. poor management of the watershed.

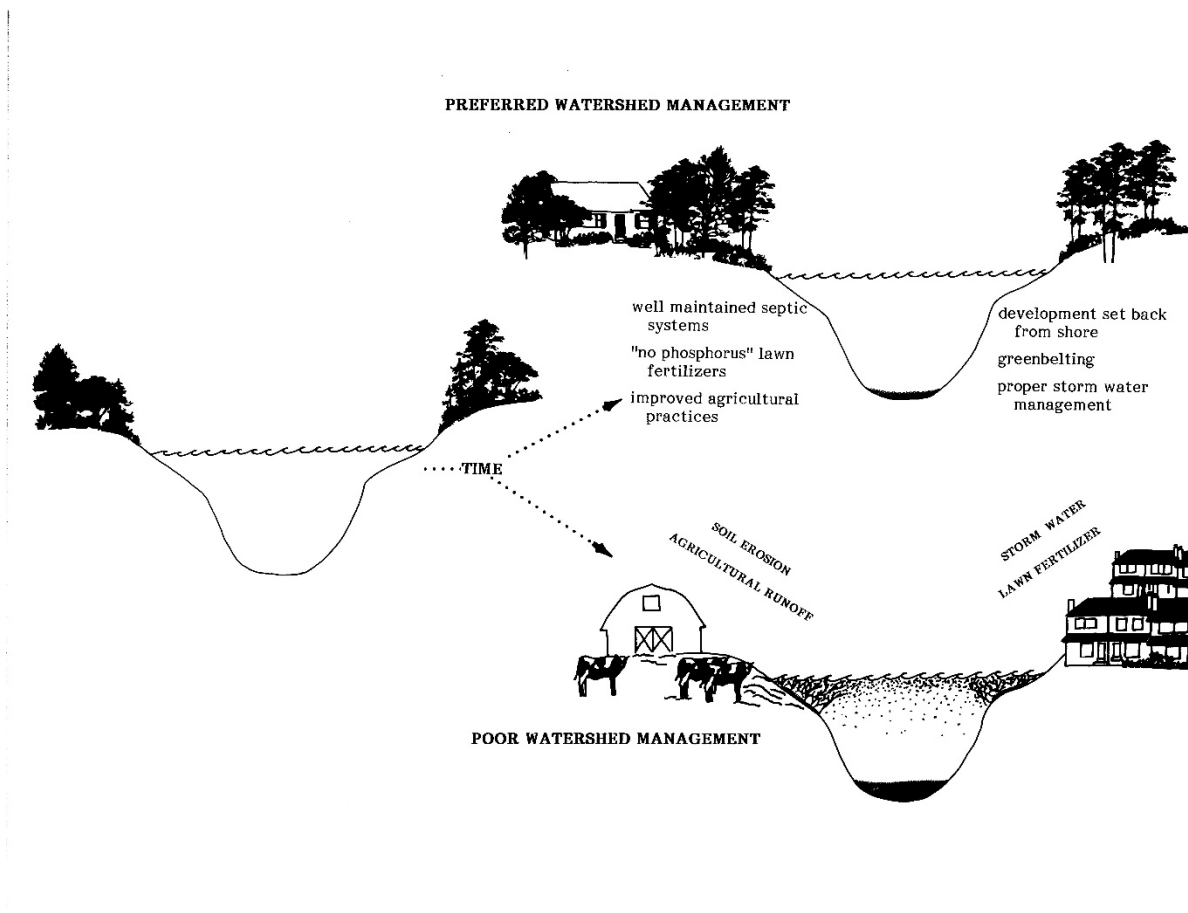


Figure 2. Preferred Watershed Management vs. Poor Watershed Management

The Aquatic Plant Management Program

The goal of any plant management program should be to maintain a proper balance of plants within a lake. Ideally, every aquatic plant management program will have two phases: (1) long-term management (nutrient control) and (2) short-term management (direct manipulation of macrophyte and algae populations). Short-term management is relatively easy to implement, but long-term management is more complicated. It requires considerable community involvement and cooperation, and results take years rather than days to develop.

The remainder of this bulletin will consider the principles and techniques of long-term and short-term aquatic plant management. Not every principle or technique presented will be applicable to every lake and even those that are should be evaluated carefully before using them. While economics must, of course, be considered, ecological values should receive prime consideration before any management technique is employed. Attention to ecological values may result in a program that is less costly over the period of a decade or two.

Long Term Management (Nutrient Control)

Aquatic plants require nutrients for growth and reproduction. The nutrients most often considered in shortest supply, and therefore limiting plant growth, are phosphorus and nitrogen. Since aquatic plant growth is directly dependent upon the amount of nutrients available, nuisance growth is a general symptom of high nutrient levels. This is important, as all too often aquatic plant control programs are directed only at the aquatic plants, and not at what causes the excessive growth (nutrients).

An effective aquatic plant management program must give proper consideration to the amount of nutrients entering the lake. Aquatic plant management techniques designed only to “kill weeds” must be considered temporary cosmetic measures to reduce the symptoms of high nutrient levels. Furthermore, this technique continues the cycle of nutrient addition, from the decaying plants, for future, excessive, plant growth.

It is more sensible to control the movement of nutrients from the watershed than to attempt remedial action after nutrients have entered the lake. Limiting the movement of nutrients into waterbodies requires management of nutrient sources. Natural sources of nutrients are those which would enter a lake, usually in small amounts, without human influence. However, cultural sources of nutrients are usually large in volumes as well as concentrations, and greatly accelerate the rate of eutrophication. Some nutrient sources, both natural and cultural, are listed in Table 1 below.

Table 1. Natural and cultural sources of plant nutrients to the aquatic environment.

Natural	Cultural
wetland runoff	domestic and industrial wastewater
meadow land runoff	agricultural runoff (cropland, feedlots, & pasture)
forest runoff	agricultural wetland drainage
precipitation on the lake surface	managed forest runoff
Non-human related soil erosion	urban stormwater runoff
aquatic bird and animal wastes	septic system discharges
leaf, pollen and dust deposition	landfill drainage
groundwater influxes	construction site runoff
nitrogen fixation by plants	lake shore lawn runoff
sediment recycling	atmospheric fall-out of wind-borne fertilizers

(Modified from Shannon and Brezonik, 1972. Relationship between lake trophic state and nitrogen and phosphorus loading rates. Environmental Science Tech. 6:719-725)

All nutrient sources will have different levels of manageability. Some may be uncontrollable, while others may be controlled with little effort or cost. Ideally, it is desirable to know which sources are contributing nutrients to a lake and in what quantities. It is then possible to adjust funds and activities to control nutrient sources to most effectively reduce the amount of nutrients entering the lake.

For lakefront property owners, and/or other concerned citizens, who are interested in monitoring a lake may be interested in the Cooperative Lakes Monitoring Program (CLMP) through the Michigan Lake and Stream Associations and the Michigan Clean Water Corps. The primary purpose of the CLMP is to help citizen volunteers monitor indicators of water quality in their lake and to document changes in lake quality over time. The CLMP is a cost-effective process for EGLE to increase the baseline data available for Michigan's inland lakes as well as to establish a continuous data record for determining water quality trends in lakes. More information on the CLMP can be found at Micorps.net/Lake-Monitoring.

The best time to begin a nutrient control program is before aquatic plants have attained nuisance levels. The management of nutrient sources is an on-going responsibility, which must be intensified as development of the watershed continues. Methods of nutrient source management include:

1. proper land use planning and zoning,
2. wise consumer use of commercial products,
3. treatment of inflowing waters high in nutrients,
4. diversion of water high in nutrients, and
5. municipal and industrial wastewater treatment.

Proper Land Use Planning and Zoning

Planning and zoning (P&Z) are public policies and laws used to regulate the use of land by local units of government. There are many objectives to P&Z, but primarily it is used to avoid land use conflicts, ensure compatibility with community characteristics, and protect public health, safety, and welfare. Over the years P&Z has evolved to include other objectives such as environmental protection. In order to meet the objectives through P&Z, local ordinances are established to include specific land use practices and should include compliance with state regulations where applicable.

In Michigan, the State Legislature enacted the Soil Erosion and Sedimentation Control Act of 1972 (Act No. 347 of Public Acts of 1972) to limit the movement of sediments and associated nutrients into surface waters during earth moving activities (except agricultural tillage).

Considerable resources regarding land use regulations can be found at the Michigan State University's Planning and Zoning Center website at www.pzcenter.msu.edu/natural.php. Some of the resources include Filling the Gaps: Environmental Protection Options for Local Governments, and Michigan Soil Erosion and Sedimentation Control Guidebook. In addition, there are other pages within the website that include other categories such as landscaping for environmental purposes.

Here are some examples of wise land use practices which reduce polluted runoff from land to waterbodies:

- Ensure the Soil Erosion and Sedimentation Control Act of 1972 (Act No. 347 of Public Acts of 1972) is properly implemented and advocate sediment control from logging and agricultural activities as well.
- Preserve wetlands through Purchase of Development Rights and/or publicly owned green space.
- Require or encourage native vegetation buffers and/or setbacks along lake and stream banks.
- Promote proper collection and land application of farm and feedlot wastes through the Right to Farm (RTF) program implemented through the Michigan Department of Agriculture
- Encourage sound farm fertilization practices, also through the RTF Program.
- Encourage proper collection and composting/disposal of leaves especially in the more urban areas.
- Require routine inspection and maintenance of catch basins in private developments. Limit or restrict the use of fertilizers on lawns adjacent to lakes and streams.
- Prevent stormwater drainage from directly discharging to a waterbody, by requiring subdivision designs to maximize infiltration and groundwater recharge.
- Regulate the size and use of lake and stream front lots and back lots to prevent over-development of the environment and its associated high nutrient loading.
- Prevent development in areas where the seasonal groundwater is higher than 3 feet below the bottom of the septic system. In addition, include a minimum setback of 200 feet or more from the shoreline for both structures and the septic system where seasonal high water tables are acceptable.
- If not already being done as part of the Michigan Municipal Separate Storm Sewer System program, ensure the community is educated in these various topics through community wide

education efforts (such as Public Service Announcements, billboards, brochures in tax mailings, etc.).

Wise Consumer Use of Commercial Products

By now it is well known that detergents and fertilizers can contribute significant amounts of nutrients to our waterbodies. However, proper use and management of these products, as well as alternative choices in detergents, would substantially reduce the loading of these nutrient sources. Specifically, waterfront property owners should take special care in the use of detergents and fertilizers.

To reduce phosphorus loading into waterways, high phosphate detergents have been banned in Michigan and several surrounding states. In addition, a phosphorous restriction law was passed in Michigan regarding fertilizers.

Many waterfront property owners prefer a nice mowed green lawn all the way to the edge of the water. However, a maintained lawn is also one of the primary causes of excessive nutrients to Michigan's waterbodies due to fertilizer runoff and the erosion of properties at the water's edge. A mowed lawn does not filter runoff or hold soil in place the way a well vegetated buffer of native plants will.

If lawns must be fertilized, soils should be tested to determine which chemical nutrients are needed. If the soil does not require phosphorus, a fertilizer with little or no phosphorus should be used. County cooperative extension agents can provide information on soil testing procedures and the best methods for applying fertilizers.

Of course, the most natural fertilizer, as well as easiest and cheapest, is simply leaving the grass clippings in place. This provides the necessary nitrogen for new growth through natural breakdown.

Better yet, native landscaping could be incorporated into one's yard. Along the water's edge, this contributes not only to nutrient treatment and soil stability (further discussed below), but is beneficial to native pollinators, native birds, and other wildlife and fish. Native landscaping is almost maintenance free once it is well established and can be as simple as a 10-foot wide buffer to an elaborate beautiful garden setting.

One excellent resource is the Michigan Natural Shoreline Partnership program, information about natural shoreline management can be found at <https://www.shorelinepartnership.org>.

A great source for waterfront property owners is [Landscaping for Water Quality: Garden Designs for Homeowners 3rd Edition](#), The Environmental Protection Agency also has an extensive resource on natural landscaping at <https://www.epa.gov/watersense/landscaping-tips>.

Treatment of Inflowing Waters

An inflowing stream, drain, or overland runoff may carry substantial amounts of nutrients and other pollutants collected from sources such as agricultural activities, urban stormwater drainage, industrial stormwater, and construction stormwater. While it is always easiest, cheapest, and best to prevent pollution from discharging to a waterbody, in some situations it is possible to treat polluted waters.

While there are regulatory programs in place for industrial, municipal, and construction wastes and stormwater, other programs are voluntary, or incentive based. In regard to these regulatory programs, Michigan.gov/EGLEStormWater be consulted. Here you will find information, permitting, and guidance for all three storm water regulations. Keep in mind, the municipal storm water program only applies to urban areas, but the guidance on this subject can still be used for more rural areas.

While most polluted agricultural runoff is not regulated, Michigan does have a Right to Farm program that includes guidance on following the Generally Accepted Agricultural Management Practices (GAAMPs). This program is implemented through the Department of Agriculture and Rural Development (MDARD). The [MDARD Right to Farm webpage](#) not only includes the information, but also includes multiple environmental programs for agriculture.

Treatment of nutrient-laden water, outside the realm the regulatory programs mentioned above can include: (1) reviving and/or expanding existing wetlands, (2) establishing new wetlands, infiltration ponds, and/or rain gardens, (3) modifying drainage areas, and (4) establishing filter strips along waterbodies and drainage ditches. In addition, there are multiple other resources for treatment and/or management of nonpoint source pollution in the publication [Landscaping for Water Quality: Garden Designs for Homeowners 3rd Edition](#), mentioned in the previous section.

Short Term Management of Aquatic Plants



Although the initial and continuing phase of aquatic plant management should be the control of nutrient sources, many lakes have such serious plant problems that short-term management techniques may be needed to maintain the recreational and economic interests in the lake. Also, in cases where nutrient control is impractical, such as shallow reservoirs on major, agricultural or urbanized river systems, short-term management practices may have to be conducted annually. Even in such cases, however, under no circumstances should the complete eradication of aquatic

plants be considered. This practice is environmentally unsound and could have very undesirable consequences. In some lakes it may be necessary to alter recreational activities somewhat to suit the lake's state of eutrophication, rather than attempt to change the lake to meet recreational demands. In situations where nutrient control is possible, short-term management techniques should be considered only as temporary measures, designed to replace nuisance plant species with plant species that conflict less with recreational and economic interests.

The short-term methods of managing aquatic plants include:

1. biological control,
2. mechanical harvesting,
3. environmental manipulation, and
4. use of herbicides.

These methods are directed primarily at the results (aquatic plants) of nutrients entering the lake and not at reducing the flow of nutrients. In some cases, however, nutrient levels with the water system may be reduced incidentally with certain techniques.

Biological Control

Biological control of aquatic vegetation is presently the least understood and utilized of the four short-term management techniques. Biological control normally includes the introduction of an organism that competes with, preys upon, inhibits the growth of, causes disease in, or parasitizes a plant species which has created a problem.

The introduction and release of exotic, foreign or non-native insects, fish or other animals into Michigan without specific authorization is strictly forbidden by state laws (Act No. 286 of the Public Acts of 1929; Act No. 196 of the Public Acts of 1958). At the present time, there are two biological control techniques being applied in Michigan waters. These methods are not regulated by state agencies, therefore, if you are interested in these programs, please contact the program directly.

The Purple Loosestrife Program was initiated by Michigan State University and Michigan Sea Grant College Program as an ecologically-sound approach to the biological control of purple loosestrife, an exotic plant species native to Europe and Asia that inhabits wetland areas. This program introduces natural insect enemies, or biological control agents, to existing purple loosestrife populations. The biological control agents feed on the leaves, and stem and root tissue, causing defoliation and eventually plant death.

Previous attempts have been made to control Eurasian watermilfoil using specific weevil species. However, the efficacy of those attempts is undetermined and currently no entity is pursuing this method as a means of invasive milfoil management.

Mechanical Harvesting

Mechanical harvesting involves the pulling or cutting and removal of macrophytes from selected areas of a lake. It may employ hand tools or highly sophisticated motorized cutting or rotovating devices. The harvesting of algae from lakes appears presently to be economically infeasible primarily due to very high energy costs to remove the microscopic plants from water.

When large areas of aquatic plants are harvested, the cut material should be removed from the lake. If left in the lake, the cut plant parts will decompose, sometimes only partially, and contribute nutrients and organic material to the lake bottom. This, in turn, helps to nourish new plant growth. In addition, during biological decomposition of the cut plant material, dissolved oxygen levels may be lowered. This can affect the delicate balance between the water and sediment chemistry. Low oxygen levels also affect fish and fish-food organisms. Removing cut material from a lake may even improve water quality somewhat if the amount of nutrients removed (in plant material) is greater than the amount of nutrients entering the lake from the watershed.

Mechanical harvesting also has drawbacks which must be considered. It has a high initial investment if a specially manufactured harvester is purchased. Many of these machines are large, heavy, and can be damaged by obstructions (logs, boulders, and debris) hidden below the lake surface. Additionally, harvesting could aid the spread of a plant problem, since fragments of certain plants could drift into unaffected areas, take root and grow.

Environmental Manipulation



The objective of environmental manipulation is to alter one or more physical or chemical factors (listed in “What Makes Aquatic Plants Grow?”) critical to plant reproduction and growth thus making the environment less suitable to the plant. Several techniques have been used with varying degrees of success. These methods may not be economically or environmentally practical in every lake. Even in practical situations, a technique should be employed only after the particular plant problem, and social and economic factors have been carefully considered. Environmental manipulation can provide some control of aquatic plants, but without reduction of nutrient inputs, any results achieved will be only temporary. Since most of these methods are somewhat technical, only a brief discussion of each is given below. Most of these activities require a permit from EGLE.

Dredging reduces nuisance aquatic macrophytes by deepening the lake bottom below the depth of light penetration. Reduction of the size of the well-lighted zone around the shore will reduce the total amount of macrophytes. The disadvantages of dredging include a temporary increase in silt suspended in the water, which on settling in non-dredged areas can smother bottom living animals. Additionally, a suitable upland site must be available for the disposal of dredge spoils.



Aeration is the introduction of air into the waters of a lake for the purpose of increasing the dissolved oxygen concentration of the water. Aeration is most effective in lakes which are devoid of oxygen in the deep water. Keeping oxygen in the bottom waters will prevent the release of nutrients from sediments. As long as nutrients remain chemically bound to the sediments in the deeper parts of the lake, they are less available for aquatic plant growth. Decreases in nuisance algal populations and a shift to more favorable species have been reported following aeration, but this result is not always observed. Control of aquatic plants by aeration has not been demonstrated. A possible disadvantage of aeration is that it can be detrimental to cold water fishes (trout) if warm surface waters are mixed with cool bottom waters making the total lake environment unsuitable for these fish species. There are methods of aerating only the deeper waters, however. The use of an aerator may also cause the re-suspension of bottom muds which may increase turbidity (“cloudiness” of the water).

Nutrient Inactivation is the application of a chemical to a lake that binds with and otherwise immobilizes nutrients necessary for plant growth. Once immobilized, the nutrients settle to the lake bottom. This method is appropriate for algae control but has little effect on the growth of aquatic plants. The chemical substance used to immobilize and settle out the nutrients is usually a metal ion (iron, aluminum, calcium). The settling process may also reduce suspended solids and decrease turbidity and color, in addition to inactivating nutrients. This technique is expensive and may adversely affect the small animals that serve as fish food.

Drawdown or water level manipulation is a potential mechanism for controlling certain types of aquatic vegetation. In this technique, water levels are lowered for a period of time to expose shallow water areas. This dries out the exposed plants and kills them. Many submerged macrophytes are susceptible to this procedure, but certain emergent macrophytes benefit from it. In addition, this method does not control algae. A drawdown period of approximately two months is necessary for drying and freezing to be effective during winter drawdown.

Dilution or displacement of low-quality water with water of higher quality may lessen algae problems but may not affect plant growth. A supply of higher quality replacement water must be available as well as an acceptable means of disposing of lower quality lake water.

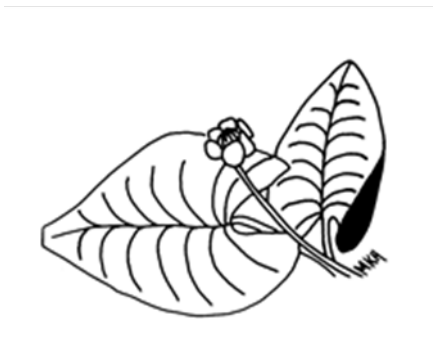
Shading for prolonged periods (4 weeks or longer) has been effective in reducing certain submerged macrophytes by light limitation. Light reduction using water dyes has been tried with some success in ponds. In Michigan, usage of these products is limited to waterbodies smaller than 10 acres. Black plastic sheeting has been used as a floating shade. Its success on small areas (swimming beaches) is good for certain submerged macrophytes and of limited control value for emergent vegetation. However, problems with wave action and currents limit the usefulness of a floating plastic shade primarily to small ponds. The plastic sheeting should be removed after five to six weeks of shading in the spring. This method does not effectively control the growth of algae.



Covering of bottom sediments with sheeting material (such as black plastic) and/or particulate material (sand, clay) can perform two functions in controlling aquatic plants. It can prevent the exchange of nutrients from the sediments to the overlying water and it can retard the establishment of rooted aquatic macrophytes. Disadvantages of this technique are that bottom dwelling animals are usually killed when the sediment is covered and often gas is produced under the plastic sheeting causing it to float to the surface. Sheeting is now available that has pores which allow gases to escape. Experience with this technique so far has resulted in good temporary control. However, macrophytes will gradually recolonize the area unless the sheeting is removed periodically and cleared of any growth.

Intensive use and periodic manual clearing of shoreline areas will in many instances prove to be an effective means of aquatic plant control in small beach areas. The rooted plants must produce sufficient food in their leaves to maintain their root systems. Frequent cutting of the leaves or their destruction by wading and swimming will eventually lead to death of the root system. This technique is particularly effective with emergent vegetation such as water lilies. Like weeding the garden, it is necessary to watch for the early development of potential problems and remove the plants as they become established and before they spread over large areas.

Use of Herbicides



Chemical control is another means of temporarily controlling aquatic plants and algae. There are a number of chemicals available which offer varying degrees of action time, persistence, cost, selectivity and safety to humans, other mammals and aquatic animal life.

When herbicides are part of an aquatic plant management program, special care must be taken to protect both the environment and individuals involved, since herbicides are potentially dangerous to both. To promote the proper use of aquatic herbicides Part 33, Aquatic Nuisance Control, of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended, has granted regulating authority over the application of these compounds to EGLE. A permit is required from EGLE prior to any chemical treatment of a waterbody. The only exemption from this permit requirement is treatment of a pond which is less than ten (10) acres, does not have an outlet, and which is owned by only one person or corporation. Even in situations where a permit is not required, only herbicides registered for use in lakes and ponds may be used. A current list of these herbicides, and permit applications, are available from EGLE, Water Resources Division, Aquatic Nuisance Control, P.O. Box 30458, Lansing, Michigan 48909-7958, EGLE-WRD-ANC@Michigan.gov, 517-284-5593, or Michigan.gov/ANC.

It is important that herbicides be used with extreme care. Herbicides require special handling such as protective clothing for application and posting of treated water so that innocent swimmers or fishermen are not exposed to potentially harmful chemicals. Before applying any chemical always read the product label completely and follow all instructions. Take special note of all warnings on the label to avoid any personal injury and dispose of all empty chemical containers as directed. The product label will also explain the best methods for using the product, as well as rate of application and a list of plants which may be controlled by the product.

If you do not have the proper training or equipment to apply herbicides, you may wish to contact a licensed aquatic herbicide applicator. A list of commercial applicators licensed by the Michigan Department of Agriculture and Rural Development (MDARD) to apply herbicides to the aquatic environment is available from the [MDARD Pesticide Section](#). Additionally, the ANC Program is available to answer questions which may arise concerning chemical control of aquatic plants or other aspects of inland lake management.

It is important to point out that the use of herbicides to control aquatic plants has certain drawbacks. Most herbicides control all forms of plant life to some extent. Beneficial aquatic plants may be killed along with the nuisance plants. It is also difficult to control the drift of herbicides under certain

conditions. Consequently, plants may be killed over a much wider area than intended. Additionally, herbicides give only temporary control. In lakes where herbicides are used repeatedly on a large scale, dramatic shifts in plant populations can occur which may seriously alter the lake's ecology.

In calculating the proper amount of herbicide to use, the first step is to determine the surface area to be treated. In the case of small ponds, this can be done by direct measurement with a tape. For waterbodies of unusual shape, divide the surface into distinct areas, each of which is a shape with which you can deal. The surface area of each section can be calculated, and the areas added together to give the total area of the waterbody. In the case of man-made ponds, the engineer or surveyor who designed the pond may already have the surface area calculated. If the area has been calculated in square feet, divide the number by 43,560 square feet/acre to obtain the number of acres. Example: treatment area of 100 feet x 200 feet = 20,000 sq. ft.; $20,000 \text{ sq. ft.} \div 43,560 \text{ sq. ft./acre} = .459 \text{ acre}$, or about one-half acre.

For some herbicides, the application rate is expressed as gallons or pounds per acre-foot. To calculate the acre-feet of a treatment area, multiply the surface area (in acres) by the average depth (in feet). If a depth contour map of the lake or pond is available, the average depth can be calculated from it. If not, the average depth can be measured through the use of a pole or sounding line (a calibrated cord with a weight at one end). Generally, in an area used for swimming or docking of boats, an average depth of 3-5 feet can be used.

If there are questions that you would like to ask, or if you simply need more information, contact:

Aquatic Nuisance Control Program
Water Resources Division
Michigan Department of Environment, Great Lakes, and Energy
PO Box 30458
Lansing, MI 48909-7958
EGLE-WRD-ANC@Michigan.gov

Additional References:

Introduction to Freshwater Vegetation by Donald N. Riemer, Krieger Publishing Company, Melbourne, Florida, 1993 reprint (hardcover 218 pp.) 1-800-724-0025

A Manual of Aquatic Plants by N.C. Fassett, revision appendix by E.C. Ogden, University of Wisconsin Press, Madison, Wisconsin, 1969 (hardcover, 405 pp.)

Illustrations by Maureen Kay Houghton, formerly of Michigan Department of Environmental Quality, Environmental Science and Services Division.

For information or assistance on this publication, please contact the Aquatic Nuisance Control Program through EGLE Environmental Assistance Center at 800-662-9278. This publication is available in alternative formats upon request.

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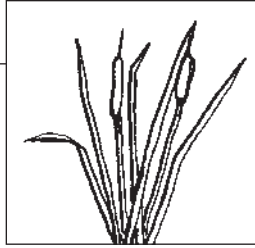


Water Quality Series: WQ-55



A Citizen's Guide for the Identification, Mapping and Management of the Common Rooted Aquatic Plants of Michigan Lakes





**A Citizen's Guide
for the Identification, Mapping
and Management of the
Common Rooted Aquatic Plants
of Michigan Lakes**

by

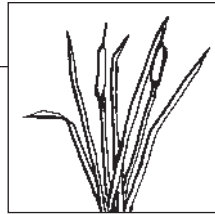
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Michigan Lake and Stream Associations, Inc.

May 2007 (2nd edition)



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MICHIGAN LAKE & STREAM
 ASSOCIATIONS, INC



Preface

This citizen's guide to the identification, mapping and management of rooted and some non-rooted aquatic plants is for riparians and others interested in Michigan lakes. It does not replace the advice of a professional aquatic ecologist, which most lake associations will find essential. Effective management requires informed citizens and professional guidance. The purpose of this manual is to help citizens know and understand aquatic plants and work with their professional consultant, contractor, Extension agent and governmental agencies to effectively manage an incredibly valuable resource — their lake.

Rooted aquatic plants include both the attached and free-floating rooted plants. Some of the larger aquatic plants, such as coontail and stonewort, are also included in this guide even though they do not possess true roots. Algae, the small, often microscopic plants, are not addressed in this manual. Though not covered here, the algae are important to the lake ecosystem. Any comprehensive lake management plan will address not only the rooted plants and algae but animal communities, watershed inputs and recreational needs. The lake is a complete ecosystem and should be managed holistically to provide the greatest benefit for present and future generations.

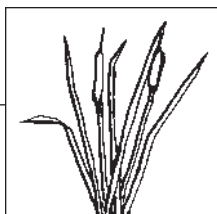
Aquatic plants are a natural and essential part of the lake, just as grasses, shrubs and trees are a natural and essential part of the land. Their roots are a fabric for holding sediments in place, reducing erosion and maintaining bottom stability. They provide habitat for fish, including structure for food organisms, nursery areas, foraging and predator avoidance. Waterfowl, shore birds and aquatic mammals use plants to forage on and within, and as nesting materials and cover. Though plants are important to the lake, overabundant plants can negatively affect fish populations, fishing and the recreational activities of

property owners. In this situation, it is advantageous to manage the lake and its aquatic plants for the maximum benefit of all users.

The chapters of this manual cover important topics for understanding aquatic plants. The first seven chapters are building blocks for Chapter 8, the management plan. Working through the chapters, the user will learn to recognize the importance of lake ecology and watershed management (Chapter 1), discern the values of aquatic plants and their interactions in the lake environment (Chapter 2), identify and characterize the common plants of Michigan lakes (Chapter 3), make a plant collection (Chapter 4), map the plants growing in a lake (Chapter 5), secure public input (Chapter 6) and select appropriate management options and tools (Chapter 7). Chapter 8 then guides the user through the development of a plant management plan for the lake.

The purpose of the manual is to assist in the development of a management plan, but the user may employ individual chapters for specific needs. Periodically, Michigan Lake & Stream Associations, Inc., MSU Extension and others may offer training in the use of this manual.

In this edition, updates are provided on herbicides, scientific name changes for plants and the invasive species hydrilla. As of Spring 2007, hydrilla has not been found in any Michigan lakes.



Copies of this book (ask for WQ55) are available from
your local county Extension office, or from:

MSU Bulletin Office
117 Central Services
Michigan State University
East Lansing, MI 48824-1001
phone: 517-353-6740
www.emdc.msue.msu.edu

or

Michigan Lake and Stream Associations, Inc.
P.O. Box 249
Three Rivers, MI 49093-0249
phone: 616-273-8200

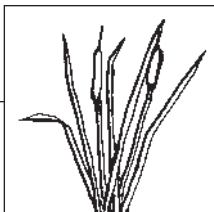


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Chapter 1

The State of Your Lake and Watershed

Introduction

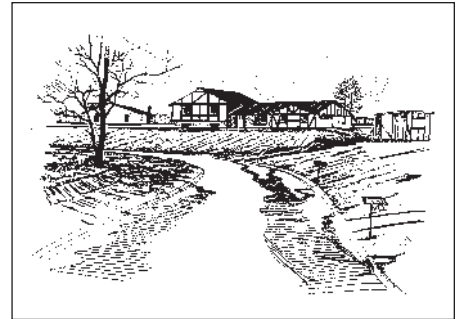
Lakes are not created equal — some are naturally large, deep and clear; others are naturally small, shallow and muddy. Generally, large, deep lakes have limited aquatic plants, while small, shallow lakes have an abundance of plants. Good resource management of aquatic plants requires knowledge of the condition of the lake and the land surrounding it. Though important, the scope of this manual does not permit a comprehensive presentation of lake ecology or land management. These issues are more completely developed in other references specifically devoted to aquatic science and resource management. The reference section at the end of the chapter refers the user to these other documents, which should be consulted for additional information. This chapter provides only an introduction to lakes and their watersheds. A lake's watershed is the land surrounding the lake across which water drains to reach the lake.

Eutrophication — the State of Lakes

All lakes “age” or naturally become more fertile with time. The rate of this aging process, referred to as “natural eutrophication”, depends on the lake's characteristics and the



quantity of sediments and nutrients that wash into the lake from the watershed. The more sediments and nutrients a lake receives, the more fertile it becomes and



Urban street runoff.

the more plant life it produces. In most lakes, natural eutrophication is a very slow, gradual process requiring thousands of years to evolve. Rapid lake aging, often referred to as cultural eutrophication, is an accelerated input of these materials and is associated with the activities of people. Human development of a lake's watershed increases the supply of nutrients available on the land and the speed at which these nutrients are transported to the lake. With cultural eutrophication, the fertility of a lake is increased rapidly and a decline in water quality often occurs.

Scientists have classified lakes by their level of fertility into three groups or “trophic states”. These trophic states are “oligotrophic”, “mesotrophic” and “eutrophic”. Lakes exhibiting these three trophic states are characterized in Box 1.1.

It is important to know the trophic state of the lake for management of aquatic plants, because oligotrophic lakes naturally have few aquatic plants, while eutrophic lakes naturally have many. Aquatic plant control program goals should be realistic and appropriate for the lake's trophic state. Merely controlling plants will not bestow upon a eutrophic lake the qualities of an oligotrophic lake. Excessive and inappropriate vegetation control in a eutrophic lake is detrimental to its plant and animal communities. It also increases the lake's instability and susceptibility to exotic invaders and aggressive native species. Chapter 2 will explain more about aquatic plant communities and the need to manage them appropriately.



Box 1.1 Lake Classifications

<p>Oligotrophic</p>	<p>The lake is typically deep with a sandy bottom. The water is clear because of low algal populations. Aquatic plants are few and limited to protected bays and inlet areas where incoming nutrients and sediments allow some growth. The deep water maintains dissolved oxygen during the summer months. Trout and other cold-water fish species are present.</p> <p>Measures :</p> <ol style="list-style-type: none"> 1. Summer Secchi disk average is greater than 15 feet. 2. Summer surface total phosphorus values are less than 10 ug/l. 3. Summer chlorophyll <u>a</u> values are less than 2.2 ug/l.
<p>Mesotrophic</p>	<p>The lake is usually of good quality, but bays tend to have mucky bottoms. Aquatic plants are common on protected shores but less prevalent on wave-washed shores. The water is less clear and an occasional algal bloom will occur. The water below 30 feet loses oxygen during the summer; and cold-water fish species are rare.</p> <p>Measures:</p> <ol style="list-style-type: none"> 1. Summer Secchi disk average is between 7.5 and 15 feet. 2. Summer surface total phosphorus values are between 10 and 20 ug/l. 3. Summer chlorophyll <u>a</u> values are between 2.2 and 6 ug/l.
<p>Eutrophic</p>	<p>The lake is generally shallow, and the water is usually turbid and colored. Aquatic plants are usually abundant in shallow water. Water below 30 feet is often devoid of oxygen, and the lake supports warm-water fish such as bass, bluegill and pike.</p> <p>Measures:</p> <ol style="list-style-type: none"> 1. Summer Secchi disk average is below 7.5 feet. Water clarity may be higher if rooted plants are very abundant. 2. Summer surface total phosphorus values are over 20 ug/l. 3. Summer chlorophyll <u>a</u> values are over 6 ug/l. (Chlorophyll <u>a</u> values may be less than 6 ug/l if rooted plants are very abundant.)

Lake Watersheds

A lake's fertility, and therefore the amount of aquatic plants present, is greatly influenced by its watershed characteristics, including watershed size, topography, soil fertility, drainage patterns and land use. These watershed characteristics determine the quantity of nutrients, such as nitrogen and phosphorus, that will be washed into the lake from the land to stimulate plant growth. Generally, the larger the watershed

and the greater the percentage of agricultural and urban land in the watershed, the greater the supply of nutrients to the lake. Without an understanding and consideration of how watershed characteristics influence aquatic plant growth, a control program may be incomplete and/or misdirected. Please see the reference section for information on watersheds and their management. The book *Developing a Watershed Management Plan for Water Quality* (available online at: www.deq.state.mi.us/documents/deq-swg-nps-watershe.pdf)



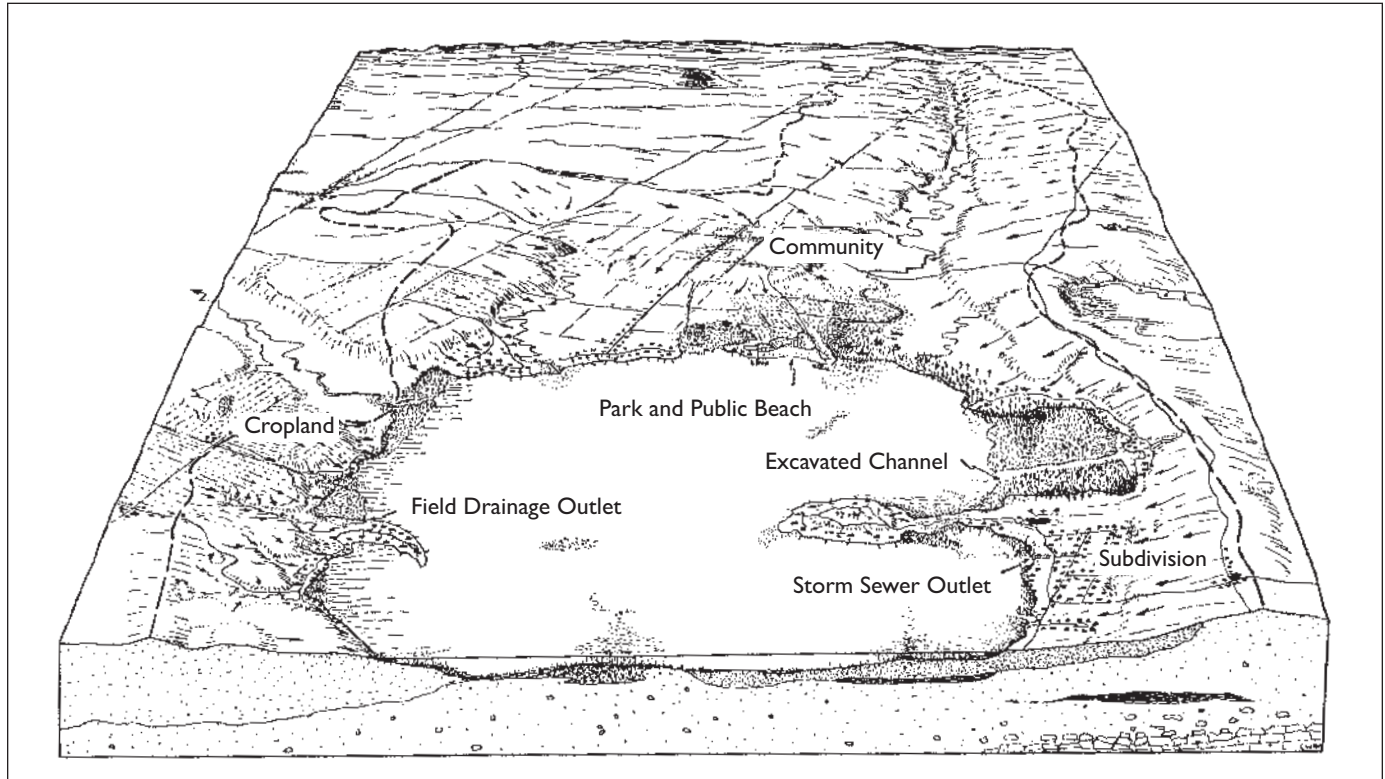
is an excellent resource on Michigan watersheds. For many lakes, a watershed component will be an important and critical element of an aquatic plant management plan.

Watershed Management as Part of a Plant Control Program

Just how important is a watershed management program for your lake? A preliminary assessment of the desirability and feasibility of watershed management as part of an aquatic plant control program may be made by considering the lake's trophic state and watershed size. A lake's trophic state is important to consider because low fertility oligotrophic and mesotrophic lakes change more dramatically with increased nutrient concentrations than more fertile eutrophic lakes. Watershed size affects management efforts by determining the magnitude of the problem and the level of effort needed to control the problem. The larger the watershed, the greater the number of potential sources of sediments and nutrients.

With more sediment and nutrient sources, lakes with large watersheds will need greater efforts to make meaningful reductions in nutrient and sediment inputs. As the watershed gets larger, the feasibility of managing the sediment and nutrient sources decreases.

To help determine the importance of having a watershed management program, a matrix using trophic state and watershed size, as measured by watershed/lake area ratio, is provided in Box 1.2. A lake's watershed/lake area ratio is calculated by dividing the area of the watershed by the area of the lake. Watershed size is available for many lakes from state resource agencies or can be delineated by a professional consultant or estimated by an individual familiar with map interpretation. A lake's trophic condition may be estimated by comparing the values provided in Box 1.1 with data collected in a quality-controlled study or program such as the Cooperative Lakes Monitoring Program sponsored by Michigan Lake & Stream Associations, Inc., and the Michigan Department of Environmental Quality. The importance of



A lake and its watershed.

(from Marsh & Borton, *Inland Lake Watershed Analysis — A Planning and Management Approach*.)



watershed management is weighted toward the low fertility lakes. It is more practical and economical to prevent cultural eutrophication in oligotrophic and mesotrophic lakes than to try to reverse its effects once the lake has become eutrophic.

Using the data for your lake's trophic state and watershed/lake area ratio, find the recommended importance of watershed management in Box 1.2. Depending on your lake and watershed, a watershed management component may be a very important element of your aquatic plant management plan. Use the documents listed in the reference section below to guide your watershed management efforts.

Box 1.2 **Importance of Watershed Management**

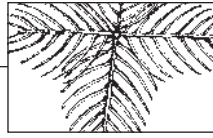
Ratio watershed/lake area	Trophic state of the lake		
	Oligotrophic	Mesotrophic	Eutrophic
Less than 10	Extremely Critical	Critical	Important for long-term benefits
10 to 30	Critical	Important	Where economically and practically feasible
Greater than 30	Important	Where economically and practically feasible	Management only of major discharges



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Chapter 2

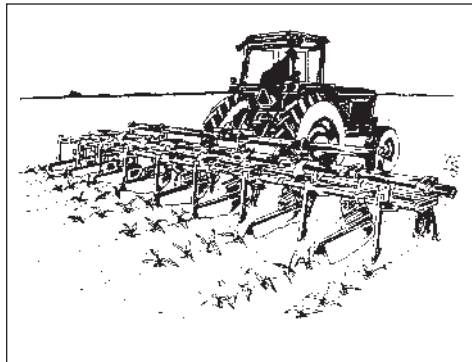
Aquatic Plant Communities

Introduction

Biological communities are made up of individuals from many species. In harsh environments such as the arctic tundra or deserts, the community consists of a few species but many individuals of each species. Such environments are said to have low species diversity. Alternatively, a tropical rain forest has thousands of species, each represented by a small to moderate number of individuals. Such an environment is said to have high species diversity.

Diversity provides stability to a community. In highly diverse communities, a serious decline in one species generally has little impact on the overall community. In a community of low diversity, however, a serious decline in one species cascades through the entire community. Impacts are major, and it may take years to reorder community structure. Consequently, maintaining community diversity is important in good resource management of natural environments.

In artificial environments, such as a farm field, diversity is completely eliminated to benefit one species, the crop being grown. In such environments, tremendous energy and cost must be expended to maintain the monoculture community. These efforts can never be terminated or reduced as long as the crop is going to be grown. Relaxing the efforts even slightly allows aggressive "weed" species to colonize the highly disturbed and unnatural environment.



Monoculture farm field.

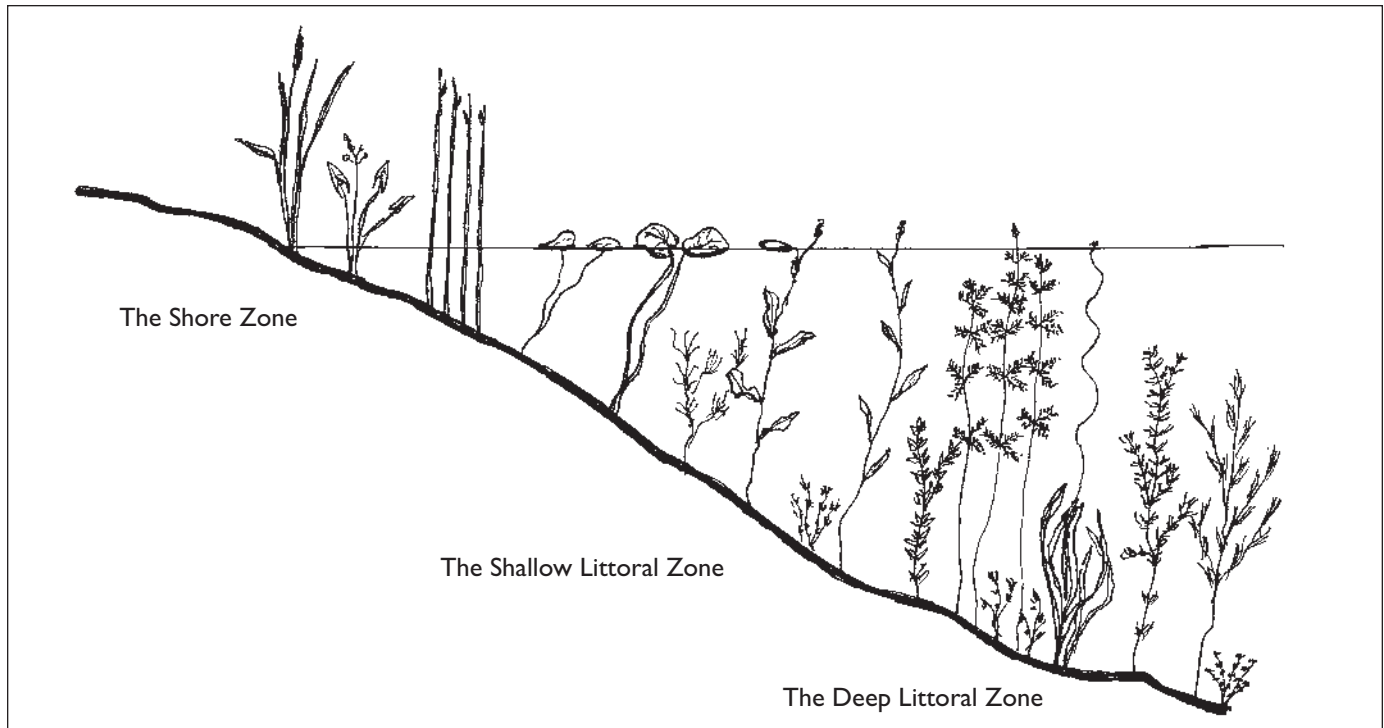
An environment greatly altered from its natural condition, such as a farm field, must progress through a succession of changes before again resembling its original natural state, most commonly a forest. The first stage of this succession, as a general rule, is the colonization of the altered environment by one or two aggressive "weed" species. Gradually, additional species return to the community. The number of individual organisms remains basically constant, but the number of species increases, expanding diversity and community stability. After many years, a forest is again growing where the farm field had been.

It is important to know and understand a lake's natural condition or trophic state. If a lake is naturally fertile, or eutrophic, it should have an abundant plant community. Aquatic plant control projects that greatly alter this community can damage its diversity and increase susceptibility to aggressive weed species. Once it's altered, many years may be needed to reestablish the lake's natural plant community.

The Lake's Plant Community

A lake's rooted plants (except the free-floating ones) extend from the moist soils of the shoreline to water depths of 15 to over 20 feet in clear Michigan lakes. This part of the lake is called the littoral zone. Typically, plants form concentric rings or zones from shore within the littoral area (see Figure 2.1).

The **shore zone** is dominated by plants with emergent leaves extending above the water surface such as cattail, bulrush, arrow arum, arrowhead and pickerelweed. These plants have root systems that extract minerals and nutrients from water-saturated soils and aerial leaves to obtain carbon dioxide from the air. They grow from the wet soils of the beach out to a water depth of 2 to 4 feet. These are the transition plants bridging the zone from the terrestrial to the aquatic environment. They are the critical habitat for amphibians, fish, reptiles, aquatic mammals, shore birds and waterfowl living at the water's edge. It is the shore zone vegetation that has been most significantly altered by human development. Many lakes

Figure 2.1 **A Lake's Aquatic Plant Communities**

have little of their original native shore left. Most of this zone now consist of lawns, seawalls and filled beaches, which provide little or no habitat for the animals that once lived at the shore.

Beyond the shore zone is the **shallow littoral zone**, which is populated with species of submerged plants, many of which have floating leaves. Common plants of this zone include water lilies, water shield, and many species of the pondweed or *Potamogeton* genus. The zone extends from about 2 feet of water depth out to 6 to 8 feet.

In the **deep littoral zone**, plants grow entirely submerged or with only a small tip breaking the water surface. Plants of this zone tend to have small, thin or finely divided leaves. These leaves have a high surface area/volume ratio, possibly improving photosynthesis and gas exchange in the darker deep water. Common plants of this zone are milfoil, coontail, sago pondweed, other thin-leaved pondweeds, bushy pondweed, stonewort, waterweed and wild celery. This zone starts at about 6 feet of water depth and extends out to the limits of rooted plant growth — 12 feet in more turbid lakes, and 20 feet or more in very clear lakes.

These zones create distinct and unique conditions for a wide range of plant species. Indeed, most lakes have many plant species growing during the summer season. Plant surveys of lakes conducted by Dr. Miles Pirmie (see publication in reference section) and associates in the 1920s found an average of 12 to 16 relatively abundant species of aquatic plants per lake. The Michigan Department of Natural Resources (MDNR) found similar results during lake surveys in the 1970s and '80s.





Exotic Invaders

Every plant and animal species has control agents such as predators, herbivores, parasites, fungi and/or diseases regulating its population. This is a natural process in continuous operation in the environment. Even humans have agents that control their numbers. Aquatic plants also have controlling agents. In a natural, diverse environment not artificially controlled or manipulated by humans, no one aquatic plant species significantly dominates for long. As its population expands, so do its control agents. Eventually, these control agents reduce its population.

Sometimes, however, a plant community is altered by an action favoring one or more species. This may occur with the intentional or accidental introduction of an exotic species. The new colonist is often able to outcompete the native plant species and expand to exceptional population levels. Support for this population explosion comes from the fact that agents that limited the exotic species' numbers in its home range are not present in the new environment. Without control agents to curb its population, the exotic has a competitive advantage over native species and is able to reach great densities. The native species trying to compete with the exotic are often greatly reduced or even eliminated.

A population explosion of an exotic plant sometimes gives rise to inappropriate plant control measures. As an example, when Eurasian milfoil invades a lake, some citizens notice the change not as a shift in plant species but as a case of all the plants "going wild". In reality, the number of individual plant organisms is relatively constant, but diversity has been lost as a community of many native species, with a few individuals in each species, has shifted to a community of one or two exotic and aggressive native species with many individuals. Without recognizing that a shift in the plant community has occurred, control actions are directed at the entire plant community rather than targeting the nuisance exotic. Indiscriminate controls on the entire plant community further encourages the exotic by reducing competition from the remaining native vegetation, thus prolonging the dominance of the exotic invader.

Given enough time, the environment evolves to restrain exotic species. Diseases, parasites and predators of native species similar to the exotic species shift to take advantage of

the exotic's large population. Eventually, the exotic becomes just another member of the community. The time required for this naturalization process varies greatly, depending on the species involved and environmental conditions, but it usually takes many years.

To accelerate the naturalization process, environmental regulatory agencies often return to the home range of a nuisance exotic to find controlling agents. After many years of quarantine and research to ensure that the control agent itself will not create problems, it is released to provide long-term control of the nuisance exotic.

The Altered/Managed Plant Community

Maintaining a desirable plant community in a large-scale plant control program will be difficult. Community succession attempts to fill the void left by plants that have been controlled with aggressive species. To achieve the best results and minimize the spread of exotic and aggressive native species, careful monitoring of the plants and continual adjustment in the control tools will be necessary to fine-tune the management plan.

In developing a management plan for aquatic plants, a key element is a vegetation goal. What will the plant community look like after implementation of controls? This is particularly important if controls are to be implemented on a large scale, resulting in significant changes in the plant community. The locations and densities of desired species should be plotted to produce a vegetation goal map. The map is used to audit the success of the control program and to implement changes to the program so results better approximate the goal.



Vegetation provides habitat for fish.



If the management plan calls for significantly altering the plant community from background conditions (see Chapter 7 — Large-scale continual maintenance), the Department of Natural Resources has provided a recommendation (Fisheries Division Position Statement – Aquatic Nuisance Control – 4/22/05) for maintaining the environmental integrity of the lake.

“Fisheries Division recommends that native macrophytes (submerged, floating-leaf, and emergent aquatic plants) not be removed or killed. Limited removal of nuisance aquatic vegetation may be warranted in certain situations (such as removal to provide access channels); however, treatment should not adversely affect the diversity and relative distribution of native aquatic plants in the water body. Any removal of nuisance aquatic vegetation should preserve 60% to 80% of the native aquatic plants as a measure of cover during the active growing season (May-September). Aquatic vegetation management should be performed only in conjunction with watershed management practices that reduce unnatural nutrient loading.”

Knowing the lake's natural trophic state, setting realistic management goals, defining and mapping the management objective, and monitoring for project results and modifications needed to achieve management goals will minimize damage to the lake environment and improve the potential for success.

References

See references at the end of Chapters 3 and 7.



Chapter 3

Identification and Portraits of the Common Aquatic Plants of Michigan Lakes

Introduction

When managing aquatic plants, it is important to know them well enough to encourage beneficial species and discourage those that often cause problems. This chapter provides an identification key and descriptive portraits for about 35 of the most common plants found in Michigan lakes. Each species has unique growth characteristics, shape, reproductive pattern, germination time and other features. For most lakes, the key and portraits will identify 70 percent or more of the plants found in them. If a plant does not fit key descriptions, it is possibly not a species identified by the key. For more complete references and plant keys, see the reference section at the end of the chapter.

When identifying plants, the citizen monitor needs to know and understand lake conditions. Environmental circumstances can significantly alter plant growth and characteristics. As an example, a drop in lake level results in water lily leaves extending out of the water, rather than floating on the surface. Nutrients and light levels can alter the size of a plant and its leaves. If uncertain about a plant, a monitor should



consult with an aquatic ecologist for assistance. Pressing and mounting unknown plants, as described in Chapter 4, allows an aquatic ecologist to identify them later.

Materials Needed

The following items are helpful when identifying plants. A shallow white pan keeps the plants damp. If unavailable, use wet paper towels. A magnifying glass assists viewing of smaller plant parts, which are sometimes important in identification. A toothpick or pointed tool is useful for separating leaves for viewing. A ruler will be needed for measuring the plant and leaves.

How to Use the Key

There are seven parts to the key (see page 13). Each part is a grouping of plants with similar characteristics. The first step in identification is deciding which part of the key best describes the unknown plant.

To continue identification, turn to that part of the key best describing the plant. At this point, the key becomes dichotomous, requiring the user to choose between two alternatives. Each choice directs the user to the next set of alternatives to evaluate. This process of selecting between two alternatives continues until identification is complete and a scientific and common name are provided for the plant, as well as a portrait number. The descriptive plant portraits, depicting the characteristics of each plant, are grouped together and follow the identification key.

Figures or drawings illustrating important plant characteristics are part of the key. Of necessity, each drawing is to a different scale. To provide a perspective for size, approximate lengths for leaves, flowers or whole plants are included with most figures.



Identification and Portraits of the Common Aquatic Plants of Michigan Lakes

Glossary of Terms Used in the Key

The identified figures provide examples for the characteristic.

Alternate leaves — only one leaf at each position on the stem (Figures 3.24, 3.25, 3.32, 3.34 and 3.35).

Central axis — a single stalk in the center part of a leaf (Figures 3.37 and 3.39).

Clasping leaf — a leaf that has no petiole but is broadly attached directly to the stem (Figures 3.51 and 3.54).

Floral bract — a very small leaf growing on the stem just below a flower (Figures 3.38 and 3.41).

Lanceolate — a leaf shape similar to the head of a spear (Figures 3.47 and 3.57).

Midrib — a central vein in a leaf (Figures 3.17 and 3.23).

Oblong — longer than wide and with nearly parallel sides (Figures 3.52 through 3.54).

Opposite leaves — two leaves at the same position on the stem but on opposite sides (Figure 3.43).

Petiole — the stalk of a leaf, which attaches it to the stem (Figures 3.18 and 3.57).

Spike — a group of flowers growing together in an elongated cluster (Figures 3.11, 3.14 and 3.18).

Stipule — a flap-like appendage attached at the base of the petiole (Figures 3.24 through 3.26 and 3.51).

Whorled leaves — many leaves arranged in a circle around the stem (Figures 3.29, 3.37 and 3.39).

How to Use the Portraits

A descriptive portrait is provided for each of the plant species in the identification key. These portraits give valuable information about the plants that will be helpful when preparing management plans. The plant key refers the user to a portrait number for each plant species. The portrait numbering code groups the plants by general growth pattern. Free-floating plants are numbers 1 through 4. Emergent plants growing along the shore, commonly in less than 3 feet of water, are numbers 6 through 14. Short submerged plants,

forming low meadows on the lake bottom, are the 20s. Submerged plants growing 2 to 5 feet tall are the 30s. Tall submerged plants growing in scattered patches are the 40s, and tall submerged plants growing in large dense mats are the 50s. Not all numbers are used. This allows the sampler to include and number plants common to their lake but not included in the key and portraits. These same numbers may be used when mapping plant populations in the lake, as described in Chapter 5.



In the portraits, each plant is generally classified as beneficial (+), neutral (0) or nuisance (-). Depending on the circumstances, however, a beneficial plant can be a nuisance and a nuisance plant can be a critical component of the plant community. The portrait also describes each plant's growth characteristics, habitat, beneficial traits, nuisance traits and other details.



Identification and Portraits of the Common Aquatic Plants of Michigan Lakes

References

Below are references for those monitors wishing other guides for identifying aquatic plants.

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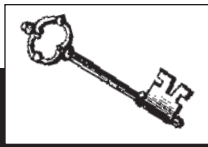
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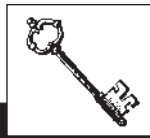
Westerdahl, H.E., and K.D. Getsinger. 1988. **Aquatic Plant Identification and Herbicide Use Guide — Volume II Aquatic Plants and Susceptibility to Herbicides**. Washington, D.C.: U.S. Army Corp of Engineers.



A Citizen's Key to the Common Rooted Aquatic Plants of Michigan Lakes

Parts to the Key

Plants that float on or grow above the water surface.		
Part One	<i>(See page 14.)</i>	Free-floating Plants — Plant floats free in the water; not attached to the lake bottom in any way. Plants small, less than ½ inch in size. <i>(See figures on page 15.)</i>
Part Two	<i>(See page 16.)</i>	Plants with Leaves that Extend Above the Water — Plant with leaves that extend out of the water. <i>(See figures on pages 17 and 18.)</i>
Part Three	<i>(See page 19.)</i>	Plants with Floating Leaves — Plant with a small or large leaf that floats on the surface of the water. <i>(See figures on page 20.)</i>
Plants growing entirely below the surface of the water.		
Possible exception is a small flower/seed stem that extends a short distance out of the water.		
Part Four	<i>(See page 21.)</i>	Plants with Leaves Thread- or Needle-like — Submerged leaves thread- or needle-like. <i>(See figures on page 22.)</i>
Part Five	<i>(See page 23.)</i>	Plants with Long, Ribbon-like Leaves — Submerged leaves long and ribbon-like — about 10 times longer than wide. <i>(See figures on page 24.)</i>
Part Six	<i>(See page 25.)</i>	Plants with Complex and Finely Divided Leaves — Submerged leaves complex and finely divided. <i>(See figures on pages 26 and 27.)</i>
Part Seven	<i>(See page 28.)</i>	Plants with Oval, Oblong or Lanceolate Leaves — Submerged leaves oval, oblong or lanceolate, as small as ½ inch or as long as 8 inches. <i>(See figures on pages 30 and 31.)</i>

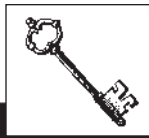


A Citizen's Key to the Common Rooted Aquatic Plants of Michigan Lakes

Part One

Free-floating Plants

#1	<p>Choose one of the following:</p> <p>Plants small, between 1/8 and 1/2 inch in size, with flat, floating leaves and small, dangling roots (Figs. 3.1 - 3.3)..... go to #2</p> <p>Plants round and very small, less than 1/8 inch in size, with no roots (Figs. 3.4 and 3.5). <i>Wolffia</i> spp. (watermeal) see Portrait 1</p>
#2	<p>Choose one of the following:</p> <p>Plants with round, flat leaves joined together at a common point (Fig 3.1) go to #3</p> <p>Plants with spade-shaped leaves connected by narrow stalks (Fig 3.3). <i>Lemna trisulca</i> (star duckweed). see Portrait 2</p>
#3	<p>Choose one of the following:</p> <p>Plant leaves red on the lower surface, more than 5 roots (Fig 3.2). <i>Spirodela polyrhiza</i> (big duckweed). see Portrait 4</p> <p>Plant leaves green on the lower surface, a single root (Fig 3.1 and Plate 4). <i>Lemna minor</i> (lesser duckweed) see Portrait 3</p>



A Citizen's Key to the Common Rooted Aquatic Plants of Michigan Lakes

Part One

Free-floating Plants

(Plants very small — drawings approximately 10 times larger than plant)



Fig. 3.1

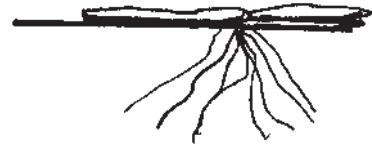


Fig. 3.2 (actual size less than 1/4 inch)

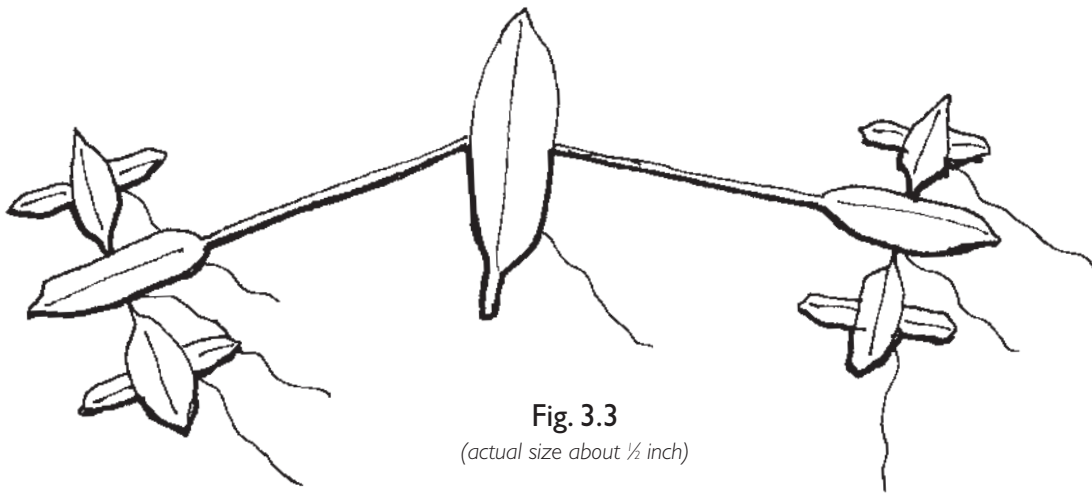


Fig. 3.3
(actual size about 1/2 inch)

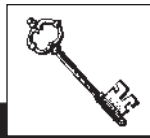


Fig. 3.4



Fig. 3.5 (actual size less than 1/8 inch)

Fig. 3.1: *Lemna minor* (lesser duckweed), Fig. 3.2: *Spirodela polyrhiza* (big duckweed), Fig. 3.3: *Lemna trisulca* (star duckweed), Figs. 3.4 and 3.5: *Wolffia* spp. (watermeal).



A Citizen's Key to the Common Rooted Aquatic Plants of Michigan Lakes

Part Two

Plants with Leaves that Extend Above the Water

#1	<p>Choose one of the following:</p> <p>Leaves other than arrowhead-shaped (Figs. 3.6 - 3.11) go to #2</p> <p>Leaves arrowhead-shaped (Figs. 3.12 - 3.17) go to #4</p>
#2	<p>Choose one of the following:</p> <p>Leaves narrow and usually several feet long, extending well out of the water (Figs. 3.6 and 3.8) go to #3</p> <p>Leaves oblong, usually less than 6 inches long. Plant may be growing erect in shallow water or as a limp vine with floating leaves trailing through the water (Fig. 3.10). Pale pink to red flower spike extends above the water (Fig. 3.11). <i>Polygonum</i> spp. (smartweeds) see Portrait 11</p>
#3	<p>Choose one of the following:</p> <p>Leaves ribbon-shaped, approximately 1 inch wide. Flower, if present, borne on a long, cylindrical spike (Figs. 3.6 and 3.7). <i>Typha</i> spp. (cattails) see Portrait 6</p> <p>Leaves cylindrical, about the diameter of a pencil. Flower, if present, borne near the tip of the leaf (Figs. 3.8 and 3.9). <i>Scirpus</i> spp. (bulrushes) see Portrait 7</p>
#4	<p>Choose one of the following:</p> <p>Leaves with a network of veins branching from a strong midrib (Figs. 3.16 and 3.17). <i>Peltandra virginica</i> (arrow arum) see Portrait 8</p> <p>Leaves with a network of veins not as above but generally radiating from a central point near the petiole attachment (Figs. 3.13 and 3.15) go to #5</p>
#5	<p>Choose one of the following:</p> <p>Leaf veins generally radiating outward from the petiole attachment to the leaf margin (Fig. 3.13). Flower, if present, a small, simple flower with three white petals (Fig. 3.12). <i>Sagittaria</i> spp. (arrowheads) see Portrait 9</p> <p>Leaf veins radiating parallel from the petiole attachment to the leaf tip (Fig. 3.15). Flower, if present, a bluish, dense spike (Fig. 3.14). <i>Pontederia cordata</i> (pickerelweed) see Portrait 10</p>



A Citizen's Key to the Common Rooted Aquatic Plants of Michigan Lakes

Part Two

Plants with Leaves that Extend Above the Water

Fig. 3.6
(actual size
3 to 6 feet)

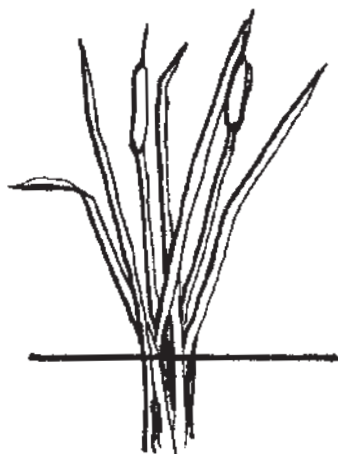


Fig. 3.7
Flower detail
(actual size
6 to 8 inches)



Fig. 3.8
(actual size
3 to 6 feet)

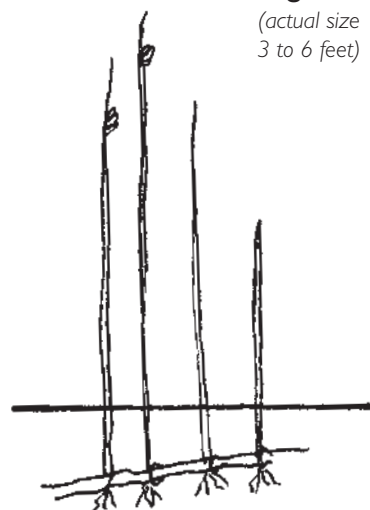


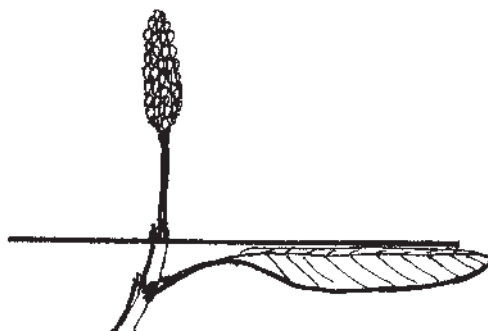
Fig. 3.9
(actual size
3 to 6 inches)



Fig. 3.10
(actual size
3 to 5 feet)



Fig. 3.11
Flower detail
(actual size
3 to 5 inches)



Figs. 3.6 and 3.7: *Typha* spp. (cattails), Figs. 3.8 and 3.9: *Scirpus* spp. (bulrushes), Figs. 3.10 and 3.11: *Polygonum* spp. (smartweeds),



A Citizen's Key to the Common Rooted Aquatic Plants of Michigan Lakes

Part Two

Plants with Leaves that Extend Above the Water

Fig. 3.12

(actual size 1 to 3 feet)



Fig. 3.13

Leaf detail
(actual size 5 to 9 inches)

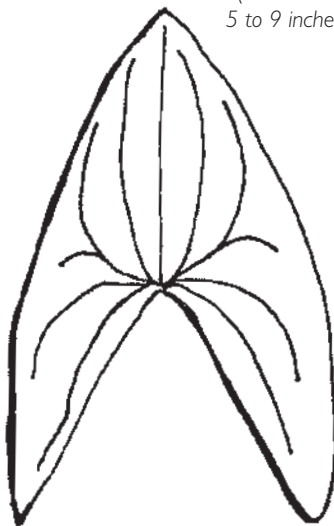


Fig. 3.14

(actual size 1 to 3 feet)

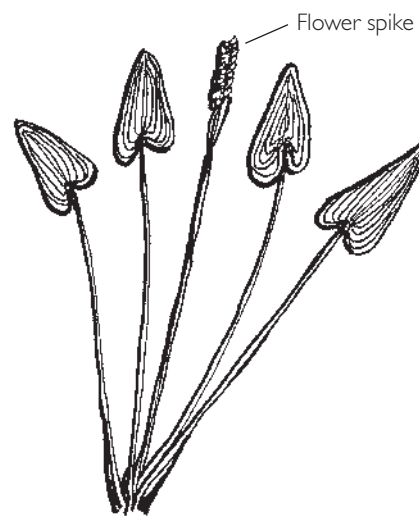


Fig. 3.15

Leaf detail
(actual size 5 to 9 inches)

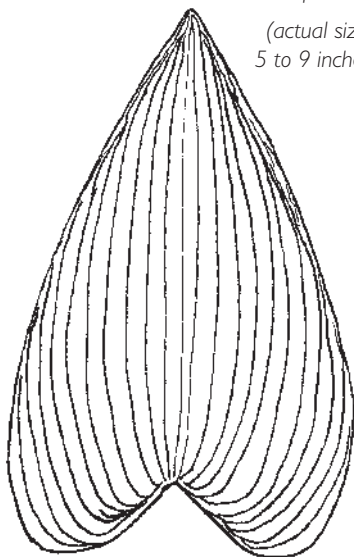


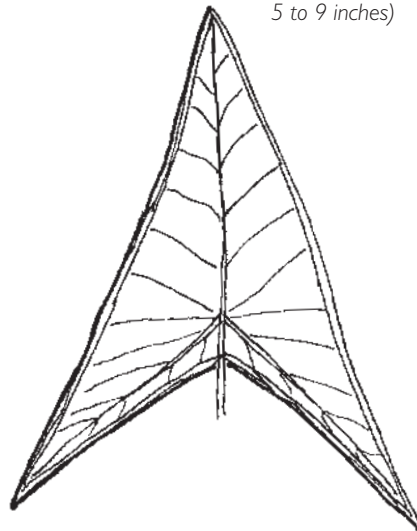
Fig. 3.16

(actual size 1 to 3 feet)

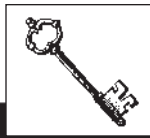


Fig. 3.17

Leaf detail
(actual size 5 to 9 inches)



Figs. 3.12 and 3.13: *Sagittaria* spp. (arrowheads), **Figs. 3.14 and 3.15:** *Pontederia cordata* (pickerelweed), **Figs. 3.16 and 3.17:** *Peltandra virginica* (arrow arum).

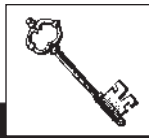


A Citizen's Key to the Common Rooted Aquatic Plants of Michigan Lakes

Part Three

Plants with Floating Leaves

#1	<p>Choose one of the following:</p> <p>Floating leaves with parallel veins arising at the base of the petiole and extending to the tip of the leaf (Figs. 3.18, 3.20 and 3.21) go to #2</p> <p>Floating leaves with veins that are not parallel but form a net pattern of some type (Figs. 3.19, 3.22 and 3.23) go to #4</p>
#2	<p>Choose one of the following:</p> <p>The plant's floating leaves heart-shaped at the base, where the leaf attaches to the petiole (Fig. 3.18). <i>Potamogeton natans</i> (floating-leaf pondweed) see Portrait 43</p> <p>The plant's floating leaves not heart-shaped at base (Fig. 3.20) go to #3</p>
#3	<p>Choose one of the following:</p> <p>Plant's submersed leaves large, 4 to 8 inches long and 1 to 3 inches wide; often curved or wavy (Fig. 3.20). <i>Potamogeton amplifolius</i> (large-leaf pondweed) see Portrait 30</p> <p>Plant's submersed leaves small to moderate in size, 1 to 3 inches long, and generally flat (Fig. 3.21). <i>Potamogeton gramineus</i> (variable pondweed), see Portrait 31</p>
#4	<p>Choose one of the following:</p> <p>Petiole attached at the middle of the floating leaf (Fig. 3.22). <i>Brasenia schreberi</i> (water shield) see Portrait 14</p> <p>Petiole attached at a notch in the floating leaf (Fig. 3.19 and 3.23) go to #5</p>
#5	<p>Choose one of the following:</p> <p>Veins of the floating leaf radiate out from the notch in the leaf (Fig. 3.19). The flower is white, if present. <i>Nymphaea</i> spp. (white water lily) see Portrait 12</p> <p>Veins of the floating leaf arise from a midrib vein running from the notch in the leaf to the tip (Fig. 3.23). The flower is yellow, if present. <i>Nuphar</i> spp. (yellow water lily) see Portrait 13</p>



A Citizen's Key to the Common Rooted Aquatic Plants of Michigan Lakes

Part Three

Plants with Floating Leaves

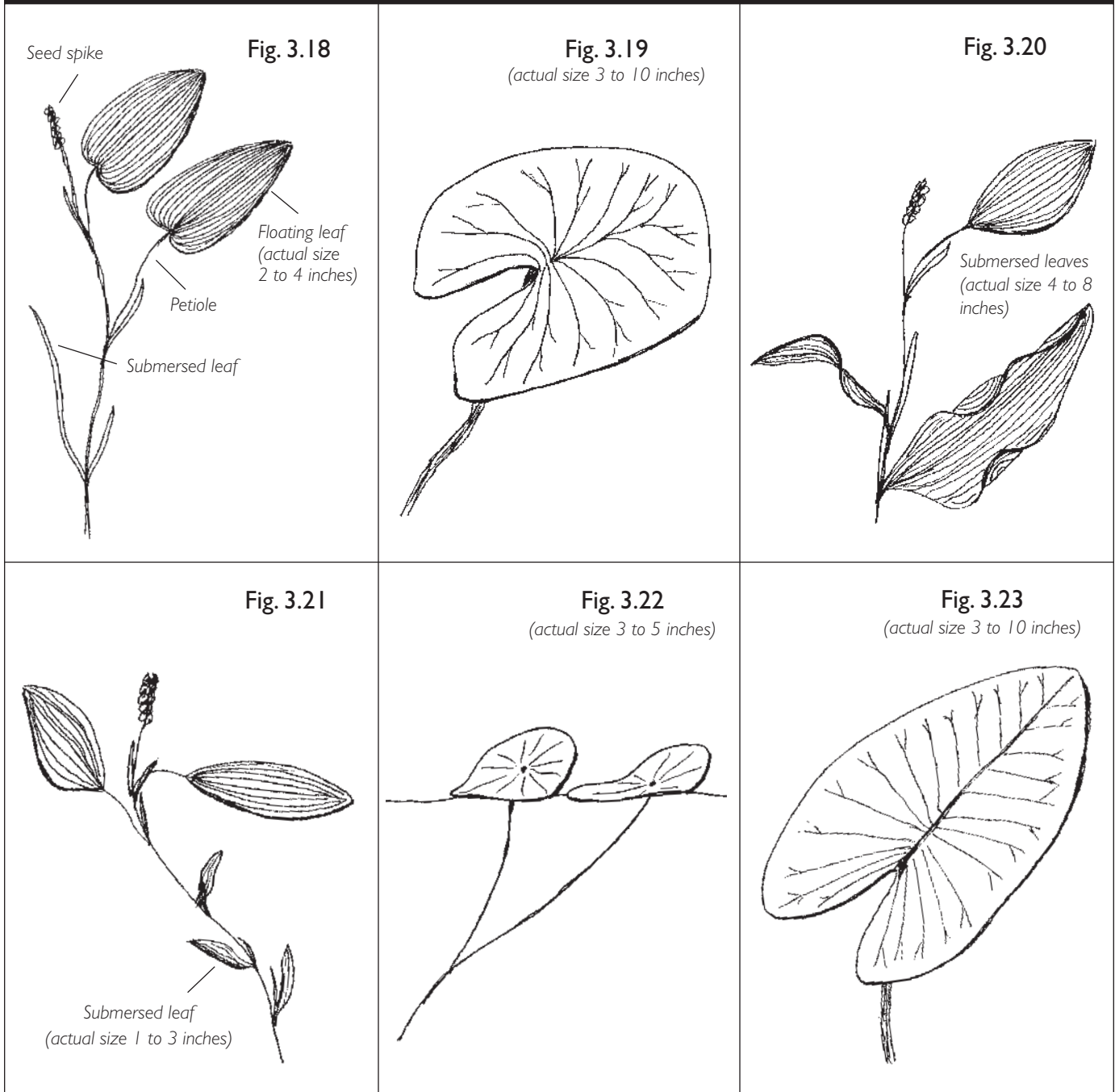
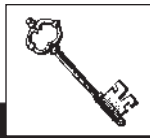


Fig. 3.18: *Potamogeton natans* (floating-leaf pondweed), **Fig. 3.19:** *Nymphaea* spp. (white water lily),
Fig. 3.20: *Potamogeton amplifolius* (large-leaf pondweed), **Fig. 3.21:** *Potamogeton gramineus* (variable pondweed),
Fig. 3.22: *Brasenia schreberi* (water shield), **Fig. 3.23:** *Nuphar* spp. (yellow water lily).



A Citizen's Key to the Common Rooted Aquatic Plants of Michigan Lakes

Part Four

Plants with Leaves Thread- or Needle-like

#1	<p>Choose one of the following:</p> <p>Leaves whorled (Figs. 3.28 - 3.30) or opposite along the stem (Fig. 3.27)..... go to #2</p> <p>Leaves alternate along the stem (Figs. 3.24 and 3.25)..... go to #4</p>
#2	<p>Choose one of the following:</p> <p>Leaves opposite but with bundles of other leaves at the base of each leaf giving the appearance of being whorled (Fig. 3.27 and Plate 4). <i>Najas</i> spp. (bushy pondweed) see Portrait 21</p> <p>Leaves truly whorled, arising entirely around the stem (Figs. 3.29, 3.37 and 3.39) go to #3</p>
#3	<p>Choose one of the following:</p> <p>Leaves with minute, spiny teeth along one side (Figs. 3.28 and 3.29 and Plate I). Plant not brittle and without musk-like odor. <i>Ceratophyllum demersum</i> (coontail) see Portrait 41</p> <p>Leaves usually very short and without minute, spiny teeth (Fig. 3.30 and Plate I). Plant sometimes encrusted with lime, brittle, and having a musk-like odor when crushed in hand. <i>Chara</i> spp. (stonewort or muskgrass) see Portrait 20</p>
#4	<p>Choose one of the following:</p> <p>Leaf tips very pointed and leaf and stipule fused at the base forming a sheath at least ¼ inch long (Figs. 3.24 and 3.26). <i>Stuckenia pectinata</i> (sago pondweed) (formerly <i>Potamogeton pectinatus</i>) see Portrait 52</p> <p>Leaf tips blunt or leaf and stipule not fused at the base or fused for less than ¼ inch (Fig. 3.25 and Plate 4). <i>Potamogeton</i> spp. (thin-leaf pondweed). see Portrait 32</p>



A Citizen's Key to the Common Rooted Aquatic Plants of Michigan Lakes

Part Four

Plants with Leaves Thread- or Needle-like

Fig. 3.24

(actual size of leaves 2 to 3 inches)

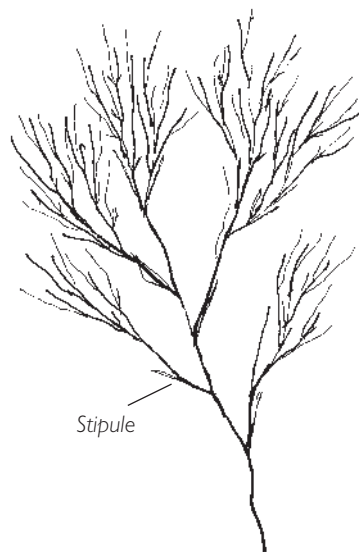


Fig. 3.25

(actual size of leaves
1 to 3 inches)



Fig. 3.26

(actual size 2 to 3 inches)

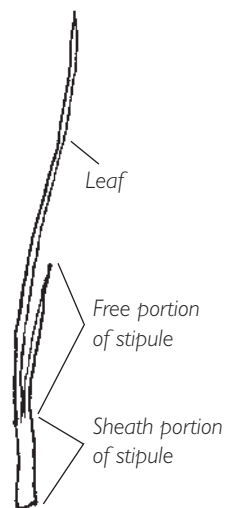


Fig. 3.27

(actual size of leaves
 $\frac{1}{2}$ to $1\frac{1}{2}$ inches)



Fig. 3.28



Fig. 3.29

(actual size of leaves $\frac{1}{2}$ to 1 inch)

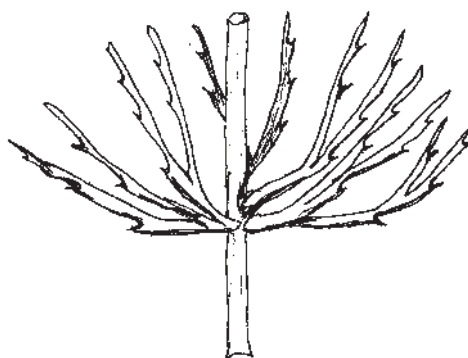


Fig. 3.30

(actual size of leaf-like structures $\frac{1}{4}$ to 1 inch)



Fig. 3.24: *Stuckenia pectinata* (sago pondweed), Fig. 3.25: *Potamogeton* spp. (thin-leaf pondweed), Fig. 3.26: Leaf with stipule, Fig. 3.27: *Najas* spp. (bushy pondweed), Figs. 3.28 and 3.29: *Ceratophyllum demersum* (coontail), Fig. 3.30: *Chara* spp. (stonewort/muskgrass).

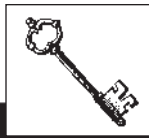


A Citizen's Key to the Common Rooted Aquatic Plants of Michigan Lakes

Part Five

Plants with Long, Ribbon-like Leaves

#1	<p>Choose one of the following:</p> <p>All leaves arising from base of plant (Fig. 3.31 and Plate 2). <i>Vallisneria americana</i> (wild celery) see Portrait 34</p> <p>Leaves arising from a stem (Figs. 3.32, 3.34 and 3.35). go to #2</p>
#2	<p>Choose one of the following:</p> <p>Stem flat (Figs. 3.32 and 3.33 and Plate 2). <i>Potamogeton zosteriformis</i> (flat-stemmed pondweed) see Portrait 33</p> <p>Stem round go to #3</p>
#3	<p>Choose one of the following:</p> <p>Leaves extending in nearly opposite directions in a single plane so that the entire plant appears somewhat flat, forming the shape of a hand fan or fern plant, particularly as seen in the water (Fig. 3.34 and Plate 2). <i>Potamogeton robbinsii</i> (fern pondweed) see Portrait 22</p> <p>Leaves of plant not arranged in a pattern to form the shape of a hand fan or fern plant but scattered along the stem (Fig. 3.35 and Figs. 3.52 and 3.53 in Part Seven of the key, "Plants with Oval, Oblong or Lanceolate Leaves") go to #4</p>
#4	<p>Choose one of the following:</p> <p>Leaves short, less than 4 inches long, and leaf margins finely toothed (see Figs. 3.52 and 3.53 and Plate 3). <i>Potamogeton crispus</i> (curly-leaf pondweed) . . . see Portrait 51</p> <p>Leaves long and flexible and leaf margins not finely toothed (Fig. 3.35 and Plate 2). <i>Heteranthera dubia</i> (water star grass) (also known as <i>Zosterella dubia</i>) see Portrait 35</p>



A Citizen's Key to the Common Rooted Aquatic Plants of Michigan Lakes

Part Five

Plants with Long, Ribbon-like Leaves

Fig. 3.31

(actual size of leaves
1 to 3 feet)

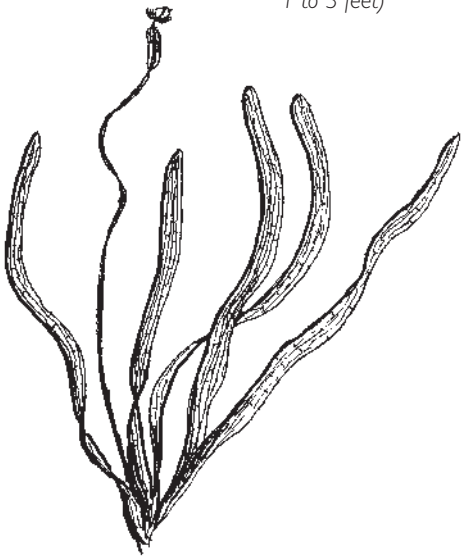


Fig. 3.32

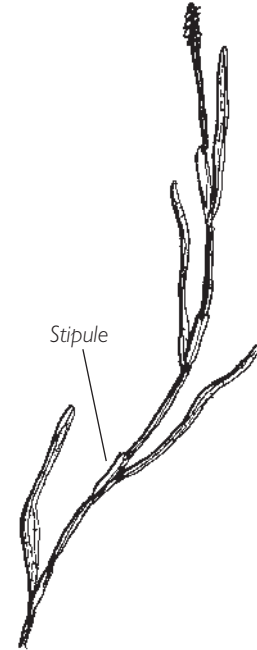


Fig. 3.33

(actual size of leaves
2 to 5 inches)

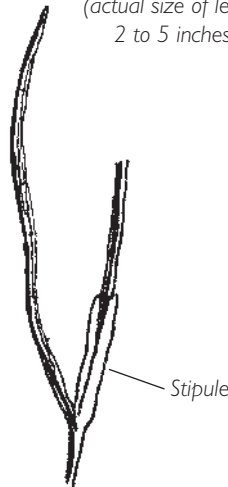


Fig. 3.34

(actual size of leaves
2 to 4 inches)

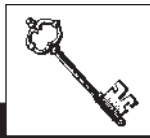


Fig. 3.35

(actual size
of leaves 2 to 6
inches)



Fig. 3.31: *Vallisneria americana* (wild celery), Figs. 3.32 and 3.33: *Potamogeton zosteriformis* (flat-stemmed pondweed), Fig. 3.34: *Potamogeton robbinsii* (fern pondweed), Fig. 3.35: *Heteranthera dubia* (water star grass).



A Citizen's Key to the Common Rooted Aquatic Plants of Michigan Lakes

Part Six

Plants with Complex and Finely Divided Leaves

#1	<p>Choose one of the following:</p> <p>Leaves with a central axis (Figs. 3.37 and 3.39) go to #2</p> <p>Leaves without a central axis (Figs. 3.42 - 3.46). go to #3</p>
#2	<p>Choose one of the following:</p> <p>Number of leaflets on one side of central axis less than 12 to 14 (Figs. 3.36 and 3.37) or floral bracts long, usually extending to near or beyond the tip of the flower (Fig. 3.38 and Plate 1). <i>Myriophyllum</i> spp. (native milfoils) see Portrait 40</p> <p>Number of leaflets on one side of central axis more than 12 to 14 (Figs. 3.39 and 3.40 and Plate 1) and floral bracts short, not reaching the tip of the flower (Fig. 3.41). <i>Myriophyllum spicatum</i> (Eurasian milfoil) see Portrait 50</p>
#3	<p>Choose one of the following:</p> <p>Leaves alternate (Figs. 3.44 and 3.45) go to #4</p> <p>Leaves opposite (Figs. 3.42 and 3.43). <i>Megalodonta beckii</i> (water marigold) see Portrait 47</p>
#4	<p>Choose one of the following:</p> <p>Leaves with small bladders (Figs. 3.45 and 3.46). <i>Utricularia</i> spp. (bladderwort) see Portrait 48</p> <p>Leaves without small bladders; a small white flower may be present (Fig. 3.44). <i>Ranunculus</i> spp. (buttercup) see Portrait 49</p>



A Citizen's Key to the Common Rooted Aquatic Plants of Michigan Lakes

Part Six

Plants with Complex and Finely Divided Leaves

Fig. 3.36

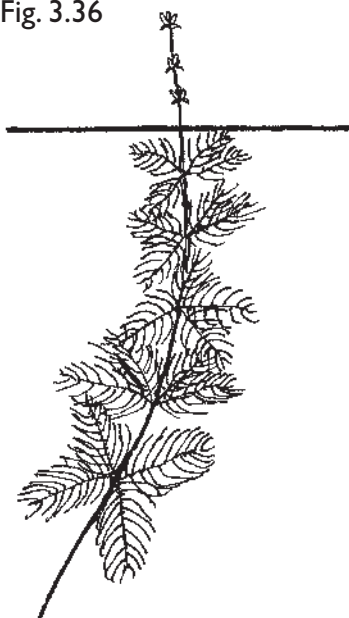


Fig. 3.37

(actual size of each leaf about 1 inch)

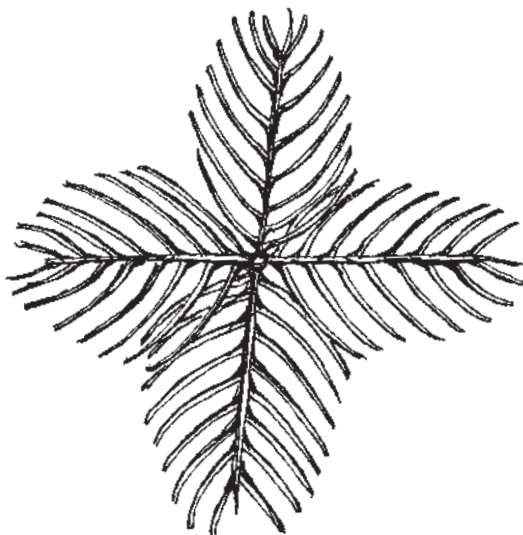


Fig. 3.38

(actual size less than 1/2 inch)

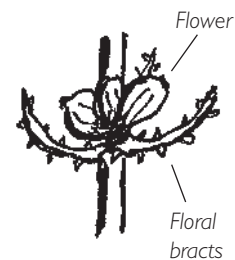


Fig. 3.40



Fig. 3.39

(actual size of each leaf about 1 1/4 inch)

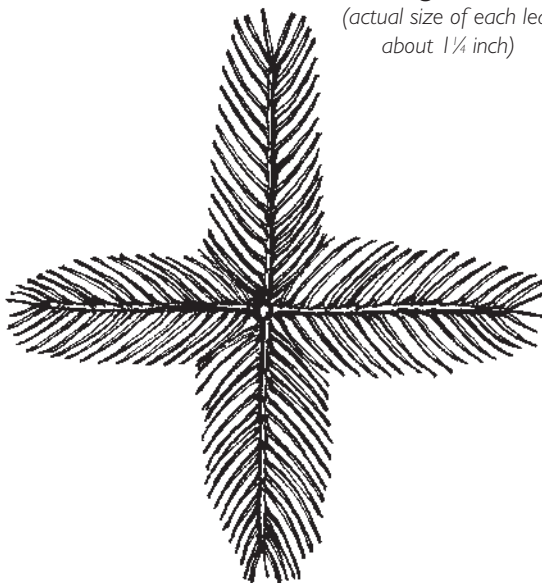
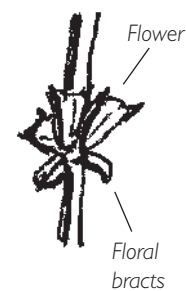
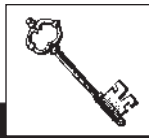


Fig. 3.41

(actual size of floral bracts less than 1/2 inch)



Figs. 3.36, 3.37 and 3.38: *Myriophyllum* spp. (native milfoil), Figs. 3.39, 3.40 and 3.41: *Myriophyllum spicatum* (Eurasian milfoil).



A Citizen's Key to the Common Rooted Aquatic Plants of Michigan Lakes

Part Six

Plants with Complex and Finely Divided Leaves

Fig. 3.42

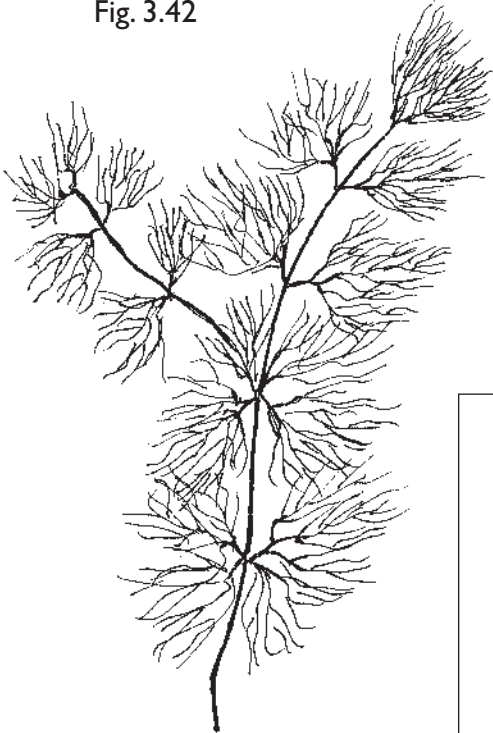


Fig. 3.45



Fig. 3.43

(actual size about 1 to 3 inches)

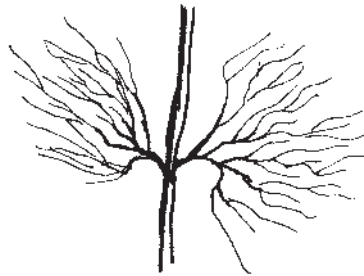


Fig. 3.44

(actual size of leaves 1 to 3 inches)

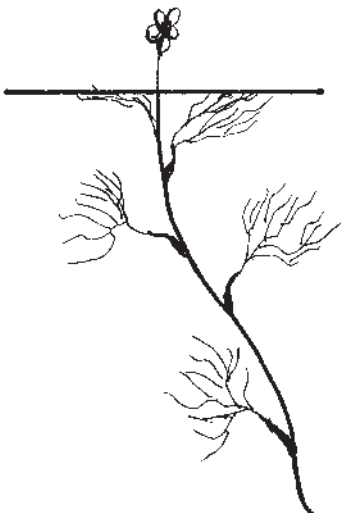
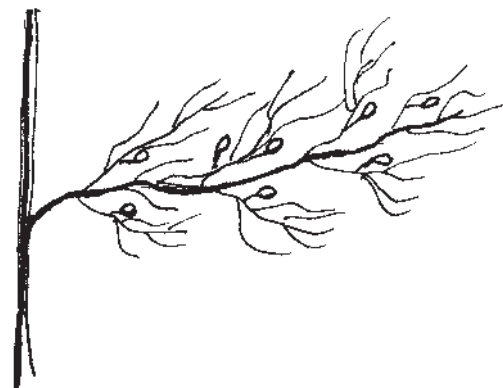
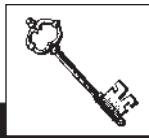


Fig. 3.46

(actual size of leaves 2 to 6 inches)



Figs. 3.42 and 3.43: *Megalodonta beckii* (water marigold), Fig. 3.44: *Ranunculus* spp. (buttercup),
Figs. 3.45 and 3.46: *Utricularia* spp. (bladderwort).



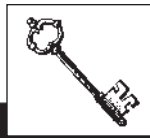
A Citizen's Key to the Common Rooted Aquatic Plants of Michigan Lakes

Part Seven

Plants with Oval, Oblong or Lanceolate Leaves

#1	<p>Choose one of the following:</p> <p>Leaves small, less than $\frac{3}{4}$ inch long, oblong or lanceolate, and whorled on stem (Fig. 3.47 a and b) go to #2</p> <p>Leaves larger than $\frac{3}{4}$ inch long, oval, oblong or lanceolate, and alternate on stem (Figs. 3.48 - 3.58) go to #3</p>
#2	<p>Choose one of the following:</p> <p>Three leaves at each node, leaf edges appear smooth or very finely toothed, and midvein smooth (Fig 3.47a and Plate 4). <i>Elodea canadensis</i> (waterweed) see Portrait 36</p> <p>Four to 7 leaves at each node (usually 5), leaf edges with fine teeth, and midvein usually with spines (Fig. 3.47b). <i>Hydrilla verticillata</i> (hydrilla). See Portrait 53</p>
#3	<p>Choose one of the following:</p> <p>Leaves large, 4 to 8 inches long, $\frac{3}{4}$ inch to 3 inches wide (Figs. 3.48 and 3.49) go to #4</p> <p>Leaves small to moderate size, usually less than 4 inches long (Figs. 3.52, 3.54, 3.56 and 3.57) go to #5</p>
#4	<p>Choose one of the following:</p> <p>Leaves 1 to 3 inches wide, curved or wavy, tip pointed (Fig. 3.55) and with a short petiole (Fig. 3.48). <i>Potamogeton amplifolius</i> (large-leaf pondweed) see Portrait 30</p> <p>Leaves $\frac{3}{4}$ inch to 1 $\frac{1}{4}$ inches wide, tip of leaf boat-shaped (Fig. 3.50); clasping leaves with no petiole (Fig. 3.51). <i>Potamogeton praelongus</i> (whitestem pondweed, Fig. 3.49 and Plate 3) see Portrait 44</p>
#5	<p>Choose one of the following:</p> <p>Leaf margins finely toothed (Fig. 3.53). <i>Potamogeton crispus</i> (curly-leaf pondweed, Fig. 3.52 and Plate 3) see Portrait 51</p> <p>Leaf margins not finely toothed. go to #6</p>

(continued)



A Citizen's Key to the Common Rooted Aquatic Plants of Michigan Lakes

Part Seven (cont.)

Plants with Oval, Oblong or Lanceolate Leaves

#6

Choose one of the following:

Leaf clasping the stem (Fig. 3.51) and with wavy margins. *Potamogeton richardsonii* (clasping-leaf pondweed, Fig. 3.54 and Plate 3) **see Portrait 42**

Leaf with a petiole (Fig. 3.57) or obscurely petioled (Figs. 3.53 or 3.58) but not clasping the stem. **go to #7**

#7

Choose one of the following:

Leaves with a sharp-pointed tip (Fig. 3.55). **go to #8**

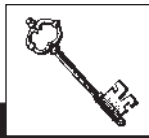
Leaves with a round or boat-shaped tip (Fig. 3.50), obscurely petioled; leaf size can vary from small to moderate size. *Potamogeton gramineus* (variable pondweed, Fig. 3.56 and Plate 3) **see Portrait 31**

#8

Choose one of the following:

Upper submersed leaves definitely petioled. Floating leaves sometimes present. *Potamogeton nodosus* (American pondweed, Fig. 3.57). **see Portrait 45**

Leaves obscurely petioled. *Potamogeton illinoensis*. **see Portrait 46** (Illinois pondweed, Fig. 3.58)



A Citizen's Key to the Common Rooted Aquatic Plants of Michigan Lakes

Part Seven

Plants with Oval, Oblong or Lanceolate Leaves

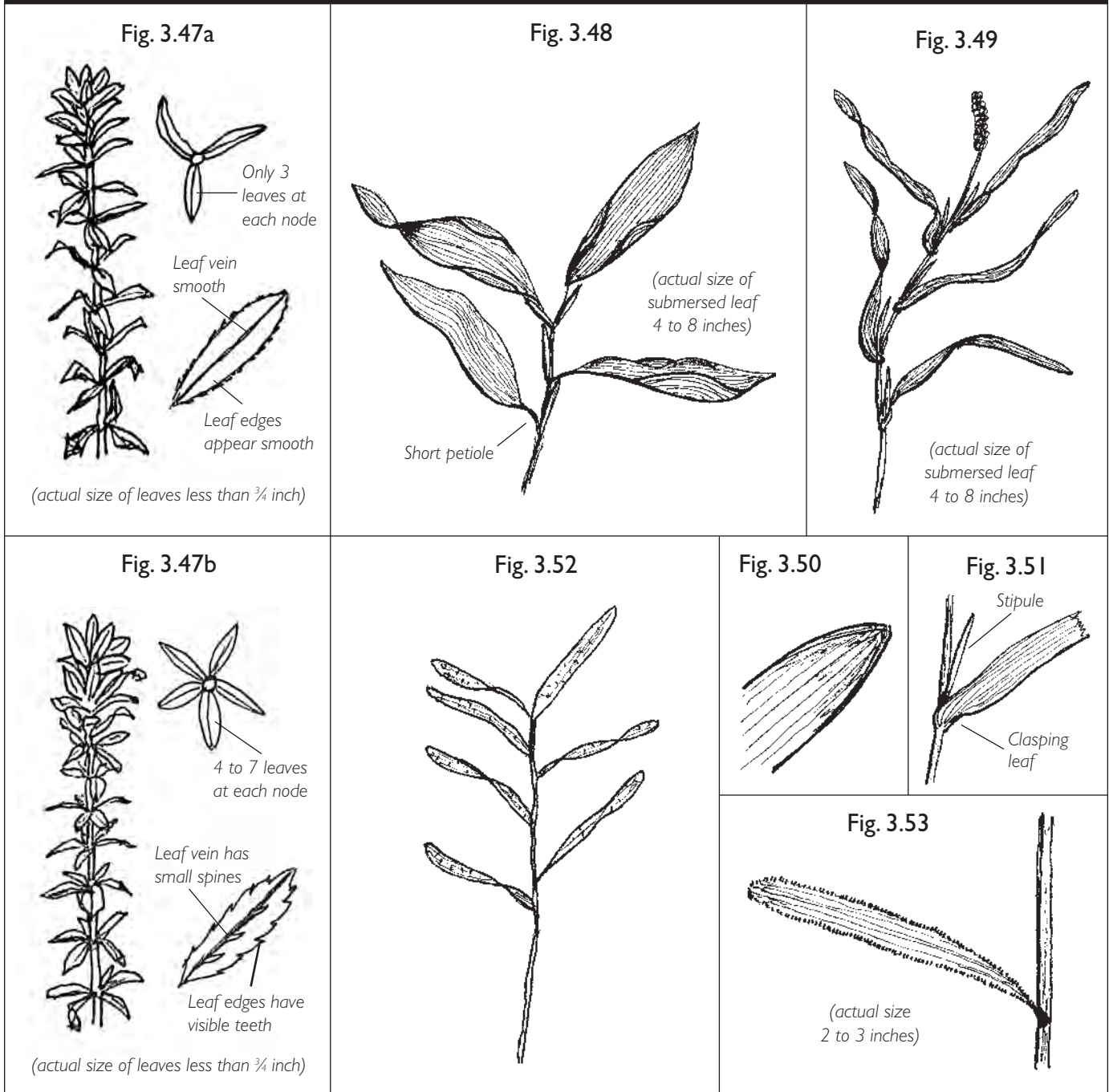
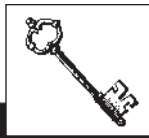


Fig. 3.47a: *Elodea canadensis* (waterweed), **Fig. 3.47b:** *Hydrilla verticillata* (hydrilla), **Fig. 3.48:** *Potamogeton amplifolius* (large-leaf pondweed), **Fig. 3.49:** *Potamogeton praelongus* (whitestem pondweed), **Fig. 3.50:** Boat-shaped leaf, **Fig. 3.51:** Clasp leaf, **Figs. 3.52 and 3.53:** *Potamogeton crispus* (curly-leaf pondweed).



A Citizen's Key to the Common Rooted Aquatic Plants of Michigan Lakes

Part Seven

Plants with Oval, Oblong or Lanceolate Leaves

Fig. 3.54



(actual size of leaves
about 2 to 3 inches)

Fig. 3.56

(actual size of leaves
1 to 3 inches)



Fig. 3.55

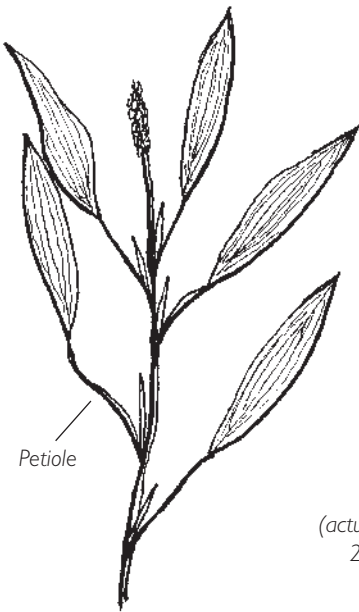
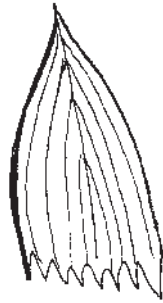


Fig. 3.57

(actual size of leaves
2 to 4 inches)

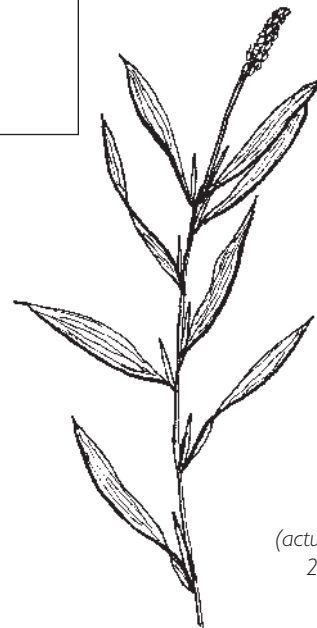


Fig. 3.58

(actual size of leaves
2 to 6 inches)

Fig. 3.54: *Potamogeton richardsonii* (claspingleaf pondweed), **Fig. 3.55:** Sharp-tipped leaf,
Fig. 3.56: *Potamogeton gramineus* (variable pondweed),
Fig. 3.57: *Potamogeton nodosus* (American pondweed), **Fig. 3.58:** *Potamogeton illinoensis* (Illinois pondweed).



Portraits of the Common Rooted Aquatic Plants of Michigan Lakes

P o r t r a i t s

Portrait Number	Description of plants (+)= beneficial, (0) = neutral, (-) = nuisance
1 to 4	<p>Watermeal (<i>Wolffia</i> spp.), star duckweed (<i>Lemna trisulca</i>), lesser duckweed (<i>Lemna minor</i>) and big duckweed (<i>Spirodela polyrhiza</i>). All four duckweed species are described collectively. (0)</p> <p>Growth characteristics Duckweed species are very small — usually less than ½ inch in size — free-floating plants. Their small size allows them to reproduce quickly. They can sometimes cover the entire surface of small lakes in a few days or quickly revegetate an area after application of plant controls.</p> <p>Habitat These plants are found in quiet water areas such as ponds, small lakes, canals and protected bays of larger lakes. They do not grow well in flowing or wave-washed areas, but they are carried by currents and deposited in quiet backwaters. They are more common in fertile environments such as eutrophic lakes and ponds.</p> <p>Beneficial traits Duckweed is an important food for waterfowl and other marsh birds.</p> <p>Nuisance traits Under heavy growth conditions, duckweed can shade out other plants. Though not seriously hindering recreation, a heavy growth of the plant can be an annoyance to people.</p> <p>Other details The duckweed watermeal (<i>Wolffia</i> spp.) is the world's smallest flowering plant. Duckweed can be difficult to control in many situations. Control is limited to herbicides, with highly variable results.</p>
6	<p>Cattails (<i>Typha</i> spp.) (+)</p> <p>Growth characteristics Two species of cattails are found in Michigan. They grow from 3 to 8 feet tall. They may grow in small patches of a few plants or in large beds covering hundreds of acres.</p> <p>Habitat Cattails are shallow-water plants, usually growing in 1 to 3 feet of water. One species can grow in deeper water to a depth of 5 to 6 feet.</p> <p>Beneficial traits Cattails provide excellent habitat for many birds, aquatic and wetland animals, and some fish species. The leaves and roots are important food for muskrats. The matted roots, stem system and leaves diminish wave energy, hold sediments in place and protect shorelines from erosion. Positioned plants can screen development and provide a natural background.</p>



Portraits of the Common Rooted Aquatic Plants of Michigan Lakes

P o r t r a i t s	
Portrait Number	Description of plants (+)= beneficial, (0) = neutral, (-) = nuisance
6	<p>Cattails (<i>continued</i>)</p> <p>Nuisance traits Cattails are not acceptable in swimming beach areas.</p> <p>Other details Cattails are one of the first plants to colonize newly flooded areas. They often greatly expand their area of coverage following lake drawdown.</p>
7	<p>Bulrushes (<i>Scirpus</i> spp.) (+)</p> <p>Growth characteristics The bulrush's slender stem grows 3 to 6 feet tall. The stems arise from a buried stem (rhizome), giving the stems the appearance of growing in rows.</p> <p>Habitat Bulrush typically grows in narrow bands along the lake shoreline in water 1 to 2 feet deep. It rarely covers an extensive area, so conflict with most recreational activities is minimal. It may appear offshore growing from sunken islands. It can grow well on sandy and marl soils.</p> <p>Beneficial traits Bulrush provides excellent habitat for many birds and animals and furnishes shelter for young fish. Its seeds are an important waterfowl food. Bass and bluegill often build their spawning nests in bulrush areas. Its matted roots and stems diminish wave energy, hold sediments in place and protect shorelines from erosion. Positioned plants can screen development and provide a natural background.</p> <p>Nuisance traits Bulrushes are not acceptable in swimming beach areas.</p> <p>Other details Turn-of-the-century photographs of Michigan lakes show many with bands of bulrush along most of the shore.</p>
8 to 10	<p>Arrow arum (<i>Peltandra virginica</i>), arrowheads (<i>Sagittaria</i> spp.) and pickerelweed (<i>Pontederia cordata</i>). All three plants are described collectively. (+)</p> <p>Growth characteristics These three plants grow 2 to 3 feet tall in small beds usually less than ¼ acre in size. Consequently, they rarely conflict with most recreational activities.</p> <p>Habitat These are shallow-water plants growing in 1 to 2 feet of water. They are often found at the outer edge of emergent vegetation, giving way to water lilies and submerged plants as the water deepens.</p> <p>Beneficial traits These three plants afford habitat for many aquatic and wetland birds and animals and shelter for young fish. Their seeds and root tubers are food for waterfowl and some wetland mammals. As transition plants from the upland to the deep water environment, they help diminish wave energy, hold sediments in place and protect shorelines from erosion.</p>



Portraits of the Common Rooted Aquatic Plants of Michigan Lakes

P o r t r a i t s	
Portrait Number	Description of plants (+)= beneficial, (0) = neutral, (-) = nuisance
8 to 10	<p>Arrow arum, arrowheads, pickerelweed (<i>continued</i>)</p>
	<p>Nuisance traits These plants are not acceptable in swimming beach areas.</p> <p>Other details Arrowhead species take on many forms. Some grow entirely submersed and have ribbon-shaped leaves instead of arrow-shaped leaves. The flower of pickerelweed is a large blue spike, very colorful in mid- to late summer.</p>
11	<p>Smartweed (<i>Polygonum</i> spp.) (+)</p>
	<p>Growth characteristics There are several species of smartweed. These plants may be flat on the water surface or grow erect 2 to 3 feet out of the water. They can form thick, tangled brushy beds.</p> <p>Habitat Smartweed is a marsh plant found along organic lakeshores in water less than a foot deep. It is typically found where a wetland habitat transitions into the lake.</p> <p>Beneficial traits The plant's seeds are highly prized for food by many birds and mammals. It provides cover for marsh wildlife and young fish. It and other transition plants protect the wetland from wave erosion and hold light organic sediments in place, reducing sediment turbidity.</p> <p>Nuisance traits The plant is found primarily in marsh areas, so it does not conflict with most recreation except where development has intruded into wetland habitat.</p> <p>Other details Smartweed is often one of the first plants to colonize an area after a lake drawdown.</p>
12 to 14	<p>White water lily (<i>Nymphaea</i> spp.), yellow water lily (<i>Nuphar</i> spp.) and water shield (<i>Brasenia schreberi</i>). All three species are described collectively. (+)</p>
	<p>Growth characteristics These are floating-leaf plants with no submersed leaves. A single floating leaf grows at the end of each leaf stalk. Leaves grow from a large root (rhizome) buried in the lake sediments.</p> <p>Habitat Lilies and water shield are more commonly found growing on organic soils. Consequently, they are often but not exclusively associated with wetland areas. They may grow as one or two isolated plants or cover several acres of water. In some lakes with organic bottoms, lilies may ring the entire shoreline or cover much of the surface if the lake is shallow. Lilies grow in water 2 to 4 feet deep; water shield may grow out to the 6-foot depth.</p>



Portraits of the Common Rooted Aquatic Plants of Michigan Lakes

P o r t r a i t s	
Portrait Number	Description of plants (+)= beneficial, (0) = neutral, (-) = nuisance
12 to 14	<p>White water lily, yellow water lily, water shield <i>(continued)</i></p> <p>Beneficial traits Lily seeds are eaten by waterfowl, and leaves and tubers by some aquatic mammals. Lilies provide habitat for fish and attract waterfowl and marsh birds. As transition zone plants, they help diminish wave energy, hold sediments in place and protect shorelines from erosion.</p> <p>Nuisance traits In dense stands, lilies may shade out other plants and hinder navigation in shallow water areas.</p> <p>Other details Water lilies have one of the most commonly recognized aquatic plant flowers.</p>
20	<p>Stonewort/Muskgrass (<i>Chara</i> spp.) (+)</p> <p>Growth characteristics Stonewort is actually algae. It grows in low mats, which can cover extensive area in some lakes. Eight to 12 inches is the maximum height for stonewort species.</p> <p>Habitat Stonewort occurs in hard water, which includes most Michigan lakes except the Precambrian shield area of the western Upper Peninsula. Stonewort can be found growing in shallow water or in very clear lakes at depths of 30 feet or more. Being an alga, it can grow deeper than rooted vascular plants.</p> <p>Beneficial traits Stonewort is an alga, so it has no roots. It obtains its nutrients from the water, competing with other algae for the available supply. A low-growing mat of stonewort impairs other algae and enhances water clarity. It also competes with and retards taller rooted plants, reducing recreational conflicts. The heavily branched stonewort provides excellent habitat for small aquatic invertebrates. The plant itself and the abundant animal life associated with it make stonewort an excellent waterfowl food and food provider for fish.</p> <p>Nuisance traits Stonewort has few negative qualities. Normally, it should be encouraged wherever found. Only heavy growth in active swimming beaches is a problem.</p> <p>Other details Stonewort when crushed in the hand has a strong musk odor. It is also commonly referred to as muskgrass. It is often covered with marl (crusty material).</p>
21	<p>Bushy pondweed (<i>Najas</i> spp.) (+)</p> <p>Growth characteristics Bushy pondweed is in the naiad genus, <i>Najas</i>, not the pondweed genus, <i>Potamogeton</i>. It is usually a low-growing plant reaching 2 to 4 feet in height. In rare situations, it may grow to 8 feet. It germinates late, reaching full growth in July or August. Normally, it doesn't form large beds except in lakes where other plants have been reduced by early summer control programs. The bare sediments allow the late blooming bushy pondweed to expand and replace the controlled species.</p>



Portraits of the Common Rooted Aquatic Plants of Michigan Lakes

P o r t r a i t s	
Portrait Number	Description of plants (+)= beneficial, (0) = neutral, (-) = nuisance
21	<p>Bushy pondweed (<i>continued</i>)</p> <p>Habitat It is found throughout the littoral zone.</p> <p>Beneficial traits Its low-growing nature minimizes most recreational impacts. Being bushy, it harbors abundant aquatic invertebrate life and so is one of the most important waterfowl food and fish food providers. Growing higher in the water column than stonewort, it affords better habitat for fish, particularly shelter for young fish.</p> <p>Nuisance trait In lakes heavily managed for aquatic plants, bushy pondweed can become overabundant.</p> <p>Other details Drawdowns enhance bushy pondweed populations.</p>
22	<p>Fern pondweed (<i>Potamogeton robbinsii</i>) (+)</p> <p>Growth characteristics Fern pondweed normally grows to a height of 3 to 4 feet.</p> <p>Habitat This plant is usually found in brown water lakes, which appear tea-colored because of organic material dissolved in the water. Such lakes are usually associated with wetland areas.</p> <p>Beneficial traits Its low-growing nature minimizes most recreational impacts. It provides a good habitat for fish.</p> <p>Nuisance traits In some brown water lakes, it can become the dominant plant and be dense.</p>
30	<p>Large-leaf pondweed (<i>Potamogeton amplifolius</i>) (+)</p> <p>Growth characteristics Large-leaf pondweed usually grows to a height of 4 to 6 feet. It may produce floating leaves. It grows in an open, scattered pattern, almost never forming dense colonies, and is usually associated with other plants in diverse communities.</p> <p>Habitat Typically it is found growing between the 4- and 8-foot depth contours.</p> <p>Beneficial traits Like most members of the <i>Potamogeton</i> (pondweed) genus, large-leaf pondweed is an important waterfowl food. Its characteristic of growing mixed with other plants in a diverse community makes it a valuable fish habitat plant. It only occasionally reaches the surface, so conflict with most recreational uses is minimal.</p>



Portraits of the Common Rooted Aquatic Plants of Michigan Lakes

P o r t r a i t s	
Portrait Number	Description of plants (+)= beneficial, (0) = neutral, (-) = nuisance
30	<p>Large-leaf pondweed (<i>continued</i>)</p> <p>Nuisance traits The plant has few negative qualities and, like most native pondweeds, should usually be encouraged.</p>
31	<p>Variable pondweed (<i>Potamogeton gramineus</i>) (+)</p> <p>Growth characteristics Variable pondweed usually grows to a height of 3 to 5 feet. It may put out floating leaves. Its submersed leaves can vary in size and shape, thus its common name. It grows in an open, scattered pattern, almost never forming dense colonies, and is usually associated with other plants in diverse communities.</p> <p>Habitat Typically it is found growing between the 4- and 8-foot depth contours.</p> <p>Beneficial traits Like most members of the <i>Potamogeton</i> (pondweed) genus, variable pondweed is an important waterfowl food. Its characteristic of growing mixed with other plants in a diverse community provides good fish habitat. It only occasionally reaches the surface, so conflict with most recreational uses is minimal.</p> <p>Nuisance traits The plant has few negative qualities and, like most pondweeds, should usually be encouraged.</p>
32	<p>Thin-leaf pondweed (<i>Potamogeton</i> spp.) (+)</p> <p>Growth characteristics Many species make up the group identified as thin-leaf pondweed. Most grow to a height of 3 to 5 feet, sometimes putting out floating leaves. Their submersed leaves are thin, thread-like and very fragile-looking. They rarely form dense colonies and are usually associated with other plants in diverse communities.</p> <p>Habitat Typically these species are found growing between the 4- and 8-foot depth contours.</p> <p>Beneficial traits Like most members of the <i>Potamogeton</i> (pondweed) genus, thin-leaf pondweeds are an important waterfowl food. Their characteristic of growing mixed with other plants in a diverse community provides good fish habitat. They only occasionally reach the surface, so conflict with most recreational uses is minimal.</p> <p>Nuisance traits These plants have few negative qualities.</p>



Portraits of the Common Rooted Aquatic Plants of Michigan Lakes

P o r t r a i t s	
Portrait Number	Description of plants (+)= beneficial, (0) = neutral, (-) = nuisance
33	<p>Flat-stemmed pondweed (<i>Potamogeton zosteriformis</i>) (+)</p> <p>Growth characteristics Flat-stemmed pondweed usually grows to a height of 3 to 5 feet. It rarely forms dense colonies and is usually associated with other plants in diverse communities.</p> <p>Habitat It is found growing out to a depth of 8 feet.</p> <p>Beneficial traits Like most members of the <i>Potamogeton</i> (pondweed) genus, flat-stemmed pondweed is an important waterfowl food. Its minimal branching supports fewer insects and other invertebrates, and therefore less fish food than other pondweeds. Its characteristic of growing mixed with other plants in a diverse community provides good fish habitat. It only occasionally reaches the surface, so conflict with most recreational uses is minimal.</p> <p>Nuisance traits The plant has few negative qualities.</p> <p>Other details Its flat stem makes it easily identifiable.</p>
34	<p>Wild celery (<i>Vallisneria americana</i>) (+)</p> <p>Growth characteristics Wild celery is a low-growing plant attaining 2 to 4 feet in height; in rare situations it may grow to a height of 6 feet. In late summer, the plant puts out a spiraling flower stalk that grows to the water surface. It germinates late, not reaching full growth until July or August. This plant usually does not form large beds except in lakes where other plants have been reduced by early summer control programs. The bare sediments allow the late-blooming wild celery to expand to replace the controlled plants.</p> <p>Habitat It is found throughout the littoral zone, sometimes as deep as 15 feet.</p> <p>Beneficial traits Its low-growing nature minimizes most recreational impacts. This plant is one of the most important waterfowl foods. All parts of the plant are eaten. Having few branches, it harbors less aquatic invertebrate life than bushier plants and so provides less fish food. The plant does furnish good habitat for young fish, however.</p> <p>Nuisance traits In lakes heavily managed for other aquatic plants, wild celery can become overabundant and a problem. It is difficult to harvest and is resistant to most herbicides.</p>



Portraits of the Common Rooted Aquatic Plants of Michigan Lakes

P o r t r a i t s	
Portrait Number	Description of plants (+)= beneficial, (0) = neutral, (-) = nuisance
34	<p>Wild celery (<i>continued</i>)</p> <p>Other details There are other plants similar in appearance to wild celery, such as bur reed (<i>Sparganium</i> spp.), water star grass (<i>Heteranthera dubia</i>) and some forms of arrowhead (<i>Sagittaria</i> spp.). It is necessary to look at the vein structure of the leaves for a positive identification. Wild celery has leaves with a broad central vein region with many longitudinal veins between the outer regions of the leaf, which have few veins. See wild celery's color plate (Plate 2) for an example of this venation. Wild celery also grows well in rivers and streams.</p>
35	<p>Water star grass (<i>Heteranthera dubia</i>) (also known as <i>Zosterella dubia</i>) (+)</p> <p>Growth characteristics Water star grass usually grows to a height of 3 to 5 feet. It rarely forms dense colonies and is usually found associated with other plants in diverse communities.</p> <p>Habitat It is typically found growing in less than 8 feet of water.</p> <p>Beneficial traits Its characteristic of growing mixed with other plants in a diverse community provides good fish habitat. However, its minimal branching means few invertebrates live on it, so it produces less fish food than other plant species. It only occasionally reaches the surface, so conflict with most recreational uses is minimal.</p> <p>Nuisance traits The plant has few negative qualities.</p> <p>Other details It looks similar to flat-stemmed pondweed but has a round stem.</p>
36	<p>Waterweed (<i>Elodea canadensis</i>) (+)</p> <p>Growth characteristics Waterweed is usually a low-growing plant attaining 3 to 5 feet in height. In rare situations, it can grow much taller. This plant usually does not form large beds but may in certain situations cover several acres. The plant can fragment and drift in floating mats of tangled plants that eventually sink to form new colonies.</p> <p>Habitat It is found throughout the littoral zone.</p> <p>Beneficial traits Its low-growing nature minimizes most recreational impacts. Being bushy, it harbors abundant aquatic invertebrate life that makes it a good waterfowl food and fish food provider. It also provides habitat for fish, especially young of the year.</p>



Portraits of the Common Rooted Aquatic Plants of Michigan Lakes

P o r t r a i t s	
Portrait Number	Description of plants (+)= beneficial, (0) = neutral, (-) = nuisance
36	<p>Waterweed (<i>continued</i>)</p> <p>Nuisance traits It can become abundant and a problem in localized areas. Floating mats of waterweed are a problem on beaches where they are windblown.</p> <p>Other details It is used extensively as an ornamental plant in aquaria. When introduced into Europe, waterweed became a serious problem on that continent.</p>
40	<p>Native milfoil (<i>Myriophyllum</i> spp.) (0/-)</p> <p>Growth characteristics Native milfoil is a tall, indigenous aquatic plant capable of reaching the surface in 10 to 12 feet of water in clear lakes. Its growth pattern allows it to grow over other plants and reach the surface from greater water depths than most other native species. Consequently, it can form dense colonies covering many acres. As a native species, it has natural biological control agents that diminish large colonies in time. Control of other aquatic plants reduces competition and allows native milfoil to maintain a greater coverage.</p> <p>Habitat Native milfoil may be found throughout the littoral zone out to a depth of 15 to 20 feet.</p> <p>Beneficial traits Its highly branched or bushy nature is excellent habitat for small aquatic invertebrates, so it is a good fish food provider. When not in dense conditions, it is excellent fish habitat, especially in deeper water areas.</p> <p>Nuisance traits Its tall growth pattern conflicts with many recreational activities. In dense conditions, it can be a serious localized problem. It is not a significant food for waterfowl or aquatic mammals.</p> <p>Other details It can regenerate from detached fragments but not as prolifically as Eurasian milfoil.</p>
41	<p>Coontail (<i>Ceratophyllum demersum</i>) (0/-)</p> <p>Growth characteristics Coontail is a tall, highly branched indigenous species without roots. Its growth pattern allows it to outcompete many other species and cover many acres. As a native species, it has natural biological control agents that diminish large colonies in time. Control of other aquatic plants reduces competition and allows coontail to maintain a greater area of coverage.</p> <p>Habitat Coontail may be found throughout the littoral zone.</p> <p>Beneficial traits Its highly branched or bushy nature is excellent habitat for small aquatic insects and other invertebrates, so it is a good fish food provider. When not in dense conditions, it provides exceptional fish habitat, especially in deeper water areas. It is also a preferred waterfowl food plant.</p>



Portraits of the Common Rooted Aquatic Plants of Michigan Lakes

P o r t r a i t s	
Portrait Number	Description of plants (+)= beneficial, (0) = neutral, (-) = nuisance
41	<p>Coontail (<i>continued</i>)</p> <p>Nuisance traits Its tall growth pattern conflicts with many recreational activities. In dense conditions, it can be a localized problem.</p> <p>Other details This plant has no root system. Its hold on the bottom is simply a portion of the stem covered with thin sediments. Even minor wave energy can dislodge large masses of a bed, which float to another part of the lake, sink and start a new colony. Large, thick floating mats of coontail can be a recreational hindrance.</p>
42 & 44	<p>Clasping-leaf pondweed (<i>Potamogeton richardsonii</i>) and whitestem pondweed (<i>Potamogeton praelongus</i>). Both species are described collectively. (0)</p> <p>Growth characteristics These pondweeds are large, leafy plants. They sometimes reach a height of 8 feet and have a more luxuriant growth than many members of the pondweed genus. Though they are usually not problem plants, in certain situations they can form dense colonies.</p> <p>Habitat These plants may be found throughout the littoral zone.</p> <p>Beneficial traits The tall, leafy nature of these plants provides excellent habitat for aquatic invertebrates, so they are a good fish food provider. When not in dense conditions, they are exceptional fish habitat, especially in deeper water areas. They are also preferred waterfowl food plants.</p> <p>Nuisance traits The tall, leafy growth pattern of these plants can conflict with some recreational activities. In dense conditions, they can be a localized problem.</p>
43	<p>Floating-leaf pondweed (<i>Potamogeton natans</i>) (+)</p> <p>Growth characteristics Floating-leaf pondweed usually grows to a height of 5 to 8 feet. It grows in an open, scattered pattern, rarely forming dense colonies, and is usually found associated with other plants in diverse communities.</p> <p>Habitat It is typically found growing between the 4- and 8-foot depth contours.</p> <p>Beneficial traits Like most members of the <i>Potamogeton</i> (pondweed) genus, floating-leaf pondweed is an important waterfowl food. Its characteristic of growing mixed with other plants in a diverse community makes it a good fish habitat plant. Its minimal branching yields few aquatic invertebrates, so it produces less fish food than other plant species.</p> <p>Nuisance traits The plant has few negative qualities.</p>



Portraits of the Common Rooted Aquatic Plants of Michigan Lakes

P o r t r a i t s	
Portrait Number	Description of plants (+)= beneficial, (0) = neutral, (-) = nuisance
45 to 46	<p>American pondweed (<i>Potamogeton nodosus</i>) and Illinois pondweed (<i>Potamogeton illinoensis</i>). Both species are described collectively. (+)</p> <p>Growth characteristics These pondweeds usually grow to a height of 5 to 8 feet. They rarely form dense colonies and are usually associated with other plants in diverse communities.</p> <p>Habitat They are typically found growing between the 4- and 8-foot depth contours.</p> <p>Beneficial traits Like most members of the <i>Potamogeton</i> (pondweed) genus, these pondweeds are important waterfowl food. Their characteristic of growing mixed with other plants in a diverse community makes them good fish habitat plants. Their open architecture growth pattern minimizes conflict with most recreational activities.</p> <p>Nuisance traits These plants have few negative qualities.</p>
47 to 49	<p>Water marigold (<i>Megalodonta beckii</i>), bladderwort (<i>Utricularia</i> spp.) and buttercup (<i>Ranunculus</i> spp.). All three species are described collectively. (0)</p> <p>Growth characteristics These plants are highly branched with finely divided leaves giving them the appearance of milfoil, with which they are often confused. They grow to a height of 6 to 8 feet. Though they can form dense colonies, these colonies rarely cover more than a few acres.</p> <p>Habitat They are usually found out to the 8-foot depth contour (buttercup somewhat shallower).</p> <p>Beneficial traits The bushy nature of these plants provides excellent habitat for small aquatic invertebrates, so they are good fish food providers. They are good fish habitat and fair waterfowl food plants.</p> <p>Nuisance traits The bushy growth pattern of these plants can conflict with some recreational activities. In small areas, they can be a localized problem.</p> <p>Other details Bladderwort is a carnivorous plant. Its bladders trap microscopic animals found in the water.</p>



Portraits of the Common Rooted Aquatic Plants of Michigan Lakes

P o r t r a i t s	
Portrait Number	Description of plants (+)= beneficial, (0) = neutral, (-) = nuisance
50	<p>Eurasian milfoil (<i>Myriophyllum spicatum</i>) (-)</p> <p>Growth characteristics Eurasian milfoil is an aggressive, tall-growing exotic aquatic plant from Europe and Asia. It is capable of growing to the surface in 12 to 15 feet of water. At the surface, it forms a dense canopy of vegetation over other plants. Many native plants may be reduced in abundance by the Eurasian milfoil canopy. Consequently, this plant can form dense colonies covering much of a lake's littoral zone. Being an exotic, it has few natural biological control agents, so it can dominate a lake for many years. A few biological control agents have been found. Some lakes have seen significant declines in Eurasian milfoil after 10 to 20 years. Control of other aquatic plants reduces competition and appears to allow Eurasian milfoil to maintain a greater coverage for a longer period.</p> <p>Habitat Eurasian milfoil may be found throughout the littoral zone, out to a depth of 20 feet.</p> <p>Beneficial traits Its bushy nature provides excellent habitat for aquatic insects and invertebrates, making it a good fish food provider.</p> <p>Nuisance traits Its tall growth pattern conflicts with many recreational activities. In dense conditions, it is a serious localized and lakewide problem. It is not a significant food crop for waterfowl, other birds or aquatic mammals.</p> <p>Other details It readily regenerates from detached fragments and spreads rapidly.</p>
51	<p>Curly-leaf pondweed (<i>Potamogeton crispus</i>) (-)</p> <p>Growth characteristics Curly-leaf pondweed is an aggressively growing exotic aquatic plant from Europe and Asia. It is capable of growing to the surface in 8 to 10 feet of water. At the surface, it forms a canopy of vegetation. It is one of the first plants to begin growing in the spring, reaching the surface before many native plants germinate from the sediments. Consequently, it can form dense colonies covering much of a lake's littoral zone by early summer. It usually dies back dramatically to minimal levels by mid-July. Curly-leaf pondweed can produce special reproductive pine cone-like structures called "turions", which are highly resistant to herbicidal damage and help spread the plant.</p> <p>Habitat It may be found throughout the littoral zone out to a depth of about 12 feet.</p> <p>Beneficial traits It is a fair fish food provider and is used by waterfowl for food.</p> <p>Nuisance traits It conflicts with many recreational uses and can be a serious localized and lakewide problem.</p> <p>Other details Curly-leaf pondweed seems to do particularly well in disturbed habitats. In lakes where large-scale aquatic plant control is conducted, this plant can quickly become a serious nuisance.</p>



Portraits of the Common Rooted Aquatic Plants of Michigan Lakes

P o r t r a i t s	
Portrait Number	Description of plants (+)= beneficial, (0) = neutral, (-) = nuisance
52	<p>Sago pondweed (<i>Stuckenia pectinata</i>) (formerly <i>Potamogeton pectinatus</i>) (0/-)</p> <p>Growth characteristics Sago pondweed is one of the taller, highly branched native aquatic plants. It can grow over other native species and form colonies covering many acres. A native species, it has natural biological control agents that diminish large colonies in time. However, control of other aquatic plants reduces competition and can allow sago pondweed to maintain a greater coverage for longer.</p> <p>Habitat Sago pondweed may be found throughout the littoral zone to a depth of 10 feet.</p> <p>Beneficial traits Its bushy nature provides excellent habitat for small aquatic invertebrates, so it is a good fish food provider. When not in dense conditions, it is exceptional fish habitat, especially in deeper water areas. It is also a preferred waterfowl food plant.</p> <p>Nuisance traits Its tall, dense growth pattern conflicts with many recreational activities. In dense conditions, it can be a localized and lakewide problem.</p> <p>Other details In lakes with major aquatic plant control projects, sago pondweed can expand its coverage and become a problem.</p>
53	<p>Hydrilla (<i>Hydrilla verticillata</i>) (-)</p> <p>Growth characteristics Hydrilla is a submersed aquatic plant native to much of Asia. Taxonomically, it is a member of the Hydrocharitaceae (frog's bit) family, the same family as Michigan's native plant <i>Elodea canadensis</i> (waterweed), which it closely resembles. It can grow in lakes, ponds, slow-flowing streams, drains and deepwater marshes. Under good conditions it can grow an inch a day and reach a length of 30 feet. It can reproduce by seeds, turions that form at the bases of leaves, tubers or stem fragments. It forms a dense canopy at the water surface, limiting the growth of native species and driving many to local extinction. It usually outcompetes even Eurasian milfoil to be the dominant plant in a lake.</p> <p>Habitat Hydrilla may be found throughout the littoral zone to a depth of 20 feet or more.</p> <p>Beneficial traits Its bushy nature provides excellent habitat for aquatic insects and invertebrates, making it a good fish food provider.</p> <p>Nuisance traits One Florida researcher referred to hydrilla as the "perfect aquatic weed." It typically invades a new environment by colonizing an area, such as deepwater sediments or other sites not colonized by native species, and then spreading to dominate the environment. Where it becomes established, it is a serious recreational and economic problem.</p> <p>Other details At the time of this writing, hydrilla is not in Michigan, but it has been found in northern Indiana and will likely invade Michigan.</p>



Chapter 4

Creating a Plant Collection

Introduction

The creation of a plant collection has several values, including:

- Helping volunteer monitors learn to recognize various aquatic plants.
- Serving as a reference for collectors.
- Providing a long-term record.
- Allowing quality control checks by an aquatic ecologist.
- Serving as a program display to acquaint property owners with aquatic plants.

There are several plant collection methods. The use of herbarium procedures produces a mounted specimen that will last a long time if stored in climate-controlled cabinets. Unfortunately, these mounted specimens are fragile and not easily handled or transported. Procedures for producing herbarium specimens are available in many botanical texts and are not presented here. Instead, this reference provides a procedure for producing a more functional collection with the obvious tradeoff in longevity.

Materials Needed

A **rake**, **cooler**, **ice**, **tape** and **zip-lock bags** are needed to collect and transport the plants. Inscribe the collection location on each bag with a **waterproof marker**. The home work area will need a **shallow pan**, a **plant press**, **newspaper**, **matte board**, **clear contact paper**, **self-adhesive labels**, **clear packaging tape**, and **toothpicks** or a **similar pointed tool**.

Procedures

A thorough search assures representation of the lake's common plant species in a collection. Survey both developed and undeveloped shorelines and all depths of water out to at least 10 feet. Collection of plants in deep water will require a rake and line. Chapter 5, "Mapping Aquatic Plants in the Lake," provides suggestions for rakes and their use.

Aquatic plants grow and bloom at various times of the year; just like land plants, so creating a good collection requires sampling at least twice during the summer. The best collection dates for Michigan are early to mid-June and late August.



After harvesting the plants, select the best specimens. Choose plants that are in bloom or fruiting, green and vigorous, and unbroken and undamaged. Retain three good examples to guarantee one good mount. Gently place gathered plants in zip-lock bags marked with location, depth and date, keep cool and press within 12 hours. Use tape to keep zip-lock bags closed, if necessary.

At the home work station, identify the plants using the Citizen's Key to Common Aquatic Plants of Michigan Lakes in Chapter 3. Keep the plants damp in a shallow pan while identifying. Press and mount unidentified plants for later identification by an aquatic ecologist or other expert.

On a newspaper, lay out a plant. Use a toothpick or other pointed tool to spread the plant so all important features are apparent. Bend the plant so it will fit onto a matte board 11 by 14 inches or larger. Fold very long plants into a **W** shape. If the plant has too many leaves, remove a few so the remaining leaves clearly display patterns and shapes. Sometimes individually mounting leaves, flowers, nutlets or other important features greatly assists identification.

Once the plant is properly spread, lay a newspaper over the plant and place it in the press. Insert a spacer board and repeat the process for the next plant. Press the plants for 6 to 8 weeks. Figure 4.1 presents a simple homemade plant press. If no plant press is available, spread the plants in newspaper and

Chapter 4



Creating a Plant Collection

press between large heavy books, such as old phone books.

After pressing, very carefully remove a plant from the newspapers and lay it out on a matte board. The matte board should already have a completed label attached in a corner. Box 4.1 provides an example label. Wrap the plant and matte board with clear contact paper. Cut squares out of the contact paper corners to allow the contact paper to fold easily around the matte board without crumpling. Small pieces of clear tape help hold the plant down when placing the contact paper. On the backside of the matte board, use clear packaging tape to secure the edges of the contact paper.

Securely store the mounted plants to avoid damaging the collection. Large file folders are available that hold 11- by 14-inch matte boards.

Training

Reviewing these procedures with an aquatic ecologist will minimize problems and provide a quality product. Michigan Lake and Stream Associations, Inc., annual meetings and Michigan State University Extension training often provide instruction in aquatic plant management. These are excellent

Box 4.1 Example Label

COMMON NAME: _____

SCIENTIFIC NAME: _____

Lake: _____

County: _____

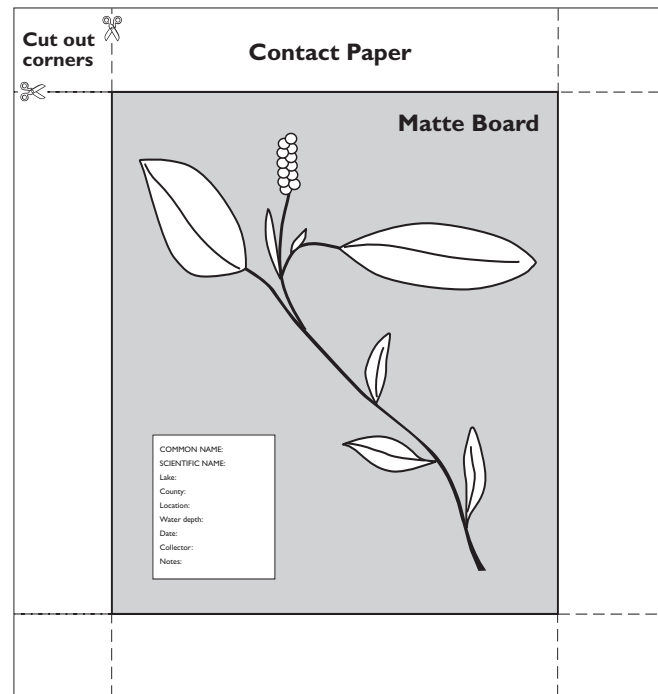
Location: _____

Water depth: _____

Date: _____

Collector: _____

Notes: _____



settings to obtain information and share problems and suggestions with other citizen volunteer monitors.

Collection Verification

Periodic review of the collection by an aquatic ecologist to verify plant identification is essential. Have the collection verified by a knowledgeable professional or in an aquatic plant workshop.

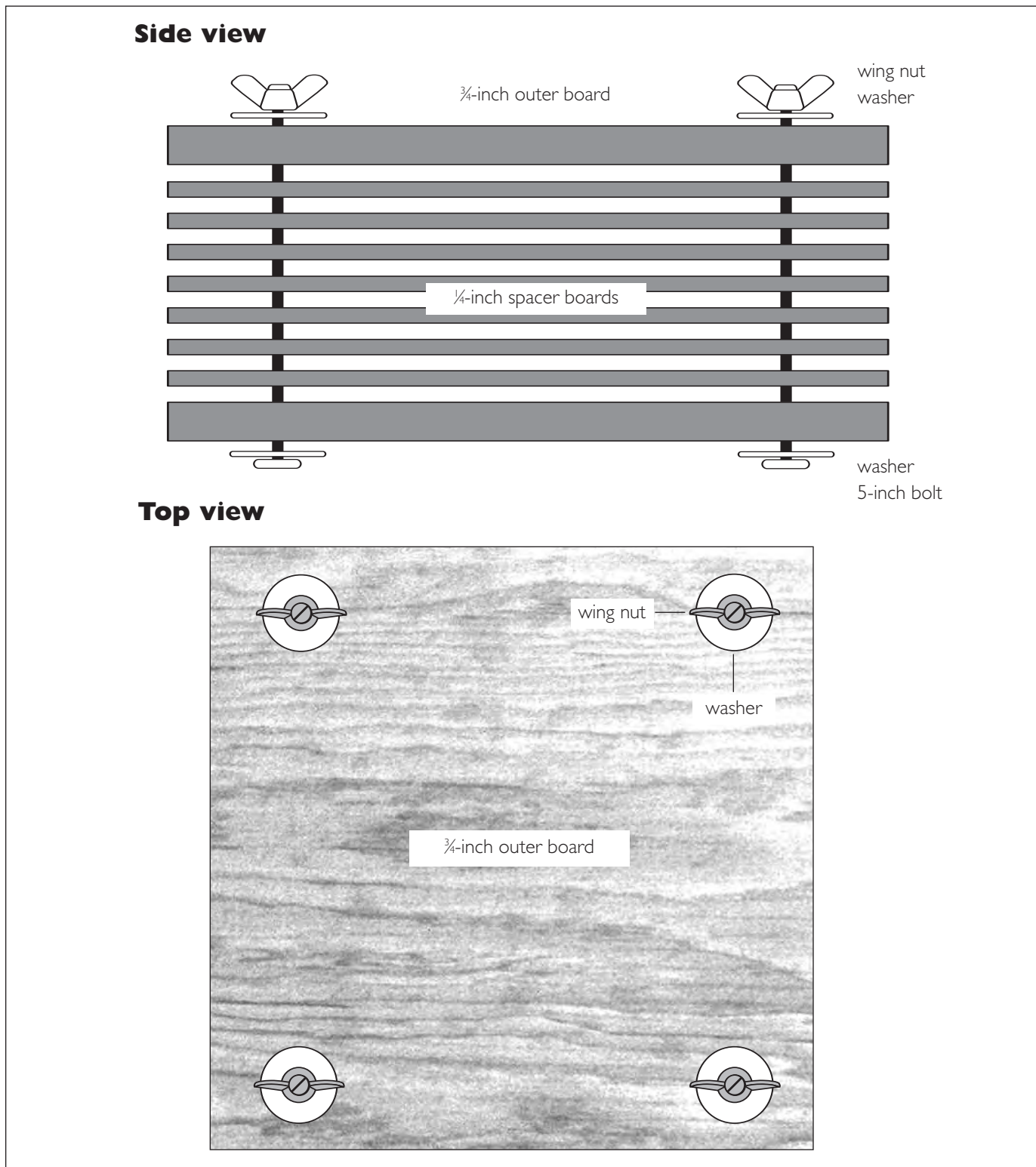
References

References on aquatic plant collections:

- Temte, J. (no date). **Aquatic Plant Monitoring Procedures - Self-Help Lake Volunteer Training Manual**. Madison, Wis.: Wisconsin Department of Natural Resources.
- Hellquist, C.B. 1993. **Taxonomic Considerations in Aquatic Vegetation Assessment**. Lake and Reservoir Management 7 (2) 175 - 183. Alachua, Fla.: North American Lake Management Society.



Fig. 4.1 **Homemade plant press.**





Chapter 5

Mapping Aquatic Plants in the Lake

Introduction

There are no easy methods to map aquatic plants. People working on the water surface sometimes can't even see the plants below. With some effort and a consistent sampling program, however, a citizen monitor can do a general assessment of a lake's plants. This general assessment is a snapshot of existing conditions. This manual provides a sampling program that volunteer monitors can use to produce an aquatic plant map and data sheet. The program may be used as presented or modified, with assistance from a water quality professional, to meet individual lake needs. Sampling could be limited to critical species, such as the exotics Eurasian milfoil and curly-leaf pondweed. Color codes could be used instead of numbers and letters to produce visual products for citizens. Whatever sampling program is used, it should produce good, reliable information and have procedures that can be duplicated in subsequent years.

The sampling program suggested in this manual is time consuming. Several teams of volunteers may be needed to complete the sampling in a timely manner. On large lakes, several days of sampling may be needed. Required equipment and supplies are generally available. A critical component is the volunteer's time and willingness to learn. Collecting the data needed to create an aquatic plant map and data sheet is



much more efficient if the volunteer is already familiar with and able to identify the plants growing in the lake. It is essential to spend some time, maybe even the first year, creating a plant collection and learning to recognize the plants. A lake-specific plant collection, verified by an aquatic ecologist, can be an invaluable tool to help volunteers construct the lake's aquatic plant map and data sheet.

The numbers generated by the sampling methods in this manual are for comparative purposes, not quantitative scientific data usable in statistical analysis. Changes in plant density scores can be the result of the procedures used or the interpretation of the data collector. Even substantial differences in density scores need to be interpreted carefully. Cautious use of this information, along with facts on shoreline land uses, watershed characteristics, nutrient concentrations and recreational goals, allows development of an aquatic plant management plan.

Many lake associations will find it beneficial to hire a professional aquatic ecologist to assess the plant populations of their lake. If they do, the association should still have individuals familiar with aquatic plant identification and assessment methods to communicate with consultants, contractors and governmental units.

Materials Needed

Boating equipment (**boat, motor, gasoline, repair kit, anchor and oars**) provides transportation and a working platform. Safety equipment (**a life vest for each person and a first-aid kit**) is very important and should not be left on shore. Always sample with two people in the boat in case an emergency should arise. Sampling equipment consists of: a sampling map, ideally a depth map of the lake, if available; **extra maps of the lake; field recording sheets; weighted sounding line**, marked for measuring water depth; **weighted rake and retrieving line; zip-lock bags; clipboard; pencils; and waterproof marker.**



When to Monitor

Aquatic plant species grow and bloom at various times of the year. Ideally, two aquatic plant maps should be created during the summer. The best data collection dates are early to mid-June and late August. If plant populations are stable and exotic nuisance species are not present, annual mapping is not necessary. Mapping every 3 to 5 years is adequate. Inspections for introduction of undesirable species are still done every year. Annual mapping is recommended if plant populations are expanding, if nuisance species are present or if plant populations are managed.

Preparations

Before mapping begins, the monitoring team(s) prepares for sampling. One monitoring team of two volunteers may process about 10 to 15 sampling transects per day. With experience and thorough preparations, sampling efficiency will improve. Some pre-sampling preparations are suggested.

The sampling map

Aquatic plant collection sites are identified on a sampling map, ideally a depth map of the lake. An example is provided in Figure 5.1. Draw sampling transect lines on the map perpendicular from the shore out to the 10-foot depth contour. Place an "X" on the transect line at approximately the 1-foot, 4-foot and 8-foot depths. Each "X" represents a plant collection site. Recording a description of the shoreline at the transect starting point permits locating this same spot again later. GPS units may also be used to identify the location. Number each transect line and record the number on the map. This number simplifies data recording.

The transect lines are regularly distributed around the lake, with two exceptions. Position one at a boat launching site and another at the major stream inlet. These sites are places of plant introductions. Sampling these sites facilitates early detection of exotic plant introductions and aquatic plant community changes in the lake.

How many sampling transect lines to create is a function of the lake's size and the number of monitors available. Box 5.1 suggests the minimum number of transect lines for lakes of three size ranges. Smaller lakes need fewer transects; larger lakes, more.

Box 5.1

Suggested Minimum Number of Transects	
Lake size in acres	Number of sampling transect lines
less than 100	5 to 15
100 to 500	15 to 30
over 500	30 to 50

Field recording sheets

The field recording sheet is the most important item in the aquatic plant mapping effort. The data recorded on these sheets are the foundation for future management decisions. They should be completed accurately and retained for future reference. Each transect line has three sampling sites (1-, 4- and 8-foot depths), so each monitoring effort needs three recording sheets for each transect line. Completing the information sections of the field recording sheets before going on the lake will save time and confusion once sampling begins. Figure 5.2 is a suggested field recording sheet. It is a modification of the recording sheet in *Volunteer Lake Monitoring: A Methods Manual*, published by the U.S. Environmental Protection Agency.

Weighted sounding line

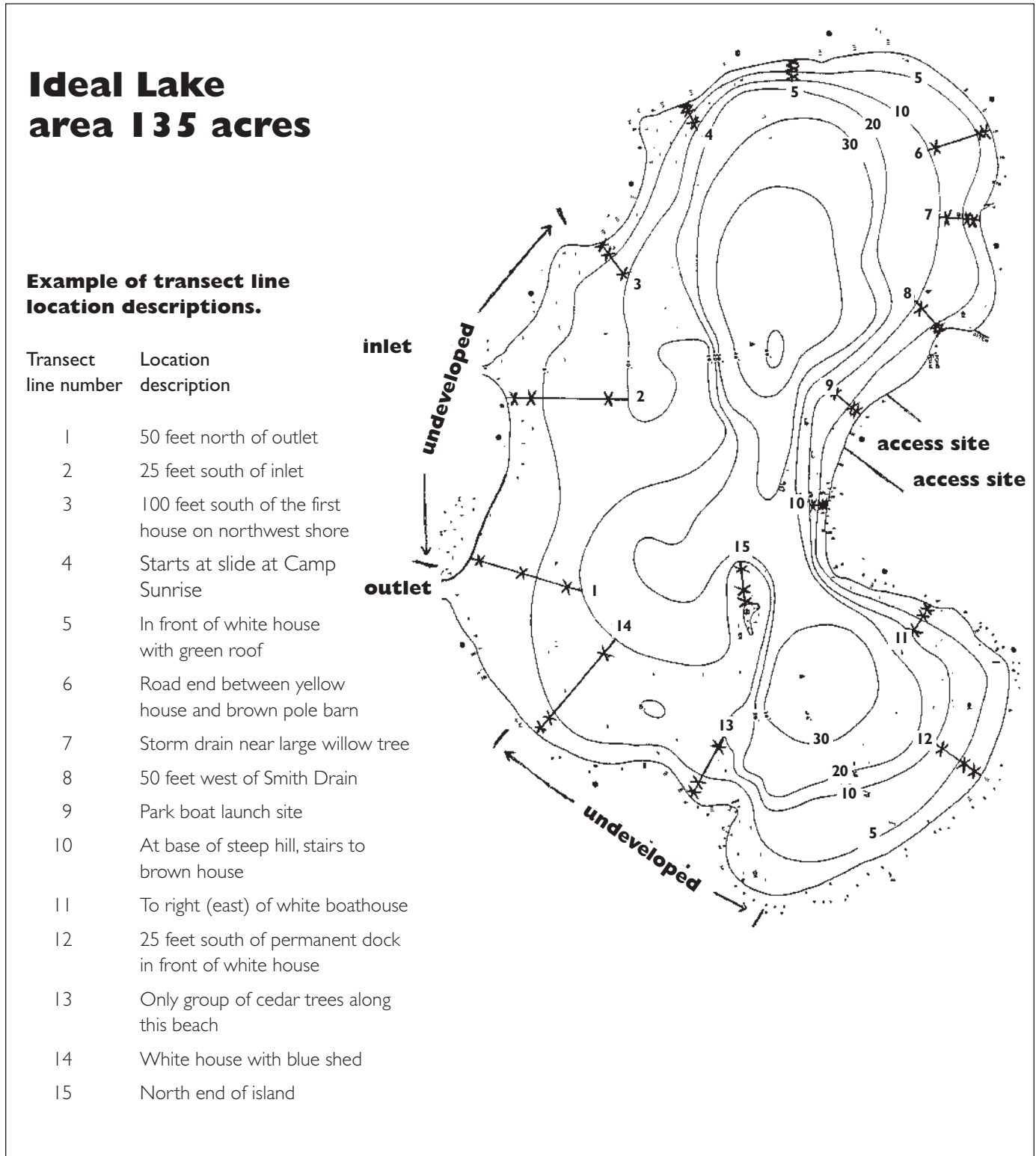
The weighted sounding line is a strong rope with a flat or disk-shaped weight attached to the end. The disk-shaped weight will not sink into organic mucky bottoms as much as more compact weights. The sounding line should be marked so the 1-, 4- and 8-foot sampling depths can be located quickly and easily.

Weighted rake and retrieving line

To collect plants, a strong rake or other harvesting device is needed. Sampling in water 8 feet deep requires a heavy or weighted rake. A long telescoping pole, at least 15 feet long, may be used for retrieval. However, a rope line usually works more efficiently. A wide landscape rake with the handle removed or cut short and secured to a strong line works well. A tool that works especially proficiently is a



Fig. 5.1. Example of field sampling map and sampling site descriptions.



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Mapping Aquatic Plants in the Lake

Fig. 5.2. Example field recording sheet.

Lake name:	County name:	Density rating chart	
Sampling date:		Rake recovery of aquatic plant	Density rating
Names of volunteers:		Taken in all 4 casts (teeth of rake full)	Dense (D)
		Taken in 4 casts	Heavy (H)
		Taken in 3 casts	Moderate (M)
		Taken in 2 casts	Sparse (S)
		Taken in 1 cast	Found (F)

Transect line no.

Position on transect line

1 foot

4 foot

8 foot

Plant name or identification number, if known	Collected in 12 o'clock position	Collected in 3 o'clock position	Collected in 6 o'clock position	Collected in 9 o'clock position	Density rating

Chapter 5



Mapping Aquatic Plants in the Lake

12- to 14-inch-wide lawn thatcher, again with the handle removed or cut short and a strong rope attached. Lines attached to the rake or thatching tool must be strong and bolted securely. Heavy plant growth creates considerable resistance when the rake is being retrieved.

Materials for identifying unknown plants

Use zip-lock bags and waterproof markers to collect unknown plant species for later identification.

Safety considerations

Before sampling starts: confirm weather conditions; ensure that all safety equipment is on board and in good condition; review safety procedures with all participating volunteers.

**Field Procedures**

During the week of scheduled plant sampling, take a tour of the lake to locate major aquatic plant beds. On an extra lake map, mark out the location of floating plants (Plant Key, Part 1), emergent plants (Plant Key, Parts 2 and 3) and submergent plants (Plant Key, Parts 4 - 7). This map is the plant location map for the lake. Figure 5.3 is an example. It provides a very general overview of the distribution of plants around the lake. The more detailed aquatic plant map is constructed by replacing the general plant categories (floating, emergent and submergent) of the plant location map, with actual plant

If volunteers are not available to undertake plant sampling, a plant location map may be completed as a first step in plant mapping for the lake. Finding and recording on the map the location of large beds of exotic species, such as Eurasian milfoil and curly-leaf pondweed, can enhance the simple plant location map. The enhanced plant location map may be used as a prototype aquatic plant map until more accurate information can be collected using the manual procedures.

species names and densities from data collected in the sampling program.

On the day chosen for plant sampling, activities proceed as follows:

- Go to the first sampling transect.
- Using the weighted sounding line, locate 1 foot of water.
- Anchor the boat facing shore. This will be the 12 o'clock position (see Figure 5.4).
- Pitch the weighted rake toward shore and retrieve.
- Remove all vegetation collected and sort into piles for each known and unknown species.
- Place three specimens of each unknown species in a zip-lock bag to be mounted for later identification.
- Record the presence of each species on the field recording sheet.
- Repeat the procedures at the 3, 6 and 9 o'clock positions.
- After completing all four clock positions, give each plant a density rating, using the rating system in Box 5.2.
- Lift anchor and move directly offshore to the 4-foot depth and anchor.
- Repeat the procedure as at the 1-foot depth site.
- After collecting at the 4-foot depth site, move to the 8-foot depth site and repeat the procedure.
- After completing the first sampling transect, move on to the next and repeat until all are completed.

With the rake, collection of floating plants is nearly impossible and emergent shoreline plants difficult. To account for this deficiency, visually check for these plants in each of the clock positions. If they are present in sufficient quantities to appear in the path of an imaginary rake tow, record their presence.

After all transects are completed, the plant data are combined with the plant location map to produce the aquatic plant map.



Fig. 5.3. Example of a plant location map.

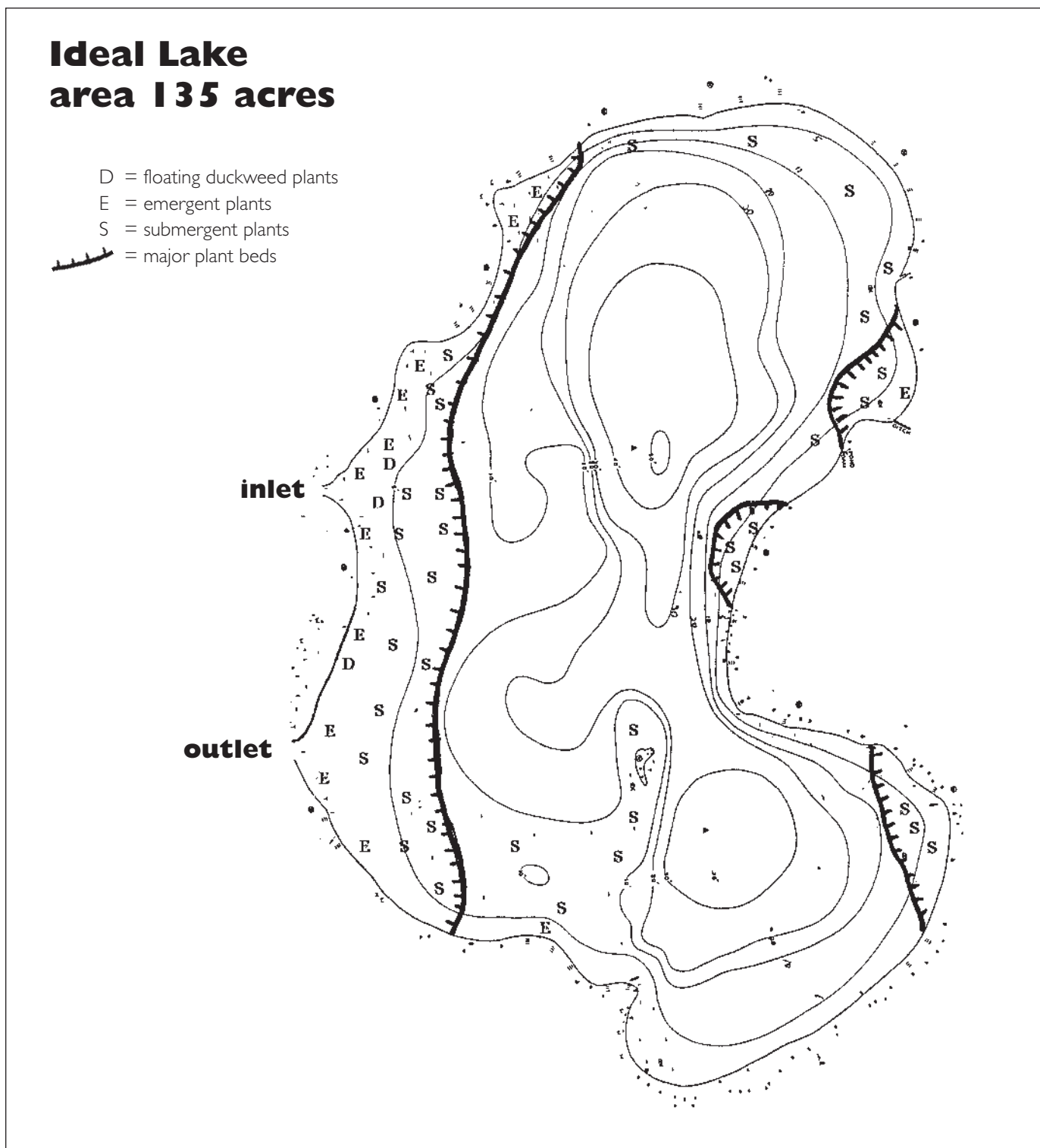
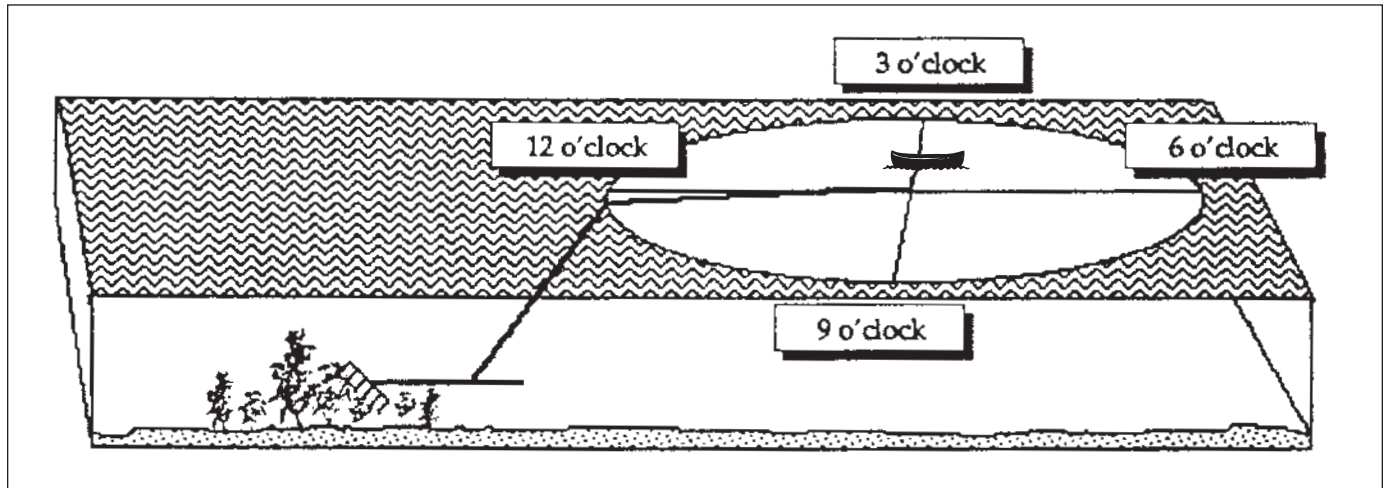




Fig. 5.4.



A rake is pitched at each clock position and then dragged along the lake bottom. The rake is then hauled back into the boat, and the collected vegetation is sorted into plant types. *Adapted from: Simpson, J.T. 1991. Volunteer Lake Monitoring: A Methods Manual. EPA 440/4-91-002.*

Box 5.2. Aquatic Plant Density Rating

Dense (D)	Species fills the rake in all four casts (12, 3, 6 and 9 o'clock).
Heavy (H)	Species found mixed with other plants in all four cast of the rake.
Moderate (M)	Species found in three of the four rake casts.
Sparse (S)	Species found in two of the four rake casts.
Found (F)	Species found in one of the four rake casts.

Producing the Aquatic Plant Map

To present the plant data on a map, a number code and a letter for its density symbolize each species. Any number code may be used, but the code in Box 5.3 is recommended. If each volunteer monitor uses the same code, sharing information is easier. The plants are ordered according to the portrait numbers given them in Chapter 3 for their growth characteristics. Numbering by growth characteristics will allow citizens to more clearly visualize the distribution of desirable low- and mid-growing species and the location of nuisance canopy species. As an example, the lake's management plan

may generally encourage plants with portrait numbers in the 20s and 30s, but plants with portrait numbers in the 50s would be controlled wherever found. Plants with portrait numbers in the 40s may be controlled only where they directly conflict with recreational uses.

The classification of aquatic plants into the growth patterns shown in Box 5.3 is a generalization and should not be strictly interpreted. The classification is based on a large number of observations by the author and colleagues. Under different environmental conditions, plant growth patterns can vary greatly. Low-growing plants such as bushy pondweed can reach the surface in 8 feet of water if conditions are right. Plants usually seen in scattered patches, such as coontail and native milfoil, can sometimes grow in large, dense beds.

To create the aquatic plant map, combine the numbers in Box 5.3 for each plant found at each sampling site with the density rating in Box 5.2 for the plant at that site. As an example, if coontail was found on three rake tows, its map symbol is 41M. On a copy of the lake map showing major plant beds, locate the map symbols for each plant found at each sampling site. A completed aquatic plant map provides a graphical description of what plants are growing in the lake, where and at what densities. Figure 5.5 is an example aquatic plant map.



Box 5.3. Aquatic Plants Numbered by Growth Pattern.

Free floating

1 - Watermeal	(0)
2 - Star duckweed	(0)
3 - Lesser duckweed	(0)
4 - Big duckweed	(0)

Low growing (1 to 3 feet)

20 - Stonewort	(+)
21 - Bushy pondweed	(+)
22 - Fern pondweed	(+)

Tall growing (4 to 10 feet); open scattered growth pattern

40 - Native milfoil	(0/-)
41 - Coontail	(0/-)
42 - Claspingleaf pondweed	(0)
43 - Floating-leaf pondweed	(+)
44 - Whitestem pondweed	(0)
45 - American pondweed	(+)
46 - Illinois pondweed	(+)
47 - Water marigold	(0)
48 - Bladderwort	(0)
49 - Buttercup	(0)

Shoreline (emergent)

6 - Cattail	(+)
7 - Bulrush	(+)
8 - Arrow arum	(+)
9 - Arrowhead	(+)
10 - Pickerelweed	(+)
11 - Smartweed	(+)
12 - White water lily	(+)
13 - Yellow water lily	(+)
14 - Water shield	(+)

Mid-water growing (2 to 5 feet)

30 - Large-leaf pondweed	(+)
31 - Variable pondweed	(+)
32 - Thin-leaf pondweed	(+)
33 - Flat-stemmed pondweed	(+)
34 - Wild celery	(+)
35 - Water star grass	(+)
36 - Waterweed	(+)

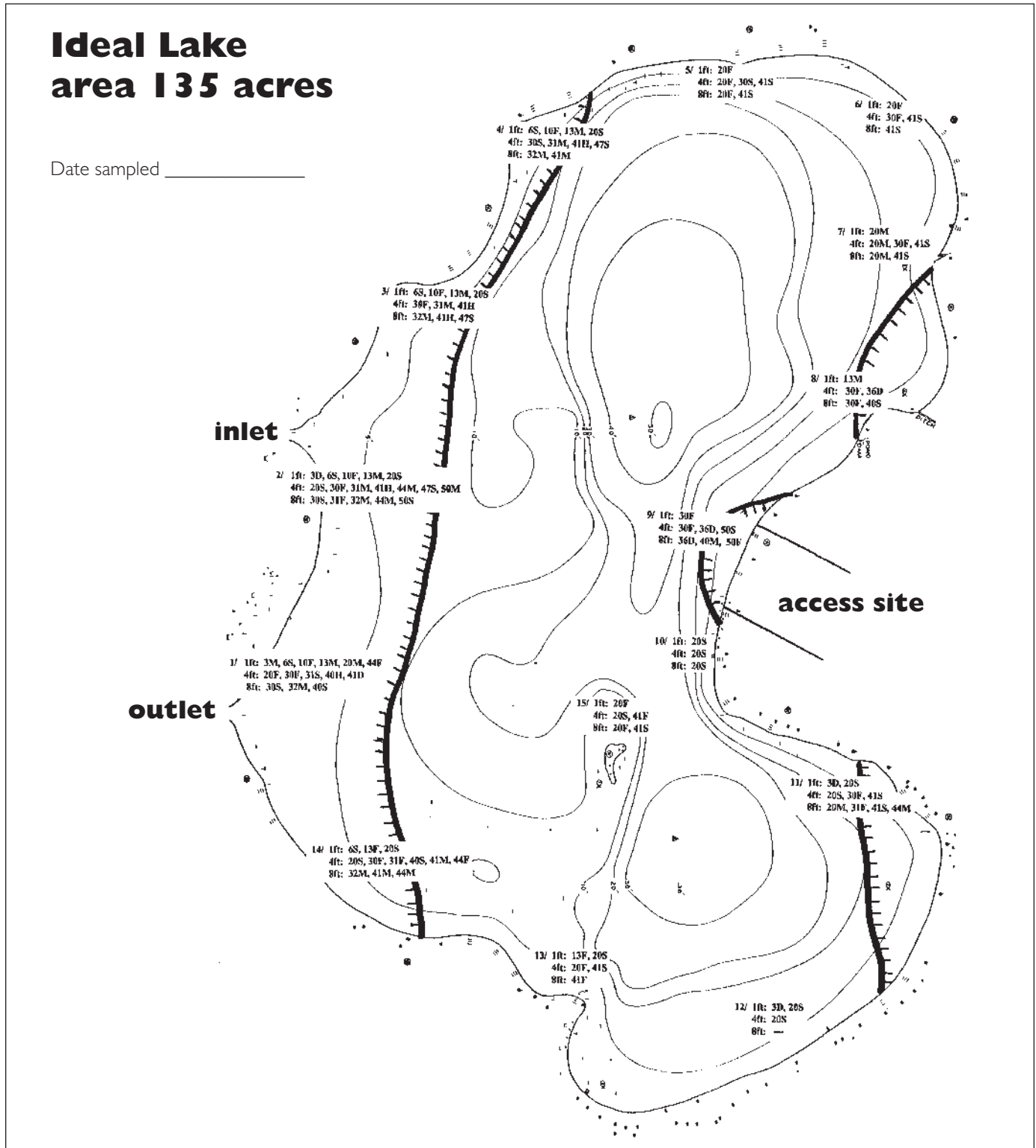
Tall growing (4 to 10 feet); dense canopy growth pattern

50 - Eurasian milfoil	(-)
51 - Curly-leaf pondweed	(-)
52 - Sago pondweed	(0/-)
53 - Hydrilla	(-)

(+) = generally beneficial, (0) = generally neutral, (-) generally a nuisance



Fig. 5.5. Example of aquatic plant map.





Producing the Data Sheet

In addition to the aquatic plant map, the information from the field recording sheets can be summarized onto a data sheet. Figure 5.6 provides an example data sheet. Summarize the data for the lake by tallying all the recorded observations for a plant and calculating its average density. This is done by assigning a number to each of the density ratings: 1 for "found"; 2 for "sparse"; 3 for "moderate"; 4 for "heavy" and 5 for "dense". Total the plant's density numbers and divide by the number of sampling sites used. An example calculation is presented in Box 5.4.

In the example in Box 5.4, coontail is present in only 20 of 45 sample sites. At most sites, it is absent or present in low densities, giving an overall lakewide density rating of 1.1. Only at a few sites does it reach dense conditions that could be a problem. Completing the calculations for each plant species establishes the relative dominance and distribution of plants throughout the lake. The same calculations can be performed, if helpful, for the near-shore sample sites (1-foot-deep

sampling station), the mid-depth sampling sites (4-foot-deep sampling sites) and the deep-water sampling sites (8-foot-deep sampling sites). In the example in Box 5.4, with 15 sampling transects there are 15 sampling sites for each water depth zone. The completed data sheet and aquatic plant map provide a good description of the general location and dominance of each plant species in the lake.

Having compiled a good database on the lake's plant population, the volunteer monitor may use the information in Chapters 6-8 to prepare a management plan.

Training and Review

Reviewing procedures and completed work with an aquatic ecologist is beneficial. Michigan Lake and Stream Associations, Inc., Michigan State University Extension and others have aquatic ecologists available at regional aquatic plant workshops and conferences. The plant data could be reviewed with one of these individuals or with a professional ecologist from a consulting firm.

Box 5.4. Example Data Sheet Calculation.

There were 15 sampling transects in the lake, giving 45 sampling sites. Coontail was present at 20 sites in the densities identified below.

Density	Number of observations	Multiplication factor	Total density points
Found	2	1	2
Sparse	10	2	20
Moderate	3	3	9
Heavy	3	4	12
Dense	2	5	10
TOTAL	20		50

50 (total density points) / 45 (sampling sites)
= 1.1 (lakewide density rating)

An average lakewide density rating of 1.1 is slightly above the "found" level.

Record observations (20) and average lakewide density rating (1.1) on the data sheet.

References

- Other references on the subject of plant mapping include:
- Madsen, J.D., and J.A. Bloomfield. 1992. **Aquatic Vegetation Monitoring and Assessment Protocol Manual**. Albany, N.Y.: A Report to the Finger Lakes Water Resources Board.
- Madsen, J.D., and K.D. Getsinger. 1997. **Evaluating Shifts in Submersed Plant Species Diversity Following Whole-Lake Fluridone Treatments. A Proposed Sampling Protocol**. Vicksburg, Miss.: COE Waterways Experiment Station.
- North American Lake Management Society. 1993. **Aquatic Vegetation Quantification Symposium**. In Lake and Reservoir Management, Volume 7, No. 2.
- Phillips, E.A. 1959. **Methods of Vegetation Study**. New York: Henry Holt & Co.
- Simpson, J.T. 1991. **Volunteer Lake Monitoring: A Methods Manual**. EPA 440/4-91-002. Washington, D.C.: U.S. Environmental Protection Agency.
- Temte, J. No date. **Aquatic Plant Monitoring Procedures - Self-Help Lake Volunteer Training Manual**. Madison, Wis.: Wisconsin Department of Natural Resources.



Chapter 6

Securing Public Input

Introduction

The management of aquatic plants requires not only a knowledge of the lake's plant community but information from the lake's citizens. It is important to understand how the citizens perceive the lake and its condition, their comprehension of lake ecology and plant communities, and their recreational aspirations. Do the citizens have realistic expectations, and are they willing to commit to comprehensive management of the lake resource? If the plan does not address the citizens' concerns and issues, it is likely to be rejected, even if it is environmentally and technically correct.

It is impossible to make good decisions without knowledge or practical information. Most lake citizens have never had a class or training session on lake ecology or read a book or manual on managing lake resources. It is unfair to expect them to make decisions regarding a multimillion dollar resource without adequate information. Citizens want to make appropriate decisions and desire the information needed for that purpose but may not know where to obtain it. Facts and reference materials should be made available for those citizens wishing more information.

In many cases, an informational program should precede completion of the management plan to prepare citizens for receipt of the plan. It may even be desirable to conduct the informational program before initiating a citizen survey. This allows them to formulate opinions on the issues with facts before they are requested to provide input to plan development. Introductory materials for an informational program are provided in this chapter. Additional information on lake ecology and aquatic plants for distribution to citizens may be assembled from the documents listed in the reference section at the end of the chapter.

Acquiring citizen input to plan development might be accomplished in several ways, including receipt of written comments, survey forms and public meetings. Depending on the circumstances, the management plan developers may use one or more of these procedures to secure citizen input. One of the

most frequently used methods is the survey questionnaire form. An example form is provided in this chapter:

Information Program

To facilitate the information process, two introductory information sheets are included in this manual. Box 6.1 provides information on lake ecology; Box 6.2 includes facts on aquatic plant communities. These information sheets may be used or modified to address a specific situation. The best information program would incorporate lake conditions for the specific lake into the information documents. This allows the citizens to relate directly to the facts provided for their lake.

Survey of Citizens

Box 6.3 provides an example of an aquatic plant survey questionnaire for obtaining the opinions and concerns of citizens living on or using the lake. This survey form may be used as is or modified to address the specific situation. The form may also be improved by incorporating lake data for the particular lake into the questions. This allows the citizens to relate directly to the issues.

Each question on the survey form is included for a distinct purpose. An individual's response to each question informs those developing the management plan how that individual defines the issues, problems and needs. The purpose for each question is as follows:

- **Question 1** – This question provides a perspective on how long the respondent has been familiar with the lake's conditions.
- **Question 2** – The response to this question identifies the disposition the individual may have for aquatic plants. Generally, those who fish will have a greater tolerance for aquatic plants. Those who only water ski and/or swim may have a low tolerance for aquatic plants.

(continued on p. 63)



Box 6.1

The Nature of Lakes

The last glacial period, about 10,000 years ago, left Michigan with a diverse arrangement of soils and topography. Depressions filled with water, creating Michigan's approximately 11,000 lakes larger than 5 surface acres. In regions where nutrient-rich soils were deposited, primarily the southern part of the Lower Peninsula, the land and the lakes are fertile. These nutrient-rich soils produce an abundance of plants and animals, both on the land and in the water. Scientists labeled these fertile lakes with abundant plants "**eutrophic**". In regions of the state where nutrient-poor soils were deposited, the lakes are less fertile and produce fewer plants and animals. Scientists classified these lakes as "**mesotrophic**", lakes of moderate fertility, and "**oligotrophic**", lakes of low fertility. These three classes of lakes are referred to as **trophic states** or levels of fertility.

Lakes are a temporary feature of the landscape. Over time, soil particles and nutrients are washed into the lake from the land around it. This drainage area is called the lake's watershed. Gradually the lake becomes shallower and more fertile, producing more plants. Eventually the lake becomes a wetland and then part of the forest. This process of aging is called **natural eutrophication** and takes thousands of years even in small, shallow lakes. The development of human civilization increases the fertility of the land and the movement of sediments and nutrients into the lakes. The eutrophication process is greatly accelerated, dramatically increasing plant growth in the lakes. This accelerated process is termed **cultural eutrophication**.

The qualities or characteristics of a lake can be changed in two ways: **short-term in-lake management** and **long-term watershed management**. In-lake management is directed at the effects of cultural eutrophication. Tools and techniques include the use of herbicides, harvesters and drawdown to reduce aquatic plant populations. These management activities do not change the environmental conditions that caused the plants to grow, so their benefits are short-term. The plants quickly return or are replaced by more

aggressive plants or by algae. The only way to change the characteristics of a lake over the long term is to address the cause of cultural eutrophication, which is the loading of the lake with sediments and nutrients from the watershed. It is possible to retard or even reverse the effects of cultural eutrophication with watershed management.

The natural trophic state of a lake is the base level of fertility, which neither short-term nor long-term management is likely to alter. A lake that is naturally eutrophic produces an abundance of plants and/or algae. Management may shift productivity from one plant to another, but it doesn't change the basic fertility of the lake. Drastically altering the characteristics of a naturally eutrophic lake is possible but not sustainable without continual application of controls. Tremendous energy and cost must be perpetually expended to maintain the artificial conditions created. Relaxing efforts even slightly allows aggressive species to colonize the highly disturbed and unnatural environment. The impacts on native plant and animal communities under such conditions are major and negative. It is important to know a lake's trophic state and the consequences of management controls before applying them.

For a list of additional references on lake ecology, please contact: (List the name, address and phone number of your lake association's contact person below.)



Box 6.2

Plants that Grow in Lakes

Plants are a natural part of the aquatic environment, just as grasses, shrubs and trees are part of the land. They are essential to lakes and the animals that live in or near the water. Their roots are a fabric that holds sediments in place, reduces erosion and maintains bottom stability. They serve to cycle nutrients through the environment and enrich the lake with oxygen. Plants provide habitat for every life stage of fish, including spawning and nursery areas as well as habitat for foraging and predator avoidance. Waterfowl, shorebirds and birds of the marsh habitat use aquatic plants for food, as nesting materials and as cover from predators. Aquatic animals such as fish, frogs, turtles, muskrats, beavers and otters, as well as water-dependent animals such as minks, martens and shrews, use these plants for similar purposes.

Plants are important to lakes, but they can become overabundant in some situations and cause negative impacts on fish populations, fishing and the recreational activities of lake users. When plants become a problem, controls should be implemented to improve environmental and recreational conditions while maintaining the proper vegetative balance for the lake's natural trophic state. The lake should be subtly changed to enhance habitat and recreational uses, not drastically altered. The use of aquatic plant controls will not change a lake's trophic state and, if misused, can negatively affect the plants and the animals that depend on them. Persistent overuse of any control tool can result in a shift to aggressive "weed" species taking advantage of disrupted natural conditions.

One hundred or more common aquatic plant species grow in Michigan lakes. Most of these species are desirable plants that conflict only minimally with recreational uses. A few, however, form dense beds that create major recreational problems. The two worst offenders are **exotic species** unintentionally imported from Europe and Asia – **Eurasian milfoil** and **curly-leaf pondweed**. These two invaders can take over a lake, crowding out native species and creating a recreational nightmare. Excessive control of native plants can facilitate the spread and dominance of these exotic pests. Additionally, a few native plants, such as **sago**

pondweed and **coontail**, may become a nuisance if competition from other plants is reduced by a plant control project.

The direct management of plants, whether in the water or on the land, generally falls into five broad options: **promotion, no intervention, selective maintenance, small-scale site maintenance** and **large-scale continual maintenance**. The introduction or planting of desirable species can increase plant variety, improve habitat for animals and add competition for undesirable species. In many lakes, the plants are well distributed and do not interfere with recreational uses. No management is needed in these lakes except monitoring to identify introductions of exotic species. Selective maintenance uses a control to remove one or two species from the lake and maintain all others, and so minimizes environmental impacts. Small-scale site maintenance removes all plants from a very small area, such as a swimming beach, leaving the remainder of the plant community intact. Large-scale continual maintenance is the removal of most plants from a large area of the lake. An analogy in the terrestrial environment would be a farm field. Once cleared, the field must be continually managed to maintain the artificial vegetative state.

Plants may also be managed indirectly by **environmental manipulation**, which often provides long-term control of the plants. Manipulating the environment discourages plant reproduction, distribution and/or colonization. The long-term control of aquatic plants in lakes usually entails reducing the amounts of nutrients and sediments entering the lake from the watershed.

For a list of additional references on aquatic plants and their management contact: (List the name, address and phone number of your lake association's contact person.)



Box 6.3

Aquatic Plant Survey Questionnaire

1. How long have you had the opportunity to observe the lake? _____ Years
2. What uses do you make of the lake? (Select all that apply.)
 Swimming Fishing Boating Water skiing Viewing Hunting Personal watercraft
3. How would you rank the quality of the lake? (Select all that apply.)
 Very good Good Average Poor Bad
4. What aquatic plant problems exist in the lake? (You may choose more than one.)
 There are not enough plants for the fish and wildlife. Plants are excessive and hinder recreation.
 Plants are not a problem. Algae blooms are a problem.
 Plants are not a problem except in certain areas. Other plant problems (please explain):
 The plants are unsightly.
5. What kinds of plants are causing a problem? (Select all that apply.)
 Shoreline plants Underwater plants Floating plants Algae
6. Do aquatic plants interfere with any of the following activities? (You may choose more than one.)
 Swimming Navigation Offshore boating Fishing Viewing
7. In your opinion, how much of the lake's vegetation should be controlled?
 None Only problem plants Only in problem areas As much as permitted All plants
8. If the lake's vegetation should be reduced, which control method do you favor?
 Drawdown Harvesting Herbicides Hand raking No preference (use what's best)
 Other (please specify):
9. What do you think are the sources of pollution to the lake? (You may choose more than one.)
 Agricultural runoff Residential runoff Urban runoff Septic seepage Storm sewers
 Other (please specify):
10. Do you fertilize your lawn? Yes No
11. Would you support a voluntary program that promotes good septic system maintenance? Yes No

Please use the back of the questionnaire to present your ideas, ask questions and make comments.



(continued from p. 59)

- **Question 3** – This question provides an overall assessment of lake conditions as seen by the citizens.
- **Questions 4, 5 & 6** – The purpose of these questions is to characterize citizens' perspectives on the aquatic plant community of the lake and the problems that exist.
- **Question 7** – This question addresses the need for plant management and the citizens' viewpoint on the level of control needed. If many respondents indicate “as much as permitted” or “all plants,” an educational program is probably needed before the management plan is finalized.
- **Question 8** – The response to this question may identify a clear preference of the citizens for a particular control tool, which may or may not be appropriate for the conditions that exist.
- **Question 9** – The purpose of this question is to identify sources contributing to an aquatic plant problem and gauge the citizens' understanding of watershed impacts on the lake.
- **Question 10** – This question will identify possible problem areas and watershed management issues and determine whether an educational program on riparian stewardship would be beneficial.
- **Question 11** – This question will help determine citizens' interest in shoreline and watershed management as a long-term control of aquatic plants.

References

The references listed below may help citizens understand lake ecology and aquatic plants.

Holdren, C., *et al.* 2001. **Managing Lakes and Reservoirs.** Madison, Wis.: North American Lake Management Society and Terrene Institute. In cooperation with the Office of Water Assessment Watershed Protection Division, U.S. Environmental Protection Agency. (Copies available from North American Lake Management Society, www.nalms.org.)

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New York State Department of Environmental Conservation and Federation of Lake Associations, Inc. 1990. **Diet for a Small Lake.** (Available from New York State Federation of Lake Associations, Inc., www.nysfola.org.)

Vigmostad, K.E. No date. **Your Lake and You.** Madison, Wis.: North American Lake Management Society.

Warbach, J., *et al.* 1990. **Protecting Inland Lakes – You Can Make A Difference.** Lansing, Mich.: Michigan Department of Environment Quality.



Chapter 7

Management Options and Control Tools

Introduction

Aquatic plants are essential for maintaining a balanced, healthy lake, but any plant that creates a nuisance is a weed. The essence of aquatic plant management is suppressing undesirable species and plants that restrict essential uses while encouraging desirable species in important habitat areas. True management has both a controlling and a promoting aspect. Undesirable conditions are controlled, and essential conditions are promoted. Very often, lake plants are controlled but not promoted. This chapter and the following chapter suggest ways to use both controlling and promoting aspects of management.

There are various ways of applying management. Controls can be applied directly to the target plant, temporarily reducing its population. Because environmental conditions that favored the plant are not altered, it eventually returns. Consequently, such direct controls are known as short-term controls. Long-term controls are directed at the environmental conditions that permit the plant to grow and flourish. Altering environmental conditions needed by the plant greatly reduces its ability to reproduce and attain nuisance levels, and thus provides long-term control.

Short-term and long-term concepts can also be applied to promoting plants. Short-term promotion introduces a plant to the lake. Long-term promotion changes the environment to improve plant growth. Most lake communities are involved in the long-term promotion of aquatic plants. Because little or no watershed management is done to abate the increasing supply of nutrients and sediments reaching the lake from expanding agricultural and residential development, plant growth is promoted.

Long-term promotion or control of aquatic plants involves manipulation of the lake and its watershed to change the conditions that favor plant growth. Long-term management is primarily watershed management, which reduces or increases nutrient loading to the lake and therefore the supply of nutrients available for plant growth. Additionally, dredging to

change lake depth and sediment fertility may have some long-term benefits if properly designed and implemented. Biological control tools may also be long-term controls, depending on the herbivore/plant interactions.

This chapter discusses management options, which are basic management philosophies, and control tools, which are methods available to manipulate plants. Only in-lake or direct management options and control tools are discussed. Watershed management or long-term control strategies are briefly presented in Chapter 1. The references suggested in Chapter 1 should be consulted for assistance with watershed management. It is important to properly assess and relate any control option and tool with the specific lake conditions present at the time. No control option or tool will work in every situation. It may be best to consult a professional — who is knowledgeable regarding lake ecology and aquatic plant biology before finalizing any control program. Necessary permits should also be secured from the Michigan Department of Environmental Quality. A Department of Natural Resources (DNR) permit may be necessary if threatened and/or endangered species will be harmed. Also, use permits may be necessary if you are using DNR property for commercial purposes. It may also be necessary to consult with the local units of government for permits, approvals or compliance with local ordinances.

Management Options

Direct management of plants, whether in water or on land, generally falls into five broad options, each with advantages and disadvantages. Each should be considered carefully before being incorporated into the lake's management plan. The five options are: plant promotion, no intervention, selective maintenance, small-scale site maintenance and large-scale continual maintenance.



Plant promotion

For the first 50 years of the 1900s, the primary objective of most aquatic plant management programs in Michigan was promoting plant growth, particularly species favorable to fish and wildlife. Research agencies conducted fertilization studies of lakes to

formulate procedures for increasing plant growth.

Conservation and lake groups spent considerable money planting desired species.



The most commonly cultivated plants included cattails, bulrushes, wild rice, water lilies, pondweeds (particularly sago and floating leaf), wild celery and bushy pondweed.

Today so much effort is expended curtailing plant growth that the idea of encouraging vegetation seems abnormal. This shift in plant management philosophy is no doubt linked to the development of large outboard motors and the building of lakefront homes following World War II. Before 1950, the lake experience consisted of challenging the wild environment, swimming, fishing and hunting. A large outboard motor was 10 horsepower. A place on the lake was a rustic cottage, with few or no modern amenities. Since 1950, pleasure boating and high-speed water sports have become significant lake use activities, and a modern second home and suburban concepts of environmental order have replaced the primitive cottage.

Controlling aquatic plants may be necessary to maintain modern recreational uses. What should not be lost from the first 50 years of plant management is the value of plants to the whole lake ecosystem and the concept of encouraging desirable species. Physically planting vegetation is probably not the best promotion of desirable species but may be necessary as a last resort. Management plans should identify desirable species, map their location, avoid using controls in important habitat areas and keep aggressive species suppressed with maintenance control strategies described in the section on selective maintenance. A healthy population of desirable species is the best defense against the spread of exotic nuisances such as Eurasian milfoil.

Advantages:

- Promotes good fish and wildlife habitat.
- Encourages native species.
- Protects against the invasion of nuisance species.
- Low or no cost.

Disadvantages:

- May conflict with some recreational uses, such as swimming and boating.

No intervention

In this management option, plants are intentionally not controlled or manipulated but allowed to grow as environmental conditions dictate. This option is used most often in higher quality (oligotrophic or mesotrophic) lakes where rooted plants and algae are not naturally abundant. The plants create no or only minor recreational conflict, so they are allowed to grow without any controls.

Even in eutrophic lakes that naturally have abundant plant and algae growth, this option should be considered in the management plan development process. If desirable plant species are growing in a good habitat arrangement and if recreation is not seriously hindered, manipulating the plants has little value and could result in a shift to less desirable species and create the need for additional control and added cost. Such action ignores the promoting aspect of management, focusing only on the control aspect. In some lakes, it may be more advantageous to slightly adjust recreational uses to the lake's natural characteristics than to attempt to alter the lake to fulfill every recreational aspiration.

Even if the no-intervention management option is used, the lake should still be monitored for the introduction of exotic nuisance species. It is easier to control these invaders in small areas rather than waiting until they have created a major problem.

Advantages:

- No cost or labor required.
- No environmental disruption.

Disadvantages:

- Certain recreational uses may be impeded.



Selective maintenance

This management option uses a control tool that removes only one or two species and maintains all others. The controlled species are usually troublesome native plants or exotics creating serious problems. Desirable species are not injured by the treatment, so they can fill the habitat opened by the reduction in undesirable species. A healthy population of desirable plants will deter the reintroduction and spread of the controlled undesirable plants. Because this option minimally affects the total plant population, it can be used in small or large areas without drastically altering the plant community and opening it for disruptive changes.

An important aspect of selective harvest in pest, parasite and disease management programs is the practice of **maintenance control**. It is extremely difficult to eradicate disease and pest organisms. Consequently, the practice of maintenance control is used to minimize the impact of troublesome pests and diseases on human culture. Maintenance control uses continual monitoring to identify the location and density of a target nuisance organism. Once it's identified, selective control techniques are immediately employed to check the pest before it can spread and cause major damage. This practice keeps the pest organism at low levels and minimizes the amount of pesticide or other control agent needed. Because the pest organism is never functionally eradicated, this practice must be employed repeatedly, thus the term "maintenance control".

Maintenance control may seem expensive and unnecessary when nuisance plants such as Eurasian milfoil or curly-leaf pondweed are only a minor problem in a lake. Exploding populations of these plants can cause major problems, however, and at high densities, control may be difficult and expensive.

Depending upon environmental conditions, some possible selective control tools may include:

- Careful hand or rake removal of small areas of recently introduced nuisance species.
- Eurasian milfoil control with the herbicide 2,4-D or triclopyr.
- Eurasian milfoil control with very low concentrations of the herbicide fluridone.
- Early-season treatment with fluridone.
- Curly-leaf pondweed control prior to about May 20 with contact herbicides.
- Mechanical harvesting of curly-leaf pondweed prior to about May 20.

The selectivity of these tools is continually being researched and improved.

Advantages:

- Controls the plants primarily responsible for recreational hindrance.
- Maintains and promotes good populations of desirable plants in the treated environment.
- Minimizes environmental impacts.
- Reduces costs.

Disadvantages:

- Some recreational uses may still be impaired.
- Water use restriction is possible.

Small-scale site maintenance

This management option controls most or all plants in a small area intensively used for recreation. Because the area of plant control is a very small part of the entire plant community, overall integrity is maintained. An example would be the complete removal of all vegetation in a swimming area. The total treated areas should be less than 20 percent of the lake's vegetation.

The size of the plant control site is key for this option to function appropriately and not cause undesirable shifts in the plant community. The complete removal of all vegetation customarily means the controlled plants are replaced by aggressive undesirable species. If the overall integrity of the plant community is sustained, however, intensively managing small sites may have minimal impact. Treated sites should be monitored to ensure that troublesome species do not use the disturbed area for invasion and spread.

Because the plant treatment site is small, the plant control tools most frequently used for this management option are small harvesting devices. They may include hand-held rakes and chains or small mechanized rakes and rolling devices or bottom barriers. All are labor-intensive. These activities may also require permits from the state (DEQ) or local units of government.

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Advantages:

- Low cost.
- Maximum use of small areas.
- Minimal environmental disruption.

Disadvantages:

- Usually labor-intensive.
- Recreational uses requiring a large area, such as boating, may still be hindered in some lakes.

Large-scale continual maintenance

This management option involves large-scale manipulation of the plant community, both in area and number of species controlled. A major reduction in plants occurs during the efficacy period of the plant control tool used. This option is environmentally disruptive and can produce substantial changes in the lake's plant and animal communities. Very careful consideration and planning should be undertaken before implementing large-scale continual maintenance.

Persistent use of this management option may cause an undesirable shift in plant species. Large treatments leave much of the littoral zone devoid of vegetation. The exposed treated area is susceptible to colonization by aggressively growing "weed" species, which can quickly dominate the ecosystem. Low-growing, non-aggressive native plant species can be greatly reduced by the control tool used and by competition from the invading weed species. Ultimately two or three tall-growing, canopy-forming plants can dominate the lake.

Once started, use of this option is difficult to stop. If the plants are left uncontrolled after a number of years, the lake will reestablish a diverse plant community, with the weed species being a minor component. However, many citizens will want the lake treated every year. Consequently, recurrent management becomes a necessity. This option should be started only with this understanding and a commitment to finance continual control. An analogy in the terrestrial environment would be a farm field. Once cleared, the field must be continually managed. If left unmanaged, even for one year, weed species proliferate.

If left unmanaged over time, the field reverts once again to a forest.

Advantages:

- Beneficial to recreational uses requiring a large area.

Disadvantages:

- High cost.
- Commitment to continual management.
- Usually disruptive to fish and wildlife populations.
- Encourages "weed" species.



Farm field undergoing plant succession.

Control Tools

The purpose of this publication is to aid riparian property owners in the identification and mapping of aquatic plants and in the development of an appropriate plant management plan for their lake. Part of the plan includes selection of control tools, which may target the plants directly or the environmental conditions that promote plant growth.

The abundance of aquatic plants largely depends on the amount of nutrients available to support their growth, so long-term management of aquatic plants involves the control of nutrients and sediments moving from the watershed into the lake. Therefore, watershed or nutrient management should be one of the control strategies used in most plant management plans. Chapter 1 provides a brief introduction to



the subject and refers the reader to other references that will aid in development of this phase of the management plan.

Control tools that more directly manipulate plant populations are profiled in this section. Most of these tools are short-term, providing only temporary control of the plants. The profiles are not meant to be comprehensive, only introductions to their advantages and disadvantages. More information on the control tools may be found in the references listed at the end of this chapter.

A permit from the Michigan Department of Environmental Quality (DEQ) will usually be required to use any of the control tools discussed. Contact the DEQ for permitting information before implementing any plant management project.

Dredging

Management options: long-term control (in certain situations) and plant promotion (in certain situations).

Dredging may provide long-term plant control benefits, depending on plan design and lake conditions. Removal of bottom sediments and the deepening of a lake can control aquatic plants in two ways. Plants must have sufficient light to germinate and grow. Water depth and turbidity diminish the amount of light reaching the sediments. Dredging a lake to a depth of 12 to 15 feet will prohibit most plants from germinating and reaching the surface in sufficient density to cause recreational problems. Dredging nutrient-rich sediments to expose nutrient-poor glaciated sediments, particularly sands, can diminish plant density by reducing nutrient availability and increasing sediment abrasiveness. If sources of sediment and nutrient inputs are not controlled, however, lake improvements may be short-term.

A dredging plan that does not achieve one or both of these goals usually brings about little change in the plant community. In shallow canals or shorelines, dredging to promote navigability may advance recreational use but not diminish the need for plant management.

Dredging can also be used to promote plant growth by altering environmental conditions such as depth, sediment type and degree of slope. Dredging based on knowledge of the environmental requirements of a desired plant can shape an area to promote that plant's colonization.

Additional management options such as control of undesired species can improve colonization of the desired species.

The two primary types of dredging are hydraulic and bucket. Hydraulic dredging utilizes lake water to pump sediments to a disposal site some distance from the lake. This type of dredging is expensive but more practical and cost-effective on large projects. Bucket dredging using backhoe-type equipment is limited to near-shore work where spoils can be sidecast or placed on trucks and transported off-site.

All forms of dredging are extremely expensive. The cost of dredging a major area of even a small lake is probably prohibitive in most situations. A good study addressing dredging feasibility can itself cost tens of thousands of dollars. If dredging is being considered for a lake, it may be advantageous to first conduct a preliminary study to consider its technical and financial feasibility.

Advantages:

- Possible long-term control of aquatic plants.
- Improved recreational use.

Disadvantages:

- Very expensive.
- Loss of lake use during dredging.
- Increased turbidity and/or algal problems during dredging.
- Possible contaminated sediments, increasing disposal costs and affecting the environment.
- Placement of spoils.
- Environmental issues regarding placement of sediments.
- If there has been no reduction of sediment and nutrient loading, dredging may only shift the lake's vegetation from rooted plants to algae.

Biological

Management options: long-term control, selective maintenance (in certain situations) and large-scale continual maintenance (in certain situations).

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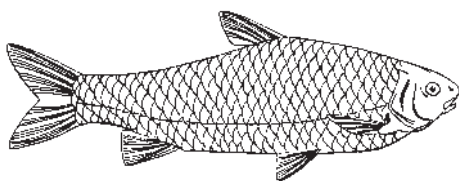


Management Options and Control Tools

Biological control uses an agent such as a predator, herbivore, parasite, fungus or disease to control a target organism. If successful, biological agents furnish long-term suppression. In most situations, however, the nuisance is not eradicated. Successful biological control agents do not eradicate their host. To do so means extinction for them. Instead, the populations of host and control agent fluctuate about an optimum level determined by environmental conditions and their interaction with each other. Permits may be required from the DNR for the introduction of non-native species into Michigan waters.

At this time, biological control agents for aquatic plant management programs in lakes are limited. Two possibilities have been or are being considered: the grass carp (*Ctenopharyngodon idella*) and an aquatic weevil (*Euhrychiopsis lecontei*).

Some southern states are using the grass carp in aquatic plant control programs; most northern states are not. Many concerns still remain regarding this fish's impacts on higher



Grass carp.

quality northern lakes and associated fish and waterfowl populations. At this time it is illegal to import the grass carp into Michigan. One of the major problems with the grass carp is its food preference. It prefers many of the plants that should be encouraged and avoids many of the nuisance species. Eurasian milfoil is one of the last plants the fish consumes. Most stocking rates recommended for the fish promote Eurasian milfoil expansion. At very high stocking rates, the grass carp will eat the Eurasian milfoil and any plant material it can find. The lake is stripped of all rooted vegetation; sport fish and waterfowl populations are negatively impacted, and the lake becomes dominated by blue-green algae.

Researchers are also evaluating the use of insects for Eurasian milfoil control. An aquatic weevil may have some potential. *E. lecontei* is native to North America. It lives most of its life cycle on native milfoil, feeding on the tips

and stem. Research has shown that it will also use Eurasian milfoil and may prefer this species if hatched from eggs deposited on Eurasian milfoil. More research, including in-lake evaluations, is needed to determine the efficacy of this weevil to control Eurasian milfoil.

Advantages:

- Long-term control.
- Potential low cost.

Disadvantages:

- Potential for significant environmental damage.
- Results may take years to manifest.
- The level of plant control may not meet lake user expectations.
- Initial cost can be high.

Drawdown

Management options: plant promotion, large-scale continual maintenance (in certain situations) and selective maintenance (in certain situations).

Drawdown or water level manipulation is a control tool for certain types of aquatic vegetation. Exposing lake sediments to drying and freezing kills the plant tissues and roots of some species. Other plants resist desiccation and freezing and proliferate after drawdown. Additionally, drawdown results have been highly variable, so it is impossible to determine definitively which species are controlled and which are favored. This variability is probably due to environmental conditions such as air temperatures, lake sediment types, groundwater influence, snow cover, length of drawdown and time of year. The best that can be suggested at this time is which plants generally decrease and which generally increase (see Box 7.1).

Because drawdown encourages some plant species, annual use of this control tool may result in a dramatic shift toward these species. Greater plant diversity may be maintained by alternating drawdown years, thus avoiding the creation of preferential conditions for a few species.

Advantages:

- Low cost.
- Eurasian milfoil generally decreases.
- May allow for certain beach maintenance activities.

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Disadvantages:

- Not practical in lakes without a water level control structure.
- Can seriously reduce fish populations, particularly northern pike.
- May damage contiguous wetlands.
- Can seriously injure hibernating wetland animals.
- May result in increased algal blooms.

Box 7.1

Generalized Response of Plants to Overwinter Drawdown			
Plant species	Generally decrease	Generally increase	Variable or unclear
Milfoil	X		
Coontail	X		
Water lilies	X		
Waterweed	X		
Bladderwort	X		
Bushy pondweed		X	
Thin-leaf pondweed		X	
Cattails		X	
Most pondweeds			X
Water stargrass			X
Curly-leaf pondweed			X
Most emergent species			X

Bottom barriers

Management options: small-scale site maintenance.

It is possible to treat small areas by placing a gas-permeable bottom barrier over the lake sediments. Plants growing beneath the barrier are unable to photosynthesize and die. The barrier can then be removed or left in place, though there are problems with both actions. Removing the barrier is labor-intensive, and the plants will immediately begin to grow from seeds or surviving root or underground tissues. If the barrier is left in place, algae can grow on it, creating a slippery condition. Over time, sediments accumulating on the barrier allow plants to grow on top of

it. Sometimes the barrier material is covered or weighed down with sand or a sand gravel mix.

It is important that a gas-permeable material be used as the barrier. If not, decomposition gases from the sediments will accumulate under the barrier and dislodge it.

Advantages:

- A good treatment for small, defined areas.
- Can be used in areas close to shore where other control tools may not work as well.

Disadvantages:

- Cost per area treated is very high.
- Labor-intensive.
- May become slippery.
- Dislodged barriers can be a boating hazard.

Aeration and nutrient inactivation

Depending upon environmental conditions, aeration of lakes and use of alum or other precipitants to remove phosphorus from the water column may reduce algal blooms. Their value as control tools for rooted plants is not adequately documented at this time.

Mechanical harvesting

Management options: large-scale continual maintenance and selective maintenance (in certain situations).

Mechanical harvesting involves the use of specially designed and constructed machines to cut and remove plant material from a lake. The machines vary in size and cost, from small, boat-mounted devices to large, expensive, combine-type machines especially designed to harvest aquatic plants.

Harvesting does not kill the aquatic plants – it only reduces their height in the water column. Plants continue to grow, usually reaching full height again in approximately four to eight weeks. Harvesting twice during the summer, once in early June and again in mid-July, provides the most control of the plants and advantage for recreational uses. If funds

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Plant harvester.

are limited, harvesting once in late June affords good control during the peak of the summer use period. Some studies suggest that harvesting more than twice per year may improve the control of some plants and slightly reduce nutrient levels in the lake.

Plants vary in their response to harvesting. The nuisance exotic Eurasian milfoil's stem is capable of yielding a new plant from a cut fragment. Harvesting and other activities that encourage fragmentation may facilitate the spread of this troublesome plant. Coontail and waterweed can also reproduce from cut or broken fragments. On the other hand, plants that rely more on sexual reproduction may be suppressed by the harvesting of flowers and seeds. Pondweeds, the *Potamogeton* genus, may be particularly susceptible to harvesting because of their dependence on sexual reproduction.

A shift in a plant community from pondweeds to Eurasian milfoil and coontail is not a positive change for most recreational uses. The potential of this shift occurring can be reduced by careful application of the harvesting tool. Variations in use can include the number of harvest cuttings, the timing of cuttings, the location of cuttings, and the use of harvesting in conjunction with other selective tools to increase control of milfoil and coontail and reduce impacts on pondweeds.

The cutting and removal of plant material from the lake has advantages over other control tools that leave the plants in the lake. Removing the cut plants reduces decomposing

matter and thus accumulation of organic material on the lake bottom. Some nutrients are removed with the cut plants. If nutrient loading from the watershed is low, there may be some restorative value in removing the plants.

Advantages:

- Cost competitive with chemical controls.
- Removes nutrients from the lake but may be minimal compared with input.
- Removes organic material from the lake.
- May provide some selective control.

Disadvantages:

- Undesirable plants may fragment, spread and colonize new areas.
- Desirable plants such as pondweeds may be suppressed.
- Limited operation in shallow water and around docks and rafts.
- Machine breakdowns can disrupt operations.
- Drifting plant fragments may accumulate at nuisance levels in quiet water areas.

Hand harvesting

Management options: small-scale site maintenance.

Plants must produce sufficient food in their leaves to maintain their root systems. Periodic cutting of the leaves or their destruction by wading and swimming will eventually kill the root system and the plant. On a small site, such as a cottage swimming beach, rakes, chains, bedsprings and other devices may be pulled through the area to clear vegetation. Once plants are removed, active swimming and wading can keep the site weed free. Clearing the site can be very labor-intensive and require several hours of work.

To facilitate this type of plant control, power rakes and mechanized rolling devices have been developed. This equipment speeds the cleaning process and reduces the labor needed but still requires some installation or handling to complete the task.

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If plant debris is removed from the lake, hand harvesting has many of the same advantages of nutrient and organic material removal as mechanical harvesting. Because the site harvested is small relative to the entire littoral zone, disruption to the entire plant community as well as fish and wildlife populations is minimal.

Advantages:

- Low cost.
- Excellent control in small areas.
- Low environmental impact.

Disadvantages:

- Labor-intensive.
- Not suitable for large areas.

Herbicides

Management options: large-scale continual maintenance (in certain situations), selective maintenance (in certain situations), small-scale site maintenance (in certain situations) and plant promotion (in certain situations).

The most frequently used control tool in aquatic plant management is herbicides registered by the U.S. Environmental Protection Agency and the Michigan Department of Agriculture for aquatic uses. There are many products available in various formulations, with various efficacy rates and toxicities to non-target organisms. They can be used individually or in various combinations and applied to large or small areas. Their use can also be controversial.

The herbicide's product label is a legal document. To use a herbicide contrary to its label is a violation of federal and state laws. Only herbicides registered for aquatic use should be applied to a lake. The label should be read carefully and all directions and precautions followed. It is often best to hire a commercial applicator, licensed by the Michigan Department of Agriculture, who is familiar with pesticide regulations to apply the herbicides to the lake.

Comprehensively addressing the topic of aquatic herbicides would require extensive writing, beyond the scope of this manual. The presentation here is of limited focus and



Herbicide application.

introductory. No discussion will be devoted to product registration, efficacy rates, toxicity, water use restrictions or application procedures. The references provided at the end of the chapter offer additional reading.

In this manual, herbicides are discussed in the context of aquatic plant community structure and management. Herbicides can be divided into **selective** and **broad-spectrum**, reflecting their scope of impact on plant species. Selective herbicides control a limited number of species; broad-spectrum herbicides control a wide range of species. Also, herbicides can be referred to as **systemic** or **contact**. Systemic herbicides are taken up by the plant and transported throughout the plant's vascular system, killing the entire plant, including the roots. Contact herbicides act externally upon the plant, destroying tissues in contact with the chemical. Root systems are not destroyed, so plants can resprout. Depending on the plant species and environmental conditions, complete regrowth may occur within four to eight weeks.

Selective herbicides

Selective herbicides control only a limited number of plant species, leaving most uninjured. This characteristic is highly beneficial if the controlled species are ones that frequently create a nuisance. The nuisance species is controlled with minimal to no disruption to the rest of the plant community. This allows even large areas to be treated without serious negative impacts.



- **2,4-D** (systemic) – This herbicide is available in liquid and granular forms. Liquid forms control emergent species such as cattails, bulrushes and lilies. At this time, liquid forms are not available for submergent plant species. Granular forms may be used on both emergent and submergent plants. The most common granular form of 2,4-D used in products registered for aquatic uses is the butoxyethanolester (BEE). At low rates, BEE forms of 2,4-D are used to selectively control Eurasian and native milfoils. Higher rates will control coontail in addition to many emergent species. In certain situations, 2,4-D has been successfully used to bring milfoil under control and maintain it at low levels in a maintenance control program. Its ability to maintain control of milfoil appears to diminish in lakes with high flushing rates, upstream milfoil infestations or where other plants are also heavily controlled.
- **Fluridone** (systemic) – Fluridone is sold in liquid and granular forms. When the liquid form is used, the entire lake must be treated. At normal label rates, it is not a selective herbicide but very broad-spectrum. Only at concentrations of about 5 to 8 parts per billion (ppb) does it appear to have selective control qualities. At these low concentrations, it controls Eurasian milfoil and curly-leaf pondweed as well as native plants such as coontail, waterweed, bushy pondweed and native milfoil. Fluridone treatments are usually done in two applications. The initial application of herbicide is followed by a second treatment several weeks later to maintain the concentration of fluridone in the water. At treatment concentrations above 5 to 8 ppb, aquatic plant communities can be greatly reduced during the year of treatment. The following year, curly-leaf pondweed sometimes returns at nuisance levels. In many lakes treated with fluridone, Eurasian milfoil is curtailed for two and sometimes three years. If there is no maintenance control program to keep it suppressed, it usually returns to nuisance levels by the third or fourth year.

Broad-spectrum herbicides

Broad-spectrum herbicides control many but not all plant species. Consequently, it is still necessary to know what plants are growing in a treatment area to ensure adequate control with the chosen herbicide. If the goal is to remove all plants from an area, such as a swimming beach, it may

be necessary to use a combination of herbicides. Employing two compatible broad-spectrum herbicides in combination provides a greater spectrum of plant control in the treatment area than using one herbicide alone.

In other situations, it may be desirable to use a broad-spectrum herbicide to control select problem plant species. In these situations, strategies are needed to restrict and target the broad-spectrum herbicide's range of control. Research is being done with these broad-spectrum herbicides to improve their selectivity. It may be possible that low concentrations applied at select times will allow targeting of specific nuisance species.

- **Copper** (contact) – Copper is available as copper sulfate, a granule, and as copper complexes in liquid or granular form. Copper sulfate is used to suppress algae and the macroalga stonewort. Copper complexes are used on algae and certain rooted plants, particularly bushy pondweed, waterweed and some pondweeds. Copper products are often mixed with diquat to improve plant control. Copper sulfate can be very toxic to some fish, such as trout. Most copper complexes are somewhat less toxic to fish.
- **Diquat** (contact) – Diquat is marketed only in liquid form. It is a restricted-use product available only to state-licensed applicators. It binds rapidly with the aquatic plants and other organic material in the lake, so drift from the treated area can be minimal. In turbid water, diquat will bind with the organic particles in the water. This may reduce its effectiveness and result in a failed treatment. Diquat is often mixed with a copper product to increase its spectrum of plants controlled, including some species of algae, and increase its toxicity to the plants, allowing application at lower concentrations. It is also mixed with endothall products to produce a very broad-spectrum combination capable of controlling most submergent aquatic plant species. Aquatic plants usually controlled by diquat include duckweed, coontail, milfoil, waterweed, bushy pondweed, buttercup, and curly-leaf, floating leaf and sago pondweeds.
- **Endothall** dipotassium salt (contact) – The dipotassium salt of endothall is available in liquid and granular forms. Endothall is particularly effective on pondweed species, most of which are susceptible. In addition to pondweeds, it may also control coontail, milfoil and bushy pondweed.



It may be mixed with diquat to increase the spectrum of plants controlled. This mixture may be used in the large-scale continual maintenance management option or carefully used in very small areas in the small-scale site maintenance option. Repeated use of this mixture may result in shifts in plant communities.

- **Endothall** mono (N, N-dimethylalkylamine) salt (contact) – This salt of endothall is available in liquid and granular forms. It is fairly broad-spectrum, controlling waterweed and wild celery in addition to the species controlled by the dipotassium salt. It is one of the few herbicide products that suppress wild celery. It may be used in the large-scale continual maintenance management option or the small-scale site maintenance option on very small areas. In addition to rooted plants at low concentrations, it controls many forms of algae. At the higher rooted plant dosages, fish kills are possible if the product is used improperly.
- **Glyphosate** (systemic) – Glyphosate is available only in liquid form. It is extremely broad-spectrum and is used extensively in agriculture. Few land plants are not injured by glyphosate. The applied product is inactivated by water; so glyphosate is ineffective on plants growing below the water surface. In the aquatic environment, it is used on emergent species and on plants with large floating leaves, such as water lilies. Water lily treatments must be done carefully to ensure adequate contact time between the product and plant. Because of the extreme broad-spectrum qualities of glyphosate, care must be exercised to avoid excessive damage to wetland and shore zone plant communities.
- **Imazapyr** (systemic) – Imazapyr is a broad-spectrum herbicide used to control a broad range of terrestrial and aquatic plants. Imazapyr may be applied by broadcast application to aquatic sites to control floating or emergent aquatic vegetation such as water lilies, pickerelweed, cattails and duckweed. It is not used for controlling submersed aquatic plants. Because it affects many plant species, ecological concerns are associated with the use of imazapyr and its impact on non-target terrestrial and aquatic plants. Therefore, care must be taken to avoid drift of imazapyr into non-target treatment areas.

- **Triclopyr** (systemic) – Triclopyr is available in liquid and granular forms. It is recommended for control of emergent and submersed aquatic plants in lakes and ponds that have little or no continuous outflow. It is fairly selective for dicotyledon plants such as Eurasian milfoil, native milfoil and coontail. It is also used along the shoreline of aquatic sites for control of shrubs and other vegetation such as water lilies, pickerelweed and purple loosestrife. For control of Eurasian milfoil, the herbicide should be applied in the spring or early summer when Eurasian milfoil is actively growing.

Advantages:

- Costs are reasonable in many situations.
- Range of products and combinations available provides flexibility in management options.
- Some products are highly selective for nuisance species.
- Can provide complete control of plants for swimming beaches.

Disadvantages:

- Involves the introduction of pesticides into shared water resources.
- Potential for misuse exists.
- May contribute to the buildup of organic material.
- Algal blooms are possible following large herbicide treatments.
- Large treatments may encourage shifts in plant communities.
- Fish kills may occur with misuse of certain products.
- Water use restrictions may need to be imposed.
- Does not address the causes of cultural eutrophication.



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Chapter 8

The Management Plan

Introduction

Plants are an essential part of a lake, but sometimes it is advantageous to alter a lake's plant community. When this is necessary, the most appropriate process is the development of a comprehensive management plan. Even the smallest lake can be a multimillion dollar resource. To initiate control practices without a well developed guidance document may be very costly in the long run. Additionally, lakes, like humans, are unique individuals. No two are exactly alike. Each management plan should be unique to the lake and the citizens for which it is developed, a compromise of many desires. Management is a continual process, so the management plan must be a living document, evolving as the lake and the riparian community change.

A lake is a complex interaction of physical, chemical and biological components. Development of an appropriate management document will require the input of an aquatic ecologist and possibly other trained professionals. It is impossible to transfer years of college and practical training into this manual. It is also impossible to relay information on every environmental, social and economic circumstance that may evolve during development of a management plan. Consequently, the advice of appropriate consultants will probably be helpful to complete and effectively implement the management plan.

There is no one right way to develop an aquatic plant management plan. This chapter offers a process that may be used or modified to address the unique conditions present at each lake community. The process comprises six steps from initial concerns to project evaluation:

- Getting started.
- Data and information collection.
- Plan development.
- Community decision.
- Implementation.
- Evaluation and feedback.

Step One – Getting Started

Interest in lake management usually begins as talk between neighbors. "There are too many plants in the lake." "There are too few plants in the lake." "Fishing isn't as good as it once was." "When is somebody going to do something about the problem?" If enough interest is generated, eventually the topic is raised at a lake association or local government board meeting. At this stage, there is much concern but few facts. The lake association or government board may hire a consultant to do a study of the lake, or an aquatic plant evaluation committee of lake residents may be appointed to gather data and develop a recommendation.

If the committee process is used, the selected committee members should not be expected to do all the work. Volunteers will be needed to conduct plant studies, mail out citizen surveys, contact local and state resource agencies, and gather basic information. Additionally, the committee should have access to trained professionals and contractors to address technical issues as they arise during development of the management plan. The committee's responsibility is to facilitate the development of the plan, not to personally complete each work element.

Step Two – Data and Information Collection

To manage a natural resource, the manager must understand and be familiar with the resource. Superficially, things may appear very simple; in the environment, they rarely are. Only by gathering data and information about the resource can managers make competent decisions and adjust them as conditions evolve. The purpose of Step Two is to collect needed information about the lake, its plants, the watershed and the interests of the citizens. (The DEQ guidance for collecting data for a lake management plan may be found on the Web site www.deq.state.mi.us/documents/deq-wd-illm-lakeplanform.doc.)



General characteristics of the lake

Information on the following characteristics is helpful and often necessary for selecting management options and control tools, calculating areas to be managed and completing permits from state agencies. Generally, this information may be available from hydrographic and topographic maps, state and local agencies, previous reports and local observation.

- **Lake area (in acres)** – The area of a lake is shown on hydrographic maps, if one has been constructed.
- **Littoral zone area (in acres)** – The littoral zone is the shallow-water area where aquatic plants grow. For practical purposes, it may be considered to be the 10-foot contour in most lakes and the 15-foot contour in very clear lakes. This area may be calculated from hydrographic maps using a planimeter or with a computer program. An estimate of the area may also be obtained by cutting the map of the lake into two pieces, the shore to the 10-foot contour and the rest of the lake. Weigh the 10-foot contour piece and then the two pieces together on a good scale and determine the percent by weight of the 10-foot contour. Multiply the area of the lake by the percent by weight of the 10-foot contour to estimate the area of the littoral zone.
- **Littoral zone area vegetated (in acres)** – This is the area of the lake's littoral zone in which plants are actually growing. The area may be estimated from the total littoral zone calculated above and the plant location map constructed for the work done in Chapter 5 (Figure 5.3).
- **Hydraulic retention time (in days)** – The hydraulic retention time is the length of time the lake needs to replace all the water with new water. A rough idea of the lake's hydraulic retention time will be helpful in selecting certain control tools. An exact calculation of retention time will require an engineering professional or may be available from an earlier report for the lake. As an example, lakes with very short retention times (less than seven days) may not be appropriate for herbicide treatment because the chemical may not remain in the treatment area long enough to work but could damage plants and crops downstream.
- **Shoreline land uses** – Mapping shoreline land uses aids in the identification of important habitat areas, residential zones and high use regions. The DNR Forest, Mineral and Fire Management Division can provide aerial photography for an area, possibly a lake's entire watershed, for minimal cost. Alternatively, a team of volunteers with a map of the lake can survey the lakeshore. Important land uses to identify include forested, undeveloped non-forested, wetlands, agriculture, low-density residential (lots wider than 150 feet), high-density residential (lots narrower than 150 feet), recreation (parks and access sites), commercial and industrial. Aerial maps and land use information can also be obtained from the Michigan Department of Information Technology or from Web sites such as TopoZone (www.topozone.com) and Google Earth (earth.google.com).
- **Inlets and outlets** – Inlets and outlets are areas of high water exchange as well as points where nutrients, sediments and biological species enter and leave the lake.
- **Endangered species** – To avoid impacts on endangered species, the management plan should identify their critical habitat. The Department of Natural Resources Wildlife Division or Michigan Natural Features Inventory can provide information on the possible presence of endangered species.



Aerial photo of lake.



Trophic state of the lake

Most of the controls presented in this manual directly manipulate plants — they do not alter the trophic state of the lake. The controls temporarily suppress the plants; the fertility of the lake is not reduced. Knowing a lake's trophic state allows development of a realistic management plan that manipulates the plants to improve recreation while retaining the lake's natural character. Excessive use of direct manipulation or short-term controls will not reduce lake fertility but will alter biological systems, usually with serious negative ecological and recreational impacts.

Box 1.1 in Chapter 1 (page 2) provides a general characterization of the three lake trophic states: oligotrophic, mesotrophic and eutrophic. The DEQ's Water Bureau has sampled more than 700 public lakes in Michigan. These data are available for distribution. The division has also classified all 700 plus lakes by their trophic state on the basis of the data collected. Additionally, the Water Bureau operates a citizen volunteer monitoring

program in cooperation with Michigan Lake & Stream Associations, Inc. This program assists citizens with the collection of water quality data for their lake. These data can help with the determination of a lake's trophic state.



Collecting data.

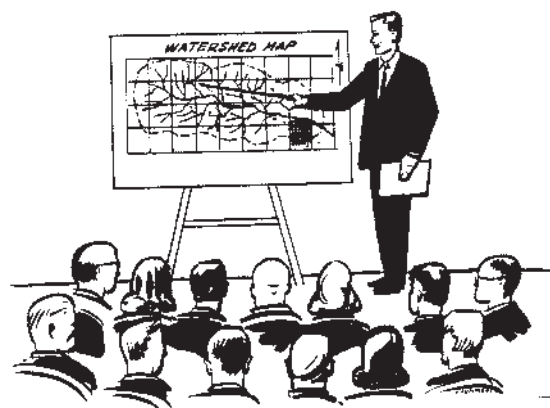
Importance of watershed management

The citizens of each lake community must decide if the aquatic

plant management program will include only short-term controls or both short-term and long-term controls. The long-term management of lakes is watershed management. Chapter 1 briefly addresses this issue. Box 1.2 (page 4) suggests the value of watershed management for lakes of various characteristics.

Citizen input

The ideas and concerns of all citizens living at or using the lake are important and should be solicited and synthesized in the development of a management plan that the public can support. Chapter 6 provides a citizen survey form that may be used or modified to address specific conditions.



Citizen involvement.

Current plant community

Delineation of the current plant community identifies species, their locations and densities. Chapter 5 outlines procedures for creating a map of the existing plant population and tables for analyzing the data collected. These are critical data for development of the management plan. Many lake associations initiate plant control programs without any idea of the true character of the lake's plant community.

The current plant community data, along with the information collected on the lake's general characteristics and citizen input, allow formulation of a plant management goal map and a plant control map. It is particularly important to identify desirable species that should be encouraged. Chapter 3 introduces portraits of the aquatic plants aiding in the identification of species that should be promoted and those that should be discouraged.

The current plant community map and data are also a benchmark for evaluating the success of the controls used and identifying positive and negative changes in the plant community resulting from the control program. Using this information allows the management plan to be adjusted to



address changing lake conditions. The map and data become a valuable record that should be kept for future reference.

Step Three - Plan Development

Following collection and analysis of all available data and information, development of the management plan begins. The following process is offered as a system for preparing the plan. The system requires implementation of seven decisions and the preparation of a report to the citizens.

Decision one – define the problem

If done properly, with an openness to all the evidence and options, defining the problem may be one of the more difficult decisions the consultant or committee will make. The remaining decisions hinge on it. It requires careful thought, consideration and discussion, and it may not be arrived at quickly or easily. It must be supported by the evidence and presented to the citizens clearly and concisely. It is possible that the decision may be contrary to the prevailing opinion of most citizens. It may be necessary to prepare educational materials to explain how the decision was arrived at and present the evidence supporting it.

It is impossible to present every conceivable problem definition that may be put forth. However, as an aid to the discovery and discussion process, the following scenarios are presented. In certain situations, two or three of these scenarios may be recommended for a lake.

- There are too few aquatic plants in the lake for the lake's trophic state, possibly as a result of prior control efforts. Desirable species need to be encouraged, using the plant promotion option in areas where they will not conflict with recreation.
- Plants in the lake are abundant, but diversity is reduced to fewer than five species, possibly as a result of prior control efforts. Control options, selective maintenance and/or small-scale site maintenance are used to control problem plants and areas. The plant promotion option is used to increase species diversity and improve stability in the environment.
- Citizens have a significant misunderstanding of the value of aquatic plants and their relative abundance in the lake. An educational program is needed to share information with the citizens.
- Recreational desires are not consistent with the reality of lake conditions. Some adjustment in recreational aspirations is needed to make realistic use of the resource.
- The lake has a well balanced aquatic plant community that does not hinder recreation. Nothing needs to be done, except to continue to monitor the lake and plants for future problems.
- The lake does not have an aquatic plant problem. In fact, it's oligotrophic or mesotrophic with few plants. Watershed management is recommended to protect current conditions.
- Nutrient and sediment loading from the watershed are significant and stimulating plant growth. Watershed management controls are recommended to provide long-term control of plant populations.
- The lake has a minor problem with native plants in small, localized areas. These problem areas need control using the small-scale site maintenance option and appropriate control tools.
- An exotic plant species has invaded the lake or an aggressive native species is creating minor to serious problems. The selective maintenance option and appropriate control tools and a maintenance control plan are recommended to carefully control these nuisance plants without significant negative impacts on the rest of the plant community.
- The lake has a diverse population of native plants, but they are abundant and hinder recreation. The selective maintenance and small-scale site maintenance options are recommended to enhance recreational uses without significantly altering the plant community. Or, the large-scale continual maintenance option may be used to reduce the plant population to the DNR's suggested minimal plant community. The recommendation is highly disruptive to the natural plant community, so a long-term (continual) funding source will be needed to maintain this artificial condition.



Once the problem has been defined, the remaining decisions can be made.

Decision two – define the desired plant community

Once a decision is made that requires altering the plant community, either to promote additional vegetation or to reduce the existing population, another map needs to be created depicting the goal – the plant community that the management plan will bring into being. This is an important decision in the planning process. It distills all the ecological data and public opinion into a goal that all actions will strive to achieve. It is the standard against which implementation efforts will be measured for success or failure. It is modified over time to incorporate new data and information, and to maintain the living quality of the management plan.

The goal map may look similar to the current vegetation map (see Figure 5.5 in Chapter 5), but it reflects the future plant community rather than the existing population. The current vegetation map may serve as a basis for constructing the goal map. Plant species may be whited out or added to areas to produce the new map.

Unfortunately, many plant control efforts are initiated without any defined goal. No one is certain what the lake should look like except that there will be fewer plants. There is no standard by which to measure success or failure. Such efforts usually continue indefinitely with no final product to produce.

Decision three – define the control area

The difference between the current vegetation map and the vegetation goal map is the map of vegetation to be controlled and/or promoted. Construction of this map will assist with calculating treatment dimensions and areas, as well as securing cost estimates from contractors.

Decision four – select the management option

Chapter 7 introduced the five direct manipulation management options: plant promotion, no intervention, selective maintenance, small-scale site maintenance and large-scale continual maintenance. The management option selected determines the level of vegetation control

applied and the impacts on the plant community and lake ecosystem. For certain lakes, two and possibly three management options may be used during the same year.

It must also be decided if watershed management will be a part of the management plan. Box 1.2 in Chapter 1 and the references at the end of the chapter furnish some assistance with this decision.

Decision five – select control tools

The second part of Chapter 7 described the most commonly used control tools. The most applicable management options are listed for each control tool. The control tools used and the scope of their use will largely dictate the cost of the project.

Decision six – define monitoring program

Annual monitoring of the plant community is recommended if control practices are implemented. Monitoring is the only way to determine if goals are achieved and to screen for undesired responses. Monitoring procedures adopted should be the same as those employed to create baseline vegetation maps (see Chapter 5), and the data collected should be recorded and saved for future application. These data are essential for adjusting the management plan to meet changes in the plant community and to plan subsequent control programs.

Decision seven – define funding

The decision on funding has two parts: implementation cost and funding sources. Implementation cost may be determined by securing formal bids from contractors. A contingency amount should be added to ensure that sufficient funds are collected to complete the project. Additionally, any cost for monitoring, public information, meetings and publication notices should be included. Once a reasonable cost estimate is arrived at, methods for paying for the project can be explored. There are basically two strategies for generating revenue: volunteer contributions from citizens participating in the project and establishment of a tax special assessment district for all properties benefiting from the project. Tax special assessment districts may be instituted under Part 309 (Inland Lake Improvements) of the Natural Resource and

Chapter 8



The Management Plan

Environmental Protection Act (P.A. 451 of 1994, as amended) and the Township Improvement Act (P.A. 188 of 1954, as amended).

Even if the no intervention management option is recommended, it may still be desirable to secure funding for the aquatic plant management program. Annual monitoring, particularly for exotic species, is highly recommended. An emergency treatment program should be in place ready to control these plants within days of identification of their presence. This monitor and control strategy will be far more cost-effective than waiting until everyone knows the exotic plants are in the lake.

Report to the citizens

Having worked through the seven decisions, the consultant or committee prepares a brief (approximately two-page) report, which is distributed to the public for review and reaction. The report should delineate the problem, possible solutions, the recommended plan, cost and funding alternatives. The report should be provided to the lake association's board or local government, which decides the best way to secure public comment on the report. If a public meeting is held, the consultant or members of the committee should be present to explain the decision process and answer questions.

If time and funds allow, a more complete report should be prepared, including all the data, maps, tables, calculations, literature references, procedures used, cost estimates and contacts made. The more complete report will be extremely valuable for documenting the entire management plan development process and as a future reference. Such reports are usually a requirement for projects funded by a tax special assessment district established by a local government.

Step Four – Community Decision

Upon receipt of the report from the consultant or committee, the lake association or local government board must decide how best to acquire endorsement by the citizenry. Methods used may include mailings, written comments, surveys or public meetings, which are often the most commonly employed and are required under certain

laws. The public may accept, reject or request modifications to the plan. If accepted, the plan moves forward to Step Five - Implementation. If it's rejected or modifications are requested, the plan returns to the planning process for additional work.



Public meeting.

Step Five – Implementation

After acceptance of the management plan, implementation of the aquatic plant enhancement/control project begins. It is usually necessary to hire a contractor to complete phases of the project. It is worthwhile and under certain laws required that bids be secured for the work to be completed by the contractor. Bid documents and contracts must be prepared. The contractor should be required to demonstrate licensing, bonding and adequate insurance. In certain situations, it is appropriate to request the contractor to expand insurance to cover the lake association or local government board.

Most projects will require a permit from the DEQ or other state or local agency. The contractor may agree to secure the needed permits. Copies of the permits should be provided to the lake association or local government board.

If, as recommended in Step Three - Decision six, the plan includes a monitoring element, preparations for this work must be arranged. Proper data collection procedures and timing are essential to secure good data that will be useful in documenting the success of the program and in planning future projects.



Step Six – Evaluation and Feedback

Collection of monitoring data provides information back to the consultant or committee. With these data, the consultant or committee can return to the planning process to redefine the problem and reevaluate goals, management options, control tools and funding for the next year and beyond. If the program changes significantly, a new report and community decision should be completed.

This feedback step is critical to the management process and maintaining the written plan as a living document. It is not only the results of past work but a link to future needs. Continuing careful management of the lake resource will secure a quality recreational experience for this and future generations.

References

Below are references on the development of aquatic plant management plans.

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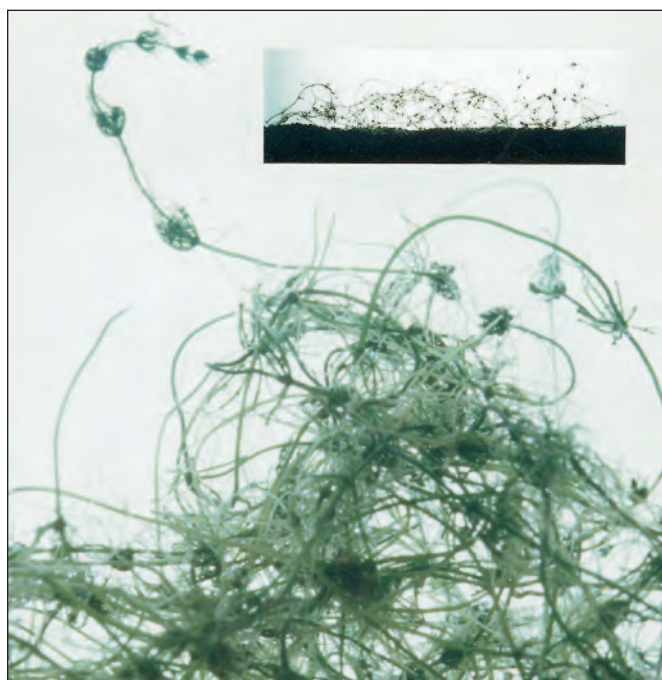
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O'Neal, R.P., and G.J. Soulliere. 2006. **Conservation Guidelines for Michigan Lakes and Associated Natural Resources.** MDNR Fisheries Division Special Report 38. (Available online at: www.michigandnr.com/publications/pdfs/ifr/ifr/libra/special/reports/SR38.pdf.)



Plate I



Chara spp. (stonewort)



Ceratophyllum demersum (coontail)



Myriophyllum spicatum (Eurasian milfoil)



Myriophyllum spp. (native milfoil)

Plate 2



Heteranthera dubia (water star grass)



Vallisneria americana (wild celery)

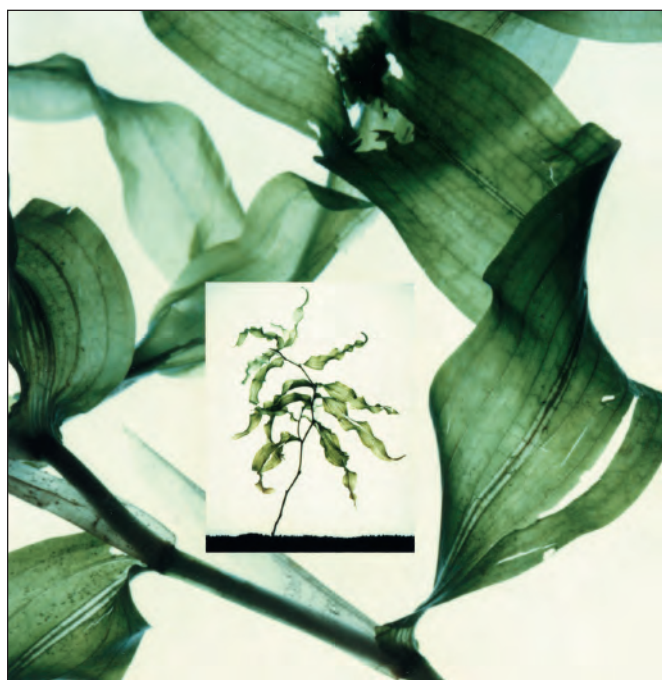


Potamogeton robbinsii (fern pondweed)



Potamogeton zosteriformis (flat-stemmed pondweed)

Plate 3



Potamogeton praelongus (whitestem pondweed)



Potamogeton gramineus (variable pondweed)



Potamogeton richardsonii (clasp-leaf pondweed)



Potamogeton crispus (curly-leaf pondweed)

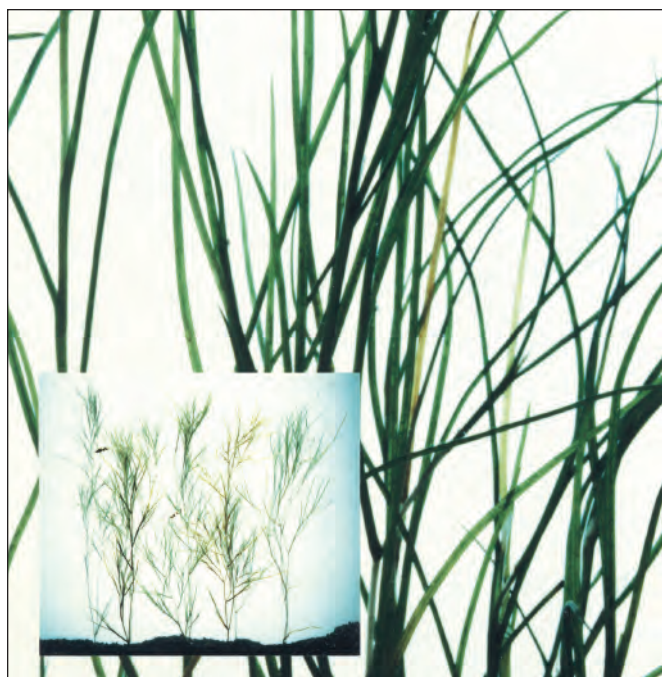
Plate 4



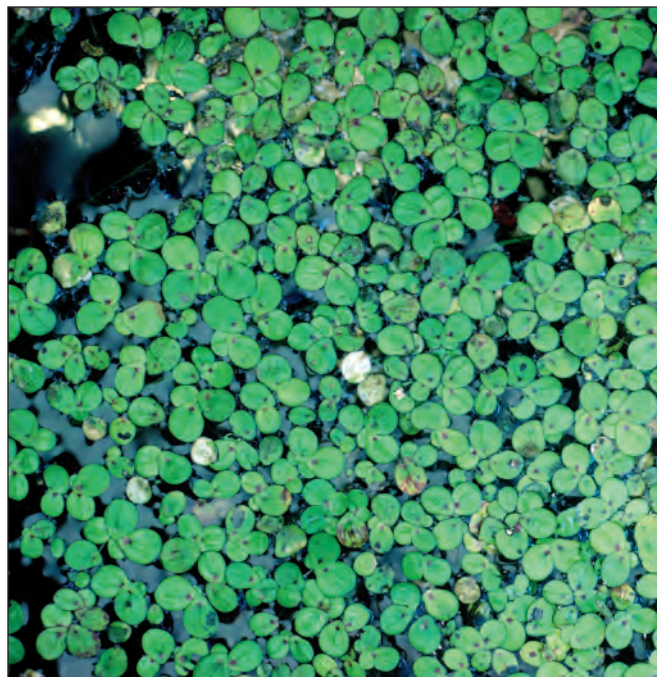
Najas spp. (bushy pondweed)



Elodea canadensis (waterweed)



Potamogeton spp. (thin-leaf pondweed)



Lemna spp. (duckweed)

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Common Aquatic Plants of Michigan



COMMON AQUATIC PLANTS OF MICHIGAN

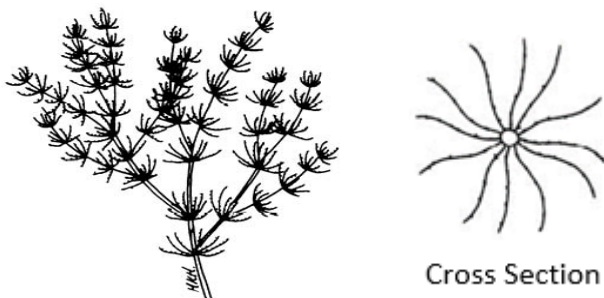
Following is a description of some of the most commonly occurring aquatic plants in Michigan. Some of the plants included in this guide are identified as invasive or non-native plants of concern. These plants can spread easily and may quickly reach nuisance density levels. They have the potential to negatively impact the native plant community and the overall health of the aquatic community.

This guide is divided into two sections: The first section contains the **submergent plants and algae**. Submergent plants are usually rooted or attached to the bottom. Their stems and leaves are located below the water surface (some plants may produce a few small floating or aerial leaves found at the water's surface). Algae may be free floating or attached to the bottom. The second group is the **emergent and floating plants**. Emergent plants grow in shallow water, with most of the plant protruding above the water surface. Floating plants are free floating on the water's surface.

If you have an aquatic plant not included here and are having difficulty identifying it, you may refer to a professional consultant. You may also consider using the internet to find dedicated websites for aquatic plant identification, or you may contact department staff by telephone at 517-284-5593 or email at egle-wrd-anc@michigan.gov for instruction on sending a small sample to our office.

Submergent Plants and Algae

Chara spp.; muskgrass

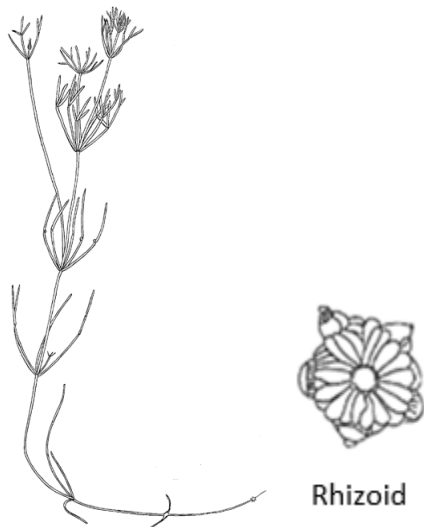


Chara is an advanced form of algae which resembles higher plants. It is easily identified by its musky odor and gritty texture due to mineral deposits on its surface. Chara rarely

creates a nuisance as it usually grows in low, dense mats, or grows sparsely where nutrient levels are low. The water is clear where chara grows densely because, like other algae, it filters nutrients out of the water instead of the sediments. In this respect, chara is highly beneficial vegetation.

Starry stonewort; *Nitellopsis obtusa*

**Invasive plant of concern*



(illustrations from <http://www.kranswieren.nl/afbeeldingen.html>)

An exotic Charoid species often confused with other native macroalgae species, such as *Chara* spp. and *Nitella* spp. Compared to similar species, starry stonewort is a brighter green and the filament branching pattern is more irregular. The star-shaped rhizoid is the feature that sets starry stonewort apart from other macroalgae species. Compared to *Chara* spp. it can grow to greater height and greater depth. The filaments feel smooth instead of crusty and ridged like *Chara*. Starry stonewort can form dense mats and outcompete native vegetation.

***Potamogeton* spp.; pondweeds**

Of the submergent plants, the pondweeds, genus *Potamogeton*, are highly variable in form and are difficult to identify. Therefore, only a few representative types are described here.



***Potamogeton natans*; Floating-leaf pondweed**

Floating leaves are slightly heart-shaped, 2 to 4 inches long. Submerged leaves long and narrow or absent. Stem attaches to leaf at right angle. Flower stalks if present, protrude above water surface.



***Potamogeton amplifolius*; Large-leaf pondweed**

Floating leaves oval in shape and not more than 2 inches. wide, submerged leaves large, wavy, recurved up to 3 inches. wide. Plants seldom branched.

***Potamogeton illinoensis*; Illinois pondweed**

Submerged leaves are lance to oval shaped (1 to 7 inches long and 0.5 to 2.5 inches wide) and often end in a sharp point. There is a narrow leaf-like structure above each leaf node (called a stipule) with two prominent ridges. Floating leaves are smaller and rounder with a thick, short stalk.

***Potamogeton richardsonii*; Claspingleaf pondweed**



Leaves are all submerged. They are wide and wavy with a broad base that clasps the stem. Base of each leaf is heart-shaped and wraps one-half to three-fourths around the stem circumference. Plant often branches toward tip.

***Potamogeton crispus*; Curly-leaf pondweed**

**Invasive plant of concern*



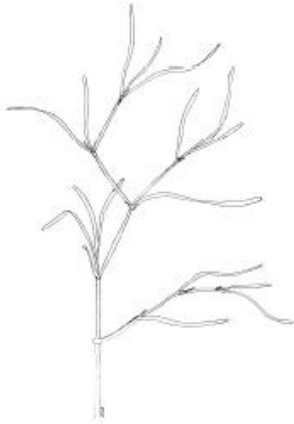
Leaves are narrow and crinkled and all submerged. They are arranged alternately around stem, becoming denser toward the end of branches. Flower stalks, if present, protrude above water surface. Curly-leaf pondweed can be distinguished from clasping leaf pondweed by the presence of small teeth on the edge of the leaf.

***Potamogeton robbinsii*; Robbins pondweed, Fern pondweed**



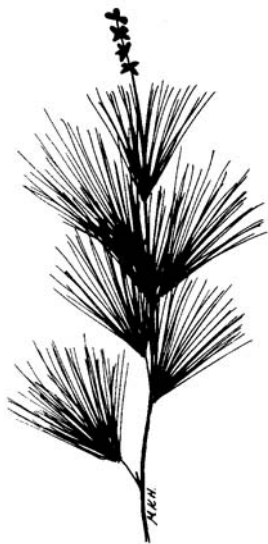
Leaves are all submerged (1.5 to 4 inches long) and closely spaced apart. Leaves are alternating on stem, creating a fan or fern-like appearance. Stem may branch.

***Zosterella dubia*; Water stargrass**



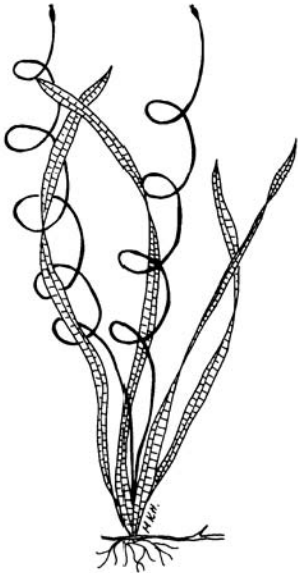
Leaves are narrow, slender, and lack a prominent midvein. Leaves alternate on freely branching stem. Produces an individual yellow star-shaped flower. Similar in appearance to Flat stem pondweed, this species has an oval shaped stem rather than a flat stem.

***Stuckenia pectinatus*; Sago pondweed**



Leaves are long and thread or needle-like, arranged alternately on stem. Leaves form dense clumps on branches, each branch may fork several times into a fan- or broom-like appearance. Flower stalks, if present, may be submerged or floating on the water surface. The flowers and fruit are arranged in small whorls, slightly spaced apart on the stalk.

***Vallisneria americana*; wild celery, eel grass**



Roots buried in bottom material. Leaves are long and grass-or ribbon-like. Leaves emerge from a single cluster and appear transparent with prominent linear veins. Rhizomes (horizontal stem system) connects tufts or clusters of leaves. Flower stalks if present, spiral toward surface of water, with a small delicate white flower. A fruit pod may develop at the floating at the end of a flower stalk.

***Najas flexilis*; Slender naiad**



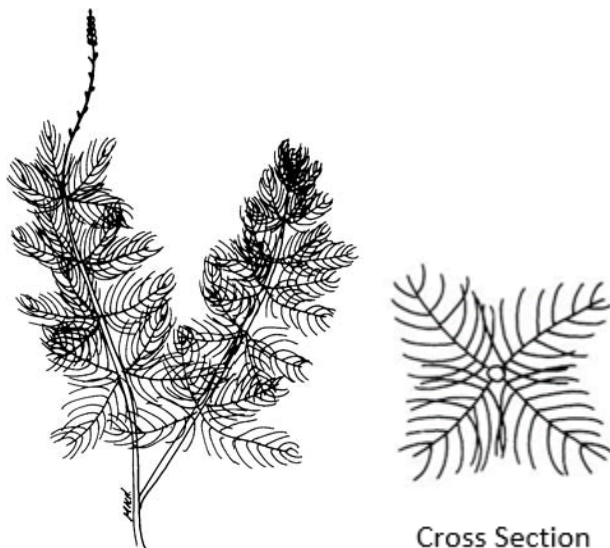
Slender naiad has fine branched stems. Nodes (swelling) present at base of leaf whorls. Leaves tapered to fine point with minute spines or serrations on the leaf margins. Spacing between whorls of leaves is highly variable.

***Certophyllum demersum*; Coontail**



Coontail is a submerged plant without roots. The leaves are arranged in whorls around the stem. Leaflets are forked, not feather-like as in milfoil (see cross-section illustration). Plants may be long and sparse, but are often bushy, especially toward the tips of branches, resembling a raccoon's tail, hence the common name "coontail."

***Myriophyllum spp.*; water milfoil**



Milfoil is a submerged plant, however, the flower stalk, when present, protrudes above the water surface. Leaves are arranged in whorls around stem. Leaflets are un-forked and arranged in a feather-like pattern (see cross-section illustration). Native milfoils typically have 5-10 leaflet pairs. Spacing between whorls varies so that plants

may appear long and sparse or bushy.

Myriophyllum spicatum*; Eurasian watermilfoil

**Invasive plant of concern*

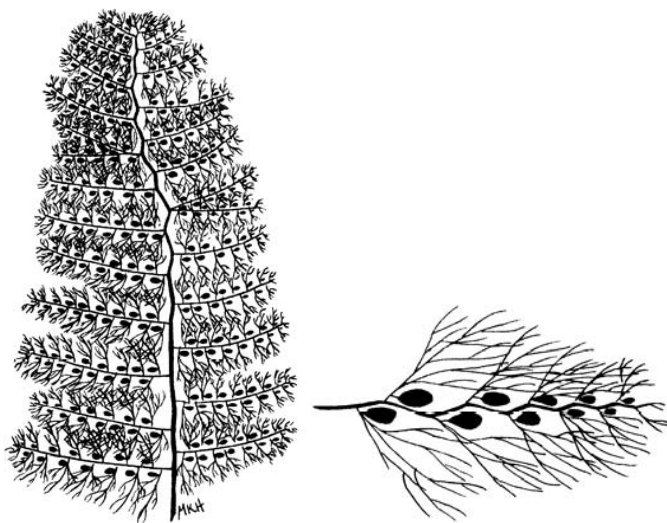


Cross Section

Eurasian watermilfoil is an exotic species of milfoil found in Michigan. This plant begins to grow early in the spring. It is fast growing and often forms a thick canopy shading out other aquatic plants. Leaves are feather-like and arranged in whorls. Leaflet pairs closest to the stem are approximately half the length of the midrib. Eurasian watermilfoil typically has more than 14 leaflet pairs while native milfoils typically have less than 14 leaflet pairs. The Eurasian form also exhibits branching stems near the surface which is not typical of the native species.

*(cross section illustration from: <https://www.seagrant.umn.edu/>)

***Utricularia* spp.; Bladderwort**



Although bladderwort is not as common as other aquatic plants presented in this article,

it is sometimes confused with milfoil. A closer look reveals that the leaflets are branched, not feather-like as on milfoil (see detail illustration). The most distinguishing feature, however, is the presence of bladder-like structures which trap small aquatic invertebrates. The "bladders" may be large and dark in color or small and inconspicuous.

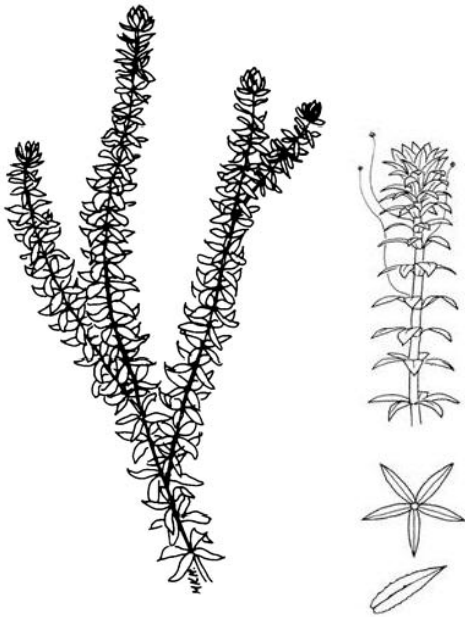
***Elodea Canadensis*; American elodea**



Leaves are oval or lance-shaped, attached directly to stem (no leaf stalk), and arranged in whorls around stem. Each whorl consists of two or three leaves with smooth edges and a smooth leaf vein. Whorls densely compacted at tips of branches. Stems may branch. Commonly used as an aquarium plant.

Hydrilla verticillata; Hydrilla*

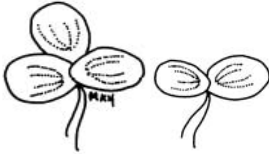
**Invasive plant of concern*



Hydrilla is not currently known to be present in the state of Michigan. However, it is a highly invasive plant that can quickly overwhelm waterways where it spreads. **Early identification of this plant in the state is critical to stopping or slowing its spread.** Hydrilla is similar to elodea in that it has oval shaped leaves arranged in whorls around the stem. Hydrilla, however, typically has four or five leaves at one node. The leaves also have small teeth and the leaf vein has small spines. If you believe you have found Hydrilla, please contact the Aquatic Nuisance Control Program by telephone at 517-284-5593 or e-mail EGLE-WRD-ANC@Michigan.gov.

Floating and Emergent Plants

Lemna minor; duckweed



5x actual size

Duckweed is a floating plant so small that a teaspoon could hold a dozen or more plants. At a distance, a congregation of duckweed plants may resemble algae on the water surface. This plant is common in ponds and quiet water of lakes and streams.

Typha spp.; cattail



Cattail is an emergent plant commonly found on the edges of lakes and wetland habitats. It has dark green sword-like leaves that are 3 feet or more tall. The flower is a cylindrical spike found at the top of the plant.

***Sagittaria latifolia*; common arrowhead**



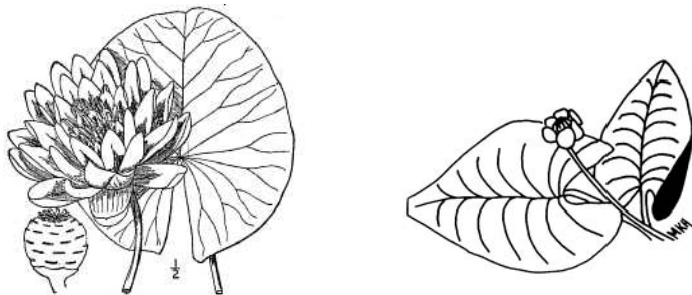
Common arrowhead is an emergent that grows from 1' to 4' tall. The plant derives its name from the distinctive arrowhead shape leaves. The flowers are white and have three petals. They are located in whorls at the end of a leafless stem. This plant, also known as "duck potato", has thick white or blue tubers that form at the end of the underground roots.

***Pontederia cordata*; Pickerelweed**



Pickerelweed is an emergent plant typically 2-4 feet tall. It has large glossy heart shaped leaves. The plant is most easily recognized by the showy spike of blue flowers located at the end of a leafless stem.

***Nuphar* spp. & *Nymphaea* spp.; Spatterdock, Water lily**



Water Lilies have thick fleshy stems that end in large floating leaves or pads. White water lilies (*Nymphaea*) have nearly rounded leaves and have showy white flowers. Spatterdock (*Nuphar*), have oblong leaves with a more distinct point and yellow flowers.

(white water lily illustration from: <http://plants.usda.gov/java/profile?symbol=NYODO>)

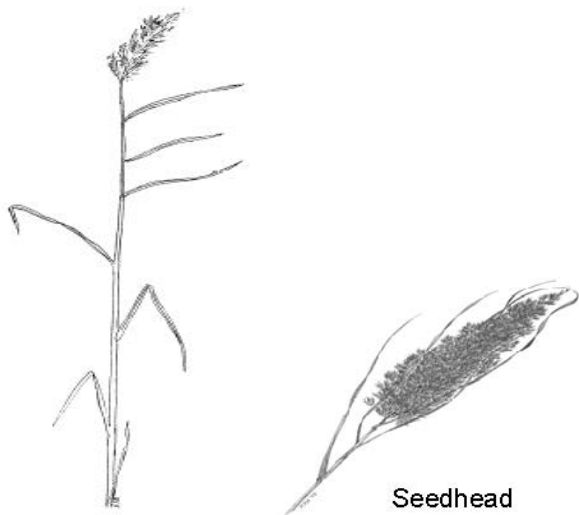
***Scirpus spp.*; Bulrush**



Bulrushes are tall slender plants that can grow as tall as five to ten feet outside of the water. The stems appear grass like and, in most cases, are triangular in cross section. Clusters of brown flowers or spikelets are located at near the end of the stems.

Phragmites australis.*; Giant Reed

*Invasive Plant of Concern



Giant or common reed is a large perennial grass that can grow up to sixteen feet tall. It is typically found in wet areas, but also can be found in disturbed sites such as road shoulders. The leaves are long (up to 2 feet), strap like, and have a tapered point. When present, the flowers are found at the top of the plant in clusters or spikelets with long silky hairs. Although the giant reed may be in part native to Michigan, in recent years the plant has become invasive and aggressive. It can form dense monoclonal stands and spreads primarily through its rhizomes.

***Lythrum salicaria*; Purple loosestrife**

*Invasive Plant of Concern



Purple loosestrife is an exotic plant frequently found in wetlands, fringing lakes and ponds, and in roadside ditches. The plant grows from 3 – 7 feet tall from a woody root crown. There are multiple stems per plant which are ridged and typically four sided. The leaves are downy with smooth edges. They are most often arranged in pairs around the stem. The plant has a striking long spike of pinkish purple flowers. Purple loosestrife has prolific seed production and spreading rhizomes which allows it to form dense stands crowding out native plants.

Illustrations by: Maureen K. Houghton, formerly of Michigan Department of Environment, Great Lakes, and Energy , Environmental Science and Services Division; Eric Bacon, Michigan of Environment, Great Lakes, and Energy, Water Resources Division. (unless otherwise noted)

References:

Borman, S., Korth, R., and Temte. 1997. *Through the Looking Glass: A Field Guide to Aquatic Plants*. Reindl Printing, Inc., Wausau, Wisconsin.

Fassett, N.C. revision appendix by E.C. Ogden. 1969. *A Manual of Aquatic Plants*. University of Wisconsin Press, Madison, Wisconsin.

Pullman D. and Crawford G. 2010. A Decade of Starry Stonewort in Michigan: Observations and Operational Management Considerations 1999 to 2009. *Lakeline*, 36 Summer 2010.

Riemer, D. 1993. *Introduction to Freshwater Vegetation*. Krieger Publishing Company, Melbourne, Florida.

Additional Resources:

Aquatic Plants of the Upper Midwest: A photographic field guide to our underwater forests by Paul M. Skawinski.

Aquatic Plant (SM50), or *Grasses, Sedges and Rushes of Wetlands* (SP255) Identification Decks, University of Florida, IFAS Extension, www.IFASbooks.com or 1-800-226-1764.

Bay Grass Key Identify SAV, Maryland Department of Natural Resources:
https://dnr.maryland.gov/waters/bay/Documents/SAV/complete_sav_key.pdf.

Center for Aquatic and Invasive Plants, University of Florida, IFAS Extension:
<http://plants.ifas.ufl.edu>.

A Citizen's Guide for the Identification, Mapping and Management of the Common Rooted Aquatic Plants of Michigan (WQ-55), Michigan State University Extension,
https://www.canr.msu.edu/resources/guide_for_the_identification_mapping_and_management_of_aquatic_plants_of_mi
To purchase: https://shop.msu.edu/product_p/bulletin-wq55.html.

Natural Resources Conservation Service, U. S. Department of Agriculture:
<http://plants.usda.gov/java/>.

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CITY OF ALBION Office of the City Manager

112 West Cass Street ♦ Albion, MI 49224
517.629.7172 ♦ hsnyder@cityofalbionmi.gov

MEMO

TO: Honorable Mayor and City Council
FROM: Haley Snyder, City Manager
DATE: August 10, 2022
RE: City Manager's Report – August 15, 2022

AEDC CEO/President Interviews – I participated in the first round of interviews with the AEDC's Hiring Committee on Tuesday, August 2nd. A community meet and greet with the final candidates will be held on Wednesday, August 17th at 7p at the Bohm Theater. Final interviews with the AEDC Board of Directors will be held on Thursday, August 18th.

MEDC Monthly Check-In Meeting – Director Arnold and I met with the city's MEDC representative for our monthly check-in on Wednesday, August 3rd.

AEDC Meeting – I attended the regular scheduled AEDC meeting on Thursday, August 4th. The board discussed and approved the following:

Albion Rotary – I provided an update on behalf of the City to the Albion Rotary Club on Thursday, August 4th.

MI Water Navigator Program – City Administration (myself, Assistant Manager Ridge, and Director Miller) met with members of the state's MI Water Navigator Program on Monday, August 8th, to discuss applying for the Drinking Water Revolving Loan Fund grant program. MI Water Navigator is a resource for navigating Michigan drinking water infrastructure funding opportunities.

Downtown Development Authority – I attended the regular DDA meeting on Wednesday, August 10th. The board discussed and approved the following: façade grant program, a recommendation to award the parking study to a consultant, Stoffer Plaza Master Plan, Optimize Main Street grant program, Interlocal Agreement for the 101-119 S. Superior Street Brownfield Plan, and the Farmer's Market rejoining the Michigan Farmer's Market Association.

AEDC Special Meeting – I attended a special scheduled AEDC meeting on Thursday, August 11th. The board discussed the status of the CEO/President hiring process.

GLCA Vice Presidents for Advancement Conference – I attended the GLCA Vice Presidents for Advancement Conference at Albion College to discuss Town & Gown relationships.

McIntosh Park Splash Pad & Playground – While we are excited to have the McIntosh Park splash pad and playground completed, please note the park space will be closed during the week to allow the contractor time to complete the remainder of the project. The splash pad will re-open on Saturday, August 13th at 10a. We appreciate your patience and understanding while we work to complete this exciting project.

Chick-Fil-A – I have been working with the Battle Creek Chick-Fil-A representatives over the past few weeks. I am happy to announce they will open a pop-up shop every Wednesday starting August 17th from 4p-7p. They will be utilizing the Bohm II building downtown.

INDIVIDUAL DEPARTMENT REPORTS

Assistant City Manager

- Interviewing DPW open positions. Currently two (2) positions are posted internally and two (2) are posted to the public
- Nicole Hathcock, Deputy Treasurer/Clerk started employment on August 1, 2022
- Waiting on notification application for Public Safety Mental Health and Wellness grant
- Searching for Assistant City Manager and Director of Finance/Treasurer position
- Renaldo Rivera, Street Maintenance Worker started employment on July 18th

Clerk's Office

- Agenda's/Minutes
- QVF Maintenance
- Process Marihuana License Renewals
- FOIA Requests
- 2022 August Primary Election

Public Safety

- Currently, we are in the process of hiring 2 public safety officers. One of our candidates has completed all the requirements and is set to attend the academy on 8/16/2022. The second candidate has to complete his MCOLES fitness requirements on 8/14/22 to be eligible to attend the academy.
- PSO Barney has entered the third phase of his field training.
- ADPS officers completed 2 hours of firefighter ladder training.
- Our new patrol vehicle is currently being outfitted. We are expecting it's delivery in the next week or two.
- We currently have no information regarding the expected delivery of our new radios.
- We have ordered the vehicle authorized by the council but are unsure when delivery might occur.
- The final steps for the implementation of the new parking ticket program are taking place and it should be up and running by the beginning of next month.
- ADPS hosted its third National Night Out event on 8/2/22. It was well attended and everyone had a great time.

Code Enforcement

- Jared is continuing to do an excellent job as our code enforcement officer. He has begun developing relationships with people including our public safety officers.
- In the last month there have been 85 abatements filed with all but 30 being abated by the owner. Currently 19 are pending and 11 have been contracted for cleanup.

Planning & Building

- The City's newly adopted Comprehensive Plan will be available online for residents soon.
- Any residents financially struggling with home improvements or repair should contact the Department of Planning and Building for information on financial assistance.

- A final draft of a Rental Certification Ordinance will be reviewed by City Council's Subcommittee on Rental Certification soon. This ordinance will then be brought before Council to discuss.

Public Services

- We are three people short across the public services department
- We are holding interviews for the water maintenance worker this week
- We had backhoe training last week for our new backhoe
- The sexton and superintendent will be going a cemetery training next week
- We had a large water main break last week. It was a great learning experience for the guys and I think we will all be better for it.
- We are hoping to start the safety committee back up, it fell apart recently with a couple members leaving the city. That will be nice to catch back up on monthly trainings.

FROM 06/01/2022 TO 06/30/2022

FUND: 101 202 203 208 214 226 250 265 367 450 452 590 591 661 711 732 735 737

CASH AND INVESTMENT ACCOUNTS

Fund Account	Description	Beginning Balance 06/01/2022	Total Debits	Total Credits	Ending Balance 06/30/2022
Fund 101	GENERAL FUND				
001.00	CASH	(319,246.32)	245,213.00	510,527.62	(584,560.94)
002.00	CASH - INCOME TAX ACCOUNT	843,458.44	106,250.43	14,668.66	935,040.21
003.00	CERTIFICATES OF DEPOSIT	55,682.00	0.00	195.25	55,486.75
004.00	PETTY CASH	100.00	0.00	0.00	100.00
004.02	PETTY CASH - CHANGE DRAWER	400.00	0.00	0.00	400.00
007.00	CASH PARK FENCE	0.99	0.00	0.00	0.99
017.00	INVESTMENTS	615,030.19	571.63	0.00	615,601.82
	GENERAL FUND	1,195,425.30	352,035.06	525,391.53	1,022,068.83
Fund 202	MAJOR STREETS FUND				
001.00	CASH	104,947.48	69,142.92	28,479.01	145,611.39
017.00	INVESTMENTS	612,635.26	569.40	0.00	613,204.66
	MAJOR STREETS FUND	717,582.74	69,712.32	28,479.01	758,816.05
Fund 203	LOCAL STREETS FUND				
001.00	CASH	49,211.00	24,150.74	23,032.93	50,328.81
017.00	INVESTMENTS	250,312.25	232.64	0.00	250,544.89
	LOCAL STREETS FUND	299,523.25	24,383.38	23,032.93	300,873.70
Fund 208	RECREATION FUND				
001.00	CASH	(40,983.13)	13,953.29	45,678.57	(72,708.41)
017.00	INVESTMENTS	180,248.08	167.54	0.00	180,415.62
	RECREATION FUND	139,264.95	14,120.83	45,678.57	107,707.21
Fund 214	CALHOON COUNTY PARKS MILLAGE				
001.00	CASH	21,438.81	22,723.23	10,992.06	33,169.98
Fund 226	SOLID WASTE FUND				
001.00	CASH	29,490.19	20,674.62	7,255.07	42,909.74
017.00	INVESTMENTS	609,672.00	566.65	0.00	610,238.65
	SOLID WASTE FUND	639,162.19	21,241.27	7,255.07	653,148.39
Fund 250	CDBG FUND				
001.01	CDBG FUND CASH	3.20	0.00	0.00	3.20
017.00	INVESTMENTS	59,744.52	55.51	0.00	59,800.03
	CDBG FUND	59,747.72	55.51	0.00	59,803.23
Fund 265	DRUG LAW ENFORCEMENT FUND				
001.00	CASH	123,151.70	3,377.00	5,898.61	120,630.09
017.00	INVESTMENTS	300,397.29	279.18	0.00	300,676.47
	DRUG LAW ENFORCEMENT FUND	423,548.99	3,656.18	5,898.61	421,306.56
Fund 367	SIDEWALK PROGRAM FUND				
001.00	CASH	4,032.77	0.00	917.50	3,115.27
017.00	INVESTMENTS	38,203.09	35.51	0.00	38,238.60
	SIDEWALK PROGRAM FUND	42,235.86	35.51	917.50	41,353.87
Fund 450	STREET IMPROVEMENTS FUND				
001.00	CASH	(177,159.41)	20,821.10	7,822.50	(164,160.81)
017.00	INVESTMENTS	363,208.55	337.57	0.00	363,546.12
	STREET IMPROVEMENTS FUND	186,049.14	21,158.67	7,822.50	199,385.31
Fund 452	MDOT RECONSTRUCTION FUND				
001.00	CASH	151,922.98	0.00	0.00	151,922.98
Fund 590	SEWER FUND				
001.00	CASH	100,684.19	131,816.25	82,561.96	149,938.48
017.00	INVESTMENTS	71,953.33	66.86	0.00	72,020.19

FUND: 101 202 203 208 214 226 250 265 367 450 452 590 591 661 711 732 735 737
 CASH AND INVESTMENT ACCOUNTS

Fund Account	Description	Beginning Balance 06/01/2022	Total Debits	Total Credits	Ending Balance 06/30/2022
	SEWER FUND	172,637.52	131,883.11	82,561.96	221,958.67
Fund 591	WATER FUND				
001.00	CASH	95,735.75	61,522.75	79,284.24	77,974.26
017.00	INVESTMENTS	537,955.82	499.97	0.00	538,455.79
	WATER FUND	633,691.57	62,022.72	79,284.24	616,430.05
Fund 661	EQUIPMENT POOL FUND				
001.00	CASH	135,795.51	59,136.16	19,862.36	175,069.31
Fund 711	CEMETERY TRUST FUND				
001.00	CASH	6,132.43	165.54	0.00	6,297.97
003.00	CERTIFICATES OF DEPOSIT	138,090.92	0.00	945.46	137,145.46
017.00	INVESTMENTS	105,335.95	97.87	0.00	105,433.82
017.06	MONROE MAUSOLEUM	8,927.80	8.29	0.00	8,936.09
	CEMETERY TRUST FUND	258,487.10	271.70	945.46	257,813.34
Fund 732	PUBLIC SAFETY PENSION TRUST				
001.00	CASH	(11,388.00)	0.00	0.00	(11,388.00)
001.01	CASH - NON-ALLOCATED	0.46	0.00	0.00	0.46
017.00	INVESTMENTS	205,993.65	1,710,421.62	75,280.01	1,841,135.26
017.04	INVESTMENTS - PS PENSION FUND	23,627,417.30	0.00	0.00	23,627,417.30
017.10	CASH & EQUIV INVESTMENTS	978,783.69	0.00	0.00	978,783.69
	PUBLIC SAFETY PENSION TRUST	24,800,807.10	1,710,421.62	75,280.01	26,435,948.71
Fund 735	ALBION TRUST				
017.01	INVESTMENTS - FIRE BARN BONDS	235,161.10	0.00	44.60	235,116.50
017.10	CASH & EQUIV INVESTMENTS	941,610.29	108.33	0.00	941,718.62
	ALBION TRUST	1,176,771.39	108.33	44.60	1,176,835.12
Fund 737	RETIREE HEALTH CARE FUND				
001.00	CASH	9,265.85	0.00	200.00	9,065.85
017.00	INVESTMENTS	27,638.86	25.67	0.00	27,664.53
	RETIREE HEALTH CARE FUND	36,904.71	25.67	200.00	36,730.38
	TOTAL - ALL FUNDS	31,090,996.83	2,492,991.27	913,646.41	32,670,341.69

REVENUE AND EXPENDITURE REPORT FOR CITY OF ALBION
 PERIOD ENDING 06/30/2022
 % Fiscal Year Completed: 49.59

GL NUMBER	DESCRIPTION	2021	END BALANCE	YTD BALANCE	2022	% BDGT USED
		AMENDED BUDGET	12/31/2021 NORMAL (ABNORMAL)	06/30/2022 NORMAL (ABNORMAL)	ORIGINAL BUDGET	
Fund 101 - GENERAL FUND						
000 - GENERAL		4,279,219.00	4,567,664.43	1,709,246.28	4,350,650.00	39.29
209 - ASSESSING		0.00	220.00	330.00	0.00	100.00
215 - CLERK		250.00	548.50	117.00	500.00	23.40
260 - FINANCE DEPT AND/OR ABA GENERAL		886.00	971.21	1,461.08	1,100.00	132.83
276 - CEMETERY		67,000.00	75,299.38	37,782.54	70,000.00	53.98
304 - CODE ENFORCEMENT		0.00	0.00	1,700.00	32,500.00	5.23
345 - PUBLIC SAFETY		74,997.00	82,764.93	25,726.71	84,300.00	30.52
422 - PLANNING & ZONING		137,659.00	180,073.86	69,314.00	82,000.00	84.53
758 - ALBION RIVER/BIKE TRAIL		280,000.00	0.00	0.00	0.00	0.00
775 - PARKS		4,100.00	3,970.00	3,055.00	5,500.00	55.55
778 - HOLLAND PARK TRANSFORMATION PROJECT		21,080.00	21,082.00	5,000.00	0.00	100.00
930 - TRANSFER IN		22,500.00	22,500.00	0.00	20,000.00	0.00
TOTAL REVENUES		4,887,691.00	4,955,094.31	1,853,732.61	4,646,550.00	39.89
101 - CITY COUNCIL		37,095.00	31,491.62	22,236.31	33,690.00	66.00
172 - CITY MANAGER		187,317.00	164,661.73	90,025.85	227,175.00	39.63
209 - ASSESSING		52,150.00	49,283.91	31,156.21	52,730.00	59.09
210 - ATTORNEY		123,800.00	109,230.36	55,673.95	110,750.00	50.27
215 - CLERK		128,944.00	119,210.60	50,855.24	163,630.00	31.08
226 - HUMAN RESOURCES		44,673.00	43,883.68	19,672.53	43,700.00	45.02
260 - FINANCE DEPT AND/OR ABA GENERAL		522,966.00	499,261.13	245,332.86	560,285.00	43.79
265 - MUNICIPAL BLDG AND/OR 201 N CLINTON ST		107,691.00	97,141.37	28,396.55	94,430.00	30.07
276 - CEMETERY		220,297.00	203,076.26	101,204.20	226,035.00	44.77
304 - CODE ENFORCEMENT		52,826.00	51,766.16	20,501.92	80,460.00	25.48
345 - PUBLIC SAFETY		2,131,487.00	2,054,787.46	921,953.82	2,157,061.00	42.74
422 - PLANNING & ZONING		212,241.00	238,862.72	110,299.01	151,035.00	73.03
442 - CITY MAINTENANCE		58,535.00	63,893.45	34,248.31	54,405.00	62.95
444 - TREE TRIMMING		82,671.00	71,361.55	42,259.83	66,125.00	63.91
447 - ENGINEERING		25,000.00	18,410.61	37,292.33	7,500.00	497.23
448 - STREET LIGHTING		150,000.00	146,942.72	56,751.46	142,500.00	39.83
526 - EPA LANDFILL		12,500.00	7,381.02	950.00	10,500.00	9.05
758 - ALBION RIVER/BIKE TRAIL		300,000.00	105,753.05	1,260.00	0.00	100.00
775 - PARKS		280,188.00	267,901.57	226,620.90	274,285.00	82.62
778 - HOLLAND PARK TRANSFORMATION PROJECT		38,500.00	20,747.90	0.00	0.00	0.00
895 - GENERAL APPROPRIATION		329,500.00	265,363.18	176,889.49	298,595.00	59.24
TOTAL EXPENDITURES		5,098,381.00	4,630,412.05	2,273,580.77	4,754,891.00	47.82
Fund 101 - GENERAL FUND:						
TOTAL REVENUES		4,887,691.00	4,955,094.31	1,853,732.61	4,646,550.00	39.89
TOTAL EXPENDITURES		5,098,381.00	4,630,412.05	2,273,580.77	4,754,891.00	47.82
NET OF REVENUES & EXPENDITURES		(210,690.00)	324,682.26	(419,848.16)	(108,341.00)	387.50

REVENUE AND EXPENDITURE REPORT FOR CITY OF ALBION
 PERIOD ENDING 06/30/2022
 % Fiscal Year Completed: 49.59

GL NUMBER	DESCRIPTION	2021	END BALANCE	YTD BALANCE	2022	% BGDG USED
		AMENDED BUDGET	12/31/2021 NORMAL (ABNORMAL)	06/30/2022 NORMAL (ABNORMAL)	ORIGINAL BUDGET	
Fund 202 - MAJOR STREETS FUND						
000 - GENERAL		889,537.00	882,989.41	275,430.49	916,150.00	30.06
486 - I-94 TRUNKLINE		15,664.00	17,349.52	0.00	17,500.00	0.00
487 - M-99 TRUNKLINE		28,077.00	33,950.64	0.00	30,000.00	0.00
488 - M-199 TRUNKLINE		14,891.00	17,195.97	0.00	15,000.00	0.00
TOTAL REVENUES		948,169.00	951,485.54	275,430.49	978,650.00	28.14
454 - ACT 51 NON-MOTORIZED		47,000.00	47,000.00	13,082.50	0.00	100.00
461 - MAINTENANCE		405,161.00	329,644.87	160,994.92	401,165.00	40.13
465 - TRAFFIC SERVICES		2,530.00	189.98	0.00	2,325.00	0.00
467 - WINTER MAINTENANCE		34,785.00	13,665.93	37,266.30	32,010.00	116.42
486 - I-94 TRUNKLINE		26,325.00	9,530.04	12,988.30	26,005.00	49.95
487 - M-99 TRUNKLINE		35,325.00	13,384.22	16,069.80	29,815.00	53.90
488 - M-199 TRUNKLINE		15,305.00	10,611.40	9,220.16	12,130.00	76.01
965 - TRANSFER OUT		653,000.00	653,000.00	0.00	278,000.00	0.00
TOTAL EXPENDITURES		1,219,431.00	1,077,026.44	249,621.98	781,450.00	31.94
Fund 202 - MAJOR STREETS FUND:						
TOTAL REVENUES		948,169.00	951,485.54	275,430.49	978,650.00	28.14
TOTAL EXPENDITURES		1,219,431.00	1,077,026.44	249,621.98	781,450.00	31.94
NET OF REVENUES & EXPENDITURES		(271,262.00)	(125,540.90)	25,808.51	197,200.00	13.09

REVENUE AND EXPENDITURE REPORT FOR CITY OF ALBION
 PERIOD ENDING 06/30/2022
 % Fiscal Year Completed: 49.59

GL NUMBER	DESCRIPTION	2021		2022		% BGD USED
		AMENDED BUDGET	NORMAL (ABNORMAL)	YTD BALANCE 06/30/2022	ORIGINAL BUDGET	
Fund 203 - LOCAL STREETS FUND						
000 - GENERAL		294,395.00	295,990.95	96,730.25	306,350.00	31.58
930 - TRANSFER IN		150,000.00	150,000.00	0.00	275,000.00	0.00
TOTAL REVENUES		444,395.00	445,990.95	96,730.25	581,350.00	16.64
461 - MAINTENANCE		466,833.00	418,925.90	153,465.69	525,260.00	29.22
465 - TRAFFIC SERVICES		10,830.00	6,642.79	1,276.66	8,650.00	14.76
467 - WINTER MAINTENANCE		48,685.00	28,204.06	37,416.80	40,895.00	91.49
965 - TRANSFER OUT		103,000.00	103,000.00	0.00	3,000.00	0.00
TOTAL EXPENDITURES		629,348.00	556,772.75	192,159.15	577,805.00	33.26
Fund 203 - LOCAL STREETS FUND:						
TOTAL REVENUES		444,395.00	445,990.95	96,730.25	581,350.00	16.64
TOTAL EXPENDITURES		629,348.00	556,772.75	192,159.15	577,805.00	33.26
NET OF REVENUES & EXPENDITURES		(184,953.00)	(110,781.80)	(95,428.90)	3,545.00	2,691.93

REVENUE AND EXPENDITURE REPORT FOR CITY OF ALBION
 PERIOD ENDING 06/30/2022
 % Fiscal Year Completed: 49.59

GL NUMBER	DESCRIPTION	2021		YTD BALANCE		2022	
		AMENDED BUDGET	NORMAL (ABNORMAL)	NORMAL (ABNORMAL)	NORMAL (ABNORMAL)	ORIGINAL BUDGET	% BDGT USED
Fund 208 - RECREATION FUND							
780 - RECREATION		204,956.00	209,946.00	14,654.13		207,900.00	7.05
TOTAL REVENUES		<u>204,956.00</u>	<u>209,946.00</u>	<u>14,654.13</u>		<u>207,900.00</u>	<u>7.05</u>
780 - RECREATION		138,624.00	148,620.52	164,365.24		157,645.00	104.26
TOTAL EXPENDITURES		<u>138,624.00</u>	<u>148,620.52</u>	<u>164,365.24</u>		<u>157,645.00</u>	<u>104.26</u>
Fund 208 - RECREATION FUND:							
TOTAL REVENUES		204,956.00	209,946.00	14,654.13		207,900.00	7.05
TOTAL EXPENDITURES		<u>138,624.00</u>	<u>148,620.52</u>	<u>164,365.24</u>		<u>157,645.00</u>	<u>104.26</u>
NET OF REVENUES & EXPENDITURES		66,332.00	61,325.48	(149,711.11)		50,255.00	297.90

REVENUE AND EXPENDITURE REPORT FOR CITY OF ALBION
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GL NUMBER	DESCRIPTION	2021	END BALANCE	YTD BALANCE	2022	% BDGT USED
		AMENDED BUDGET	12/31/2021 NORMAL (ABNORMAL)	06/30/2022 NORMAL (ABNORMAL)	ORIGINAL BUDGET	
Fund 226 - SOLID WASTE FUND						
000 - GENERAL		309,746.00	315,143.43	22,056.40	313,325.00	7.04
TOTAL REVENUES		<u>309,746.00</u>	<u>315,143.43</u>	<u>22,056.40</u>	<u>313,325.00</u>	<u>7.04</u>
523 - LEAF PICKUP		19,395.00	2,913.61	521.90	19,610.00	2.66
524 - TREE DUMP		15,960.00	11,365.90	6,710.57	15,805.00	42.46
528 - SOLID WASTE		182,827.00	159,744.71	51,139.90	186,715.00	27.39
965 - TRANSFER OUT		49,000.00	49,000.00	0.00	46,500.00	0.00
TOTAL EXPENDITURES		<u>267,182.00</u>	<u>223,024.22</u>	<u>58,372.37</u>	<u>268,630.00</u>	<u>21.73</u>
Fund 226 - SOLID WASTE FUND:						
TOTAL REVENUES		309,746.00	315,143.43	22,056.40	313,325.00	7.04
TOTAL EXPENDITURES		<u>267,182.00</u>	<u>223,024.22</u>	<u>58,372.37</u>	<u>268,630.00</u>	<u>21.73</u>
NET OF REVENUES & EXPENDITURES		42,564.00	92,119.21	(36,315.97)	44,695.00	81.25

REVENUE AND EXPENDITURE REPORT FOR CITY OF ALBION
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GL NUMBER	DESCRIPTION	2021		YTD BALANCE		2022	
		AMENDED BUDGET	NORMAL (ABNORMAL)	END BALANCE 12/31/2021	NORMAL (ABNORMAL)	ORIGINAL BUDGET	% BDGT USED
Fund 265 - DRUG LAW ENFORCEMENT FUND							
000 - GENERAL		438,302.00	438,353.78		739.58	1,500.00	49.31
400 - FED DRUG LAW ENFOR - REIMBUR		40,000.00	29,128.39		30,578.49	30,000.00	101.93
TOTAL REVENUES		<u>478,302.00</u>	<u>467,482.17</u>		<u>31,318.07</u>	<u>31,500.00</u>	<u>99.42</u>
333 - DRUG LAW ENFORCEMENT		96,580.00	9,412.97		46,817.44	51,300.00	91.26
400 - FED DRUG LAW ENFOR - REIMBUR		47,185.00	44,428.64		22,289.50	58,000.00	38.43
TOTAL EXPENDITURES		<u>143,765.00</u>	<u>53,841.61</u>		<u>69,106.94</u>	<u>109,300.00</u>	<u>63.23</u>
Fund 265 - DRUG LAW ENFORCEMENT FUND:							
TOTAL REVENUES		<u>478,302.00</u>	<u>467,482.17</u>		<u>31,318.07</u>	<u>31,500.00</u>	<u>99.42</u>
TOTAL EXPENDITURES		<u>143,765.00</u>	<u>53,841.61</u>		<u>69,106.94</u>	<u>109,300.00</u>	<u>63.23</u>
NET OF REVENUES & EXPENDITURES		<u>334,537.00</u>	<u>413,640.56</u>		<u>(37,788.87)</u>	<u>(77,800.00)</u>	<u>48.57</u>

REVENUE AND EXPENDITURE REPORT FOR CITY OF ALBION
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 % Fiscal Year Completed: 49.59

GL NUMBER	DESCRIPTION	2021	END BALANCE	YTD BALANCE	2022	% BDTG USED
		AMENDED BUDGET	12/31/2021 NORMAL (ABNORMAL)	06/30/2022 NORMAL (ABNORMAL)	ORIGINAL BUDGET	
Fund 275 - ALBION BUILDING AUTHORITY FUND						
000 - GENERAL		3,336.00	3,069.13	916.43	3,050.00	30.05
265 - MUNICIPAL BLDG AND/OR 201 N CLINTON ST		1,512.00	1,512.00	756.00	2,000.00	37.80
271 - FIRE/AMBULANCE BUILDING		35,511.00	38,010.94	7,200.00	31,000.00	23.23
273 - 112 E ERIE ST		163,418.00	163,417.54	0.00	0.00	0.00
TOTAL REVENUES		203,777.00	206,009.61	8,872.43	36,050.00	24.61
260 - FINANCE DEPT AND/OR ABA GENERAL		6,950.00	6,075.96	3,187.50	7,075.00	45.05
265 - MUNICIPAL BLDG AND/OR 201 N CLINTON ST		3,150.00	2,145.26	9,210.08	2,265.00	406.63
271 - FIRE/AMBULANCE BUILDING		25,750.00	18,410.26	12,844.50	24,420.00	52.60
273 - 112 E ERIE ST		1,015.00	463.52	0.00	0.00	0.00
TOTAL EXPENDITURES		36,865.00	27,095.00	25,242.08	33,760.00	74.77
Fund 275 - ALBION BUILDING AUTHORITY FUND:						
TOTAL REVENUES		203,777.00	206,009.61	8,872.43	36,050.00	24.61
TOTAL EXPENDITURES		36,865.00	27,095.00	25,242.08	33,760.00	74.77
NET OF REVENUES & EXPENDITURES		166,912.00	178,914.61	(16,369.65)	2,290.00	714.83

REVENUE AND EXPENDITURE REPORT FOR CITY OF ALBION
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GL NUMBER	DESCRIPTION	2021		2022		% BDTG USED
		AMENDED BUDGET	END BALANCE 12/31/2021 NORMAL (ABNORMAL)	YTD BALANCE 06/30/2022 NORMAL (ABNORMAL)	ORIGINAL BUDGET	
Fund 277 - ABA SEC 8 MAPLE GROVE						
000 - GENERAL		491,958.00	508,395.36	255,099.47	502,000.00	50.82
TOTAL REVENUES		<u>491,958.00</u>	<u>508,395.36</u>	<u>255,099.47</u>	<u>502,000.00</u>	<u>50.82</u>
701 - ABA SEC 8 MAPLE GROVE		454,400.00	399,678.86	169,523.97	453,395.00	37.39
TOTAL EXPENDITURES		<u>454,400.00</u>	<u>399,678.86</u>	<u>169,523.97</u>	<u>453,395.00</u>	<u>37.39</u>
<hr/>						
Fund 277 - ABA SEC 8 MAPLE GROVE:						
TOTAL REVENUES		491,958.00	508,395.36	255,099.47	502,000.00	50.82
TOTAL EXPENDITURES		<u>454,400.00</u>	<u>399,678.86</u>	<u>169,523.97</u>	<u>453,395.00</u>	<u>37.39</u>
NET OF REVENUES & EXPENDITURES		<u>37,558.00</u>	<u>108,716.50</u>	<u>85,575.50</u>	<u>48,605.00</u>	<u>176.06</u>

REVENUE AND EXPENDITURE REPORT FOR CITY OF ALBION
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GL NUMBER	DESCRIPTION	2021	END BALANCE	YTD BALANCE	2022	% BDGT USED
		AMENDED BUDGET	12/31/2021 NORMAL (ABNORMAL)	06/30/2022 NORMAL (ABNORMAL)	ORIGINAL BUDGET	
Fund 367 - SIDEWALK PROGRAM FUND						
000 - GENERAL		(335.00)	169.01	89.84	(450.00)	(19.96)
TOTAL REVENUES		<u>(335.00)</u>	<u>169.01</u>	<u>89.84</u>	<u>(450.00)</u>	<u>(19.96)</u>
443 - SIDEWALK PROGRAM		450,000.00	417,920.45	1,582.60	9,500.00	16.66
TOTAL EXPENDITURES		<u>450,000.00</u>	<u>417,920.45</u>	<u>1,582.60</u>	<u>9,500.00</u>	<u>16.66</u>
Fund 367 - SIDEWALK PROGRAM FUND:						
TOTAL REVENUES		(335.00)	169.01	89.84	(450.00)	19.96
TOTAL EXPENDITURES		450,000.00	417,920.45	1,582.60	9,500.00	16.66
NET OF REVENUES & EXPENDITURES		<u>(450,335.00)</u>	<u>(417,751.44)</u>	<u>(1,492.76)</u>	<u>(9,950.00)</u>	<u>15.00</u>

REVENUE AND EXPENDITURE REPORT FOR CITY OF ALBION
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 % Fiscal Year Completed: 49.59

GL NUMBER	DESCRIPTION	2021	END BALANCE	YTD BALANCE	2022	% BDGT USED
		AMENDED BUDGET	12/31/2021 NORMAL (ABNORMAL)	06/30/2022 NORMAL (ABNORMAL)	ORIGINAL BUDGET	
Fund 590 - SEWER FUND						
000 - GENERAL		1,490,687.00	1,644,576.21	789,538.29	1,510,350.00	52.28
TOTAL REVENUES		<u>1,490,687.00</u>	<u>1,644,576.21</u>	<u>789,538.29</u>	<u>1,510,350.00</u>	<u>52.28</u>
536 - SEWER UTILITY OPERATIONS		1,608,829.00	1,523,258.19	585,661.08	1,558,525.00	37.58
542 - WWTP ENERGY IMPROVEMENTS		8,600.00	10,074.69	4,385.28	8,250.00	53.15
906 - DEBT SERVICE - LOANS		1,700.00	1,309.37	0.00	1,700.00	0.00
965 - TRANSFER OUT		143,500.00	143,500.00	0.00	143,500.00	0.00
TOTAL EXPENDITURES		<u>1,762,629.00</u>	<u>1,678,142.25</u>	<u>590,046.36</u>	<u>1,711,975.00</u>	<u>34.47</u>
Fund 590 - SEWER FUND:						
TOTAL REVENUES		1,490,687.00	1,644,576.21	789,538.29	1,510,350.00	52.28
TOTAL EXPENDITURES		<u>1,762,629.00</u>	<u>1,678,142.25</u>	<u>590,046.36</u>	<u>1,711,975.00</u>	<u>34.47</u>
NET OF REVENUES & EXPENDITURES		(271,942.00)	(33,566.04)	199,491.93	(201,625.00)	98.94

REVENUE AND EXPENDITURE REPORT FOR CITY OF ALBION
 PERIOD ENDING 06/30/2022
 % Fiscal Year Completed: 49.59

GL NUMBER	DESCRIPTION	2021	END BALANCE	YTD BALANCE	2022	% BDGT USED
		AMENDED BUDGET	12/31/2021 NORMAL (ABNORMAL)	06/30/2022 NORMAL (ABNORMAL)	ORIGINAL BUDGET	
Fund 591 - WATER FUND						
000 - GENERAL		952,793.00	1,081,706.33	491,190.22	956,200.00	51.37
TOTAL REVENUES		<u>952,793.00</u>	<u>1,081,706.33</u>	<u>491,190.22</u>	<u>956,200.00</u>	<u>51.37</u>
536 - WATER UTILITY OPERATIONS		1,264,259.00	1,220,171.25	505,398.11	1,276,300.00	39.60
906 - DEBT SERVICE - LOANS		4,000.00	3,277.48	0.00	3,000.00	0.00
965 - TRANSFER OUT		11,150.00	11,150.00	0.00	10,500.00	0.00
TOTAL EXPENDITURES		<u>1,279,409.00</u>	<u>1,234,598.73</u>	<u>505,398.11</u>	<u>1,289,800.00</u>	<u>39.18</u>
Fund 591 - WATER FUND:						
TOTAL REVENUES		952,793.00	1,081,706.33	491,190.22	956,200.00	51.37
TOTAL EXPENDITURES		<u>1,279,409.00</u>	<u>1,234,598.73</u>	<u>505,398.11</u>	<u>1,289,800.00</u>	<u>39.18</u>
NET OF REVENUES & EXPENDITURES		(326,616.00)	(152,892.40)	(14,207.89)	(333,600.00)	4.26

REVENUE AND EXPENDITURE REPORT FOR CITY OF ALBION
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GL NUMBER	DESCRIPTION	2021		2022		% BGD USED
		AMENDED BUDGET	END BALANCE 12/31/2021 NORMAL (ABNORMAL)	YTD BALANCE 06/30/2022 NORMAL (ABNORMAL)	ORIGINAL BUDGET	
Fund 661 - EQUIPMENT POOL FUND						
000 - GENERAL		328,239.00	343,635.50	222,646.50	346,545.00	64.25
TOTAL REVENUES		<u>328,239.00</u>	<u>343,635.50</u>	<u>222,646.50</u>	<u>346,545.00</u>	<u>64.25</u>
770 - EQUIPMENT POOL		318,730.00	335,160.89	81,282.39	317,395.00	25.61
965 - TRANSFER OUT		17,400.00	17,400.00	0.00	17,400.00	0.00
TOTAL EXPENDITURES		<u>336,130.00</u>	<u>352,560.89</u>	<u>81,282.39</u>	<u>334,795.00</u>	<u>24.28</u>
Fund 661 - EQUIPMENT POOL FUND:						
TOTAL REVENUES		328,239.00	343,635.50	222,646.50	346,545.00	64.25
TOTAL EXPENDITURES		336,130.00	352,560.89	81,282.39	334,795.00	24.28
NET OF REVENUES & EXPENDITURES		<u>(7,891.00)</u>	<u>(8,925.39)</u>	<u>141,364.11</u>	<u>11,750.00</u>	<u>1,203.10</u>
TOTAL REVENUES - ALL FUNDS		10,740,378.00	11,129,634.42	4,061,358.70	10,109,970.00	40.17
TOTAL EXPENDITURES - ALL FUNDS		11,816,164.00	10,799,693.77	4,380,281.96	10,482,946.00	41.78
NET OF REVENUES & EXPENDITURES		<u>(1,075,786.00)</u>	<u>329,940.65</u>	<u>(318,923.26)</u>	<u>(372,976.00)</u>	<u>85.51</u>