

Agenda

Natural Features Protection Review Board



City of Kalamazoo

Tuesday, November 25, 2025

4:00 PM

City Commission Chambers at City Hall - 241 W. South Street

A. CALL TO ORDER/ROLL CALL

1. Excuse Absent Board Members (**Action: Motion to Excuse Absent Board Members**)

B. ADOPTION OF AGENDA

(Action: Motion to approve the agenda)

1. Agenda Approval

C. APPROVAL OF MINUTES

1. Approval of the meeting minutes from the Natural Features Protection Review Board Meeting on October 28th, 2025 (**Action: Motion to approve the meeting minutes from the Natural Features Protection Review Board Meeting on October 28th, 2025**)

D. PUBLIC COMMENTS

E. BOARD MEMBER COMMENTS

F. NEW BUSINESS

1. 1400 Harrison Street - New Wastewater Treatment Facility

G. UNFINISHED BUSINESS

H. STAFF REPORTS AND UPDATES

1. Imagine Kalamazoo 2035 Presentation

I. COMMUNICATIONS AND ANNOUNCEMENTS

J. ADJOURNMENT



**Natural Features
Protection Review
Board
Minutes
October 28th, 2025
Held at City Hall
Commission Chambers 4:00 p.m.**

A. Call to Order: Director Martin called the meeting to order at 4:00 p.m.

Members absent: Director Rowe and Director Murgia

1. Excuse Absent Board Members: The motion to excuse absent board members was made by Director Hollander and supported by Director Bassett, and the motion passed unanimously.

B. Adoption of Agenda

Motion to adopt the agenda made by Director Fredrickson supported by Director Bassett, motion passed unanimously.

C. Approval of the Meeting Minutes

Motion to approve the minutes from September 23rd, 2025, NFP Review Board Meeting made by Director Bassett, supported by Director Stemple, motion passed unanimously with correction of absences.

D. General Citizen Comments

E. Board Comments

No comments



F. New Business

1. 433 Reed Court/Reed Avenue Stormwater Restoration Project; Presentation by Tom Palumbo, City of Kalamazoo, Department of Public Services

Restoration of floodplain and stormwater functions along Reed Court through excavation and grading to water quality of Portage Creek. Project includes native vegetation to be planted to stabilize soils, filter runoff, and enhance habitat for fish and wildlife; as well as stormwater infrastructure upgrades to reduce localized flooding and improve water quality.

Motion to approve 433 Reed Court Project contingent of Full Site Plan Approval by Director Hollander and supported by Director Bassett and passed unanimously.

2. 3317 & 3329 South Burdick Street – Cold Storage Facility; Presentation by Dave Kudwa from SME (Stafford-Smith)

Adding storage building with associated access points and stormwater management facility with electricity.

Director Bassett asked about the trees that were proposed because of the power lines overhead and recommended using some, for example, crab apple, berry, or trees with lower growth height potential.

Motion to approve 3317 & 3329 South Burdick Street contingent on Full Site Plan Approval by Director Bassett and supported by Director Stemple and passed unanimously.

Questions?

Public Comments: None in-person or by phone.

Unfinished Business

Upcoming joint board training with Planning Commission and Zoning Board of Appeals

Staff Reports and Update

None

Communications and Announcements:

Adjourn Meeting

Director Martin adjourned the meeting at 4:52 pm



NFP Review Board Staff Report

City of Kalamazoo

TO: The Natural Features Protection Review Board

FROM: Nolan Bergstrom, NFP Board Liaison

DATE: November 25, 2025

SUBJECT: 1400 Harrison Street - New Wastewater Treatment Facility

RECOMMENDATION:

It is recommended the Natural Features Protection (NFP) Review Board approve the NFP Site Plan application for 1400 Harrison Street conditioned upon:

- Approval from the City Stormwater Engineer
- Addition of Tree Protection Fencing for the tree stands adjacent to the Kalamazoo River be included on the SESC plans.
- Full Site Plan Approval

BACKGROUND:

1400 Harrison Street is owned by Graphic Packaging International, LLC. The parcel is zoned M-2 or General Manufacturing. The M-2, General Manufacturing district is primarily intended to accommodate low-, moderate- and high-impact industrial uses and activities and to prevent encroachment by residential and other uses that would eventually lead to land use conflicts.

The goal of the project is to construct a new Plastics Removal Facility for the Wastewater Treatment Plant.

This project is before the NFP Board seeking Full NFP Site Plan Approval. This property previously came before the NFP Board in 2023 for a separate project to conduct site enhancements related to the wastewater clarifier facility.

FINDINGS:

The site is within the NFP Overlay District due to its proximity to the Kalamazoo River. The site also requires MNFI Rare Species Review (the report was provided by the applicant).

Since the project is located within the NFP Overlay District, the site requires the following NFP Site Development Standards:

- **Water Resources Standard (§ 50-6.2D)**– This is the primary standard for the site with proximity to the Kalamazoo River. The site is greater than 1 acre in area and requires a setback to at minimum 25ft. The project area is outside the setback from the Kalamazoo River. There is no proposed work that should affect the River or Riparian Zone.
- **Wetland Standard (§ 50-6.2C)** – Wetlands do not exist / have not been identified on-site.
- **Woodland Protection Standard (§ 50-6.2G)** – The site is developed and has isolated pockets of trees but none that are delineated as a Woodland according to the NFP Ordinance.
- **Rare Species Review** – This site required Rare Species Review to be completed by the [Michigan State University Extension](#). This review was completed by the MSU Extension and a Field Inspection was conducted by ASTI Environmental and submitted to city staff. This report is in the Agenda Packet. The MNFI Report and Field inspection are from 2023 when the property was before the NFP Board related to the Clarifier project. The field inspector concludes: *No high quality habitat, including potential bat trees, exists within the Project Area that could provide habitat for threatened or endangered species. It is highly unlikely that the Project Area is utilized by rare or protected plants or animals. Thus, it is ASTI's opinion that the Project will have no effect on any state or federal listed species.*
- **Plant Selection (§ 50-6.2J(4)(b))** – Landscaping and screening are required for this project as well as other plantings. Per [§ 50-6.1C](#) *If a conflict arises between the overlay district regulations and those of the base zoning district, the overlay district regulations control.* Some of the landscaping was planted in 2023 and can be viewed on the Civil Site Plans. The Zoning code requires 1 canopy tree to be planted per acre. For this project that equates to 2 trees. Two Red Maple trees of 3" Caliper are shown being planted between the project area and the Kalamazoo River. Lawn areas are stated to be seeded and mulched with a mixture of 20% improved perennial ryegrass, 40% fine fescue, and 40% kentucky bluegrass with 8-10 pounds per 1000 square feet.
- **Stormwater Management (§ 50-6.2J(6))** – Stormwater requirements on NFP sites are dictated by the City of Kalamazoo Performance Standards for Groundwater Protection within Wellhead Protection Capture Zones. The applicant has also submitted materials to EGLE (Michigan Department of Environment, Great Lakes, and Energy) which will be required. Parts of the project are in proximity to the Floodplain of the Kalamazoo River in Zones X and AE.
- **Public Notice Requirement (§ 50-6.2K(1)(c))** — **The** project is located *within 100 feet of a wetland or water resource [Kalamazoo River] or adjacent to land publicly used for open space or recreation [Verburg Park]*. Due to this Public Notice was required.

This project is scheduled for Site Plan Review on December 3rd, 2025.

SUPPLEMENTAL SITE PLAN REVIEW APPLICATION FOR NATURAL FEATURES PROTECTION

For projects located within the Natural Features Protection (NFP) Overlay District, separate site plan approval is required before the full site plan can be approved. This review is done either by the NFP Review Board or administratively by staff to verify conformance with NFP Overlay District zoning code ([Chapter 50, NFP](#)). The NFP Overlay District map can be found on the [City's GIS mapping website](#) (select "Planning & Zoning" layer and make sure "NFP Overlay" is clicked on).

The NFP Supplemental Application must be completed and submitted with the regular Site Plan Review Application and checklists. The NFP Review Board meets monthly to review and approve applications. City staff can assist in scheduling a project at an upcoming NFP Review Board meeting. While the review process offers some flexibility, projects often seek NFP approval between the Pre-Application meeting and regular Site Plan Review meeting.

Section I. Project & Applicant Information

All projects must complete Section I. If the project will not impact any natural features on the site, and does not trigger additional stormwater controls or treatment, applicants should sign and submit Section I only. Staff will review and determine if the application can be approved administratively.

Section II. Natural Features Checklist & Attachments

For projects proposing improvements or changes to the site that impact natural features, change grading, or involve work in or near NFP setbacks, Sections II and III must be completed. Section II identifies which natural features are present and standards apply. Section III will assist you in determining what documentation and additional plan sets are needed for a complete application. Once a complete application is submitted to the City, the project will be scheduled for the next available NFP Review Board meeting and an application fee of \$110 will apply.

QUESTIONS

Contact the NFP staff liaison with any questions about your NFP Supplemental Application at (269) 337-8045 or development@kalamazoo.org.

SECTION I. PROJECT AND APPLICANT INFORMATION

Please provide all of the project and applicant information requested below. Include the date of your regular site plan review meeting, if one has been scheduled or already taken place.

APPLICANT NAME:	(first) Eric (last) Barkovich		
APPLICANT ADDRESS:	2800 (number) South 11th Street (street name)		
	(city) Kalamazoo (state) MI (Zip) 49009		
APPLICANT EMAIL:	ebarkovich@hurleystewart.com	PHONE:	269-492-3306
PARCEL ADDRESS/PIN:	1400 Harrison St PIN# 06-10-487-003		
PROJECT DESCRIPTION:	Construction of a new waste water treatment facility		
OWNER NAME: <i>(if different)</i>	(first) Eddie (last) Canales		
HAS REGULAR SITE PLAN REVIEW MEETING OCCURRED?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	DATE OF SITE PLAN REVIEW MEETING:	

NFP APPLICATION REQUIRED?

Is the project limited to interior work <u>only</u> with no exterior ground changes or increase in impervious coverage?	
<input type="checkbox"/> YES	If YES, Sections II & III of this application are not needed. Sign below & submit only this page with your site plan review or permit application.
<input checked="" type="checkbox"/> NO	If NO, proceed to Sections II & III. Do NOT sign below.

By signing below, the applicant certifies that no natural features will be disturbed as part of this project.

Print name: Eric Barkovich

Signature: Eric Barkovich

Date: 10/17/2025

SECTION II. NFP SITE PLAN CHECKLIST & ATTACHMENTS

Use the checklist to determine what documentation and additional plans sets must be prepared for this application. All plan sets, maps, and additional information must be attached to this application to be considered complete. If you checked “no” to certain NFP items in questions 1-7 in Section II, record “N/A” on the checklist.

REQUIRED: NFP SITE PLAN SET

All applications must include separate sheets in the plan set showing the following:

1. Existing conditions map showing an inventory of all protected natural features and any associated natural features setbacks with distances (use checklist below)
2. Future development plan overlaid onto the existing conditions and natural features inventory; indicate where and to what extent protected natural features will be disturbed, removed, altered, or impacted in any way and which natural features will be protected during and after construction

Future development plan must include:

- **Boundary with extent of re-grading**, construction, or site preparation activities
 - **All existing and new building footprints** (mark whether existing buildings will be removed or maintained)
 - **New and existing parking** surfaces or structures, sidewalks, trails, and other impervious or semi-impervious surfaces including decks, patios, viewing platforms, etc. (list proposed surface materials and whether existing surfaces will be maintained or removed)
 - **Proposed location of fencing and screening**, whether permanent, natural, or construction silt fencing and/or natural feature protection fencing (with specifications)
 - **Stormwater facilities** showing boundary of ground disturbance, grading or construction activities, if located near natural features
 - **New utilities** and/or relocation of existing utilities showing corridors that could impact natural features
3. Landscape plan detailing the minimum elements needed to meet zoning code requirements and all proposed additional landscaping elements or features (include table with species name)
 4. Any additional plans or tables detailing which natural features will be restored or replaced after construction, if required (e.g., riparian buffer installation or slope restoration plan may be required under certain circumstances when the ordinance allows changes within these protected areas)

WETLANDS	Present:	Included on page #:	Notes:
<p>Mark existing wetland boundaries with notes about wetland conditions. <i>Attach a copy of EGLE permit or permit application for work impacting Part 303 wetlands regulated by the State.</i></p>	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Not shown	Any wetlands will be along River edge, not impacted
WATER RESOURCES	Present:	Included on page #:	Notes:
<p>Mark the location of all water resources on the parcel and those within 25 feet of the parcel boundaries. <i>Attach a copy of EGLE permit or permit application for work impacting Part 301 waters regulated by the State.</i></p>	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Cover Sheet	Kalamazoo River, not impacted
<p>Show required setbacks with dimensions; describe existing or future ground cover within riparian setbacks.</p>	N/A		Well outside of setback.
TREES	Present:	Included on page #:	Notes:
<p>Mark the location of all “protected” trees that are proposed to be removed and those that will remain and require protection fencing.</p>	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Cover Sheet and S-2	Not impacted.
<p>Include a table with species name, size (DBH and height), and condition of “protected” trees that are proposed to be removed and list replacement tree information.</p>	N/A		Trees are not impacted.
<p>Provide a note with justification for removal.</p>	N/A		Not impacted.
WOODLANDS	Present:	Included on page #:	Notes:
<p>Delineate the boundary of all woodlands on the parcel noting where woodlands likely extend onto adjacent parcels.</p>	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No		
<p>Mark all areas of woodland that will be retained and removed (i.e., cleared).</p>	N/A		
<p>Include a table or note with the required preservation ratio (based on existing woodland coverage), percentage proposed to be removed, and rationale for selecting area for removal.</p>	N/A		
SLOPES	Present:	Included on page #:	Notes:
<p>Provide a slope analysis that shows the boundaries of all “protected” slopes and mark the required setback(s).</p>	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No		
<p>Include a note with co-existing feature that triggers “protected” slope status (e.g., wooded, within 500 ft of water resource).</p>	N/A		

NATURAL HERITAGE AREAS	Present:	
Is an MNFI* rare species review required? <i>Parcels can be pre-screened using the City's GIS website, click on the "Planning & Zoning" layer and "NFP Overlay" layer; then click on parcel and see MNFI status.</i>	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Attaching T&E species report from previous project on this parcel, completed in 2023. No adverse impact.
If an MNFI rare species review is required, attach the resulting report.		

*Michigan Natural Features Inventory (MNFI) Rare Species Reviews can be requested at:
<https://mnfi.anr.msu.edu/services/rare-species-reviews>

ACCEPTED DATA SOURCES & ANALYSIS

All data sources, analysis, and professionals are subject to approval by the City Planner according to Chapter 50-6.2. The following guidance may be useful when selecting a professional or methodology for inventorying natural features.

1. WETLANDS

- Wetland delineation report performed by a qualified consultant including a map denoting delineated boundary of all wetlands, OR
- Most recent US Fish & Wildlife Service's National Wetlands Inventory boundary (State of Michigan mapper: <https://www.michigan.gov/egle/about/organization/water-resources/wetlands/inventory-maps>)

2. PROTECTED TREE IDENTIFICATION

- May be performed by an qualified professional (including ISA Certified Arborist or similar); a full tree inventory is not required if all necessary information can be obtained and communicated using another survey, inventory, or site assessment methodology

3. WOODLANDS

- A qualified professional, such as an ISA Certified Arborist, landscape architect, or license engineer may perform a desktop analysis or field survey to delineate woodlands
- When a variances is being requests to remove more woodland cover than is allowed under the preservation ration, the following is required
 - Woodland assessment report with determination that the Trees per Area (TPA) meets the NFP definition of a woodland and mapped delineation of woodland
 - Woodland assessment report with a determination that Basal Area is equivalent to the TPA in the NFP definition and meets definition of a woodland and mapped delineation of woodland
 - In addition to determination of whether stand of trees meets NFP definition of a woodland, assessment must include information on general species diversity,
 -

composition of species, any notable trees (either notable species or size), invasive species composition, and general health and age observations of tree stand

4. PROTECTED SLOPES

- Topographic survey performed in the field by a qualified consultant to delineate areas of a slope with grade of 20% or greater
- Desktop analysis performed using U.S. Geological Survey digital topographic maps, LIDAR, digital elevation map, or equivalent data showing 2' intervals or finer resolution, performed by a qualified consultant or engineer

HS
hurley & stewart
2800 South 11th Street
Kalamazoo, Michigan 49009



1205 Riverview Dr.
Kalamazoo, MI 49004

HS
hurley & stewart
2800 South 11th Street
Kalamazoo, Michigan 49009



1415 Harrison St.
Kalamazoo, MI 49007

HS
hurley & stewart
2800 South 11th Street
Kalamazoo, Michigan 49009



1209 Riverview Dr.
Kalamazoo, MI 49004

HS
hurley & stewart
2800 South 11th Street
Kalamazoo, Michigan 49009



669 Gull Rd.
Kalamazoo, MI 49007

HS
hurley & stewart
2800 South 11th Street
Kalamazoo, Michigan 49009



1217 Riverview Dr.
Kalamazoo, MI 49004

HS
hurley & stewart
2800 South 11th Street
Kalamazoo, Michigan 49009



1123 Riverview Dr.
Kalamazoo, MI 49004

HS
hurley & stewart
2800 South 11th Street
Kalamazoo, Michigan 49009



1523 Riverview Dr.
Kalamazoo, MI 49004

HS
hurley & stewart
2800 South 11th Street
Kalamazoo, Michigan 49009



1203 Riverview Dr.
Kalamazoo, MI 49004

NOTICE OF A PUBLIC HEARING

THE NATURAL FEATURES PROTECTION (NFP) REVIEW BOARD

November 11, 2025

You are receiving this letter because you live or own property within 300' of a project being reviewed by the City of Kalamazoo's NFP Review Board. The Board is reviewing the project to confirm there will be no impact on any Natural Features. You can view the Overlay District map at www.kalamazoo.org/maps.

The NFP Board will review the project on Tuesday, November 25th, at or after 4:00 p.m. The meeting will be held in-person at City Hall (241 W. South Street). This meeting is a public hearing, and comments will be taken in-person.

The project involves the development of a new plastics removal building. There are no proposed impacts on any Natural Features related to this project. It is anticipated that construction will begin in Spring of 2026.

The Zoning Board of Appeals (ZBA) is the official body that reviews and makes decisions on all site plans; the NFP Board provides the ZBA with a recommendation for properties in the NFP Overlay District.

A copy of the site plan for this project can be viewed at Hurley & Stewart, LLC, 2800 S. 11th Street, Kalamazoo, MI 49009 Monday-Friday between the hours of 8 a.m – 5 p.m.

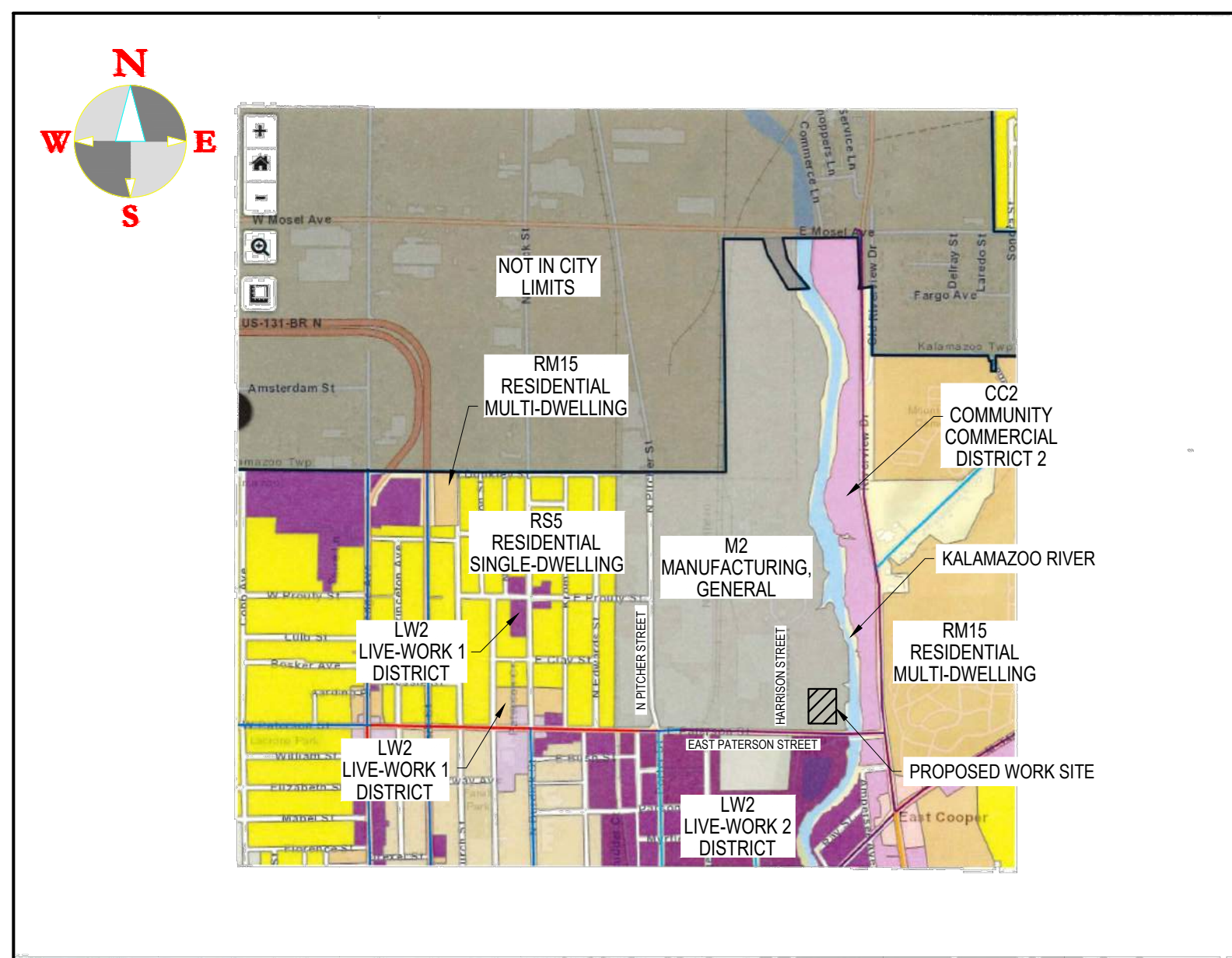
For project questions, please contact:

Eric Barkovich
Hurley and Stewart, LLC
(269) 552-4960
ebarkovich@hurleystewart.com

For NFP Review Board questions, please contact:

Nolan Bergstrom
Community Planning & Economic Development
(269) 337-8045
bergstromn@kalamazoo.org

GRAPHIC PACKAGING INTERNATIONAL LLC APPROVAL FOR SITE WORK TO CONSTRUCT NEW PLASTICS REMOVAL BUILDING KALAMAZOO, MICHIGAN



ZONING MAP
NTS

ZONING REQUIREMENTS

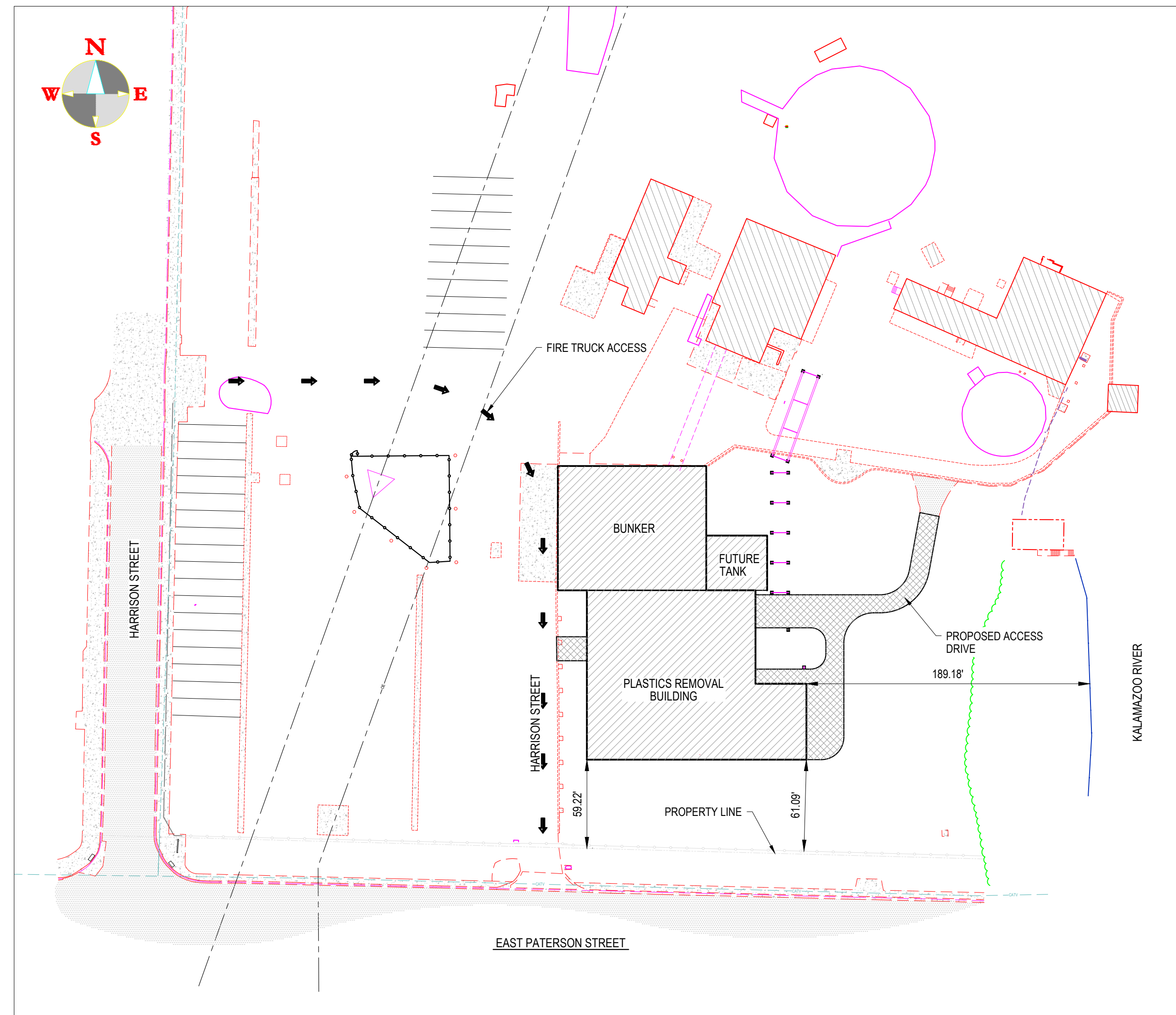
ZONING
THE SITE IS ZONED - M2 (MANUFACTURING GENERAL)
SETBACKS: FRONT - 25'
SIDES - 25'
REAR - 25'

PROPOSED USE
MANUFACTURING FACILITY
STEEL FRAME

1400 HARRISON STREET
KALAMAZOO, MI 49007
PARCEL NO. 06-10-487-003

PROPERTY LEGAL DISCRPTION

Parcel of land bounded on the E by the Kalamazoo River; on the S by the S li of Sect 10 on the W and N by the following described li: Com at S 1/4 post Sect 10-2-11; th E 1776.1ft on S li Sect 10 to p.o.b for this li; th turning at an angle to the left of 90deg 9min a distance of 308.3ft; th NLY on same li 770ft; th turning at an angle of 90deg 0min to the right a distance of 324ft m-or-l; th NELY parallel to and 80ft distant from the NWLY li of r-o-w, formerly known as the Michigan Electric Railway Company to the WLY bank of the Kalamazoo River. Excluding the S 50ft for East Paterson Street. Also all that part of an Island No. 1 - Winslow Island - in the SE part of Sect 10 according to a government survey. Also including all that part of the meander of the Kalamazoo River (now dried and filled) lying between Winslow Island and the WLY li of sd meander. Entire parcel contains approximately 16.1375 Acres of land. Described in some parts as follows: 3234 Com at S 1/4 post Sect 10-2-11; th E 1776.1ft on S li Sect 10; th turning at an angle to the left of 90deg 9min a distance of 308.3ft to p.o.b.; th NLY on same li 770ft; th turning at an angle of 90deg 0min to the right a distance of 324ft m-or-l to WLY bank of the Kalamazoo River; th SLY alg the bank of sd River to a li which is parallel to & 80ft distance from NWLY li of r-o-w, formerly known as the Michigan Electric Railway Company; th SWLY alg sd li to a pt which lies on a li passing thru the p.o.b. & at right angles to li NLY thru the p.o.b.; th WLY 68.6ft to p.o.b. 3160 part of SE 1/4 Sect 10-2-11 Beg in S li Sect 10-2-11 1825.4ft E of S 1/4 post; th N 18deg 16min E alg WLY li of former Michigan Railroad 854.4ft to WLY bank of the Kalamazoo River; th SELY alg sd WLY bank to a pt 100ft SELY from and measured at right angles with the WLY li of Michigan Railroad; th S 18deg 16min W 854.4ft to the S li Sect 10; th W alg sd S li 105.35ft to p.o.b. 3226 Sect 10-2-11 Parcel of land bounded on the E by the Kalamazoo River; on the NW by the SE li of the r-o-w formerly known as the Michigan Electric Railway Company & on the S by the S li of Sect 10, Exc S 50ft. Also all that part of an Island No. 1 - Winslow Island - in the SE part of Sect 10 according to a government survey thereof which lies S of a li parallel to the S li of sd Sect & 1077.86ft N thereof, exc all land now owned by Consumers Power Co. 3238 Com at S 1/4 post Sect 10-2-11 th E 1776.1ft on S li Sect 10; th turning at an angle to the left of 90deg 9min a distance of 33ft to p.o.b.; th NLY 275.3ft m-or-l on the same li of Indian Reservation li; th E 153ft to the WLY li of a r-o-w formerly known as the Michigan Electric Railway Company; th SWLY alg sd li of r-o-w to a pt 33ft N of S li Sect 10; th W to p.o.b. 3232 Com at S 1/4 post Sect 10-2-11 th E 1746.1ft on S li Sect 10; th turning at an angle to the left of 90deg 9min a distance of 308.3ft; th turning at an angle of 90deg 0min to the right & a distance of 98.6ft to beg; th ELY on same li 84.4ft to NWLY li of r-o-w formerly known as the Michigan Electric Railway Company; th NELY on sd li of r-o-w 530ft m-or-l to WLY bank of the Kalamazoo River; th NWLY alg sd bank to a pt on the li which is parallel to & 80ft distant from NWLY li of sd r-o-w; th SELY alg sd li to p.o.b. 3161 Part of Island No. 1, in SE 1/4 Sect 10-2-11 known as Winslow Island, described as follows - a strip of land 100ft in width, 50ft on each side of the following described ctr li; beg at a pt in the WLY side of sd island, 464ft W of a pt in the E li of sd Sect 1789.9ft S of E 1/4 post thereof; th N 17deg 40min E 385.2ft to a pt 339.6ft W of a pt in E li sd Sect 1424.8ft S of E 1/4 post of Sect 10-2-11



PROPOSED SITE PLAN
SCALE: 1" = 60'

LIST OF DRAWINGS

- | | | | |
|-----|--------------------|---|--|
| 1. | COVER SHEET | | |
| 2. | 15083-4007-CIV-01 | CIVIL SITE PLAN | |
| 3. | 15083-4007-CIV-02 | SITE LAYOUT & PAVING PLAN | |
| 4. | 15083-4007-CIV-03 | FIRE PROTECTION AND SANITARY SEWER PLAN | |
| 5. | 15083-4007-CIV-04 | OVERALL SITE GRADING PLAN | |
| 6. | 15083-4007-CIV-05 | SITE SECTIONS & DETAILS | |
| 7. | 15083-4007-CIV-06 | OVERALL SESC PLAN | |
| 8. | 15083-4007-CIV-07 | SITE DEMOLITION PLAN | |
| 9. | 15083-4007-CIV-08 | WATERSHED MAP | |
| 10. | 15083-4007-LAND-09 | LANDSCAPE PLAN | |

PROJECT ENGINEER

YATES
YATES ENGINEERS, LLC
1853 DATA DR, BIRMINGHAM, AL 35244
(205) 940-4000

OWNER

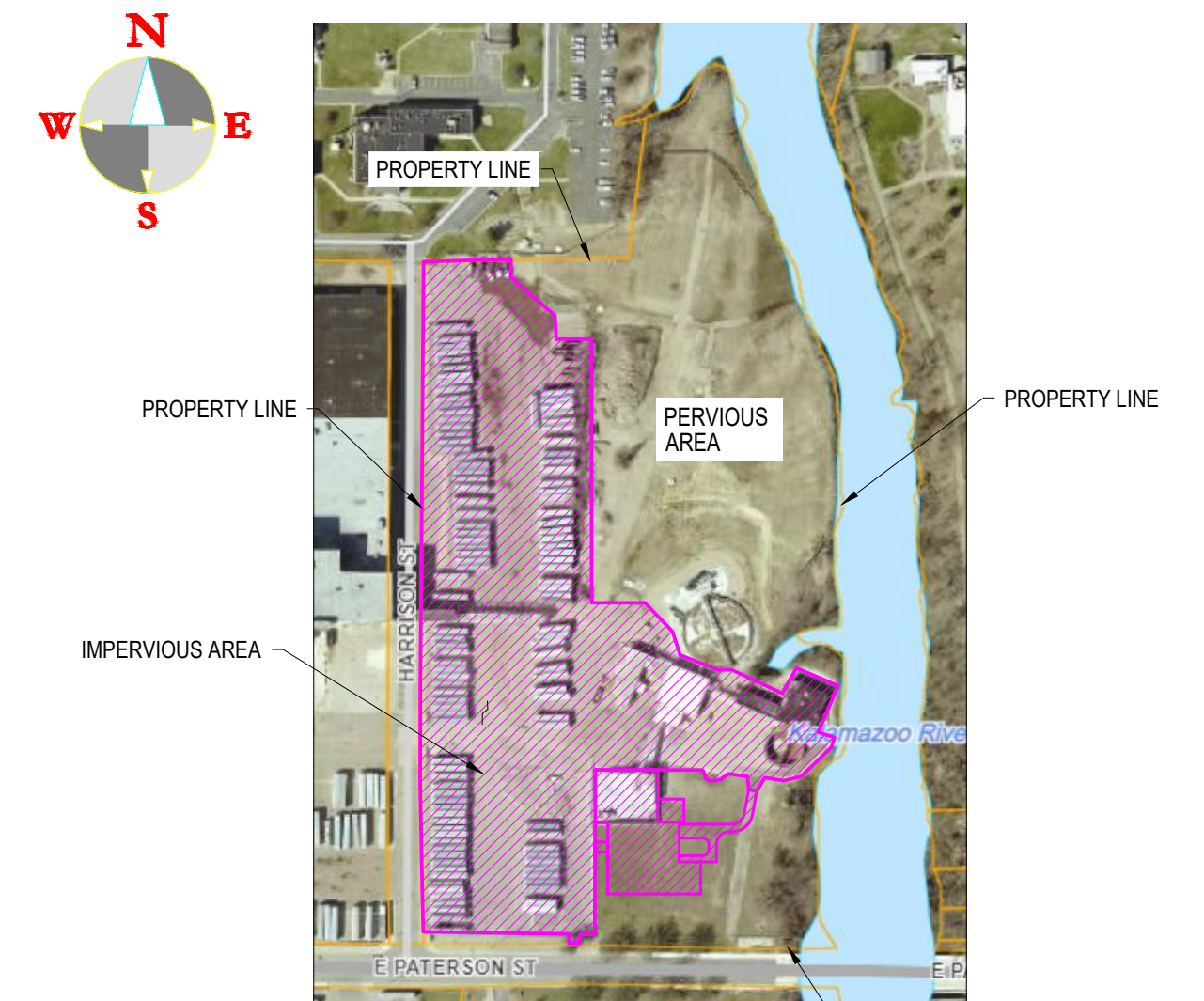
Graphic Packaging International
GRAPHIC PACKAGING INTERNATIONAL LLC
1400 HARRISON STREET
KALAMAZOO, MI 49007
(269) 383-5000
PARCEL NO. 06-10-487-003

SITE VICINITY MAP
IMAGE TAKEN FROM GOOGLE EARTH PRO,
SEPTEMBER 2025



VICINITY MAP

NTS
SECTION 10, TOWN 02 S, RANGE 11 W,
CITY OF KALAMAZOO, KALAMAZOO COUNTY,
MICHIGAN
N PITCHER ST AND E PROUTY ST



PARCEL SIZE = 16.14 ACRES
IMPERVIOUS AREA = ±8.44 ACRES
PERVIOUS AREA = ±7.70
8.44/16.14 = 51.46% IMPERVIOUS AREA

IMPERVIOUS SURFACE MAP
NTS



MICHIGAN



PROJECT NO:	TBD
CAD FILE:	COVER SHEET.dwg
DATE:	09/25
SCALE:	NTS
DISP. LEAD:	GB
DRAWN BY:	MGB
CHK'D BY:	PM: SH
WBS:	TBD

KALAMAZOO MILL PLASTICS REMOVAL BUILDING COVER SHEET
DESCRIPTION

COVER SHEET

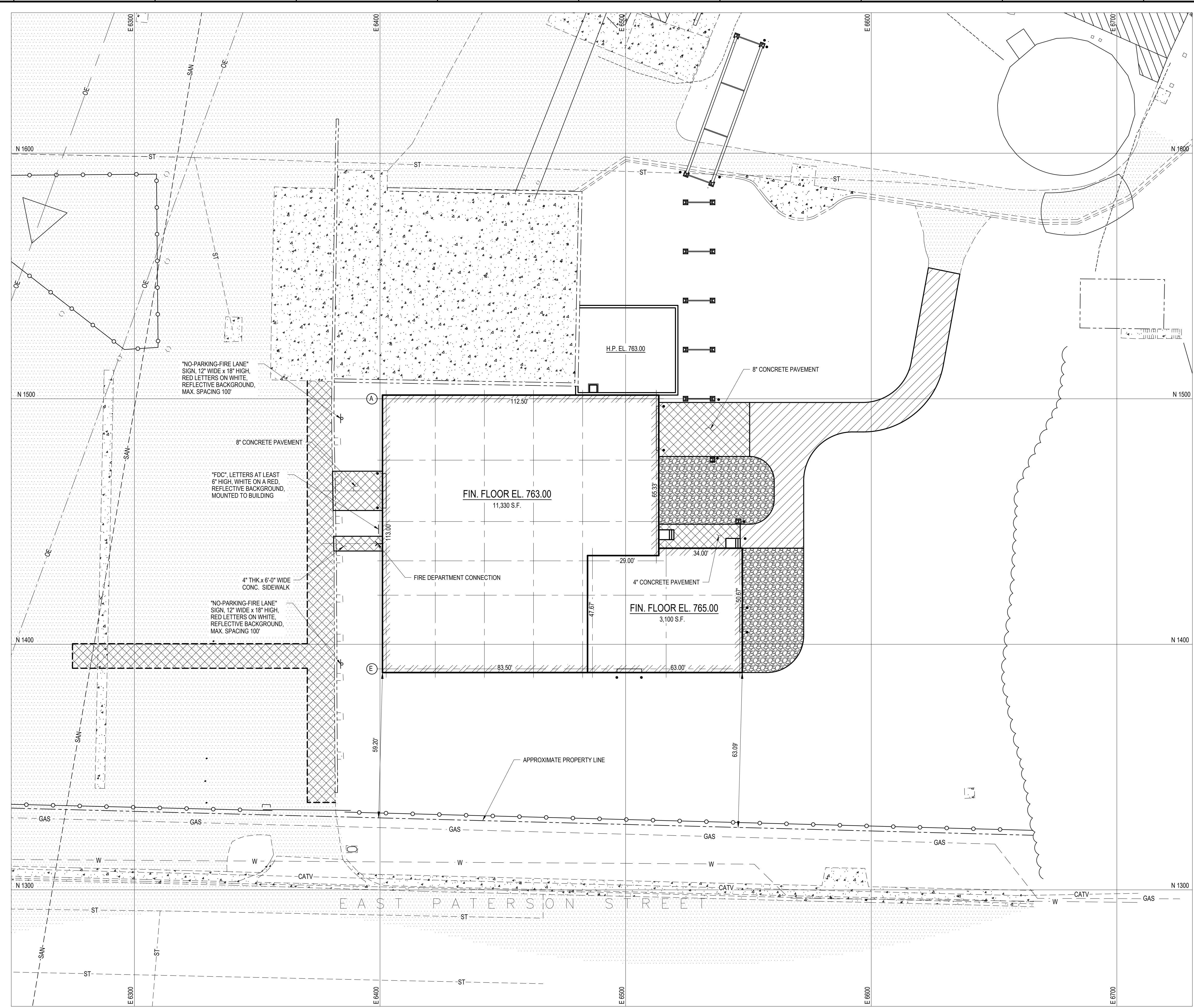
DRAWING NUMBER	A
SHEET 1 OF 1	REV.

File: C:\p\working\kbr\150834007\CIV.dwg | Title: Block | Drawing Size: 24x36 | Plot Date: 10/14/2025

150834007-CIV-01

PLANT NORTH

GRAPHIC SCALE



LEGEND:

- NEW BUILDING
- NEW ASPHALT PAVEMENT
- NEW CONCRETE PAVEMENT
- EXISTING ASPHALT PAVEMENT
- EXISTING CONCRETE PAVEMENT
- NEW AGGREGATE PAVEMENT
- EXISTING FENCE
- EXISTING WATER LINE
- EXISTING STORM DRAIN LINE
- EXISTING GAS LINE
- EXISTING CABLE TV LINE
- EXISTING SANITARY SEWER
- EXISTING OVERHEAD ELECTRICAL

ABBREVIATIONS:

MH - MANHOLE	TIP - TOP OF PIPE
CB - CATCH BASIN	EXIST - EXISTING
CONC - CONCRETE	REF - REFERENCE
DI - DUCTILE IRON	DWG - DRAWING
DWG - DRAWING NUMBER	NO - NOT TO SCALE
P.I. - POINT OF INTERSECTION	N.T.S. - NOT TO SCALE
HDPE - HIGH DENSITY POLYETHYLENE PIPE	CL - CENTER LINE
INV - INVERT	H.P. - HIGH POINT
FL - FLOW LINE	MIN - MINIMUM
IE - INVERT ELEVATION	MAX - MAXIMUM
PIV - POST INDICATOR VALVE	TYP - TYPICAL
EL - ELEVATION	GR - GRADE
T - TOP	DIA - DIAMETER
E.O.P. - EDGE OF PAVEMENT	COL - COLUMN
R - RADIUS	N - NORTH
E - EAST	

- GENERAL NOTES:**
- LOCATION AND ELEVATIONS OF EXISTING UNDERGROUND LINES AND FOUNDATIONS WERE OBTAINED FROM EXISTING PLANT DRAWINGS AND TOPOGRAPHIC SURVEY INFORMATION. THE CONTRACTOR SHALL VERIFY LOCATION AND ELEVATION OF EXISTING LINES AND FOUNDATIONS PRIOR TO COMMENCING WORK. CONTRACTOR SHALL MAKE MINOR FIELD ADJUSTMENTS IF REQUIRED.
 - THE CONTRACTOR SHALL PROVIDE AN AS-BUILT SURVEY FOR ALL INSTALLED PIPE, STRUCTURES, ETC., INCLUDING HORIZONTAL AND VERTICAL INFORMATION BASED ON REFERENCED DATUM.
 - ALL DIMENSIONS ARE IN U.S. CUSTOMARY UNITS (DECIMAL FEET).
 - MATERIALS AND CONSTRUCTION SHALL BE IN CONFORMANCE WITH THE REFERENCED STANDARDS AND SPECIFICATIONS. WHERE SPECIFICATIONS ARE IN CONFLICT WITH THE DRAWINGS, THE DRAWINGS CONTROL.
 - IF ANY EXISTING STRUCTURES TO REMAIN ARE DAMAGED DURING CONSTRUCTION IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO REPAIR AND/OR REPLACE THE EXISTING STRUCTURE AS NECESSARY TO RETURN IT TO EXISTING CONDITIONS OR BETTER, TO THE SATISFACTION OF THE OWNER.
 - THE STANDARD SPECIFICATIONS SHALL BE MICHIGAN DEPARTMENT OF TRANSPORTATION "STANDARD SPECIFICATION FOR CONSTRUCTION", LATEST EDITION.
 - THE CONTRACTOR IS SUBJECT TO THE CONSTRUCTION MANAGEMENT SAFETY REQUIREMENTS WHILE IN PLANT PROPERTY. THE CONTRACTOR SHALL SUPPLY ALL NECESSARY EQUIPMENT TO MEET PLANT REQUIREMENTS. SAFETY IS THE RESPONSIBILITY OF THE CONTRACTOR.
 - WHEN UNDERGROUND PRESSURE AND GRAVITY LINES CONFLICT IN THE VERTICAL PLANE, ROUT PRESSURE LINE UNDER THE GRAVITY LINE AND PROVIDE A MINIMUM 1'-0" CLEAR BETWEEN PIPES.
 - IF ELECTRONIC FILES ARE UTILIZED BY THE CONTRACTOR FOR SITE LAYOUT OR ANY OTHER PURPOSE, THE WRITTEN INFORMATION INDICATED ON THE HARD COPY SHALL GOVERN. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ALL LAYOUT THAT IS UNDERTAKEN UTILIZING ELECTRONIC FILES AND SHALL ENSURE THAT THE ELECTRONIC INFORMATION MATCHED THE PAPER COPY.
 - THE TOPOGRAPHIC SURVEY WAS PREPARED BY HURLEY & STEWART, LLC, 2800 S. 11th STREET, KALAMAZOO, MI 49009 JOB NO. 24-130D. REFERENCE TOPOGRAPHIC SURVEY FOR HORIZONTAL CONTROL POINTS.
 - BUILDING IDENTIFICATION SIGN SHALL COMPLY WITH THE CITY OF KALAMAZOO FIRE MARSHALL REQUIREMENTS. LETTERS SHALL BE MINIMUM 12" HIGH, RED WITH WHITE REFLECTIVE BACKGROUND.
 - NO SNOW MELT SYSTEMS ARE PROPOSED FOR THIS PROJECT.

- SURVEYOR'S NOTES:**
- BASIS OF BEARINGS: MICHIGAN STATE PLANE COORDINATE SYSTEM, SOUTH ZONE, NAD 83
 - CONTOUR INTERVAL = 1 FOOT
 - UTILITIES SHOWN ARE BASED ON FIELD LOCATION OF SURFACE EVIDENCE AND RECORDS PROVIDED BY OTHERS. UNDERGROUND UTILITY LOCATIONS ARE APPROXIMATE. ADDITIONAL UTILITIES MAY BE ENCOUNTERED. PRIOR TO ANY EXCAVATION THE CONTRACTOR SHALL CALL MISS DIG AT 1-800-482-7171.
 - BY SCALED MAP LOCATION AND GRAPHIC PLOTTING ONLY, THE LAND DEPICTED IN THIS SURVEY LIES IN ZONE X AND ZONE AE. MAP 26077C0187E, EFFECTIVE DATE 07/31/2024.
 - WETLANDS ARE ON SITE PER THE NATIONAL WETLANDS INVENTORY. A DELINEATION OF THE WETLANDS BY A QUALIFIED CONSULTANT WAS NOT PERFORMED AT THE TIME OF SURVEY. IT IS RECOMMENDED THAT A DELINEATION OF THE WETLANDS BY A QUALIFIED CONSULTANT BE PERFORMED. THIS IS NOT A WETLANDS DELINEATION SURVEY.

BENCHMARKS

ELEVATIONS OF THIS SURVEY ARE BASED ON NAVD 88 AS DERIVED FROM GPS

BM 1 EL = 762.48'
CUT X IN SOUTHWEST BURY BOLT OF HYDRANT ON THE WEST SIDE OF HARRISON ST.

BM 3 EL = 764.98'
CUT BOX IN SOUTH SIDE OF LIGHT POLE BASE ON THE NORTH SIDE OF DRIVE SOUTH OF TREATMENT TANK.

BM 4 EL = 763.96'
CUT X BOX ON SOUTH SIDE OF LIGHT POLE BASE SOUTHEAST OF TWO TANKS WEST OF HARRISON ST.

ISSUED FOR APPROVAL

BY SABRINA HANSEN DATE 10/14/2025



REV	REVISION DESCRIPTION	DATE	DR'N	CHK'D	FILE NO.
A	ISSUED FOR APPROVAL	10/14/2025	MGB	BHC	

YATES

YATES ENGINEERS, LLC
1853 DATA DR, BIRMINGHAM, AL 35244
15083-4007

PROJECT NO: TBD
CAD FILE: 15083-4007-CIV-01.dwg
DATE: 08/28/2025
SCALE: 1" = 20'
DISP. LEAD: GB DRAWN BY: MGB
CHK'D BY: BHC PM: SH WBS: TBD

KALAMAZOO MILL
PLASTICS REMOVAL BUILDING
CIVIL SITE PLAN

15083-4007-CIV-01

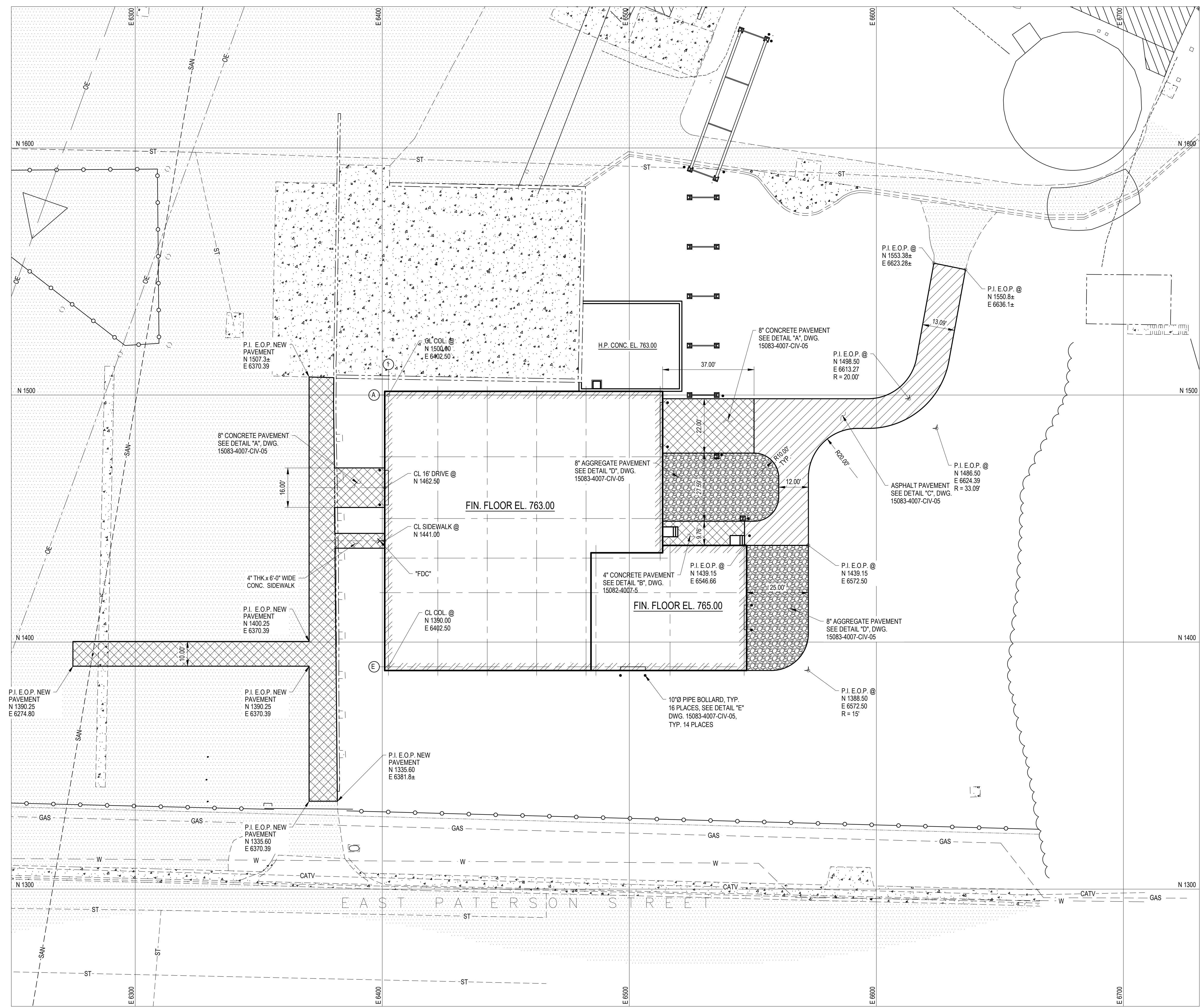
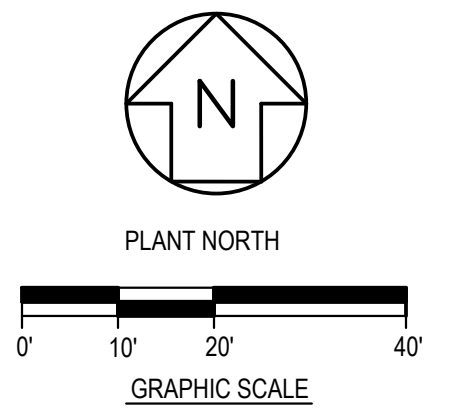
DESCRIPTION

DRAWING NUMBER
SHEET 1 OF 1

A REV.

File: C:\pvc_wor\yates\1853-4007-CIV-02.dwg | Title: Block | Drawing Size: 24x36 | Plot Date: 10/14/2025

15083-4007-CIV-02



- LEGEND:**
- NEW BUILDING
 - NEW ASPHALT PAVEMENT
 - NEW CONCRETE PAVEMENT
 - EXISTING ASPHALT PAVEMENT
 - EXISTING CONCRETE PAVEMENT
 - NEW AGGREGATE PAVEMENT
 - EXISTING FENCE
 - 10" PIPE BOLLARD

- NOTES:**
1. SEE DRAWING 15083-4007-CIV-01 FOR GENERAL NOTES AND ABBREVIATIONS.
 2. ALL DIMENSIONS ARE IN U.S. CUSTOMARY UNITS (DECIMAL FEET).
 3. SEE DRAWING 15083-4007-CIV-05 FOR PAVEMENT DETAILS.

ISSUED FOR APPROVAL
 BY SABRINA HANSEN DATE 10/14/2025



REV	DESCRIPTION	DATE	DRN	CHK'D	FILE NO.
A	ISSUED FOR APPROVAL	10/14/2025	MGB	BHC	-

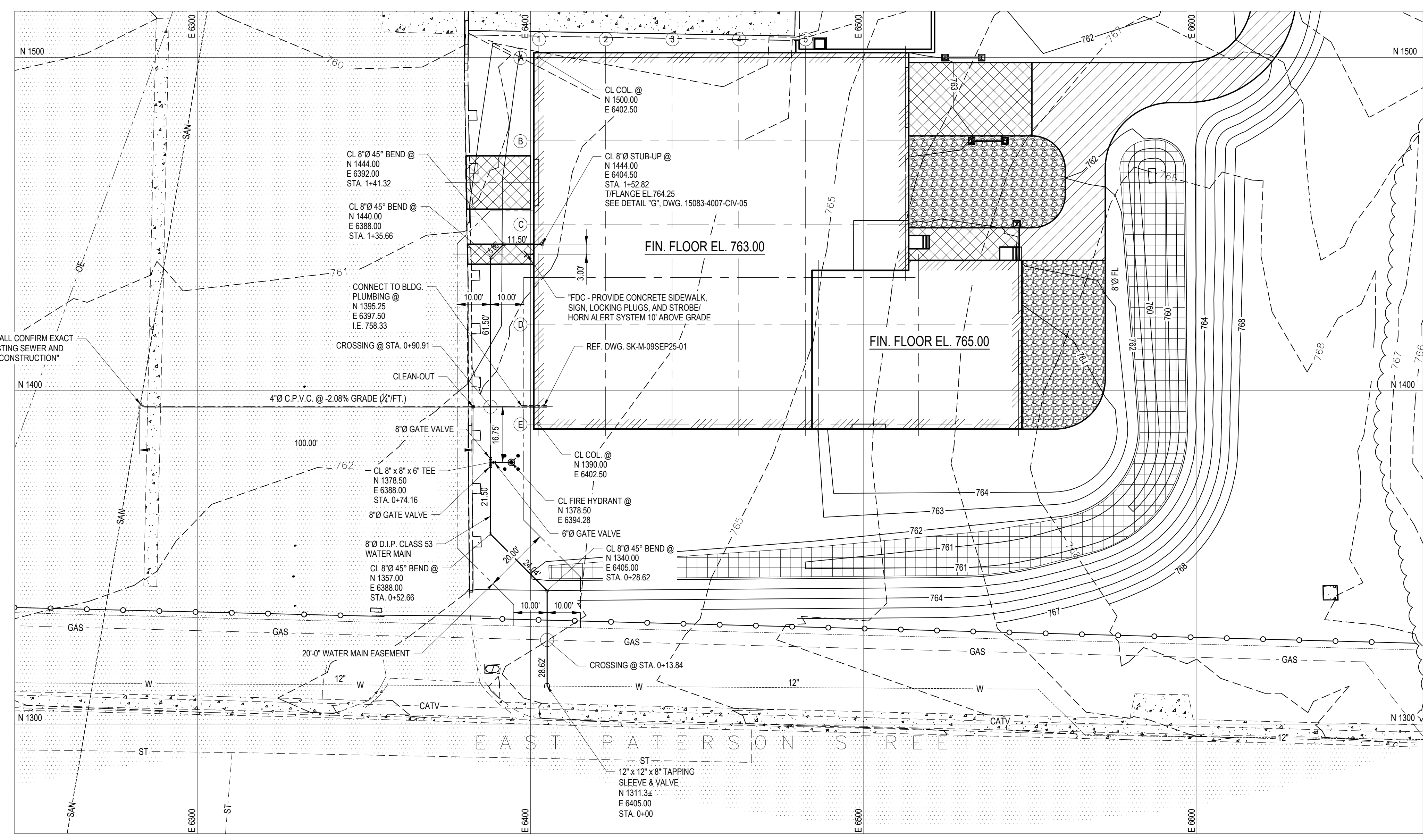
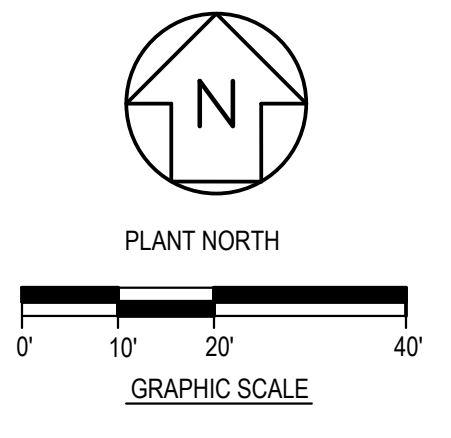
PROJECT NO:	TBD
CAD FILE:	15083-4007-2.dwg
DATE:	07/07/2025
SCALE:	1" = 20'
DISP. LEAD:	GB
DRAWN BY:	MGB
CHK'D BY:	BHC
PM:	SH
WBS:	TBD

KALAMAZOO MILL
 PLASTICS REMOVAL BUILDING
 CIVIL LAYOUT & PAVING PLAN

15083-4007-CIV-02
 DRAWING NUMBER
 SHEET 1 OF 1

File: C:\pvc_wor\yates\15083-4007-CIV-03.dwg | Title: Box 1 | Drawing Size: 24x36 | Plot Date: 10/14/2025

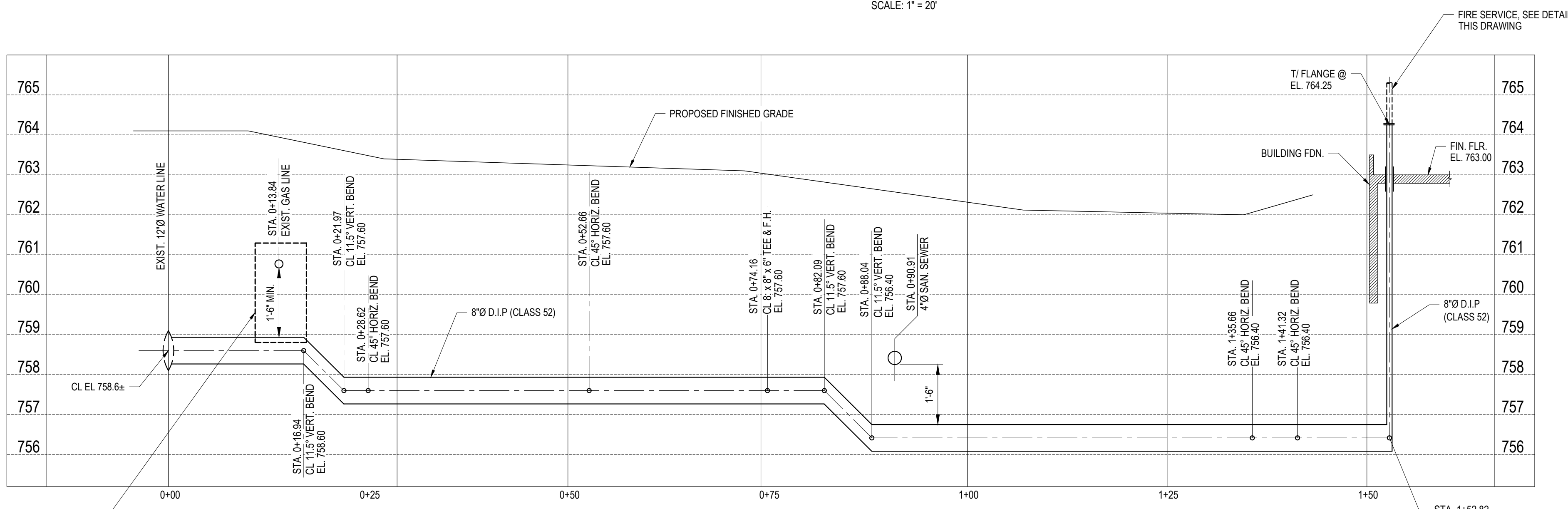
15083-4007-CIV-03



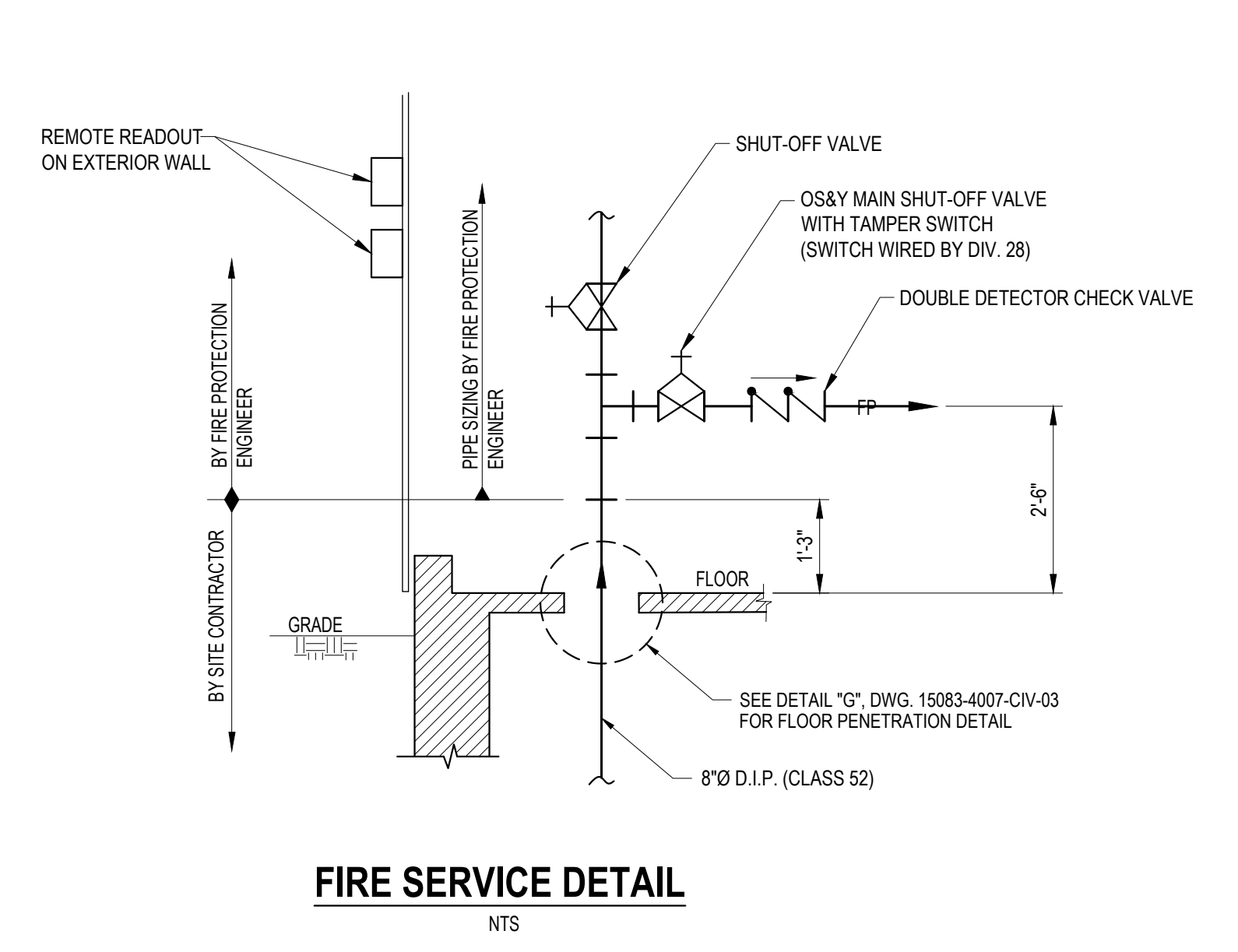
PLAN
SCALE: 1" = 20'

- LEGEND:**
- NEW BUILDING
 - NEW ASPHALT PAVEMENT
 - NEW CONCRETE PAVEMENT
 - EXISTING ASPHALT PAVEMENT
 - EXISTING CONCRETE PAVEMENT
 - NEW AGGREGATE PAVEMENT
 - HDPE DITCH LINER
 - EXISTING FENCE
 - W ----- EXISTING WATER LINE
 - S ----- EXISTING STORM DRAIN LINE
 - GAS ----- EXISTING GAS LINE
 - CATV ----- EXISTING CABLE TV LINE
 - SAN ----- EXISTING SANITARY SEWER
 - OE ----- EXISTING OVERHEAD ELECTRICAL
 - 8" FL ----- NEW UNDERGROUND FIRE LINE

- NOTES:**
- SEE DRAWING 15083-4007-CIV-01 FOR GENERAL NOTES & LIST OF ABBREVIATIONS.
 - WATER MAIN MATERIALS AND INSTALLATION SHALL COMPLY WITH THE CITY OF KALAMAZOO STANDARD SPECIFICATIONS FOR WATER MAIN AND SERVICE INSTALLATION, 2021. EGLE PA 399 PERMIT IS REQUIRED FOR WATER MAIN AND HYDRANTS.
 - ANY UTILITIES REQUIRING DEWATERING SHALL BE INSTALLED TO THE CITY OF KALAMAZOO STANDARDS AND INCLUDED IN THE INSTALLATION COST. CONTRACTOR IS RESPONSIBLE FOR ALL DEWATERING NECESSARY TO CONSTRUCT IN THE DRY.
 - WORK WILL ADHERE TO THE CITY OF KALAMAZOO STANDARD SPECIFICATIONS FOR SANITARY SEWER CONSTRUCTION, 2013.



PROFILE - PROPOSED 8" H.D.P.E. FIRE LINE
SCALE: 1" = 10' HORIZONTAL
1" = 5' VERTICAL



FIRE SERVICE DETAIL
NTS

EXISTING GAS MAIN DEPTH IS APPROXIMATE. CONTRACTOR TO CONFIRM 18" SEPARATION FROM PROPOSED WATER MAIN



REV	DESCRIPTION	DATE	DR'N	CHK'D	FILE NO.
A	ISSUED FOR APPROVAL	10/14/2025	MGB	BHC	



PROJECT NO:	TBD
CAD FILE:	15083-4007-CIV-03.dwg
DATE:	08/24/2025
SCALE:	1" = 20'
DISP. LEAD:	GB
DRAWN BY:	MGB
CHK'D BY:	BHC
PM:	SH
WBS:	TBD

**KALAMAZOO MILL
PLASTICS REMOVAL BUILDING
FIRE PROTECTION AND
SANITARY SEWER PLAN**

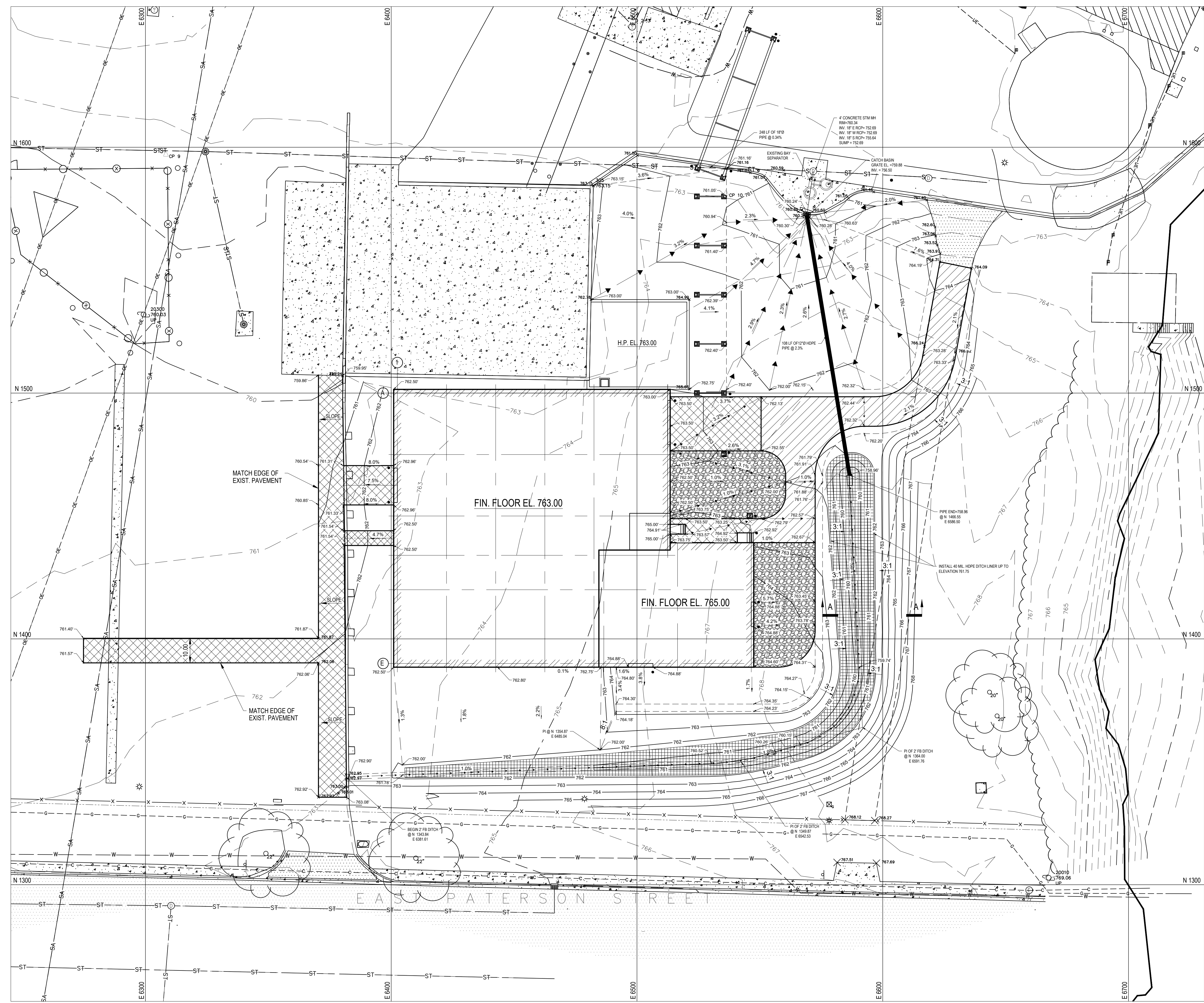
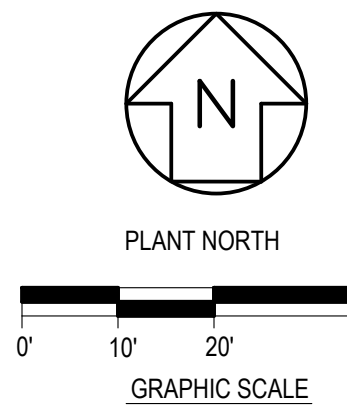
ISSUED FOR APPROVAL
BY: SABRINA HANSEN DATE: 10/14/2025

15083-4007-CIV-03

DRAWING NUMBER
SHEET 1 OF 1

15083-4007-CIIV-04

15083-4007-CIIV-04



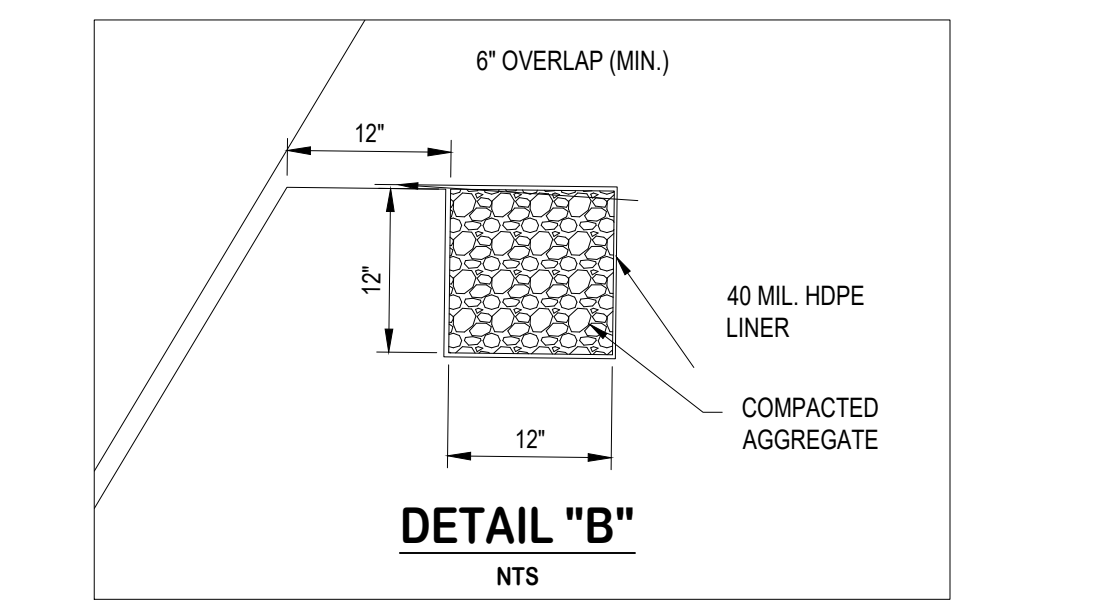
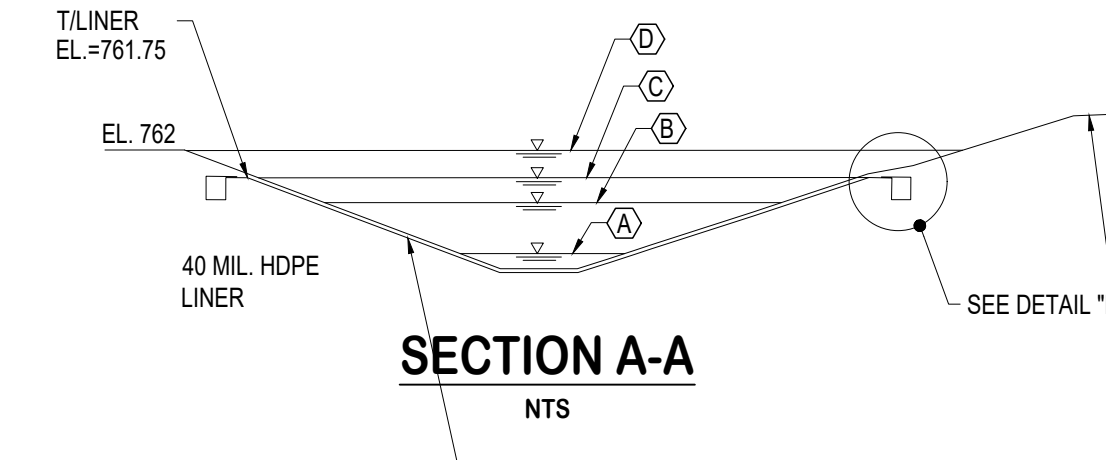
- LEGEND:**
- NEW BUILDING
 - NEW ASPHALT PAVEMENT
 - NEW CONCRETE PAVEMENT
 - EXISTING ASPHALT PAVEMENT
 - EXISTING CONCRETE PAVEMENT
 - NEW AGGREGATE PAVEMENT
 - NEW 40 MIL. HDPE DITCH LINER
 - EXISTING CONTOURS
 - PROPOSED CONTOURS

- NOTES:**
- SEE DRAWING 15083-4007-CIV-01 FOR GENERAL NOTES, LEGEND AND ABBREVIATIONS.
 - FINISH GRADE SPOT ELEVATIONS AND CONTOURS SHOWN ON THE PLAN ARE TOP OF PAVEMENTS AND FINISHED GRADE.
 - EXISTING GRADE CONTOURS SHOWN AT 1 FOOT INTERVALS.
 - PROPOSED GRADE CONTOURS SHOWN AT 1 FOOT INTERVALS.

- SUB-GRADE PREPARATION:**
- THE WORK AREA SHALL BE STRIPPED OF ALL VEGETATION AND TOPSOIL, TO BE WASTED ON-SITE AS DIRECTED BY THE OWNER. AFTER EXCAVATING WHERE REQUIRED THE SUB-GRADE SHALL BE PROOF ROLLED USING A LOADED TANDEM DUMP TRUCK (MIN. 15 CUBIC YARDS). AREA SHALL BE PROOF-ROLLED MAKING TWO PASSES AT 90° ANGLES. ANY AREAS THAT DEFLECT OR PUMP SHALL BE EXCAVATED AS DIRECTED BY THE GEOTECHNICAL ENGINEER AND BACK-FILLED WITH COMPACTED ENGINEERED FILL.
 - AFTER STRIPPING, EXCAVATING WHERE REQUIRED AND PROOF-ROLLING, BUT PRIOR TO PLACING FILL, THE EXPOSED SOILS SHOULD BE SCARIFIED AND THEN PROCESSED TO A MOISTURE CONTENT AS SPECIFIED IN THE GEOTECHNICAL REPORT. THE SUBGRADE SOILS SHOULD BE RE-COMPACTED TO A DRY DENSITY OF AT LEAST 95 PERCENT OF THE STANDARD PROCTOR (ASTM D698) MAXIMUM DENSITY FOR A DEPTH OF AT LEAST EIGHT (8) INCHES BELOW THE SURFACE.

- ENGINEERED FILL MATERIALS:**
- ENGINEERED FILL MATERIAL, PLACEMENT AND COMPACTION SHALL BE AS SPECIFIED IN THE PROJECT GEOTECHNICAL REPORT PREPARED BY TERRACON, TERRACON PROJECT NO. CK255059.

- (A) EL. 760.58, VOL. 930 C.F. - REQUIRED STORAGE VOLUME, 930 C.F.
- (B) EL. 761.55, VOL. 2782 C.F. - TREATMENT VOL. 2725 C.F.
- (C) EL. 761.75, VOL. 3456 C.F.
- (D) EL. 762.00, VOL. 4400 C.F.



Graphic Packaging INTERNATIONAL

NO.	REVISION DESCRIPTION	DATE	DR'N	CHK'D	FILE NO.
A	ISSUED FOR APPROVAL	10/14/2025	BHC	MGB	

YATES ENGINEERS, LLC
 1853 DATA DR. BIRMINGHAM, AL 35244
 15083-4007

ISSUED FOR APPROVAL
 BY: SABRINA HANSEN DATE: 10/14/2025

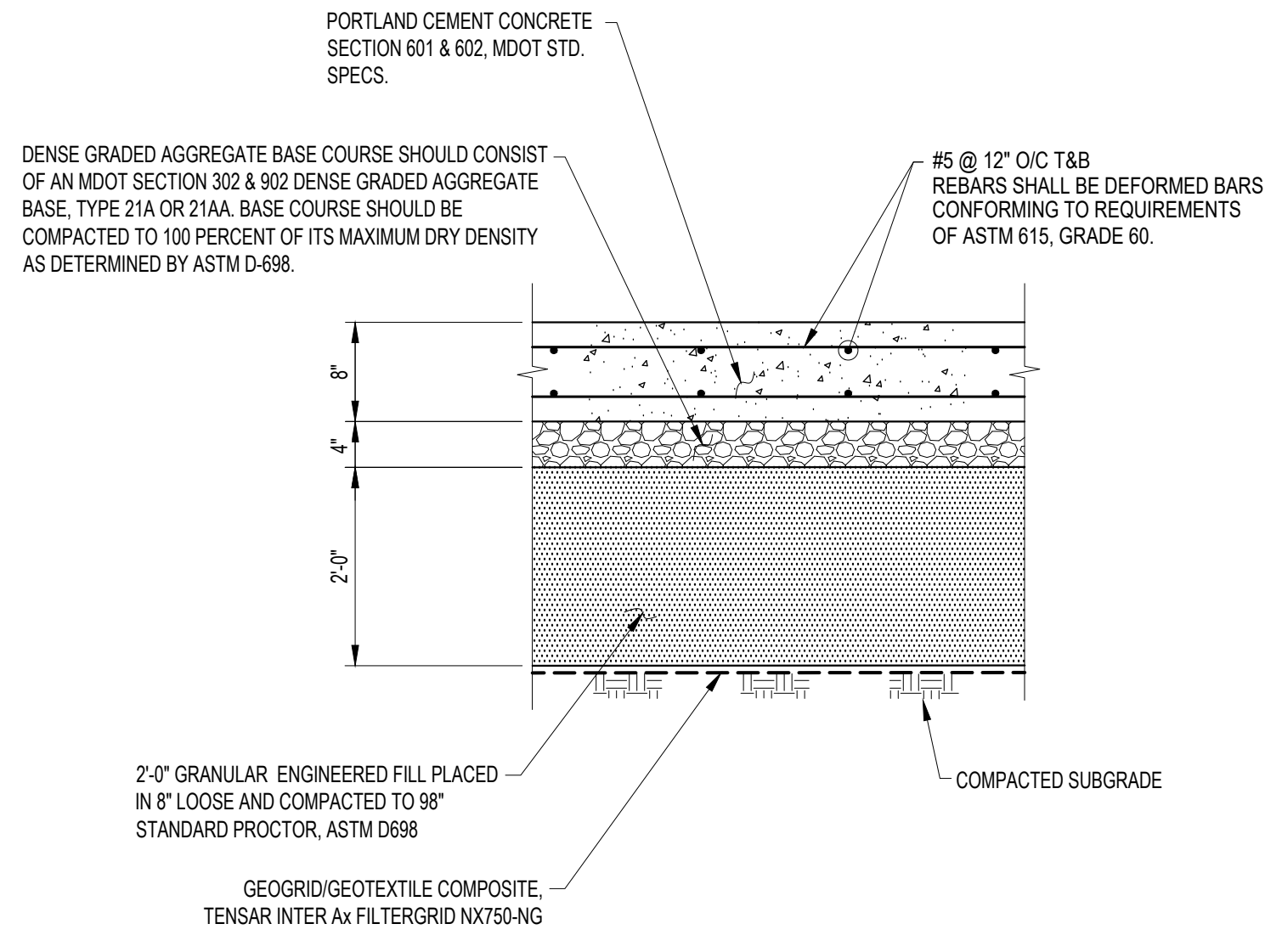
**KALAMAZOO MILL
 PLASTICS REMOVAL BUILDING
 OVERALL SITE GRADING PLAN**

15083-4007-CIIV-04

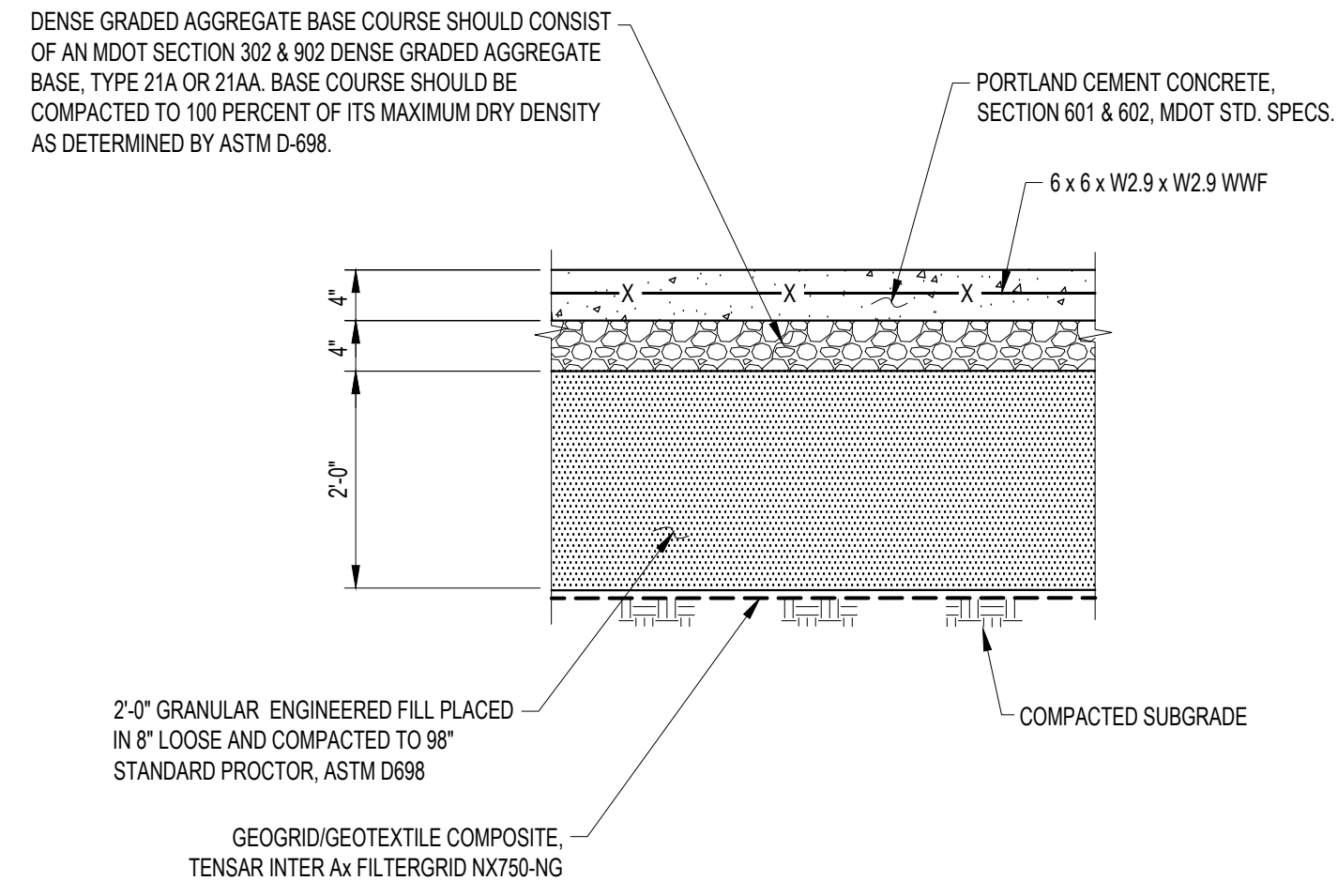
PROJECT NO: TBD
 CAD FILE: 15083-4007-CIV-04
 DATE: 07/25/2025
 SCALE: 1" = 20'
 DISP. LEAD: GB DRAWN BY: BHC
 CHK'D BY: MGB PM: SH WBS: TBD

DESCRIPTION: PLASTICS REMOVAL BUILDING OVERALL SITE GRADING PLAN

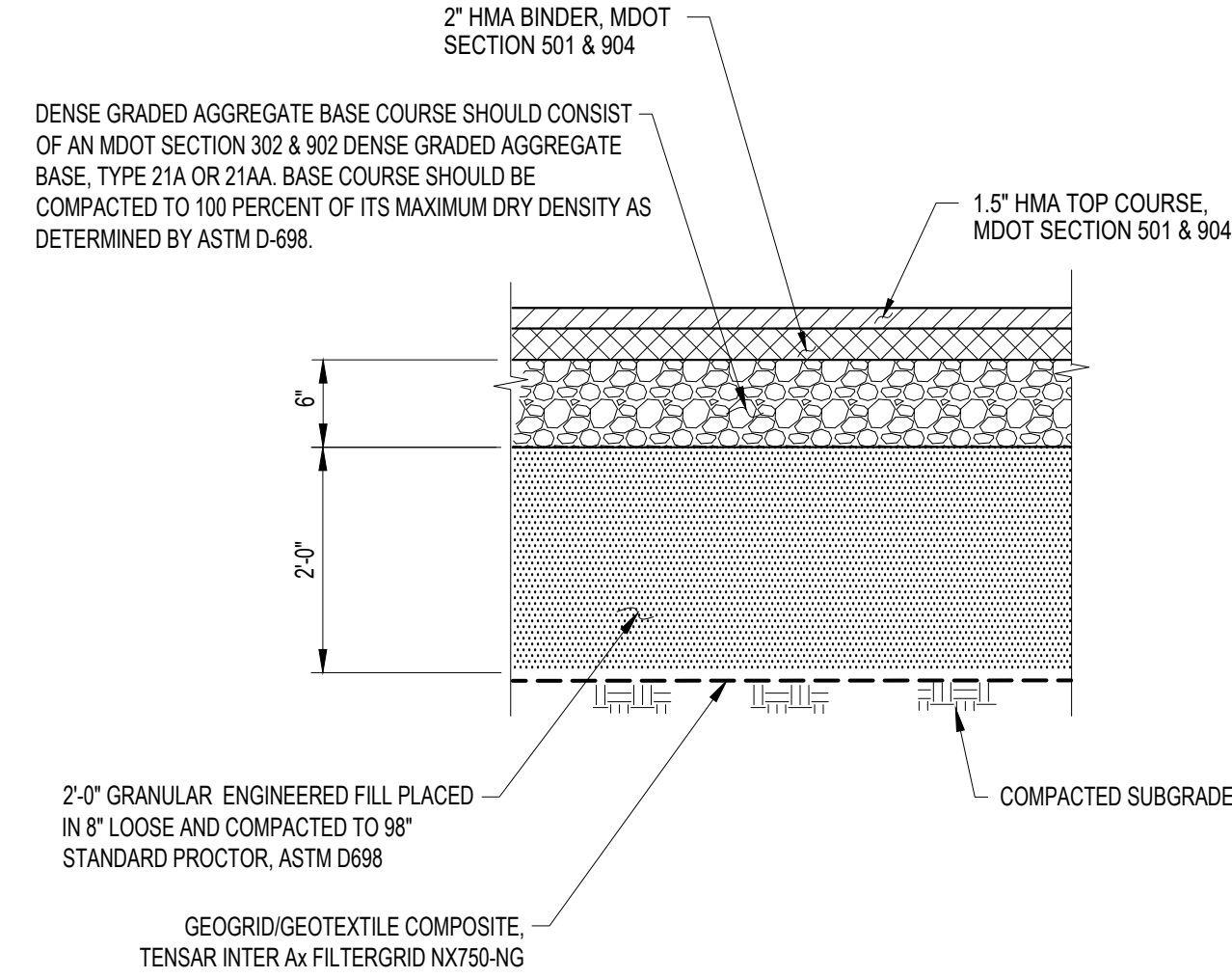
DRAWING NUMBER: 15083-4007-CIIV-04
 SHEET 1 OF 1
 A REV.



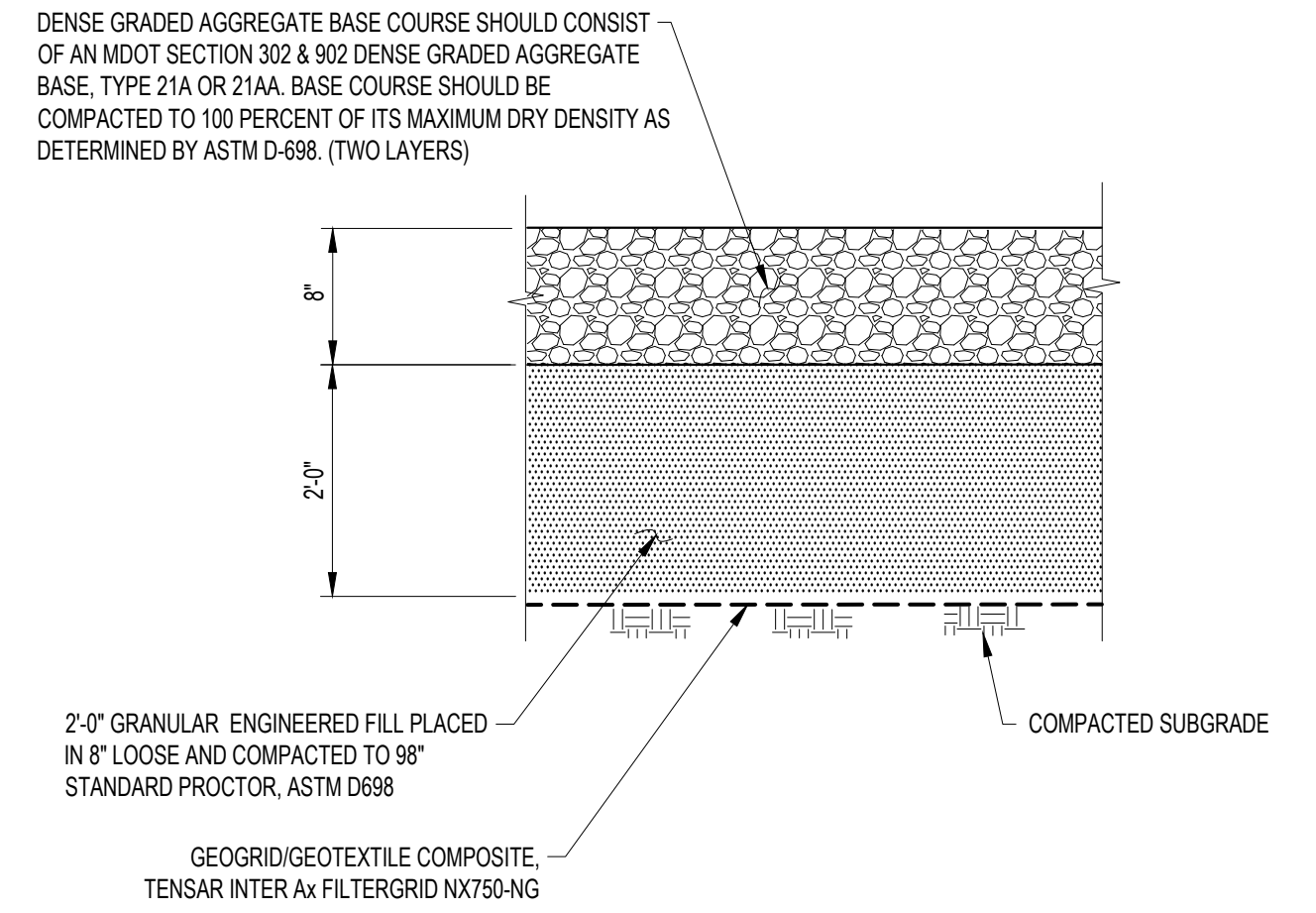
DETAIL "A"
CAST-IN-PLACE CONCRETE PAVEMENT DETAIL
NTS



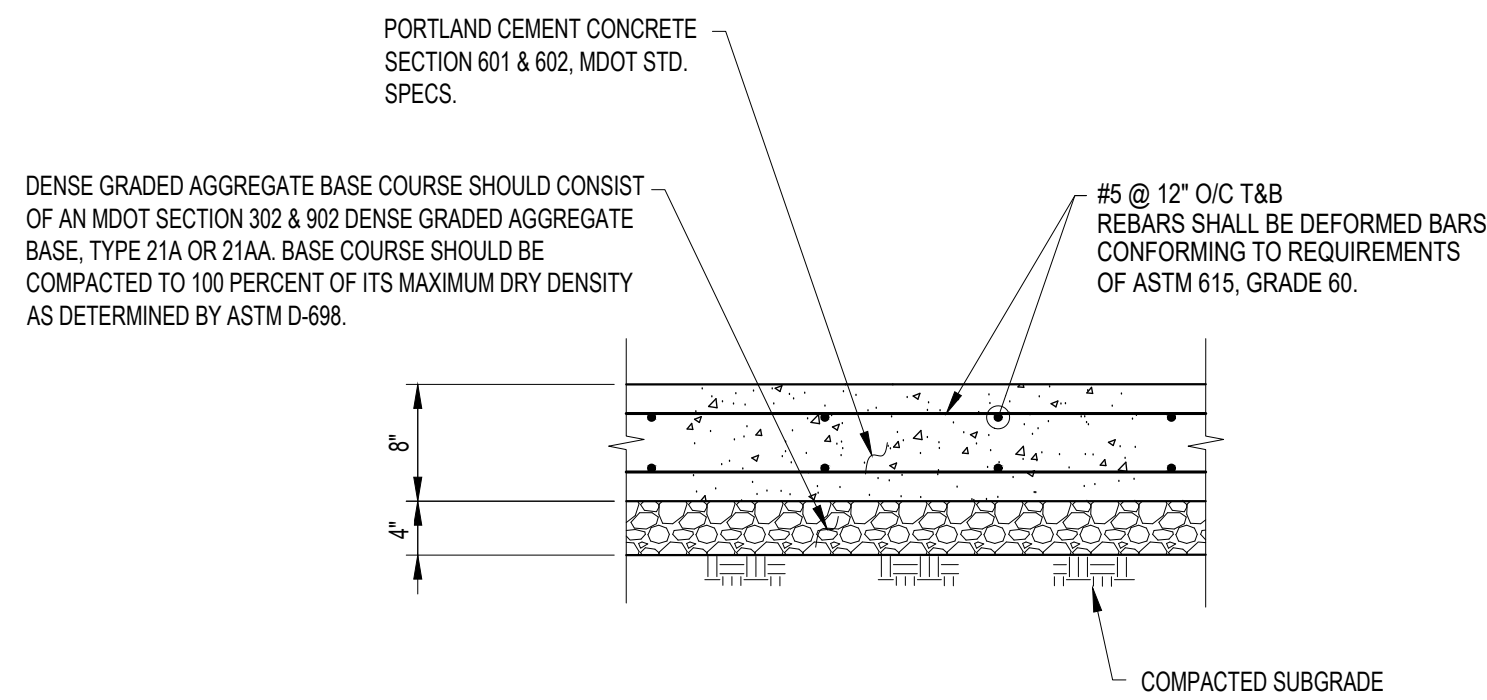
DETAIL "B"
4" CAST-IN-PLACE CONCRETE PAVEMENT DETAIL
NTS



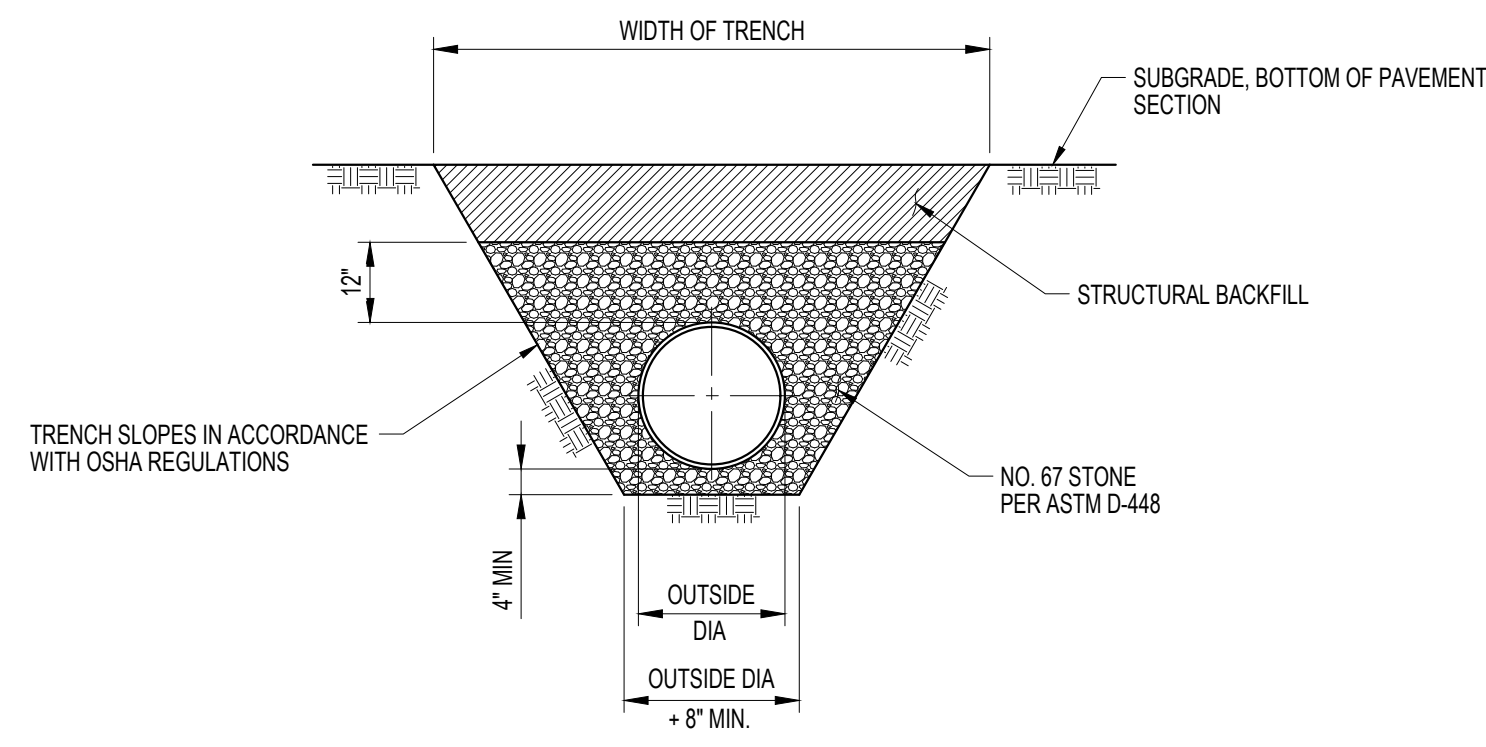
DETAIL "C"
ASPHALT PAVEMENT PAVEMENT DETAIL
NTS



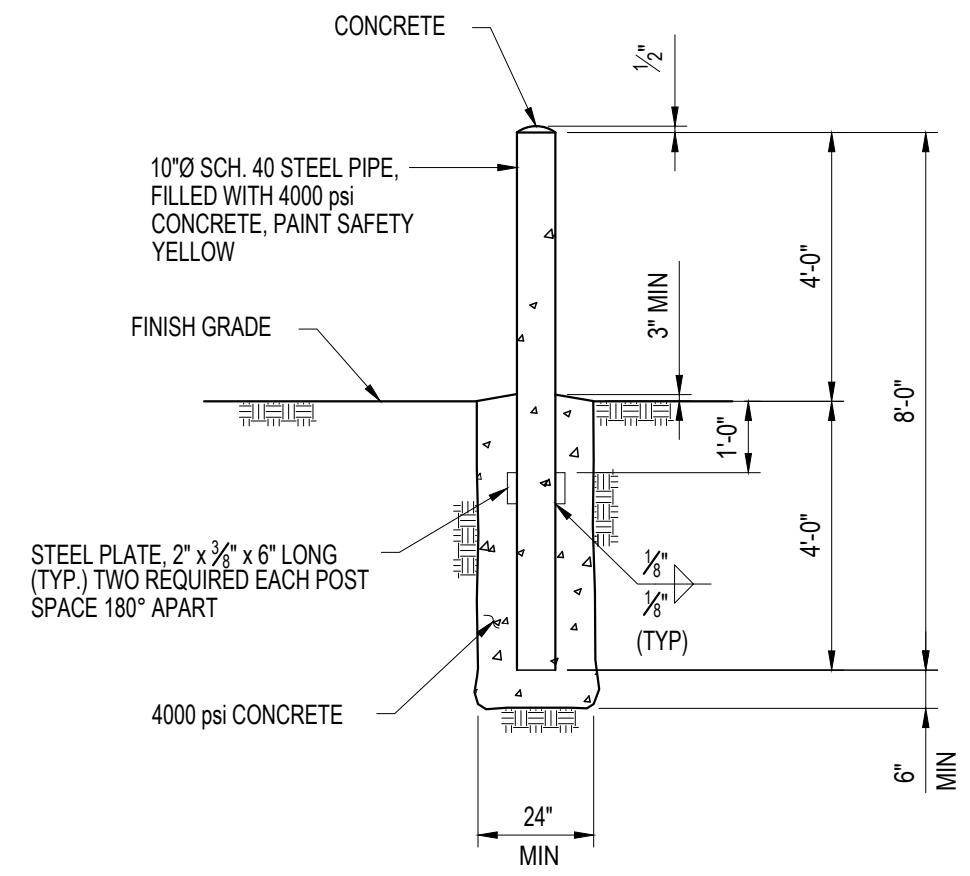
DETAIL "D"
AGGREGATE PAVEMENT PAVEMENT DETAIL
NTS



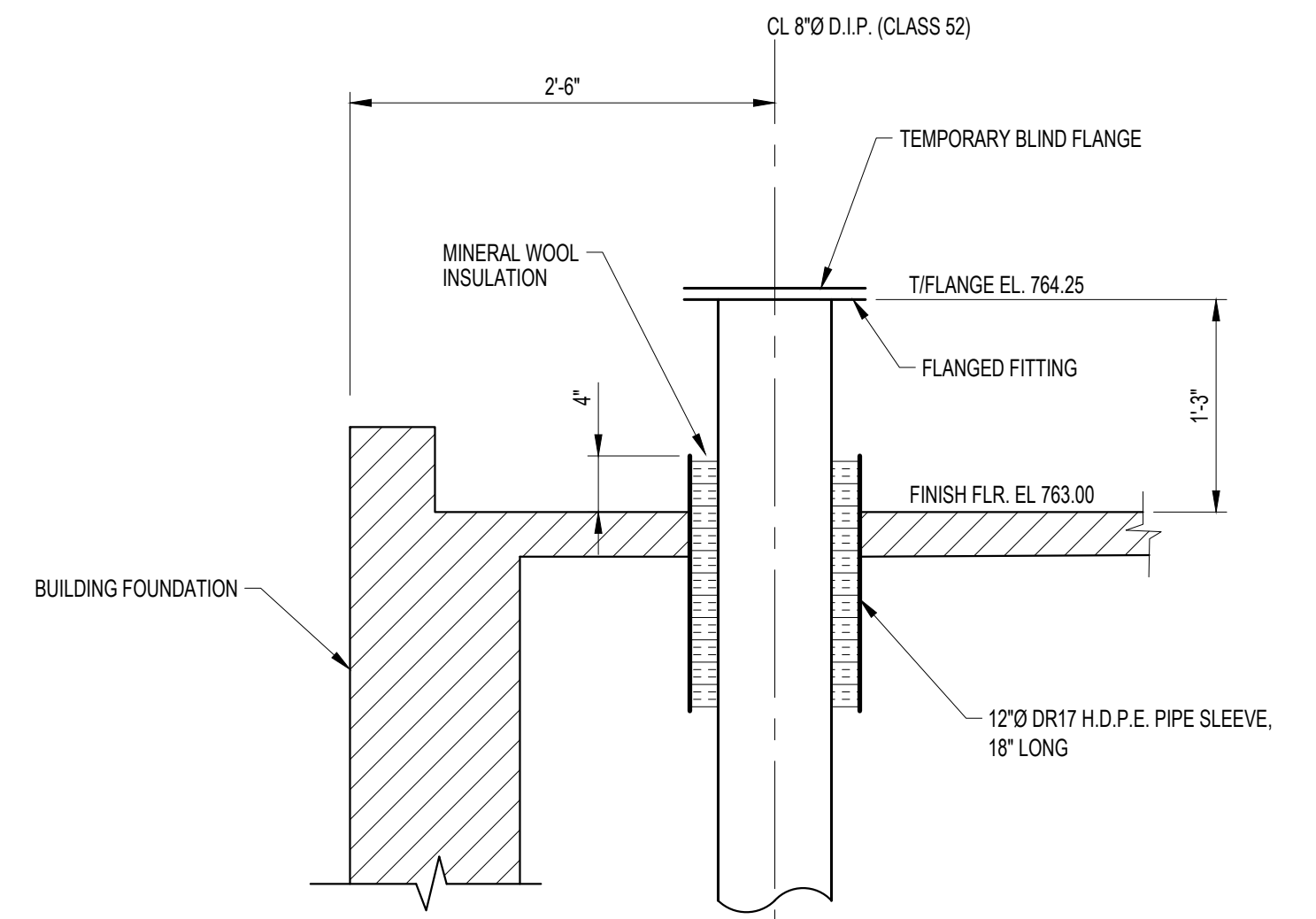
DETAIL "E"
CAST-IN-PLACE CONCRETE PAVEMENT DETAIL
NTS



STORM & SANITARY PIPE BEDDING DETAIL
NOTE:
BEDDING SHALL BE ACCOMPLISHED BY LAYING PIPE ON A FOUNDATION OF DENSELY COMPACTED COARSE STONE FOUNDATION. COMPACTED COARSE STONE SHALL BE PLACED TO A MINIMUM POINT 12" ABOVE THE TOP OF THE PIPE.



DETAIL "F"
10" PIPE BOLLARD DETAIL
NTS
(REF. DWG 15083-4007-CIV-02)



DETAIL "G"
FLOOR PENETRATION DETAIL
NTS
(REF. DWG 15083-4007-CIV-03)

ISSUED FOR APPROVAL
BY: SABRINA HANSEN DATE: 10/14/2025



REV	REVISION DESCRIPTION	DATE	DR'N	CHK'D	FILE NO.
A	ISSUED FOR APPROVAL	10/14/2025	MGB	BHC	-

YATES
YATES ENGINEERS, LLC
1853 DATA DR, BIRMINGHAM, AL 35244
15083-4007

PROJECT NO: TBD
CAD FILE: 15083-4007-CIV-05
DATE: 09/01/2025
SCALE: NTS
DISP. LEAD: GB DRAWN BY: MGB
CHK'D BY: BHC PM: SH WBS: TBD

KALAMAZOO MILL
PLASTICS REMOVAL BUILDING
SITE SECTIONS & DETAILS

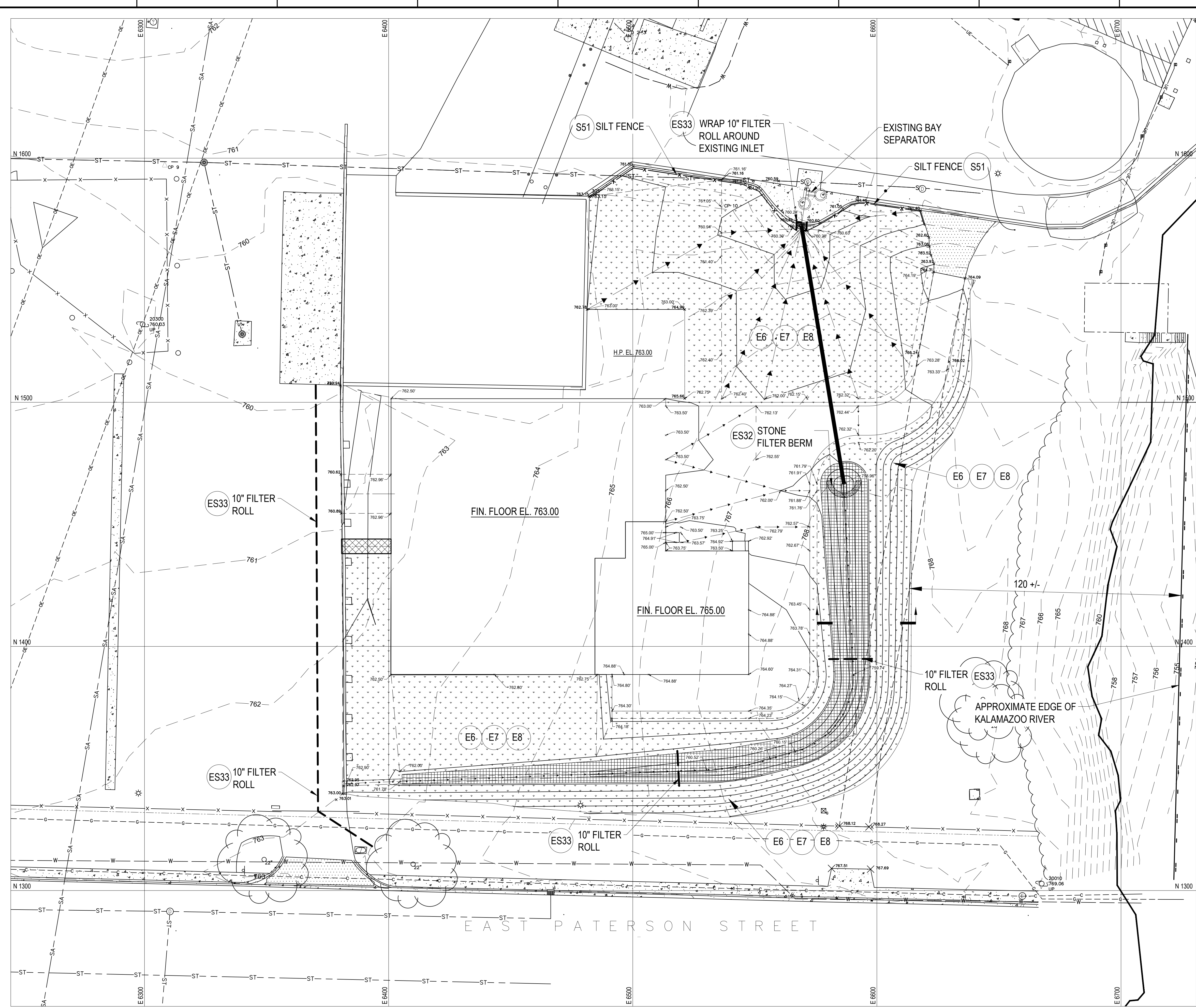
15083-4007-CIV-05
DRAWING NUMBER
SHEET 1 OF 1
A
REV.

File: C:\pvc_workepub\87168107\15083-4007-CIV-06.dwg | Drawing Size: 24x36 | Plot Date: 10/14/2025

15083-4007-CIV-06

0' 10' 20' 40'

GRAPHIC SCALE



LEGEND:

- NEW BUILDING
- NEW ASPHALT PAVEMENT
- NEW CONCRETE PAVEMENT
- EXISTING ASPHALT PAVEMENT
- EXISTING CONCRETE PAVEMENT
- NEW AGGREGATE PAVEMENT
- NEW 40 MIL. HDPE DITCH LINER
- PROPOSED GRASSING
- EXISTING CONTOURS
- PROPOSED CONTOURS
- PROPOSED FILTER ROLL (ES33)
- PROPOSED SILT FENCE (S51)
- PROPOSED STONE FILTER BERM (ES32)
- PROPOSED MULCHING (E6)
- PROPOSED TEMPORARY SEEDING (E7)
- PROPOSED PERMANENT SEEDING (E8)

- NOTES:**
1. SEE DRAWING 15083-4007-CIV-01 FOR GENERAL NOTES, LEGEND AND ABBREVIATIONS.
 2. EXISTING GRADE CONTOURS SHOWN AT 1 FOOT INTERVALS.
 3. PROPOSED GRADE CONTOURS SHOWN AT 1 FOOT INTERVALS.
 4. SEDIMENT AND EROSION CONTROL SHALL COMPLY WITH THE STATE OF MICHIGAN "SOIL EROSION AND SEDIMENTATION CONTROL GUIDE BOOK"

- SOIL EROSION AND SEDIMENTATION CONTROL MAINTENANCE NOTES:**
1. INSTALL TEMPORARY INLET FILTERS AT ALL ADJACENT AND DOWN-GRADIENT STORM WATER INLETS, CATCH BASINS AND MANHOLES THAT MAY BE IMPACTED. CATCH BASIN INLET FILTERS SHALL BE MAINTAINED CLEAN AT ALL TIMES THROUGHOUT THE CONSTRUCTION PERIOD. IF A FILTER HAS HOLES OR IS INUNDATED WITH SEDIMENT, THE FILTER WILL REQUIRE REPLACEMENT.
 2. INSTALL AN ANTI-TRACKING PAD AT THE SITE ENTRY AND EXIT(S). THE ANTI-TRACKING PAD SHOULD BE CONSTRUCTED OF GEOTEXTILE FABRIC WITH LIMESTONE OVER IT.
 3. SILT FENCE SHALL BE MAINTAINED AT ALL TIMES THROUGHOUT THE CONSTRUCTION PERIOD. IF REPAIR OR REPLACEMENT IS NECESSARY, IT SHALL BE PERFORMED ACCORDING TO THE MANUFACTURER'S SPECIFICATIONS. MAINTENANCE INCLUDES THE REMOVING OF BUILT-UP SEDIMENT ACCUMULATES TO 1/2 THE HEIGHT OF THE FENCE. CONTRACTOR SHALL REMOVE, REPLACE, RETRENCH, OR RE-BACKFILL THE FENCE IF IT FAILS. ADDITIONALLY, THE CONTRACTOR SHALL REINSTALL ANY PORTION OF THE FENCING DAMAGED BY CONSTRUCTION MACHINERY.
 4. PLACE STOCKPILES AND OTHER SPOIL PILES AWAY FROM THE DRAINAGE SYSTEM TO MINIMIZE SEDIMENT TRANSPORT. IF THE STOCKPILE AND/OR SPOIL PILE MUST REMAIN ON-SITE OVERNIGHT, OR IF THE WEATHER CONDITIONS INDICATE THE CHANCE FOR PRECIPITATION, A) COVER THE PILE WITH WATER REPELLENT MATERIAL TO PREVENT EROSION AND/OR B) INSTALL SILT FENCING AROUND THE BASE OF THE PILE TO PREVENT TRANSPORT OF SEDIMENT TO THE STORM WATER SYSTEM, OR APPLY OTHER CONTROL METHODS APPROPRIATE TO THE SIDE. CONTROL MEASURES TO GUARD AGAINST WIND EROSION MUST ALSO BE EMPLOYED, SUCH AS WETTING OR COVERING THE STOCKPILES. KEEP AS FEW STOCKPILES AS POSSIBLE DURING THE COURSE OF THE PROJECT.
 5. THROUGHOUT THE CONSTRUCTION PERIOD, ALL MUD/SILT TRACKED ONTO EXISTING ROADS FROM THE SITE DUE TO CONSTRUCTION SHALL BE IMMEDIATELY REMOVED BY THE CONTRACTOR.
 6. SEEDING OR OTHER STABILIZATION SHALL BE REQUIRED IMMEDIATELY TO AREAS WHICH HAVE BEEN DAMAGED BY RUNOFF.
 7. THE CONTRACTOR SHALL MAINTAIN DUST CONTROL ON THE SITE THROUGHOUT THE DURATION OF THE CONSTRUCTION PROCESS.
 8. WEEKLY INSPECTIONS BY A UNIVERSITY SESC TRAINED CERTIFIED STORM WATER MANAGEMENT OPERATOR AS WELL AS PERIODIC INSPECTION WITHIN 24 HOURS OF A SIGNIFICANT RAIN EVENT WILL OCCUR. THESE INSPECTIONS MAY RESULT IN RECOMMENDATIONS FOR ROUTINE MAINTENANCE OF THE SOIL EROSION CONTROL DEVICES, AS WELL AS ADDITIONAL CONTROLS.

ISSUED FOR APPROVAL
 BY SABRINA HANSEN DATE 10/14/2025



REV	REVISION DESCRIPTION	DATE	DR'N	CHK'D	FILE NO.
A	ISSUED FOR APPROVAL	10/14/2025	BHC	MGB	

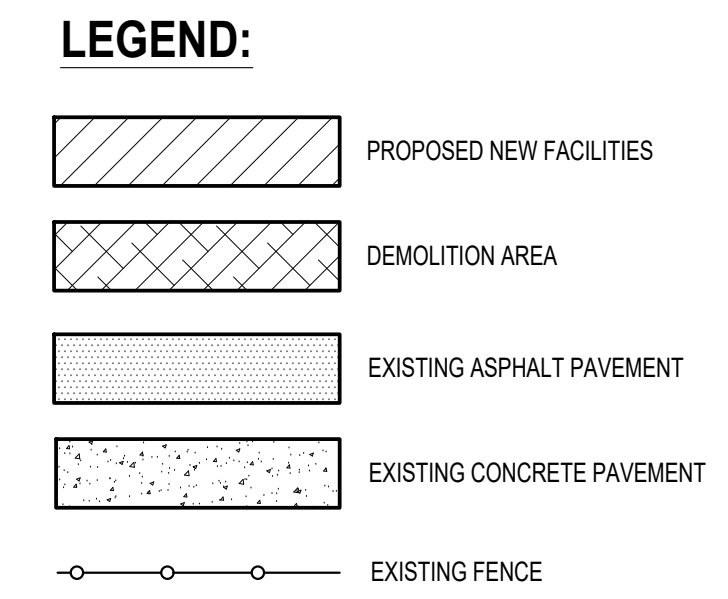
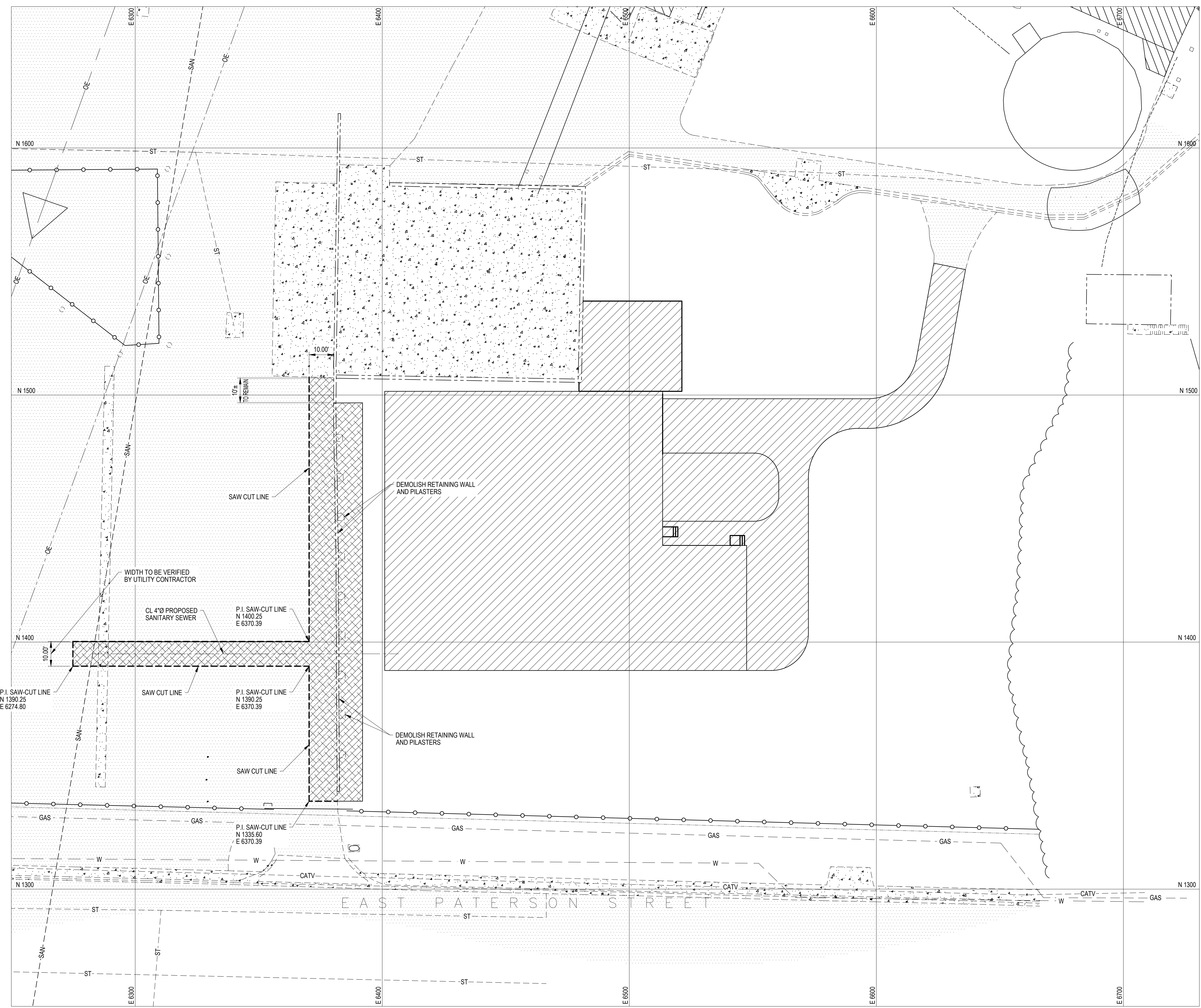
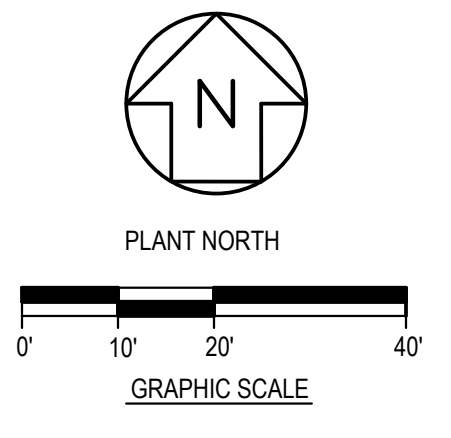
YATES
 YATES ENGINEERS, LLC
 1853 DATA DR. BIRMINGHAM, AL 35244
 15083-4007

KALAMAZOO MILL
 PLASTICS REMOVAL BUILDING
 OVERALL SESC PLAN

15083-4007-CIV-06
 DRAWING NUMBER
 SHEET 1 OF 1

File: C:\p\working\4871\15083-4007-CIV-07.dwg | Title: Block 1 | Drawing Size: 24x36 | Plot Date: 10/14/2025

15083-4007-CIV-07



- NOTES:**
- SEE DRAWING 15083-4007-CIV-01 FOR GENERAL NOTES AND ABBREVIATIONS.
 - ALL DIMENSIONS ARE IN U.S. CUSTOMARY UNITS (DECIMAL FEET).

- GENERAL DEMOLITION NOTES:**
- THE CONTRACTOR AND ALL SUBCONTRACTORS SHALL VISIT THE SITE PRIOR TO SUBMITTING HIS PROPOSAL TO BECOME FAMILIAR WITH ALL FIELD CONDITIONS, AND REPORT ANY DISCREPANCIES TO THE GENERAL CONTRACTOR AND ENGINEER.
 - THE CONTRACTOR SHALL BE RESPONSIBLE FOR VERIFYING THAT THERE ARE NO EXISTING UTILITIES IN THE AREA WHICH WILL INTERFERE WITH THE PROPOSED WORK.
 - IT IS THE INTENT THAT ALL EXISTING WORK INTERFERING WITH THE INSTALLATION OF NEW WORK BE REMOVED AS REQUIRED.
 - OWNER HAS THE RIGHT OF REFUSAL OF ALL SALVAGEABLE ITEMS.
 - DEMOLITION CONTRACTOR SHALL NOT USE ANY CONSTRUCTION METHODS THAT WILL CAUSE DAMAGE TO THE WORK LEFT IN PLACE.
 - DURING DEMOLITION OPERATIONS PROVIDE ALL NECESSARY PROTECTION AND SAFE PASSAGE FOR PERSONNEL, SUCH AS, BUT NOT LIMITED TO BARRICADES, TEMPORARY PARTITIONS, DUST BARRIERS, SIGN, ETC. ERECT AND MAINTAIN THESE BARRIERS TO THE SATISFACTION OF THE OWNER AND ALL APPLICABLE RULES AND REGULATIONS.
 - IF ANY EXISTING CONSTRUCTION THAT IS TO BE LEFT IN PLACE OR NOT SPECIFICALLY NOTE FOR REMOVAL IS DAMAGED DURING DEMOLITION, IT SHALL BE REPAIRED OR REPLACED TO MATCH EXISTING CONDITIONS AT NO ADDITIONAL COST TO THE OWNER.
 - ALL DEMOLISHED MATERIAL SHALL BE HAULED OFF SITE AND DISPOSED OF IN ACCORDANCE WITH GOVERNING AGENCIES.

ISSUED FOR APPROVAL
 BY SABRINA HANSEN DATE 10/14/2025



REV	REVISION DESCRIPTION	DATE	DR'N	CHK'D	FILE NO.
A	ISSUED FOR APPROVAL	10/14/2025	MGB	BHC	-

YATES
 YATES ENGINEERS, LLC
 1853 DATA DR, BIRMINGHAM, AL 35244
 15083-4007

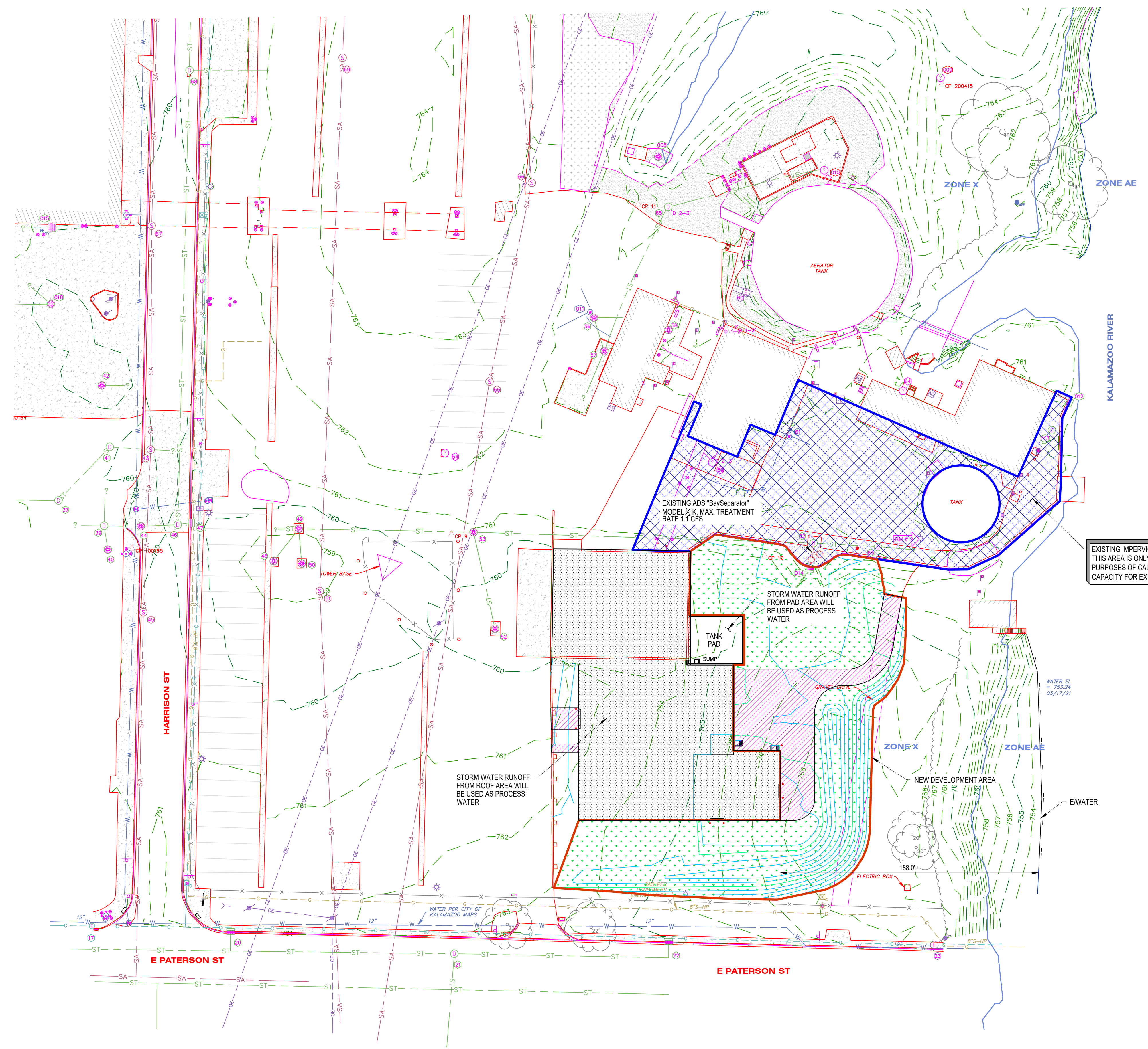
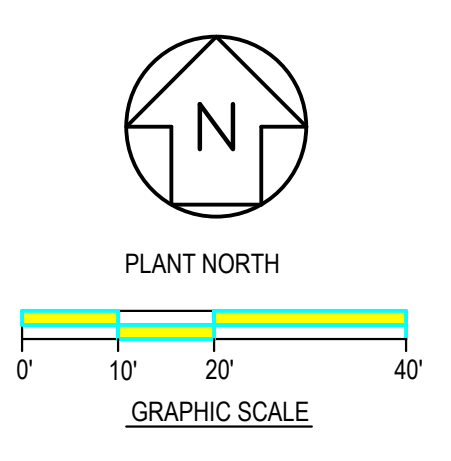
PROJECT NO:	TBD
CAD FILE:	15083-4007-2.dwg
DATE:	10/04/2025
SCALE:	1" = 20'
DISP. LEAD:	GB
DRAWN BY:	MGB
CHK'D BY:	BHC
PM:	SH
WBS:	TBD

KALAMAZOO MILL
 PLASTICS REMOVAL BUILDING
 CIVIL DEMOLITION PLAN

15083-4007-CIV-07
 DRAWING NUMBER
 SHEET 1 OF 1

File: C:\pvc\working\15083-4007-CIV-08.dwg | PLAN | Drawing Size: 24x36 | Plot Date: 10/14/2025

15083-4007-CIV-08



LEGEND:

EXISTING CONDITIONS	
	OVERALL DRAINAGE AREA = 22,822 S.F.
	IMPERVIOUS AREA = 22,822 S.F. (ASPHALT, CONCRETE & GRAVEL)
NEW-DEVELOPMENT CONDITIONS	
	OVERALL DRAINAGE AREA = 32,699 S.F.
	IMPERVIOUS AREA = 6,800 S.F. (ASPHALT, CONCRETE & GRAVEL)
	PERVIOUS AREA = 25,899 S.F. (LAWN AREA)
ROOF AREA	
	ROOF AREA = 22,850 S.F.

ISSUED FOR INFORMATION
BY: SABRINA HANSEN DATE: 10/14/2025



REV	REVISION DESCRIPTION	DATE	DR'N	CHK'D	FILE NO.
C	ISSUED FOR INFORMATION	10/14/2025	MGB		

PROJECT NO:	TBD
CAD FILE:	15083-4007-CIV-08
DATE:	09/08/2025
SCALE:	1" = 20'
DISP. LEAD:	GB
DRAWN BY:	MGB
CHK'D BY:	BHC
PM:	SH
WBS:	TBD

KALAMAZOO MILL
PLASTICS REMOVAL BUILDING
WATERSHED MAP

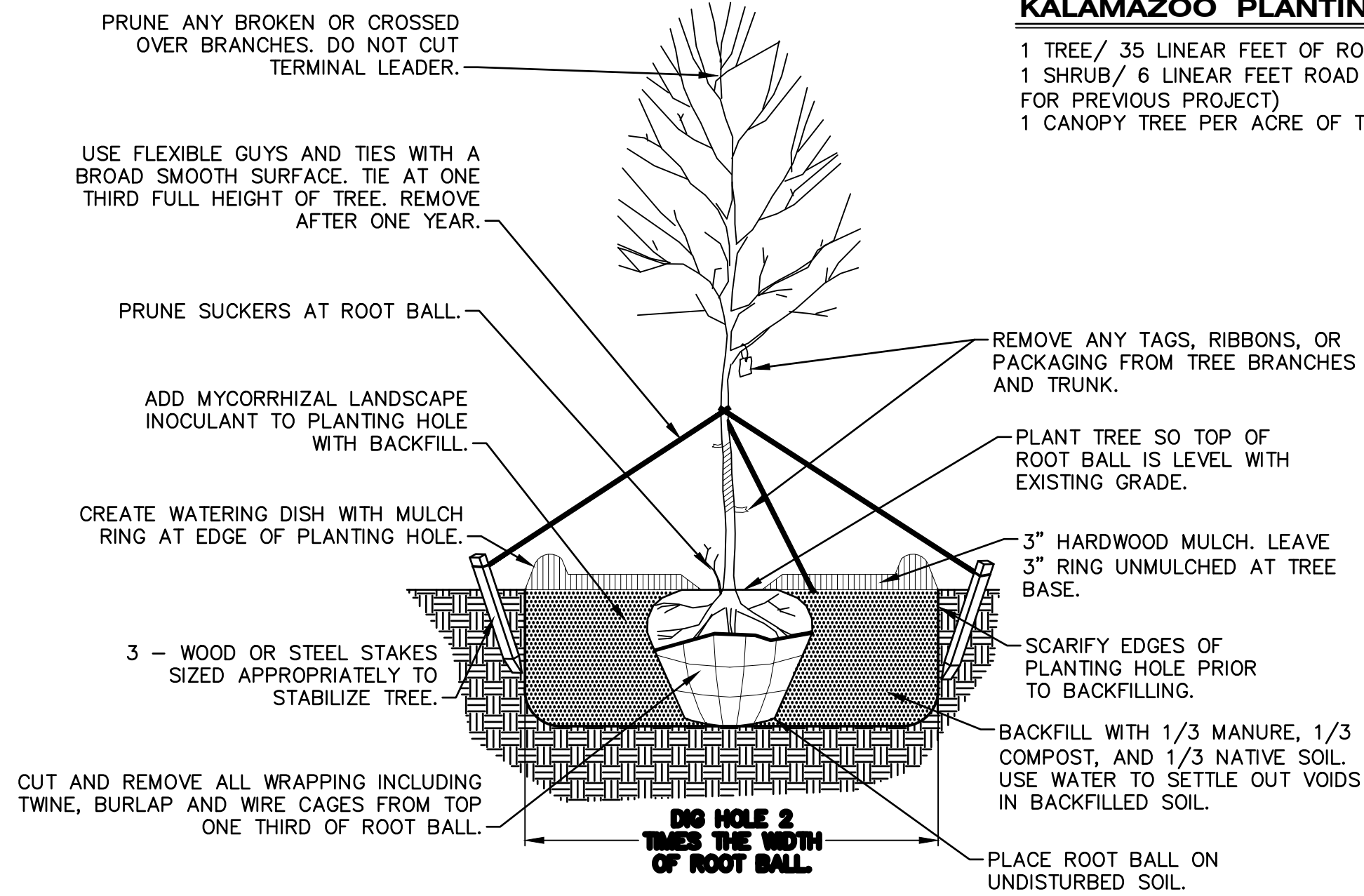
DESCRIPTION	15083-4007-CIV-08
DRAWING NUMBER	15083-4007-CIV-08
SHEET 1 OF 1	

15083-4007-LAND-09

NOTE:
STAKING OF BALL AND BURLAP TREES REQUIRED
AT THE DISCRETION OF THE CONTRACTOR.
CONTRACTOR IS RESPONSIBLE FOR REMOVAL OF
ALL STAKING AT END OF ONE YEAR WARRANTY
PERIOD.

KALAMAZOO PLANTING REQUIREMENTS

- 1 TREE / 35 LINEAR FEET OF ROW = 18 TREES (18 TREES PLANTED FOR PREVIOUS PROJECT)
- 1 SHRUB / 6 LINEAR FEET ROAD FRONTAGE = 96 SHRUBS (96 SHRUBS/GRASSES PLANTED FOR PREVIOUS PROJECT)
- 1 CANOPY TREE PER ACRE OF THE SITE 1.9 ACRES = 2 REQUIRED TREES

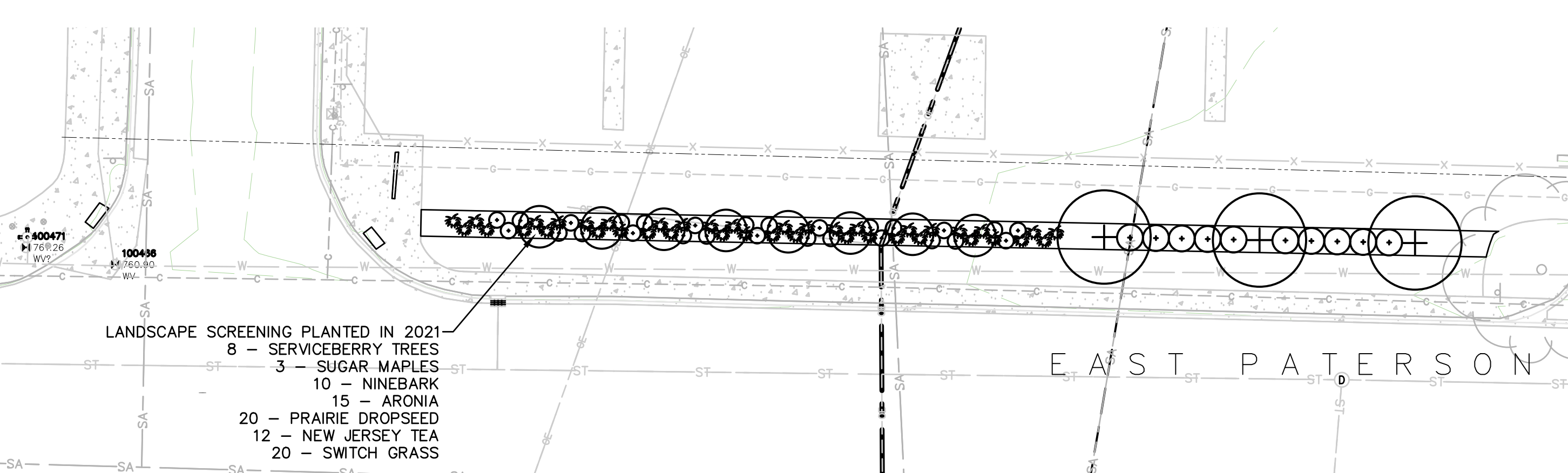


DECIDUOUS TREE

NOT TO SCALE

LANDSCAPE NOTES:

- ALL LAWN AREAS SHALL BE SEEDED AND MULCHED WITH THE FOLLOWING MIXTURE: 20% IMPROVED PERENNIAL RYEGRASS, 40% FINE FESCUE, AND 40% KENTUCKY BLUEGRASS AT A RATE OF 8-10 LBS/ 1000 SFT. PROVIDE 19-19-19 STARTER FERTILIZER AT A RATE OF 5-7 LBS/1000 SFT.
- PROVIDE QUALITY, SIZE, GENUS, SPECIES, AND VARIETY OF EXTERIOR PLANTS INDICATED, COMPLYING WITH APPLICABLE REQUIREMENTS IN ANSI Z60.1 "AMERICAN STANDARD FOR NURSERY STOCK." MEASURE ACCORDING TO ANSI Z60.1 STANDARDS.
- WARRANT TREES FOR ONE YEAR FROM DATE OF SUBSTANTIAL COMPLETION AGAINST DEFECTS INCLUDING DEATH AND UNSATISFACTORY GROWTH, EXCEPT FOR DEFECTS RESULTING FROM INCIDENTS THAT ARE BEYOND CONTRACTOR'S CONTROL.
- REMOVE AND REPLACE DEAD PLANTS IMMEDIATELY. REPLACE PLANTS THAT ARE MORE THAN 25% DEAD OR IN AN UNHEALTHY CONDITION AT END OF WARRANTY PERIOD. A LIMIT OF ONE REPLACEMENT OF EACH PLANT WILL BE REQUIRED, EXCEPT FOR LOSSES OR REPLACEMENTS DUE TO FAILURE TO COMPLY WITH REQUIREMENTS.
- MAINTAIN TREES FOR ONE YEAR FROM DATE OF SUBSTANTIAL COMPLETION BY PRUNING, CULTIVATING, WATERING, WEEDING, FERTILIZING, RESTORING PLANTING SAUCERS, TIGHTENING AND REPAIRING STAKES AND GUY SUPPORTS, AND RESETTling TO PROPER GRADES OR VERTICAL POSITION, AS REQUIRED TO ESTABLISH HEALTHY VIABLE PLANTINGS. SPRAY AS REQUIRED TO KEEP TREES AND SHRUBS FREE OF INSECTS AND DISEASE.
- BEGIN LAWN MAINTENANCE IMMEDIATELY AFTER EACH AREA IS PLANTED AND CONTINUE UNTIL ACCEPTABLE LAWN IS ESTABLISHED: A MINIMUM OF 60 DAYS AFTER SUBSTANTIAL COMPLETION.
- MAINTAIN AND ESTABLISH LAWN BY WATERING, FERTILIZING, WEEDING, USING CHEMICAL TREATMENT TO ELIMINATE BROADLEAF AND NOXIOUS WEEDS, MOWING, TRIMMING, REPLANTING, AND OTHER OPERATIONS. ROLL, REGRADE, AND REPLANT BARE OR ERODED AREAS AND REMULCH TO PRODUCE A UNIFORMLY SMOOTH LAWN.
- PROTECT ADJACENT AND ADJOINING STRUCTURES, UTILITIES, SIDEWALKS, PAVEMENTS, AND PLANTINGS FROM HYDROSEEDING OVER-SPRAY AND DAMAGE CAUSED BY PLANTING OPERATIONS.
- REMOVE STONES LARGER THAN 1" IN ANY DIMENSION AND REMOVE STICKS, ROOTS, RUBBISH, AND OTHER EXTRANEIOUS MATTER FROM SITE.
- MAINTAIN LAWN UNTIL A HEALTHY, UNIFORM, CLOSE STAND OF GRASS HAS BEEN ESTABLISHED, FREE OF WEEDS AND SURFACE IRREGULARITIES, WITH COVERAGE EXCEEDING 90% OVER ANY 10 SQFT AND BARE SPOTS DO NOT EXCEED 5 BY 5 INCHES.



PLANT SCHEDULE						
SYMBOL	CODE	BOTANICAL NAME	COMMON NAME	SIZE	CONTAINER	REMARKS
TREES						
	Ar	Acer rubrum	Red Maple	3" Cal.	B&B	

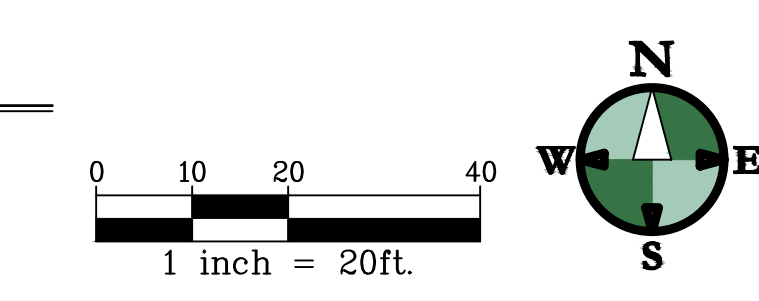


hurley & stewart
 hurley & stewart, llc
 2800 s. 11th street
 kalamazoo, michigan 49009
 269.552.4960 fax 269.552.4961
 www.hurleystewart.com



LEGEND

- NUMBER AND TYPE OF PLANTS TO BE PROVIDED AND INSTALLED.
- SEEDED LAWN.



UNCHECKED

PRELIMINARY NOT FOR CONSTRUCTION

ISSUED FOR REVIEW

BY: SABRINA HANSEN DATE: 10/01/2025

REV#	REVISION DESCRIPTION	DATE	DR'N	CHK'D	FILE NO.
A	ISSUED FOR REVIEW	10/2/2025	LAD		

YATES
 YATES ENGINEERS, LLC
 1853 DATA DR. BIRMINGHAM, AL 35244
 15083-4007

PROJECT NO: TBD
 CAD FILE: Landscape Plan.dwg
 DATE: 10/2/2025
 SCALE: 1" = 20'
 DISP. LEAD: LAD DRAWN BY: LAD
 CHK'D BY: PM: WBS: TBD

KALAMAZOO MILL
 PLASTICS REMOVAL BUILDING
 OVERALL SITE LANDSCAPE PLAN

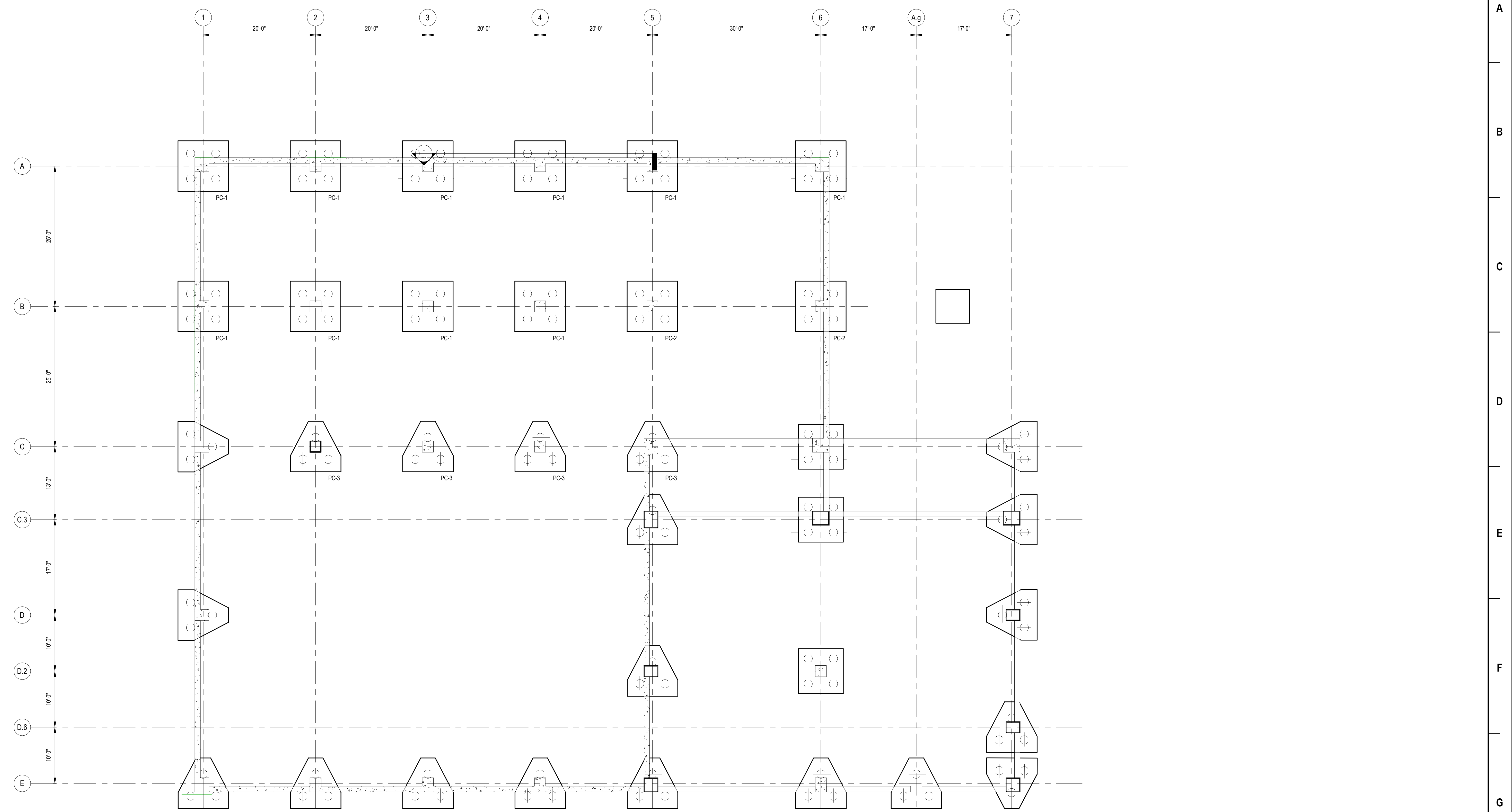
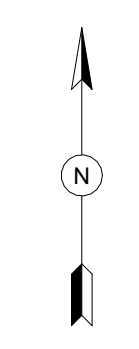
15083-4007-LAND-09

DESCRIPTION

DRAWING NUMBER
 SHEET 1 OF 1

1 2 3 4 5 6 7 8 9 10 11 12

111S



PILE CAP BLDG PLAN
N.T.S.



NO.	REVISION DESCRIPTION	DATE	DESIGNED	CHECKED	FILE NO.



PROJECT NO:	Project Number
CAD FILE:	
DATE:	
SCALE:	1/8" = 1'-0"
DESIGNED BY:	Design
CHECKED BY:	Check
DATE:	
PROJECT NUMBER:	
COA NUMBER:	

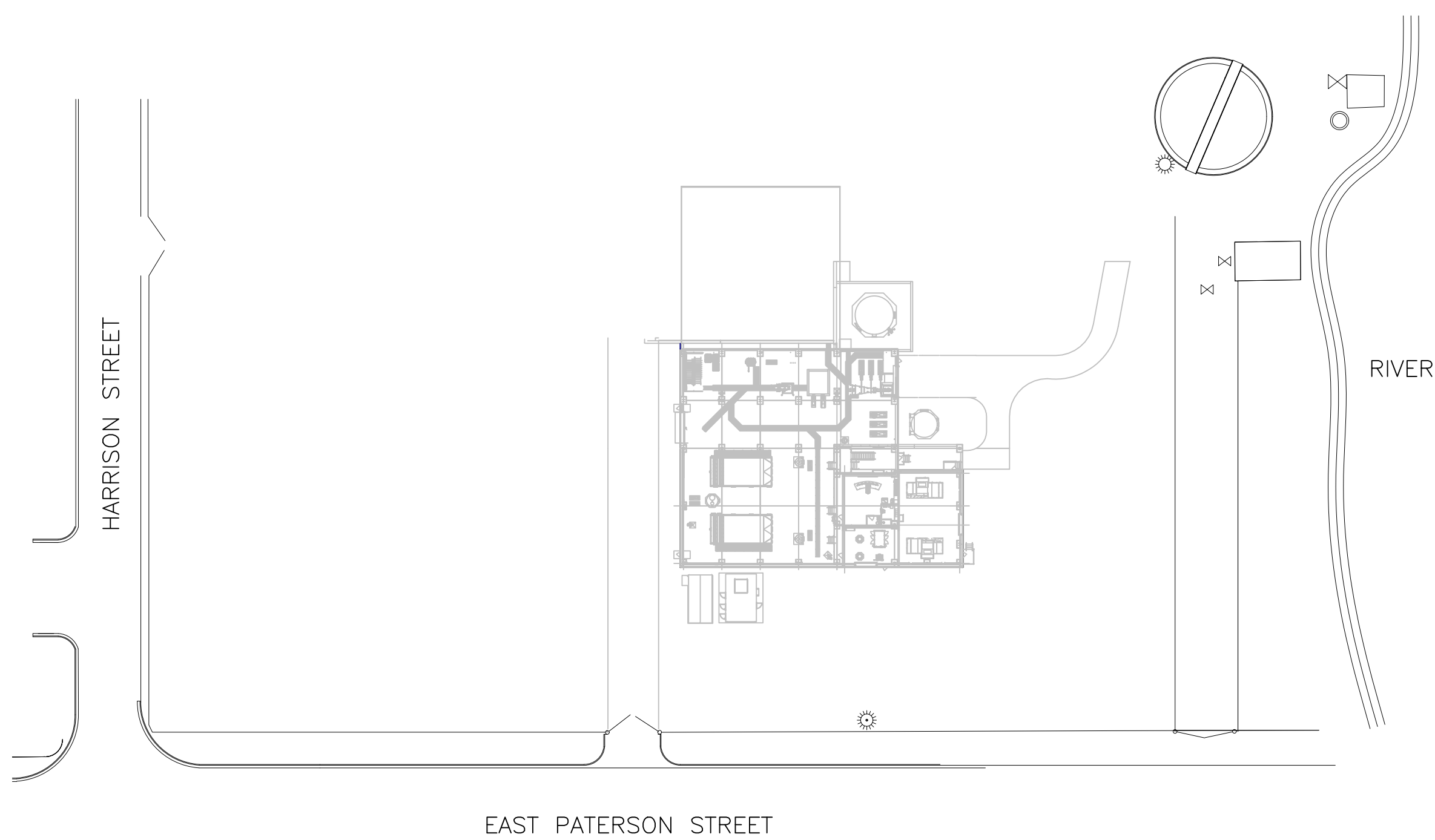
**PRELIMINARY
NOT FOR
CONSTRUCTION**

15083-4007-FDN-S113

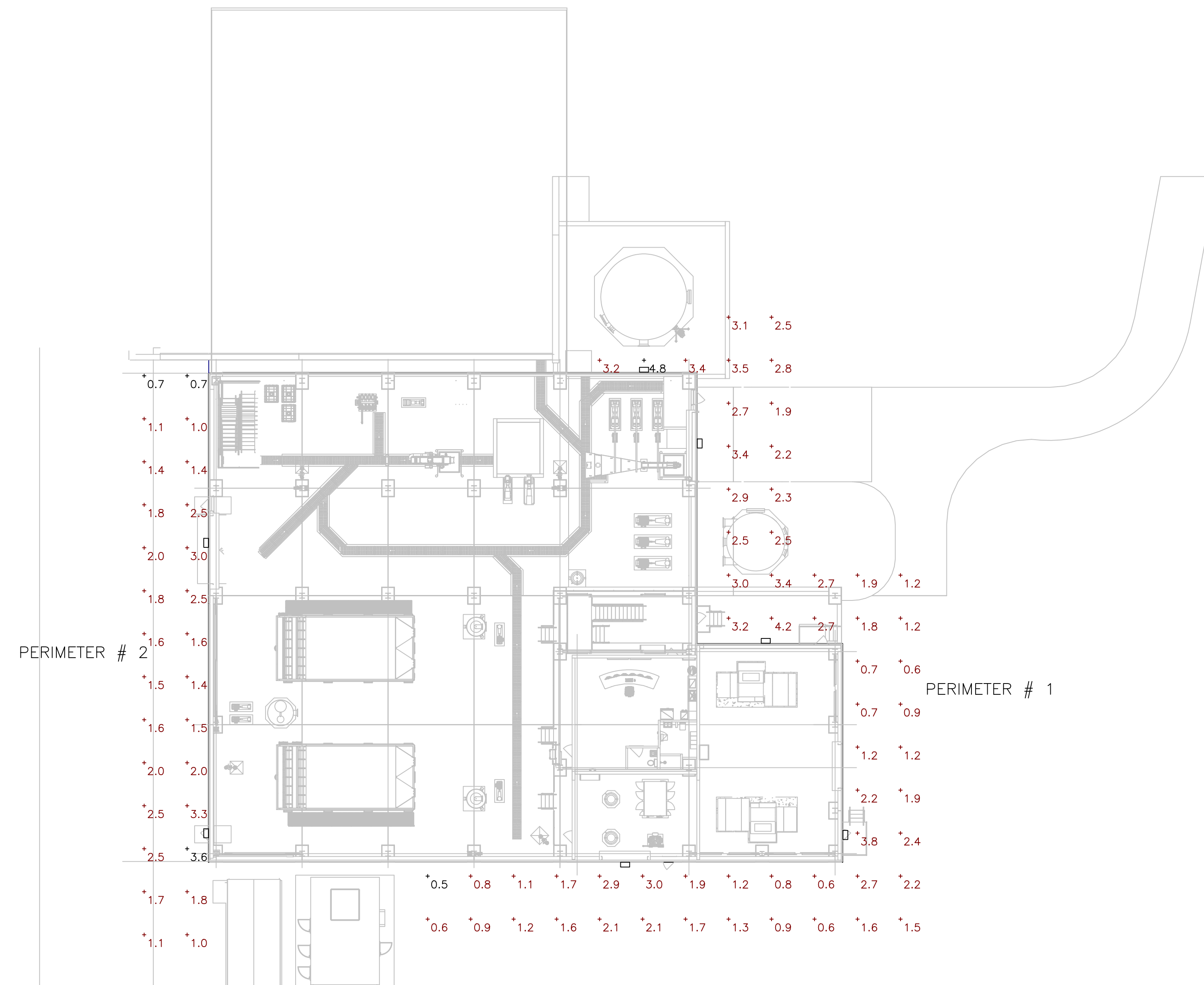
FOUNDATION PLAN	DESCRIPTION
DRAWING NUMBER	
SHEET OF	REV

SCHEDULE										
Symbol	Label	Image	Quantity	Manufacturer	Catalog Number	Description	Number Lamps	Lumens Per Lamp	Light Loss Factor	Wattage
□	B		3	Lithonia Lighting	DSXW1 P5 40K 80CRI T4M	6000 4000K 80CRI Type 4 Medium	1	4774	1	37.19
□	A		4	Lithonia Lighting	DSXW1 P7 40K 80CRI T4M	10000 4000K 80CRI Type 4 Medium	1	9418	1	72.52

STATISTICS						
Description	Symbol	Avg	Max	Min	Avg/Min	Max/Min
PERIMETER #1	+	1.8 fc	3.6 fc	0.7 fc	2.6:1	5.1:1
PERIMETER #2	+	2.0 fc	4.8 fc	0.5 fc	4.0:1	9.6:1



SITE PLAN



PHOTOMETRIC PLAN

PRELIMINARY NOT FOR CONSTRUCTION
ISSUED FOR INFORMATION
 BY SABRINA HANSEN DATE 09/12/25



REV	REVISION DESCRIPTION	DATE	DR'N	CHK'D	FILE NO.
A	ISSUED FOR INFORMATION	09/12/25	RS	XX	-

YATES
 YATES ENGINEERS, LLC
 1853 DATA DR. BIRMINGHAM, AL 35244
 15083-4007

PROJECT NO: TBD
 CAD FILE: WT-38-E-0200.dwg
 DATE: 09/10/25
 SCALE: NONE
 DISP. LEAD: RS DRAWN BY: RS
 CHK'D BY: XX PM: SH WBS: TBD

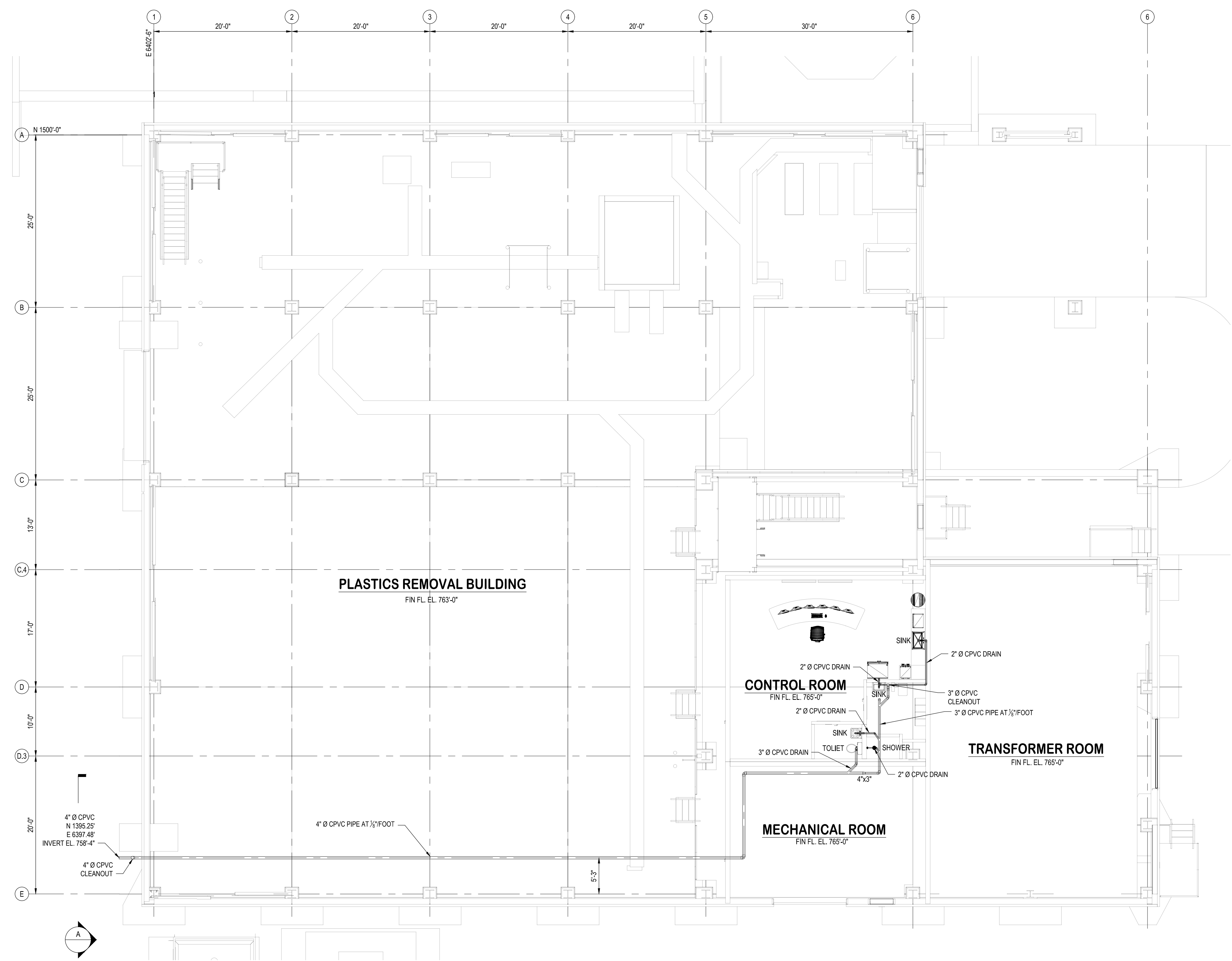
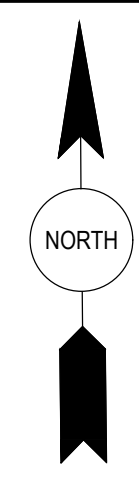
KALAMAZOO MILL
 PLASTICS REMOVAL BUILDING
 BUILDING EXTERIOR
 LIGHTING PLAN

WT-38-E-0200

DRAWING NUMBER
 SHEET 1 OF 1
 A REV.

File: C:\Users\maddie\AppData\Local\Autodesk\AutoCAD\Temp\3D\3dshortcuts\150834007\Chino\DWG\PLUMBING\WT-38-P-6000.dwg | Title Block | Drawing Size: 24x36 | Plot Date: 9/11/2025

0009-P-9C-1M



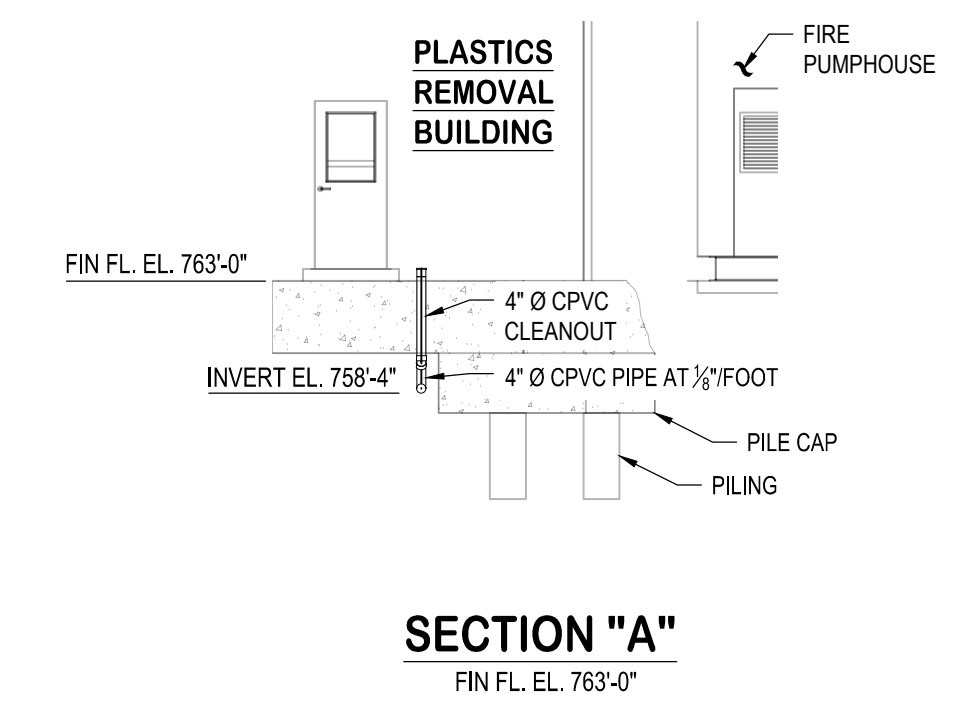
EXISTING GRADE
EL. 763'-0"

4" Ø CPVC
N 1395.25'
E 6397.48'
INVERT EL. 758'-4"

4" Ø CPVC
CLEANOUT

4" Ø CPVC PIPE AT 1/2' FOOT

PLAN
FIN FL. EL. 763'-0"



SECTION "A"
FIN FL. EL. 763'-0"

PRELIMINARY NOT FOR CONSTRUCTION

ISSUED FOR INFORMATION

BY SABRINA HANSEN DATE 09/11/2025



REV#	REVISION DESCRIPTION	DATE	DR'N	CHK'D	FILE NO.
A	ISSUED FOR INFORMATION	11SEP25	JWH	DAA	-



PROJECT NO:	TBD
CAD FILE:	WT-38-P-6000.dwg
DATE:	11SEP25
SCALE:	1/4" = 1'-0"
DISP. LEAD:	DAA
DRAWN BY:	TCM
CHK'D BY:	DAA
PM:	SB
WBS:	TBD

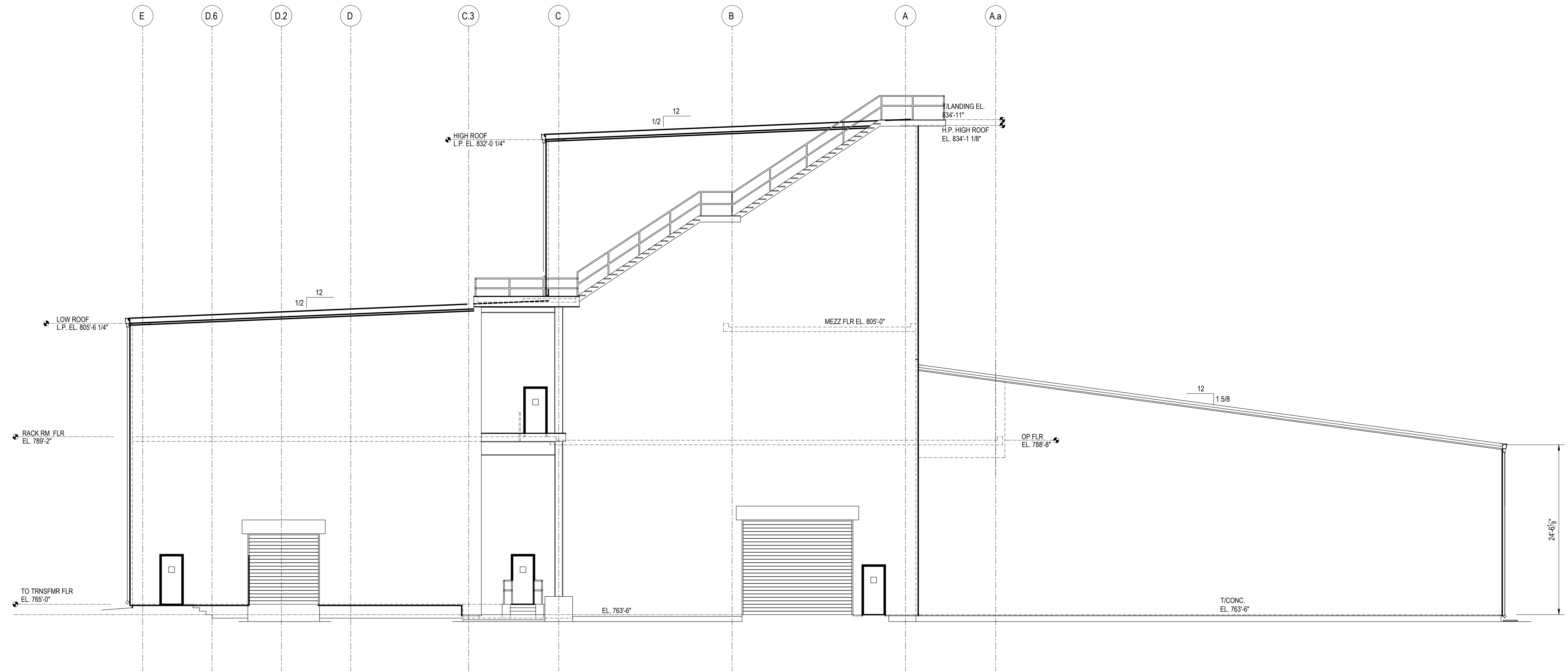
KALAMAZOO MILL
PLASTICS REMOVAL BUILDING
SANITARY SEWER BUILDING TIE-IN
PLAN

WT-38-P-6000

DRAWING NUMBER

SHEET 1 OF 1

A REV.



EAST ELEVATION

ISSUED FOR REVIEW
 BY _____ DATE _____
PRELIMINARY NOT FOR CONSTRUCTION

UNCHECKED



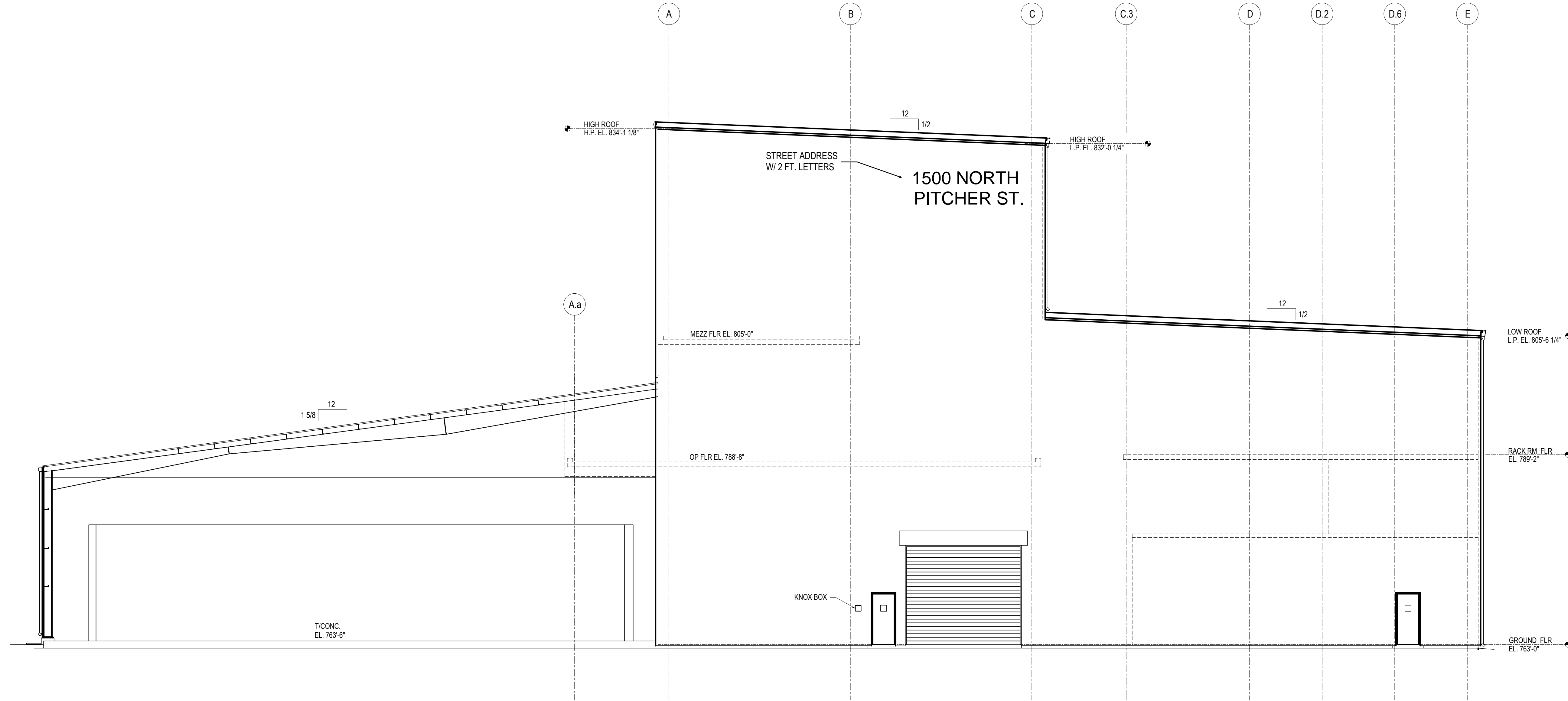
REV	REVISION DESCRIPTION	DATE	DR'N	CHK'D	FILE NO.
A	ISSUED FOR REVIEW	04SEPT25	JND		

YATES
 YATES ENGINEERS, LLC
 1853 DATA DR, BIRMINGHAM, AL 35244
 15083-4007

PROJECT NO:	15083-4007
CAD FILE:	WT-38-A-5002
DATE:	31JULY25
SCALE:	1/8"=1'-0"
DISP. LEAD:	GB
DRAWN BY:	JND
CHK'D BY:	PM
WBS:	XXXX

KALAMAZOO MILL
 WASTEWATER TREATMENT
 ARCHITECTURAL
 EAST ELEVATION

WT-38-A-5002
 DRAWING NUMBER
 SHEET 1 OF 1
 A
 REV.



WEST ELEVATION

ISSUED FOR INFORMATION
 BY _____ DATE _____
PRELIMINARY NOT FOR CONSTRUCTION

UNCHECKED



REV	REVISION DESCRIPTION	DATE	DR'N	CHK'D	FILE NO.
A	ISSUED FOR INFORMATION	30SEPT25	JND		

YATES
 YATES ENGINEERS, LLC
 1853 DATA DR, BIRMINGHAM, AL 35244
 15083-4007

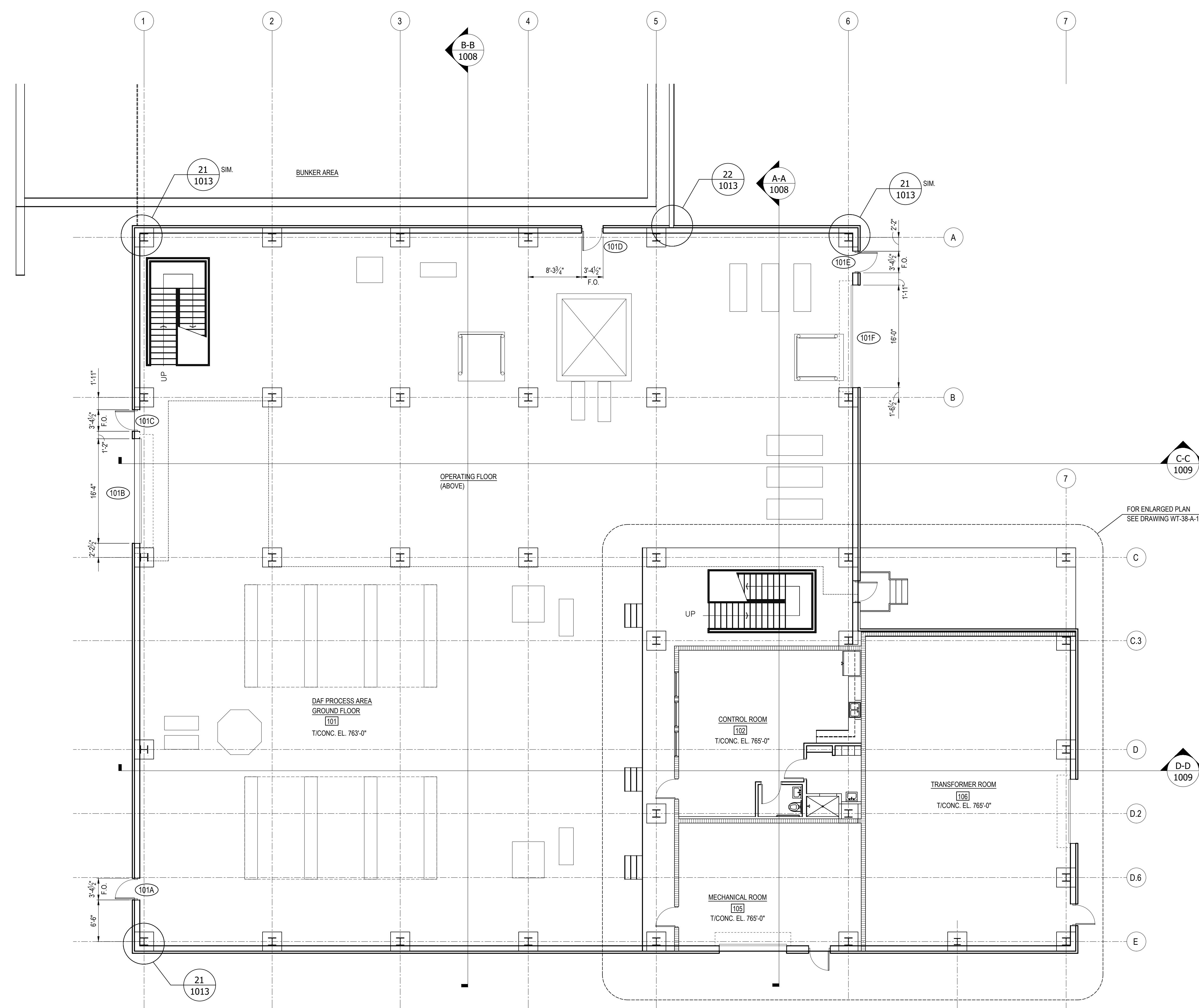
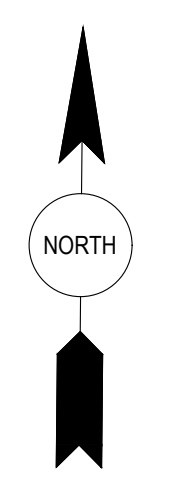
PROJECT NO:	15083-4007
CAD FILE:	WT-38-A-5004
DATE:	31JULY25
SCALE:	1/8"=1'-0"
DISP. LEAD:	GB
DRAWN BY:	JND
CHK'D BY:	PM
WBS:	XXXX

KALAMAZOO MILL
 PLASTIC REMOVAL BUILDING
 ARCHITECTURAL
 WEST ELEVATION

WT-38-A-5004
 DRAWING NUMBER
 SHEET 1 OF 1

File: C:\p\working\1508\150824\150824071512\WT-38-A-1001.dwg | Ground Floor | Drawing Size: 24x36 | Plot Date: 8/10/2025

WT-38-A-1001



FOR ENLARGED PLAN
SEE DRAWING WT-38-A-1006

GROUND FLOOR PLAN

UNCHECKED

ISSUED FOR REVIEW
BY _____ DATE _____
PRELIMINARY NOT FOR CONSTRUCTION



REV#	REVISION DESCRIPTION	DATE	DR'N	CHK'D	FILE NO.
A	ISSUED FOR REVIEW	04SEPT25	JND		

YATES
YATES ENGINEERS, LLC
1853 DATA DR, BIRMINGHAM, AL 35244
15083-4007

PROJECT NO:	15083-4007
CAD FILE:	WT-38-A-1001
DATE:	21JULY25
SCALE:	1/8"=1'-0"
DISP. LEAD:	GB
DRAWN BY:	JND
CHK'D BY:	
PM:	
WBS:	XXXX

KALAMAZOO MILL
WASTEWATER TREATMENT
ARCHITECTURAL
GROUND FLOOR PLAN

WT-38-A-1001
DRAWING NUMBER
SHEET 1 OF 1
A
REV.

TOPOGRAPHIC SURVEY

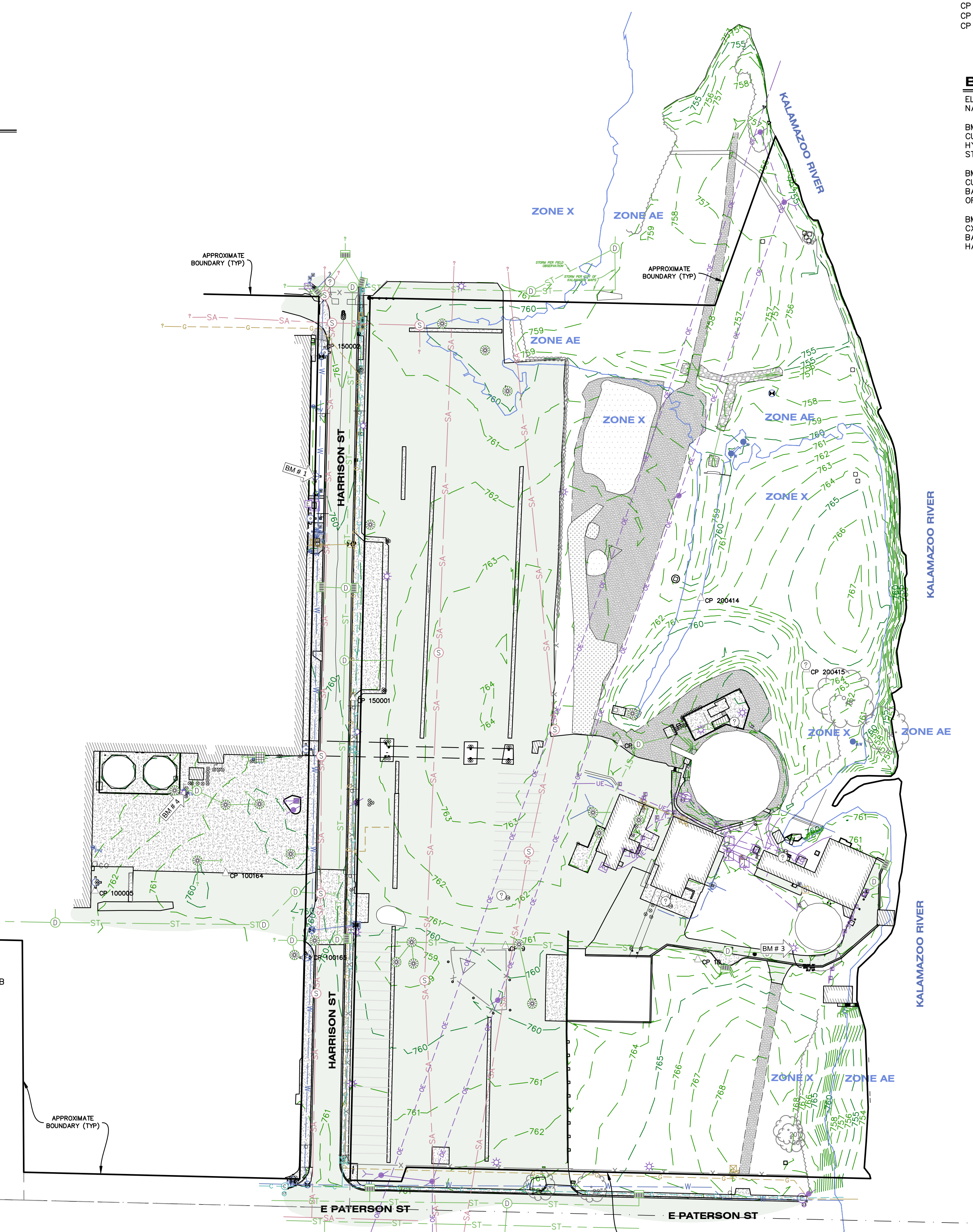
SURVEYOR'S NOTES

- BASIS OF BEARINGS: MICHIGAN STATE PLANE COORDINATE SYSTEM, SOUTH ZONE, NAD 83
- CONTOUR INTERVAL = 1 FOOT
- UTILITIES SHOWN ARE BASED ON FIELD LOCATION OF SURFACE EVIDENCE AND RECORDS PROVIDED BY OTHERS. UNDERGROUND UTILITY LOCATIONS ARE APPROXIMATE. ADDITIONAL UTILITIES MAY BE ENCOUNTERED. PRIOR TO ANY EXCAVATION THE CONTRACTOR SHALL CALL MISS DIG AT 1-800-482-7171.
- BY SCALED MAP LOCATION AND GRAPHIC PLOTTING ONLY, THE LAND DEPICTED IN THIS SURVEY LIES IN ZONE X AND ZONE AE. MAP 26077C0187E, EFFECTIVE DATE 07/31/2024.
- WETLANDS ARE ON SITE PER THE NATIONAL WETLANDS INVENTORY. A DELINEATION OF THE WETLANDS BY A QUALIFIED CONSULTANT WAS NOT PERFORMED AT THE TIME OF SURVEY. IT IS RECOMMENDED THAT A DELINEATION OF THE WETLANDS BY A QUALIFIED CONSULTANT BE PERFORMED. THIS IS NOT A WETLANDS DELINEATION SURVEY.
- THIS IS NOT A BOUNDARY SURVEY.

EXISTING STRUCTURE DATA

⊙ = STRUCTURE DATA FROM PREVIOUS H&S SURVEY DATED 03/26/21
 ⊗ = STRUCTURE DATA FROM CURRENT SURVEY

- | | | |
|--|--|--|
| <p>⊙ 4.0' CONCRETE STM MH
RIM = 761.10'
INV. 12" N RCP = 755.40'
INV. 12" SE RCP = 755.40'
INV. 12" SW RCP = 755.40'
SUMP = 755.40'</p> <p>⊙ 4.0' CONCRETE UNKNOWN MH
RIM = 761.42'
INV. N = 761.42'
INV. S = 761.42'
WATER = 749.52'
SUMP = 748.97'</p> <p>⊙ 2.0' CONCRETE STM CB
RIM = 761.24'
INV. 12" NW RCP = 755.99'
SEDIMENT = 756.24'</p> <p>⊙ 4.0' CONCRETE STM MH
RIM = 761.5'
INV. 18" S RCP = 756.40'
INV. 30" W SLOPP = 755.60±
INV. 30" E SLOPP = 755.60±
WATER = 756.10'
SEDIMENT = 755.60'</p> <p>⊙ 2.0' CONCRETE STM CB
RIM = 761.08'
INV. 12" NE RCP = 757.08±
SUMP = 757.08±</p> <p>⊙ 6.0' CONCRETE STM MH
RIM = 761.42'
INV. NE 30° SLOPP = 754.37'
INV. W 24° CMP = 754.37'
WATER = 755.97'
SUMP = 762.97'</p> <p>⊙ 4.0' CONCRETE STM MH
RIM = 759.38'
INV. N 30° SLOPP = 754.16±
INV. SW 30° SLOPP = 754.16±
PIPES HARD TO SEE DUE TO OFFSET
WATER = 755.96'
SEDIMENT = 853.86'</p> <p>⊙ STM CB
RIM = 758.42'
UNABLE TO ACCESS DUE TO SILT SACK</p> <p>⊙ 6.0± CONCRETE BLOCK UNKNOWN MH
RIM = 764.00'
NO PIPES VISIBLE
SUMP = 754.30'</p> <p>⊙ UNKNOWN MH
RIM = 764.78'
UNABLE TO OPEN. ELECTRIC RUNNING THROUGH MH LID
SUMP = 757.53'</p> <p>⊙ WTR MH
RIM = 761.48'
3 VALVES</p> <p>⊙ STM CB
RIM = 760.99'
NOT OPENED, UNDER SNOW PILE</p> <p>⊙ STM MH
RIM = 761.46'
NOT OPENED, UNDER SNOW PILE</p> <p>⊙ STM CB
RIM = 759.88'
NOT OPENED, UNDER SNOW PILE</p> <p>⊙ 2.0'X2.0' CONCRETE STM CB
RIM = 759.91'
INV. 8" W IRON = 758.71'
WATER = 758.91'
SUMP = 758.66'</p> <p>⊙ 1.0' CONCRETE STM CB
RIM = 762.63'
BOTTOM 6" VERTICAL IRON = 759.33'
SUMP = 759.33'</p> <p>⊙ 4.0' CONCRETE STM CB
RIM = 760.40'
INV. 12" NW RCP = 755.55'
INV. 12" E RCP = 755.40±
WATER = 755.55'
SEDIMENT = 754.40'</p> <p>⊙ 4.0' CONCRETE STM CB
RIM = 759.43'
INV. 12" W RCP = 756.23'
INV. 6" NW IRON = 756.28'
WATER = 756.23'
SEDIMENT = 755.53'</p> <p>⊙ 4.0' CONCRETE STM MH
RIM = 761.85'
INV. 15" N RCP = 754.80'
INV. 8" W RCP = 754.70'
INV. 12" SE RCP = 754.90'
WATER = 754.80'
SEDIMENT = 753.00'</p> <p>⊙ 4.0' CONCRETE STM CB
RIM = 759.98'
INV. 6" S IRON = 756.93'
INV. 12" E RCP = 756.73'
NO OTHER PIPES VISIBLE
WATER = 756.93'</p> <p>⊙ MH
RIM = 761.34'</p> <p>⊙ STM CB
RIM = 760.95'</p> <p>⊙ STM MH
RIM = 762.51'</p> | <p>⊙ STM CB
RIM = 764.51'</p> <p>⊙ ELECTRIC MH
RIM = 768.60'</p> <p>⊙ 4.0' CONCRETE STM MH
RIM = 762.09'
INV. E 18" PVC = 753.22'
INV. W 18" PVC = 753.27'
INV. N 4" PVC = 758.09±</p> <p>⊙ STM MH
RIM = 760.81'
INV. W 18" = 752.36'
INV. NE 18" = 751.71'</p> <p>⊙ 4.0' CONCRETE STM MH
RIM = 760.13'
INV. N 12" RCP = 756.23±
INV. S 8" PVC = 756.13'
INV. E 18" RCP = 754.23'
INV. W 18" RCP = 754.88'</p> <p>⊙ 4.0' PERFORATED CONCRETE STM CB
LEACHING BASIN
RIM = 760.28'
INV. N 8" PVC = 756.81'
WATER = 755.66'
SEDIMENT = 754.41'</p> <p>⊙ 4.0' CONCRETE STM MH
RIM = 760.05'
INV. E 18" PVC = 751.51'
INV. SW 18" PVC = 753.05±</p> <p>⊙ 6.0' PERFORATED CONCRETE STM MH
RIM = 761.18'
INV. 12" N SLOPP = 756.58'
SUMP = 755.18'</p> <p>⊙ SAN MH
RIM = 759.90'
INV. N = 749.30±
INV. S = 749.35±
E/W TOP OF PIPE = 753.45'</p> <p>⊙ 2.0' STM CB
RIM = 759.56'
INV. E 6" PVC = 758.41'
WATER = 758.71'
SUMP = 757.71'
NO OTHER PIPES VISIBLE</p> <p>⊙ SAN MH
RIM = 760.20'
INV. N = 749.55'
INV. S = 749.60'</p> <p>⊙ 2.0' BLOCK/BRICK STM MH
RIM = 759.76'
INV. W 6" PVC = 758.18'
INV. E 6" PVC = 758.21'
WATER = 758.48'
SEDIMENT = 757.01'</p> <p>⊙ 2.0' BLOCK STM CB
RIM = 759.60'
INV. W 6" PVC = 758.40'
WATER = 758.55'
SUMP = 758.10'</p> <p>⊙ 2.0' BLOCK STM CB
RIM = 758.03'
INV. N 8" PVC = 755.98'
WATER = 755.98'
SEDIMENT = 755.28'</p> <p>⊙ SAN MH
RIM = 758.87'
INV. N = OVER 25' DOWN
INV. S = OVER 25' DOWN</p> <p>⊙ 4.0' BLOCK STM CB
RIM = 759.23'
INV. N 8" PVC = 756.31'
WATER = 756.31'
SUMP = 753.81'</p> <p>⊙ 4.0' CONCRETE STM MH
RIM = 760.92'
INV. S 8" PVC = 756.52±
INV. E 18" RCP = 753.54±
INV. W 18" RCP = 753.54±</p> <p>⊙ 4.0' CONCRETE SAN MH
RIM = 762.26'
INV. 24" NE RCP = 750.81'
24" W RCP = 750.96'</p> <p>⊙ 55 SAN MH
RIM = 762.64'
NOT OPENED, UNDER TRAILER</p> <p>⊙ STM CB
RIM = 761.43'
INV. SE = 752.38'
INV. E 4" = 755.23'
INV. E = 752.63'</p> | <p>⊙ 4.0' CONCRETE STM CB
RIM = 761.38'
INV. NE PVC = 756.78±
INV. NW = 753.08±
INV. SW = 748.88±</p> <p>⊙ STM CB
RIM = 761.86'
NOT OPENED, UNDER TANK</p> <p>⊙ MH
RIM = 761.60'
INV. NE 6" PVC = 758.00±
INV. NW 6" PVC = 757.40±</p> <p>⊙ 8.0' ELECTRIC MH
RIM = 765.04'
(2) CABLE GROUPS RUNNING E/W
(4) GATE VALVES</p> <p>⊙ WATER MH
RIM = 761.77'
(4) GATE VALVES</p> <p>⊙ 4.0' CONCRETE STM MH
RIM = 760.34'
INV. 18" E RCP = 752.69'
INV. 18" W RCP = 752.69'
INV. 12" S SLOPP = 755.64'
SUMP = 752.69'</p> <p>⊙ 4.0' CONCRETE STM MH
RIM = 761.66'
INV. E 18" = 752.84'
INV. W 18" = 752.84'</p> <p>⊙ MH
RIM = 761.23'
FILLED WITH DIRT TO THE TOP</p> <p>⊙ 4.0' STM MH
RIM = 761.30'
INV. NE = 757.30'
INV. S 6" PVC = 757.16'</p> <p>⊙ 4.0' SAN MH
RIM = 762.97'
WATER = 750.72±
SUMP = 747.87±
NO PIPES VISIBLE UNDER WATER</p> <p>⊙ SAN MH
RIM = 760.19'
INV. N = 749.34'
INV. S = 749.44'</p> <p>⊙ 2.0' BRICK STM MH
RIM = 759.78'
INV. N 15" RCP = 757.00'
INV. S 10" PVC = 758.00'
INV. E 12" RCP = 757.28'
WATER = 757.43'
SUMP = 757.06'</p> <p>⊙ 69 SAN MH
RIM = 763.24'
NOT OPENED, UNDER TRAILER</p> <p>⊙ 2.0' CONCRETE STM CB
RIM = 759.13'
INV. W 10" PVC = 757.23'
WATER = 757.23'
SEDIMENT = 757.03'</p> <p>⊙ 2.0' BLOCK STM MH
RIM = 759.52'
INV. N 15" RCP = 756.97±
INV. S 15" RCP = 756.97'
INV. E 10" PVC = 757.32'
INV. W 12" CLAY = 757.04'</p> <p>⊙ 2.0' BLOCK STM CB
RIM = 759.32'
INV. S 12" CLAY = 757.12'
WATER = 757.27'
SUMP = 757.12'</p> <p>⊙ 4.0' PERFORATED CONCRETE STM CB
LEACHING BASIN
RIM = 760.63'
WATER = 753.88'
SUMP = 752.63'
NO PIPES VISIBLE</p> <p>⊙ STM CB
RIM = 759.16'
NOT OPENED, UNDER SNOW PILE</p> <p>⊙ STM CB
RIM = 759.09'
NOT OPENED, UNDER SNOW PILE</p> <p>⊙ STM CB
RIM = 759.10'</p> <p>⊙ SAN MH
RIM = 760.11'
INV. S = 749.31±
INV. W = 749.31±
COULD NOT SEE THROUGH STEAM</p> <p>⊙ SAN MH
RIM = 761.08'
INV. N = 748.63±
INV. S = 748.68±
E/W ENCLOSED PIPE, TOP OF PIPE = 751.93'</p> <p>⊙ SAN MH
RIM = 761.11'
INV. N = 747.61±
INV. S = 748.11±
INV. NE = 748.11±</p> |
|--|--|--|



SURVEY CONTROL

CP 1	N = 10000	E = 10000	EL = 760.93'
CP 2	N = 9751.54	E = 9994.94	EL = 764.74'
CP 3	N = 9754.09	E = 10292.14	EL = 762.04'
CP 4	N = 10356.96	E = 10112.04	EL = 761.12'
CP 5	N = 10332.53	E = 10670.26	EL = 763.39'
CP 6	N = 10706.74	E = 10533.54	EL = 760.16'
CP 7	N = 11454.03	E = 10498.84	EL = 761.64'
CP 8	N = 10727.89	E = 9854.164	EL = 761.21'
CP 9	N = 10686.18	E = 10720.01	EL = 760.65'

BENCHMARKS

ELEVATIONS OF THIS SURVEY ARE BASED ON NAVD 88 AS DERIVED FROM GPS

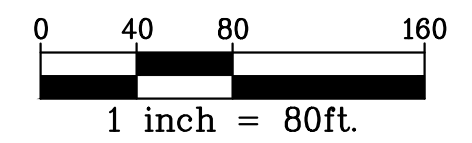
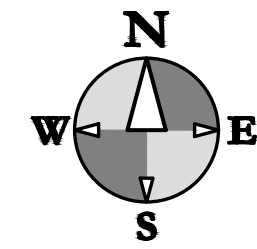
BM 1 EL = 764.48'
CUT X IN SOUTHWEST BURY BOLT OF HYDRANT ON THE WEST SIDE OF HARRISON ST.

BM 3 EL = 764.98'
CUT BOX IN SOUTH SIDE OF LIGHT POLE BASE ON THE NORTH SIDE OF DRIVE SOUTH OF TREATMENT TANK.

BM 4 EL = 763.86'
CUT BOX ON SOUTH SIDE OF LIGHT POLE BASE SOUTHEAST OF TWO TANKS WEST OF HARRISON ST.



SECTION 10, TOWN 02 S, RANGE 11 W,
CITY OF KALAMAZOO, KALAMAZOO COUNTY,
MICHIGAN
N PITCHER ST AND E PROUTY ST



LEGEND

<p>BM #XX BENCH MARK</p> <p>□ SET MONUMENT</p> <p>● FOUND MONUMENT</p> <p>■ SET CAPPED IRON LIC. # 57885</p> <p>● FOUND IRON</p> <p>■ SET CHISELED "X"</p> <p>● FOUND CHISELED "X"</p> <p>▲ CP # CONTROL POINT</p> <p>P= PLATTED</p> <p>D= DESCRIBED</p> <p>M= MEASURED</p> <p>R= RECORDED</p> <p>C= CALCULATED</p> <p>▨ CURB CATCH BASIN</p> <p>▨ SQUARE CATCH BASIN</p> <p>▨ ROUND CATCH BASIN</p> <p>▨ STORM MANHOLE</p> <p>▨ DOWN SPOUT</p> <p>▨ YARD DRAIN</p> <p>▨ FLARED END SECTION</p> <p>▨ SANITARY MANHOLE</p> <p>▨ SANITARY CLEANOUT</p> <p>▨ FIRE HYDRANT</p> <p>▨ FIRE DEPARTMENT CONNECTION</p> <p>▨ WATER VALVE</p> <p>▨ WATER METER</p> <p>▨ WELL HEAD</p> <p>▨ SPRINKLER CONTROL VALVE</p> <p>▨ SPRINKLER HEAD</p> <p>▨ MONITOR WELL</p> <p>▨ POST INDICATOR VALVE</p> <p>▨ SPIGOT</p> <p>▨ TRANSFORMER</p> <p>▨ YARD LIGHT</p> <p>▨ HAND HOLE (ELECTRIC)</p> <p>▨ LIGHT POLE</p> <p>▨ GUY WIRE</p> <p>▨ ELECTRIC METER</p> <p>▨ ELECTRIC MANHOLE</p> <p>▨ AIR CONDITIONER</p> <p>▨ GAS METER</p> <p>▨ GAS VALVE</p> <p>▨ TELEPHONE MANHOLE</p> <p>▨ COMMUNICATION MANHOLE</p>	<p>▨ RISER</p> <p>▨ PIPE MARKER COMMUNICATIONS</p> <p>▨ PIPE MARKER FIBEROPTICS</p> <p>▨ PIPE MARKER ELECTRIC</p> <p>▨ PIPE MARKER GAS</p> <p>▨ SIGN</p> <p>▨ MAILBOX</p> <p>▨ PARKING METER (SINGLE/DOUBLE)</p> <p>▨ POST</p> <p>▨ SOIL BORING</p> <p>▨ FLAG</p> <p>▨ BOLLARD</p> <p>▨ CONTOUR HIGHLIGHTED</p> <p>▨ CONTOUR NORMAL</p> <p>▨ POWER LINE</p> <p>▨ OVERHEAD UTILITY</p> <p>▨ COMMUNICATION</p> <p>▨ ELECTRIC</p> <p>▨ FIBEROPTIC</p> <p>▨ GAS</p> <p>▨ SANITARY SEWER</p> <p>▨ SANITARY WATER</p> <p>▨ TELEPHONE</p> <p>▨ WATER</p> <p>▨ WETLAND MARKER</p> <p>▨ UNKNOWN</p> <p>▨ TREE LINE</p> <p>▨ FENCE</p> <p>▨ GUARD RAIL</p> <p>▨ DECIDUOUS TREE</p> <p>▨ CONIFEROUS TREE</p> <p>▨ BUSH</p> <p>▨ PAVEMENT</p> <p>▨ CONCRETE SURFACE</p> <p>▨ DETECTABLE WARNING</p> <p>▨ GRAVEL</p> <p>▨ LANDSCAPING</p> <p>▨ PAVERS</p>
--	--

TOPOGRAPHIC SURVEY
TREATMENT PLANT
GRAPHIC PACKAGING

Sheet Title:
Project:
Client:

09/26/25
Sheet
S-1



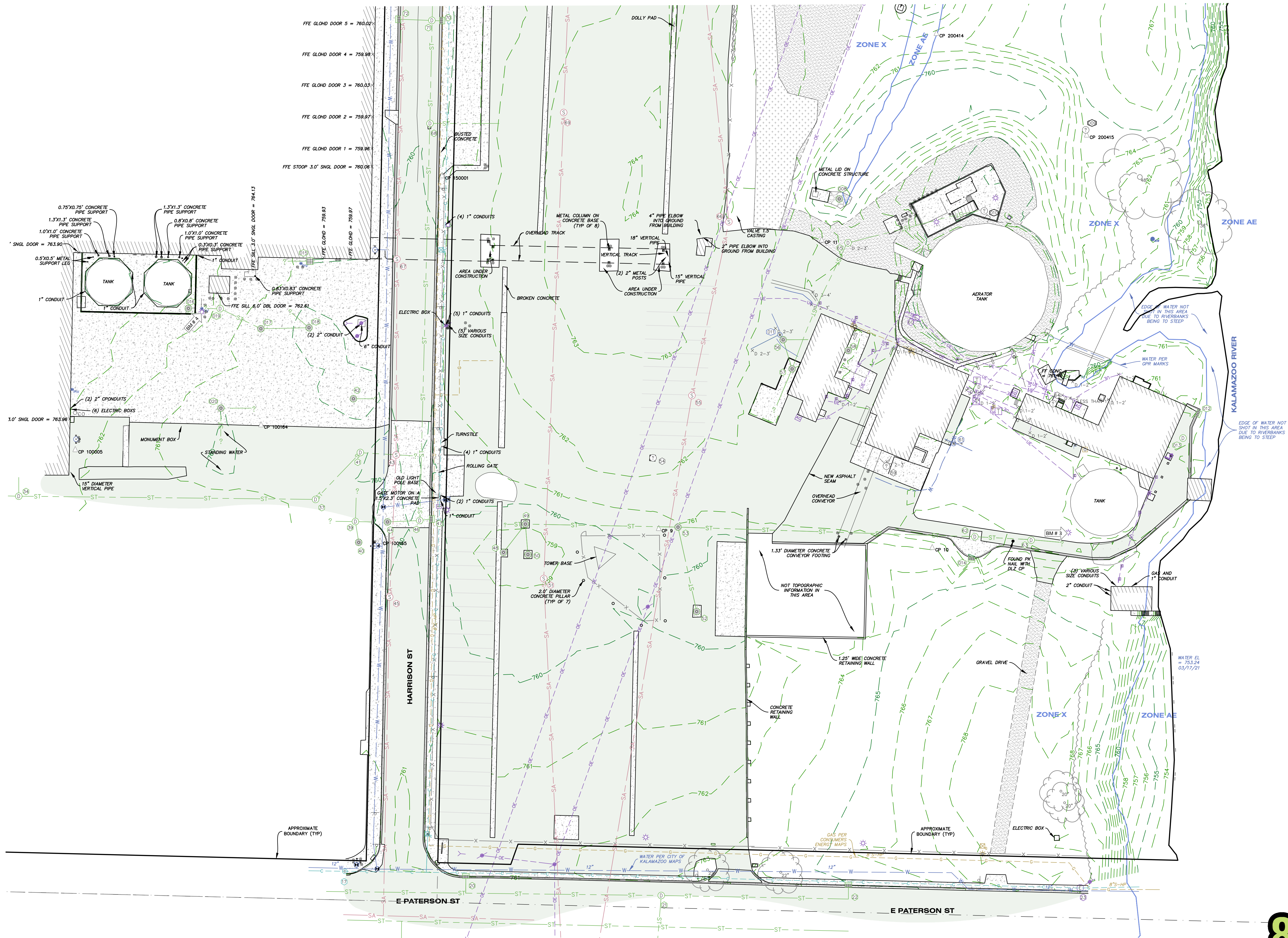
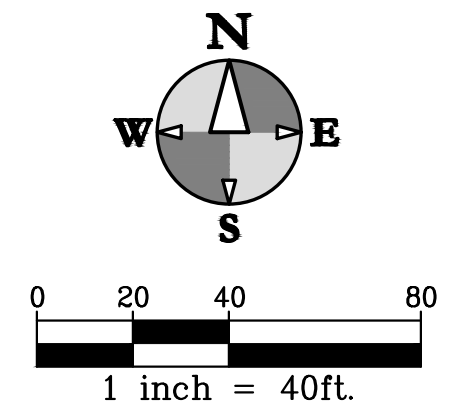
hurley & stewart, llc
2800 s. 11th street
kalamazoo, michigan 49009
269.552.4960 fax 269.552.4961
www.hurleystewart.com



Job No: 24-1-100D P.M.TAK DTL BDE QA/QC 09/26/25
ISSUED FOR REVISIONS:
#1 TOPOGRAPHIC SURVEY 02/28/25
#2 APPROXIMATE BOUNDARY ADDED 09/26/25

Copyright © of Hurley & Stewart, LLC

TOPOGRAPHIC SURVEY



hurley & stewart, llc
 2800 s. 11th street
 kalamazoo, michigan 49009
 269.552.4960 fax 269.552.4961
 www.hurleystewart.com



Job No. 24-130D P.M.TAK DFL BDE QA/QC 09/26/25
 ISSUED FOR REVISIONS: 02/28/25
 #1 TOPOGRAPHIC SURVEY 09/26/25
 #2 APPROXIMATE BOUNDARY ADDED

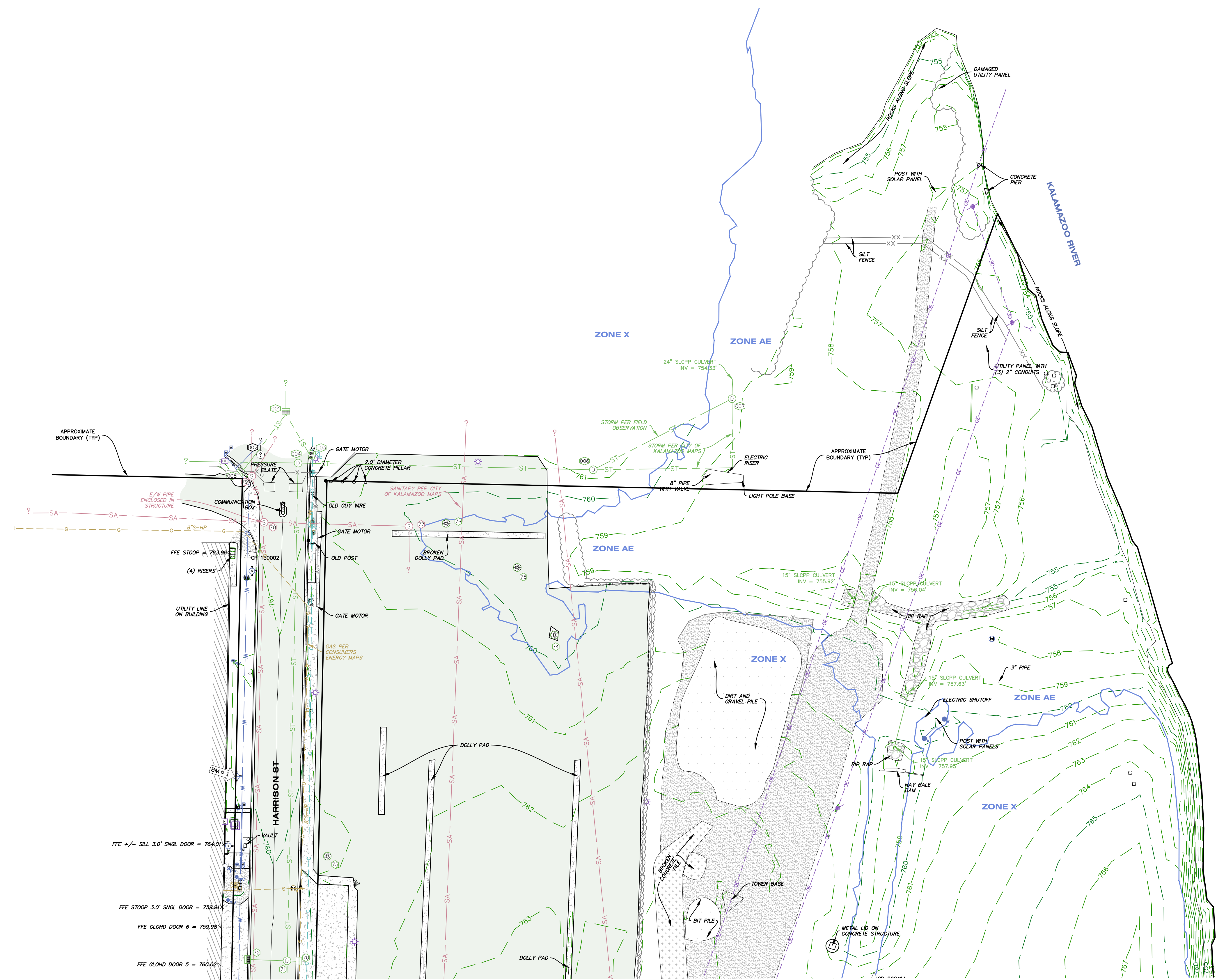
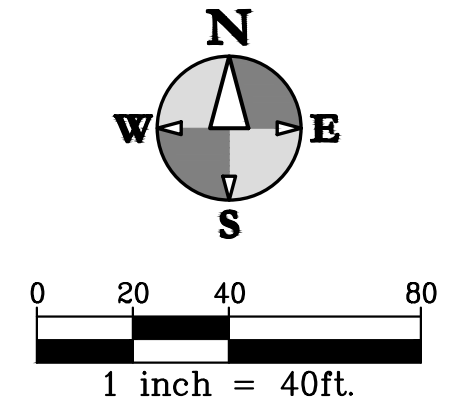
**TOPOGRAPHIC SURVEY
 TREATMENT PLANT
 GRAPHIC PACKAGING**

Sheet Title:
 Project:
 Client:

09/26/25
 Sheet
S-2



TOPOGRAPHIC SURVEY



APPROXIMATE BOUNDARY (TYP)

E/W PIPE ENCLOSED IN STRUCTURE

COMMUNICATION BOX

FFE STOOP = 763.09

(4) RISERS

UTILITY LINE ON BUILDING

HARRISON ST

Vault

FFE +/- SILL 3.0' SINGL DOOR = 764.01

FFE STOOP 3.0' SINGL DOOR = 759.91

FFE GLOHD DOOR 6 = 759.98

FFE GLOHD DOOR 5 = 760.02

GATE MOTOR

2.0' DIAMETER CONCRETE PILLAR

OLD GUY WIRE

GATE MOTOR

OLD POST

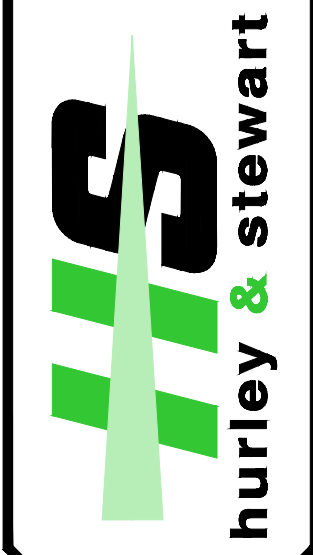
GATE MOTOR

SANITARY PER CITY OF KALAMAZOO MAPS

BROKEN DOLLY PAD

8\"/>

hurley & stewart, llc
 2800 s. 11th street
 kalamazoo, michigan 49009
 269.552.4960 fax 269.552.4961
 www.hurleystewart.com



Job No.: 24-130D	P.M.: TAK	DTL. BDE. QA/QC:	09/26/25
ISSUED FOR REVISIONS:			
#1 TOPOGRAPHIC SURVEY	02/28/25		
#2 APPROXIMATE BOUNDARY ADDED	09/26/25		

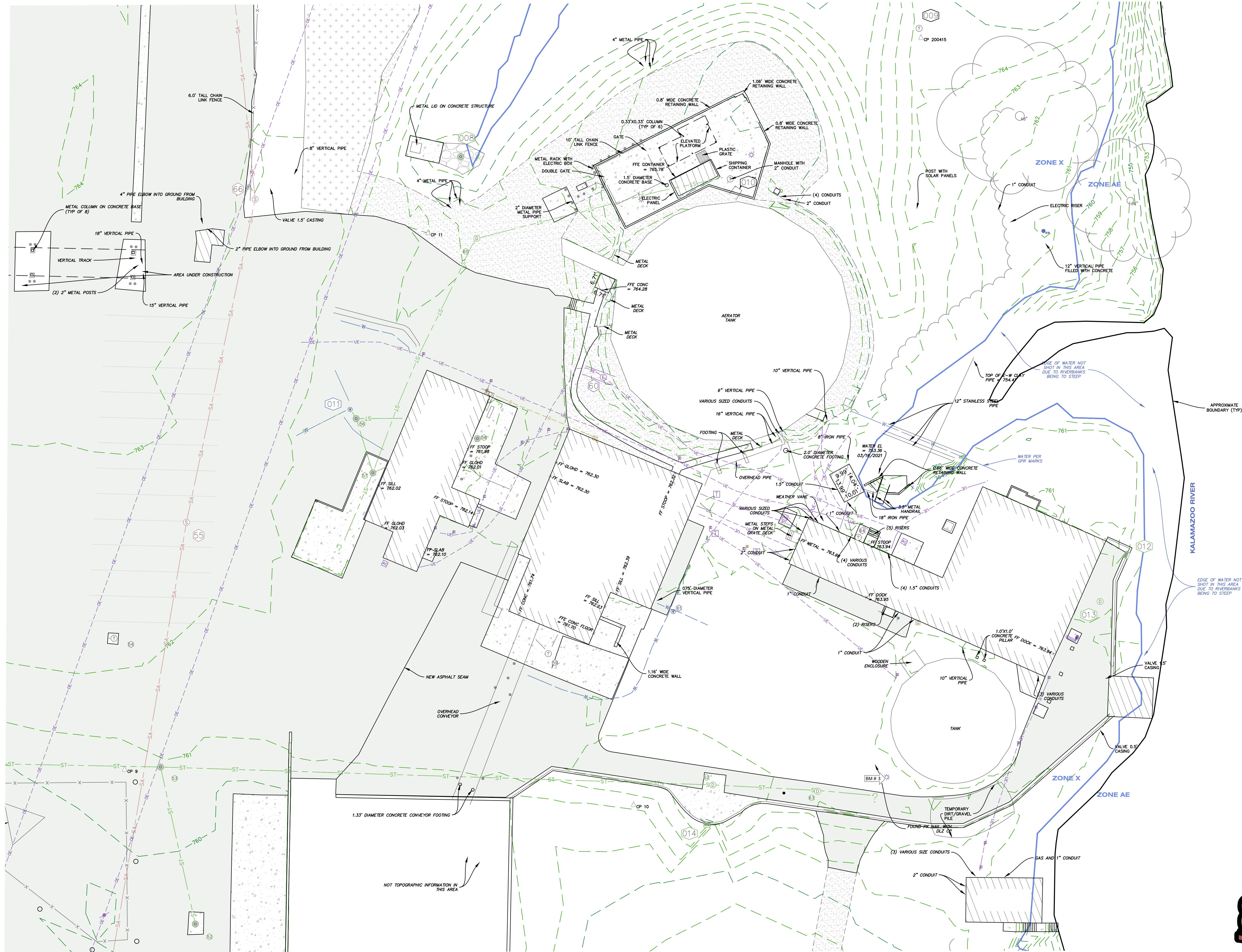
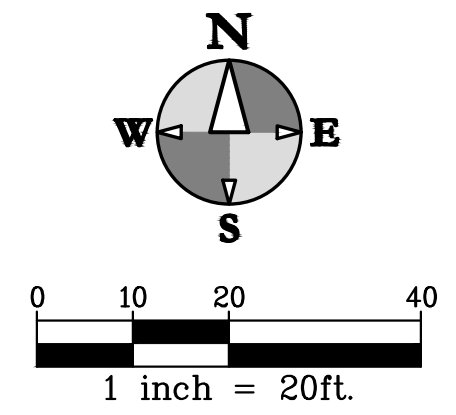
TOPOGRAPHIC SURVEY TREATMENT PLANT GRAPHIC PACKAGING

Sheet Title:
 Project:
 Client:

09/26/25
 Sheet
S-3



TOPOGRAPHIC SURVEY



hurley & stewart, llc
 2800 s. 11th street
 kalamazoo, michigan 49009
 269.552.4960 fax 269.552.4961
 www.hurleystewart.com

hurley & stewart

Job No: 24-130D P.M.TAK DTL BDE QA/QC 09/26/25
 ISSUED FOR REVISIONS: 02/28/25
 #1 TOPOGRAPHIC SURVEY 09/26/25
 #2 APPROXIMATE BOUNDARY ADDED 09/26/25

COPYRIGHT © of Hurley & Stewart, LLC

**TOPOGRAPHIC SURVEY
 TREATMENT PLANT
 GRAPHIC PACKAGING**

Sheet Title:
 Project:
 Client:

09/26/25
 Sheet
S-4





Sent Via Email Only

August 17, 2023

Eric Barkovich
Hurley & Stewart
2800 S. 11th Street
Kalamazoo, MI 49009

*RE: Threatened and Endangered Species Assessment
1400 Harrison Street, City of Kalamazoo,,
Kalamazoo County, MI
ASTI File No. 12892*

Mr. Eric Barkovich:

On August 1, 2023, ASTI Environmental (ASTI) conducted a threatened and endangered species assessment for those plant and animal species protected by the Michigan Department of Natural Resources (DNR) under Part 365 (Endangered Species Protection) of the Natural Resources and Environmental Protection Act (1994 P.A. 451) or by the US Fish and Wildlife Service (USFWS) under the federal Endangered Species Act of 1973, as amended at 1400 Harrison Street in City of Kalamazoo, Kalamazoo County, Michigan (Project Area).

The Project Area is currently comprised of the habitat types: developed area, the Kalamazoo River, mowed lawn, and riparian woods (Figure 1 – Habitat Types). Proposed project activities include improvements to the existing wastewater treatment O2 injection system (Project); improvements include removal of old asphalt, installation of new asphalt and additional parking spaces, adding crushed concrete paths and a large containment area, proposed storm and sanitary connection, and maintenance to underground portions of the treatment plant.

A Rare Species Review for the Project Area was requested from the Michigan Natural Features Inventory (MNFI) by Hurley & Stewart. The results of the MNFI review, received in a letter dated June 6, 2023 (Appendix A – MNFI Rare Species Review Letter), documents an MNFI database search for known rare Michigan species and unique natural feature occurrences within a 1.5-mile radius of the Project Area. The MNFI Rare Species Review also provides supplemental information regarding federally protected species within a 1.5-mile radius of the Project Area for projects involving federal funding or federal authorization. Using this information, ASTI conducted a field investigation to map habitat types that exist within the Project Area and to directly search for listed species and/or associated species and habitats, as appropriate. From the Rare Species Review and field investigation, ASTI was able to render a professional opinion on whether impacts to protected species could occur from the Project.

State Listed Species

According to the MNFI letter “several at-risk species and/or natural communities have been documented within 1.5 miles of the project location and it is possible that adverse impacts will occur.” MNFI only provided comments for one state threatened species, as outlined in Table 1 below.

Table 1. State Listed Species Requiring Further Assessment Within Project Area

Common Name	Scientific Name	Status
Slippershell	<i>Alasmidonta viridis</i>	State Threatened

Federally Listed Species

MNFI also provided supplemental information regarding possible federally protected species that occur in Kalamazoo County and may be impacted by the proposed Project. This supplemental information is for projects that will involve federal funding or federal agency authorization. In addition, pursuant to a 2011 Memorandum of Agreement between the Michigan Department of Environmental Quality (now EGLE) and the USEPA regarding Michigan’s administration of Section 404 (wetlands) of the federal Clean Water Act, EGLE permit applications with reasonable potential to affect federally listed species shall be submitted for federal review. This review may take the form of EGLE attaching special conditions to a wetland (Part 303) or inland lake and stream (Part 301) permit such as restricting the timing of construction activities within the Project Area or it may result in a “red-file,” requiring further USFWS review of the permit application. Please note that regardless of a federal project nexus, it is illegal to harm federally listed species; thus, ASTI has included a review of these species as part of this assessment.

MNFI indicates that according to the USFWS, the Project Area falls within the range of six federally listed species identified for Kalamazoo County. For two of the six species listed, MNFI indicates that “there does not appear to be suitable habitat within the 1.5-mile search buffer.” Only four of the six species required further analysis (Table 2).

Table 2. Federally Listed Species Requiring Further Assessment Within Project Area

Common Name	Scientific Name	Status
Indiana bat	<i>Myotis sodalis</i>	State and Federally Endangered
Northern long-eared bat	<i>Myotis septentrionalis</i>	State and Federally Endangered
Eastern massasauga rattlesnake	<i>Sistrurus catenatus</i>	State and Federally Threatened
Snuffbox	<i>Epioblasma triquetra</i>	State and Federally Endangered

Existing Property Conditions

On August 1, 2023, ASTI performed a threatened and endangered species survey and habitat assessment within the Project Area. As appropriate given the time of year, ASTI directly searched for the listed species. The Project Area possesses multiple habitat types including: developed area, the Kalamazoo River, mowed lawn, and riparian woods. Each of the observed habitat types is identified on Figure 1 – Habitat Types, and briefly described in the following sections.

Developed Area

The vast majority of the Project Area is developed as the existing wastewater treatment plant. Additionally, access drives and parking areas exist throughout the Project Area.

Kalamazoo River

The Kalamazoo River is present along the eastern edge of the Project Area. No impacts are proposed within or along the river.

Mowed Lawn

Portions of mowed lawn exist on the northern and southern portion of the Project Area. Dominant vegetation includes Kentucky bluegrass (*Poa pratensis*) and common plantain (*Plantago major*).

Riparian Woods

A riparian woods exists along the edge of the Kalamazoo River on the eastern side of the Project Area. This area is steeply sloped down to the river, and there is no wetland fringe. Dominant vegetation includes silver maple (*Acer saccharinum*), autumn olive (*Elaeagnus umbellata*), staghorn sumac (*Rhus typhina*), amur honeysuckle (*Lonicera maackii*), and poison ivy (*Toxicodendron radicans*).

Assessment Methods and Results

ASTI evaluated suitable habitat for the listed species, as detailed in the following sections.

Indiana Bat & Northern Long-eared Bat

ASTI evaluated suitable habitat for the Indiana bat and the northern long-eared bat throughout the Project Area by conducting an inventory of trees that could be potentially used for roosting or colonizing for maternity sites. No trees suitable for bat habitat were observed within the Project Area; all other trees observed were healthy and devoid of cavities, holes, and/or peeling/sloughing bark. There may be suitable habitat for bats in the vicinity (i.e., outside of the Project Area, but along the Kalamazoo River corridor; however, activities associated with the proposed Project will not negatively impact any bats that may be using the vicinity. It is ASTI's opinion that the Project will have No Effect on either bat species.

Eastern Massasauga Rattlesnake (EMR)

The Project Area falls within Tier 2 EMR habitat. Tier 2 habitat means habitat that is highly suitable and EMR is likely present. EMR require sites that contain a minimum of 5 contiguous acres of suitable habitat, including adjacent properties. Sites must contain all of the snake's microhabitat requirements, either on the subject site or on immediately adjacent properties. Table 2 below summarizes the microhabitat requirements of the EMR and documents the rationale for determining if the Project Area meets each requirement.

Table 3. EMR Requirements and Site Suitability

Habitat Requirement	Description of Habitat Need	On Site	On Immediately Adjacent Properties (not separated by barriers)	Field Notes	Is Habitat Requirement Met?
At least 5 total acres	A minimum of 5 contiguous acres of wetland and upland habitat			No wetland on site or visible on adjacent sites.	No
Basking areas	Either wetland or upland with open canopy, shorter vegetation, in close proximity to retreat cover	X	X	Riparian woodline offers open canopy and nearby retreat cover	Yes
Retreat cover	Burrows, hummocks, rock piles, downed logs, dense vegetation	X		Noted throughout	Yes
Foraging areas	Areas with dense grasses or sedges that will attract small mammals			None on site	No
Migratory corridors	Between 100-600 meters of migration route between hibernaculum and foraging areas, wetland and upland, with no major barriers				No
Hibernation structures	Crayfish burrows, mammal burrows	X		Mammal burrows present	Yes

Based on ASTI's field observations, it is ASTI's opinion that it is unlikely that the EMR utilizes the Project Area. The Project Area and adjoining properties do not possess all elements of required habitat for EMR. No preferred wetland habitat or associated foraging habitats are present within the Project Area or on immediately adjacent properties. Additionally, the site as a whole is likely far too disturbed by wastewater activities as well as recent heavy equipment usage to be used by this species. It is highly unlikely EMR utilizes the Project Area, and it is ASTI's opinion that this project should have No Effect on EMR.

Snuffbox and Slippershell Mussels

Snuffbox and slippershells inhabit rivers. This project has no proposed impacts to the Kalamazoo River, and thus this project should have No Effect on snuffbox or slippershell mussels.

Summary

Table 4 summarizes ASTI's opinion regarding the presence of the species in question or suitable habitat for each of the identified protected species, as well as an opinion on the potential impact to each species from the Project.

Table 4. Listed Species and Potential Project Impact

Species/Natural Feature	Ranking	Habitat	ASTI Findings
Indiana Bat (<i>Myotis sodalis</i>)	State and Federally Endangered	Winter habitat: caves and mines Summer habitat: Small to medium river and stream corridors with well-developed riparian woods; woodlots within 1 to 3 miles of small to medium rivers and streams; and upland forests.	No potential bat trees located on site. The Project will have No Effect on this species.
Northern Long-eared Bat (<i>Myotis septentrionalis</i>)	State and Federally Endangered	Winter habitat: caves and mines Summer habitat: Any forested areas with open understory where trees are exposed to direct sunlight and have sloughing bark or crevices. Will also roost in structures	No potential bat trees located on site. The Project will have No Effect on this species.
Eastern Massasauga Rattlesnake (<i>Sistrurus catenatus</i>)	State and Federally Threatened	Open, sunny areas intermixed with high quality wetland.	No wetland on site, and habitat requirements are not met. The Project will have No Effect on this species.
Snuffbox Mussel (<i>Epioblasma triquetra</i>)	State and Federally Endangered	River and stream buried in mixed substrates	No proposed impacts to river. The Project will have No Effect on this species.
Slippershell Mussel (<i>Alasmidonta viridis</i>)	State Threatened	River and stream buried in mixed substrates	No proposed impacts to river. The Project will have No Effect on this species.



Conclusions

The MNFI indicated in a Rare Species Review that there are several known occurrences of state listed species within 1.5 miles of the Project Area, and that it is possible that adverse impacts will occur, but only commented on one species. The Rare Species Review also indicated that 4 federally protected species have the potential to be within the Project Area. ASTI conducted an assessment for all appropriate state and federally listed species of concern to MNFI.

No high quality habitat, including potential bat trees, exists within the Project Area that could provide habitat for threatened or endangered species. It is highly unlikely that the Project Area is utilized by rare or protected plants or animals. Thus, it is ASTI's opinion that the Project will have no effect on any state or federal listed species.

Thank you for the opportunity to work with you on this project. Please do not hesitate to contact us with questions.

ASTI ENVIRONMENTAL

A handwritten signature in blue ink, appearing to read 'Emmett Smrcka'.

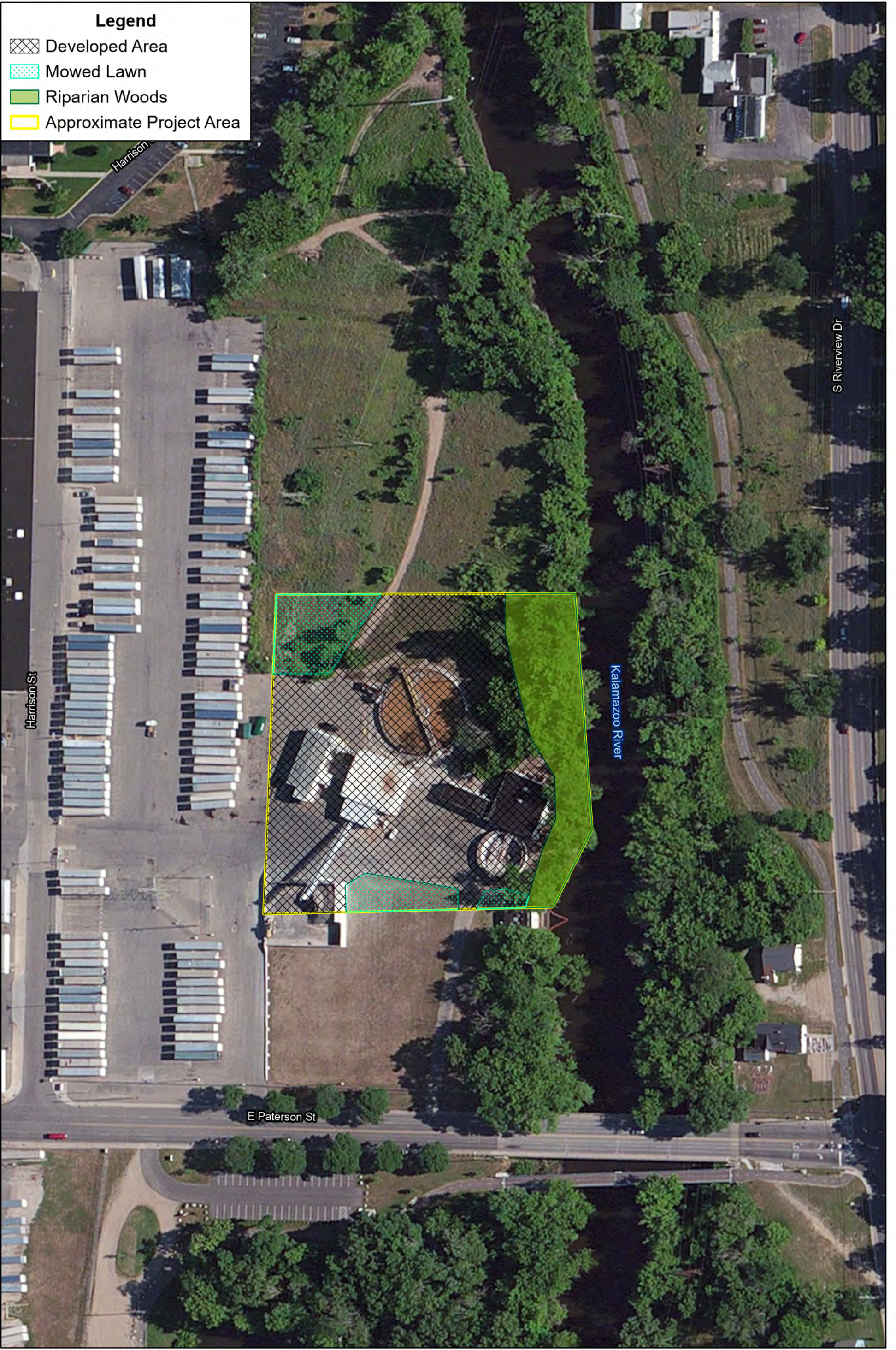
Emmett Smrcka
Ecologist

A handwritten signature in blue ink, appearing to read 'Dianne C. Martin'.

Dianne C. Martin
Vice President
Professional Wetland Scientist
#1313
MDNR T&E Permit TE060

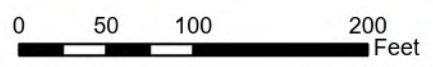
Attachments:

Figure 1 – Habitat Types
MNFI Rare Species Review Letter



1400 Harrison Street

City of Kalamazoo, Kalamazoo County, MI



Client: Hurley & Stewart
 Created by: EAS, August 10, 2023, ASTI Project 12892
 Imagery: ESRI, Maxar, Earthstar Geographics, Airbus

Figure 1 - Habitat Types

Nicholas Richmond
Hurley & Stewart
2800 South 11th Street
Kalamazoo, MI 49009

June 6, 2023

Re: Rare Species Review #3508 – Graphic Packaging Wastewater treatment (WWT) O2 Injection system, City of Kalamazoo, Kalamazoo County, MI.

Hello:

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

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



MSU EXTENSION
Michigan Natural Features Inventory

PO Box 13036
Lansing MI 48901

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

mnfi.anr.msu.edu

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

Sincerely,

Michael Sanders

Michael Sanders
Environmental Review Specialist/Zoologist
Michigan Natural Features Inventory

Comments for Rare Species Review #3508:

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

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

NOTE: Michigan rivers and streams have been grouped according to existing information of mussel distribution and individual species conservation status. The Mussel Protocol Stream Groups are designed to document the **potential** presence or absence of state or federally listed mussel species. The layer was created by modeling the habitat suitability for each mussel species and may not correspond directly with a documented location for a listed mussel. A segment may be predicted as suitable for a number of mussel species, so the stream group number was assigned to the most restrictive of the potential mussel species present. This stretch of the **Kalamazoo River** is designated a Group 1 mussel stream which means that state special concern mussel species may occur here and that certain surveys and possibly relocation procedures apply. I encourage you to read the [Michigan Freshwater Mussel Survey Protocols and Relocation Procedures](#) publication if in-stream work and/or land clearing activities occur that result in streambed disturbance and erosion and sedimentation into the river. A copy of the publication is being provided to you in this mailing.

NOTE: Freshwater mussels (*Unionida*) require a fish host to complete their life cycle. Eggs are fertilized and develop into larvae within the gills of the female mussel. These larvae, called glochidia, are released into the water and must attach to a suitable fish host to survive and transform into the adult mussel. As zebra mussel (*Dreissena polymorpha*) infestation has led to the extirpation of many native mussel communities, boat hulls and trailers, fishing gear and scuba equipment should be thoroughly cleaned before moving between waterbodies, to prevent the spread of zebra mussel larvae and adults.

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

Element Category	Scientific Name	Common Name	Federal Status	State Status	G Rank	S Rank	EO Rank	First Observed Date	Last Observed Date
Animal	<i>Clonophis kirtlandii</i>	Kirtland's snake		E	G2	S1	H	1879	1879-07-11
Plant	<i>Silphium integrifolium</i>	Rosinweed		T	G5	S2	CD	1947	1999-10-08
Plant	<i>Asclepias hirtella</i>	Tall green milkweed		T	G5	S2	D	2001-06-04	2001-06-04
Animal	<i>Falco peregrinus</i>	Peregrine falcon		E	G4	S3	A	2010	2020
Plant	<i>Panax quinquefolius</i>	Ginseng		T	G3G4	S2S3	H	1838-07-27	1838-07-27
Animal	<i>Alasmidonta viridis</i>	Slippershell		T	G4G5	S2S3	E	2017	2017

Comments for Table 1:

Slippershell (*Alasmidonta viridis*)

Habitat

Known to occur in Kalamazoo River, the slippershell typically occurs in creeks and headwaters of rivers in sand or gravel substrates. Occasionally, they occur in larger rivers and lakes and in mud substrates.

Management Recommendations

The slippershell requires clear, clean water and substrates for survival. Like other mussels, threats include: siltation, poor water quality, point and non-point source pollution, and alteration of natural flow regimes. Maintenance or establishment of vegetated riparian buffers can help protect mussel habitats from these threats. Additionally, zebra mussels and other exotic species are a major threat to all mussels. Hence, control and management of exotic species also help protect native mussel species. And as with all mussels, protection of their hosts habitat is also crucial.

For more information, see the [Alasmidonta viridis](#) species page on the MNFI website.

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

Element Category	Scientific Name	Common Name	Federal Status	State Status	G Rank	S Rank	EO Rank	First Observed Date	Last Observed Date
Animal	<i>Alasmidonta marginata</i>	Elktoe		SC	G4	S3?	E	2000-07	2018-07-19
Animal	<i>Pandion haliaetus</i>	Osprey		SC	G5	S4	E	2006-04-14	2020
Animal	<i>Villosa iris</i>	Rainbow		SC	G5	S3	H		
Animal	<i>Sphaerium fabale</i>	River fingernail clam		SC	G5	SNR	H		
Animal	<i>Lasmigona costata</i>	Flutedshell		SC	G5	SNR	E	2000-08-01	2000-08-01
Animal	<i>Pandion haliaetus</i>	Osprey		SC	G5	S4	E	2017	2020
Animal	<i>Bombus affinis</i>	Rusty-patched bumble bee	LE	SC	G2	SH	H	1963-07-25	1975-07-12
Animal	<i>Bombus pensylvanicus</i>	American bumble bee		SC	G3G4	S1	H	1963-05-30	1965-08-09
Animal	<i>Bombus pensylvanicus</i>	American bumble bee		SC	G3G4	S1	H	1963-09-04	1963-09-04
Animal	<i>Bombus auricomus</i>	Black and gold bumble bee		SC	G5	S2	H	1963-08-02	1963-08-02
Plant	<i>Collinsia verna</i>	Blue-eyed Mary		SC	G5	SNR	H	1838-08-27	1877-05-06

Animal	<i>Pleurobema sintoxia</i>	Round pigtoe		SC	G4G5	S3	E	2018-08-14	2018-08-14
Animal	<i>Utterbackia imbecillis</i>	Paper pondshell		SC	G5	S2S3	E	2018-08-14	2018-08-14
Animal	<i>Lithobates palustris</i>	Pickerel frog		SC	G5	S3S4	H	1911-08-30	1911-08-30
Animal	<i>Alasmidonta marginata</i>	Elktoe		SC	G4	S3?	E	2019-07-17	2019-07-17
Animal	<i>Lasmigona compressa</i>	Creek heelsplitter		SC	G5	S3	E	2019-07-17	2019-07-17
Animal	<i>Lasmigona costata</i>	Flutedshell		SC	G5	SNR	E	2019-07-17	2019-07-17
Animal	<i>Pleurobema sintoxia</i>	Round pigtoe		SC	G4G5	S3	E	2019-07-17	2019-07-17
Animal	<i>Villosa iris</i>	Rainbow		SC	G5	S3	E	2019-07-17	2019-07-17
Animal	<i>Lasmigona costata</i>	Flutedshell		SC	G5	SNR	E	2017	2017
Animal	<i>Lasmigona costata</i>	Flutedshell		SC	G5	SNR	E	2017	2017
Animal	<i>Lasmigona costata</i>	Flutedshell		SC	G5	SNR	E	2017	2017
Animal	<i>Alasmidonta marginata</i>	Elktoe		SC	G4	S3?	E	2017	2017
Animal	<i>Alasmidonta marginata</i>	Elktoe		SC	G4	S3?	E	2017	2017
Animal	<i>Alasmidonta marginata</i>	Elktoe		SC	G4	S3?	E	2017	2017
Animal	<i>Alasmidonta marginata</i>	Elktoe		SC	G4	S3?	E	2017	2017

Comments for Table 2:

Round pigtoe (*Pleurobema sintoxia*)

Habitat

Known to occur in Kalamazoo River, the round pigtoe occurs in mud, sand, or gravel substrates of medium to large rivers.

Management Recommendations

Like other mussels, threats to the round pigtoe include: natural flow alterations, siltation, channel disturbance, point and non-point source pollution, and exotic species. Maintenance or establishment of vegetated riparian buffers can help protect mussel habitats from many of their threats. Control of zebra mussels is critical to preserving native mussels. And as with all mussels, protection of their hosts habitat is also crucial.

For more information, see the [Pleurobema sintoxia](#) species page on the MNFI website.

Flutedshell (*Lasmigona costata*)

Habitat

Known to occur in Kalamazoo River, the flutedshell is found in small and medium rivers, and in Lake St. Clair and Lake Erie. They are often found in sandy mud and cobble substrates.

Management Recommendations

The flutedshell is being impacted by point source pollution, non-point source pollution, alteration of natural stream flow patterns, barriers to host fish passage, direct alteration of habitat, and invasive zebra mussels.

Limit or eliminate point source discharges of ammonia, chloride, sulfate, heavy metals, and other substances toxic to native mussels. Avoid use of aquatic herbicides containing copper. Maintain riparian buffers along streams and promote land conservation programs to help reduce excessive erosion, sedimentation, and nutrient input from non-point sources. Maintain integrity of headwater streams and wetlands, which support the ecological function of downstream river habitats. Improve passage for fish by removing unnecessary dams and upgrading poor stream/road crossings such as culverts that are too small or are perched. Flutedshell and other native mussels require fish hosts to complete their life cycle and rely on fish passage to travel to new habitats and facilitate gene flow among mussel populations. Avoid dredging, channelization, and other in-stream impacts whenever possible.

The spread of zebra mussels into Michigan's streams and lakes remains a serious threat throughout the flutedshell's range. Reduce the impact of zebra mussels by avoiding the transport of water or aquatic plants – which can contain zebra mussel larvae – from one body of water to another while boating, fishing, hunting, and researching. Washing boats, trailers, and gear, and letting them dry overnight reduces the potential for spreading zebra mussels.

For more information, see the [Lasmigona costata](#) species page on the MNFI website.

Creek heelsplitter (*Lasmigona compressa*)

Habitat

Known to occur in Kalamazoo River, the creek heelsplitter is found in creeks and small rivers in a variety of substrates.

Management Recommendations

The creek heelsplitter is at risk from point source pollution, non-point source pollution, alteration of natural stream flow patterns, barriers to host fish passage, direct alteration of habitat, and invasive zebra mussels.

Maintain riparian buffers along streams and promote land conservation programs to help reduce excessive erosion, sedimentation, and nutrient input from non-point sources. Maintaining integrity of headwater streams and wetlands is especially important for creek heelsplitters since they are strongly associated with small rivers and creeks. Improve passage for fish by removing unnecessary dams and upgrading poor stream/road crossings such as culverts that are too small or are perched. Creek heelsplitter and other native mussels require fish hosts to complete their life cycle and rely on fish passage to travel to new habitats and facilitate gene flow among mussel populations. Avoid dredging, channelization, and other in-stream impacts whenever possible. Limit or eliminate point source discharges of ammonia, chloride, sulfate, heavy metals, and other substances toxic to native mussels.

Since the range of creek heelsplitter is typically restricted to smaller sized streams with little or no boat traffic, this species has not been impacted by zebra mussels as much as most other native mussel species. Still, the spread of zebra mussels into Michigan's streams and lakes remains a serious threat. Avoid the transport of water or aquatic plants – which can contain zebra mussel larvae – from one body of water to another while boating, fishing, and hunting. Wash boats, trailers, and gear, and let them dry over night to reduce the potential for spreading zebra mussels.

For more information, see the [Lasmigona compressa](#) species page on the MNFI website.

Elktoe (*Alasmidonta marginata*)

Habitat

Known to occur in Kalamazoo River, the Elktoe is found in small to large sized streams and small to medium rivers. It is a riffle species, preferring swifter currents over packed sand and gravel substrates. The Elktoe is typically only found in clean, clear water (Cummings and Mayer 1992).

Management Recommendations

The elktoe needs clean, fast-flowing water to survive. Therefore, changes to its habitat, such as river impoundment, siltation and channel disturbances, including dredging, negatively affect this species. Pollution from point (industrial and residential discharge) and non-point (siltation, herbicide and surface run-off) sources is also a threat to mussels and should be limited and monitored to insure compliance with the Clean Water Act. Control of zebra mussels is critical to preserving native mussels. It is essential to protect not only the habitat of the elktoe, but also the white sucker, northern hog sucker, shorthead redhorse, rockbass and warmouth, as they serve as hosts for the glochidia.

For more information, see the [Alasmidonta marginata](#) species page on the MNFI website.

Codes to accompany table

State Protection Status Code Definitions (SPROT)

E = Endangered

T = Threatened

SC = Special concern

Federal Protection Status Code Definitions (USESA)

LE = listed endangered

LT = listed threatened

LELT = partly listed endangered and partly listed threatened

PDL = proposed delist

E(S/A) = endangered based on similarities/appearance

PS = partial status (federally listed in only part of its range)

C = species being considered for federal status

Global Heritage Status Rank Definitions (GRANK)

The priority assigned by [NatureServe](#)'s national office for data collection and protection based upon the element's status throughout its entire world-wide range. Criteria not based only on number of occurrences; other critical factors also apply. Note that ranks are frequently combined.

G1 = critically imperiled globally because of extreme rarity (5 or fewer occurrences range-wide or very few remaining individuals or acres) or because of some factor(s) making it especially vulnerable to extinction.

G2 = imperiled globally because of rarity (6 to 20 occurrences or few remaining individuals or acres) or because of some factor(s) making it very vulnerable to extinction throughout its range.

G3 = Either very rare and local throughout its range or found locally (even abundantly at some of its locations) in a restricted range (e.g. a single western state, a physiographic region in the East) or because of other factor(s) making it vulnerable to extinction throughout its range; in terms of occurrences, in the range of 21 to 100.

G4 = Apparently secure globally, though it may be quite rare in parts of its range, especially at the periphery.

G5 = Demonstrably secure globally, though it may be quite rare in parts of its range, especially at the periphery.

Q = Taxonomy uncertain

State Heritage Status Rank Definitions (SRANK)

The priority assigned by the Michigan Natural Features Inventory for data collection and protection based upon the element's status within the state. Criteria not based only on number of occurrences; other critical factors also apply. Note that ranks are frequently combined.

S1 = Critically imperiled in the state because of extreme rarity (5 or fewer occurrences or very few remaining individuals or acres) or because of some factor(s) making it especially vulnerable to extirpation in the state.

S2 = Imperiled in state because of rarity (6 to 20 occurrences or few remaining individuals or acres) or because of some factor(s) making it very vulnerable to extirpation from the state.

S3 = Rare or uncommon in state (on the order of 21 to 100

occurrences). S4 = apparently secure in state, with many occurrences.

S5 = demonstrably secure in state and essentially ineradicable under present conditions.

SX = apparently extirpated from state.

EO Rank Codes

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

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

Section 7 Comments for Rare Species Review #3508
Wastewater treatment (WWT) O2 Injection system

Nicholas Richmond
Hurley & Stewart
2800 South 11th Street
Kalamazoo, MI 49009

June 6, 2023

For projects involving Federal funding or a federal agency authorization

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

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

Federally Endangered

Indiana bat - there appears to be suitable habitat within 1.5 miles of the project. The state and federally endangered Indiana bats (*Myotis sodalis*) are found only in the eastern United States and are typically confined to the southern three tiers of counties in Michigan. Indiana bats that summer in Michigan winter in caves in Indiana and Kentucky. This species forms colonies and forages in riparian and mature floodplain habitats. Nursery roost sites are usually located under loose bark or in hollows of trees near riparian habitat. Indiana bats typically avoid houses or other artificial structures and typically roost underneath loose bark of dead elm, maple and ash trees. Other dead trees used include oak, hickory and cottonwood.

Foraging typically occurs over slow-moving, wooded streams and rivers as well as in the canopy of mature trees. Movements may also extend into the outer edge of the floodplain and to nearby solitary trees. A summer colony's foraging area usually encompasses a stretch of stream over a half-mile in length. Upland areas isolated from floodplains and non-wooded streams are generally avoided.

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

Snuffbox – there appears to be suitable habitat within 1.5 miles of the project. The state and federally endangered snuffbox mussel (*Epioblasma triquetra*) inhabits rivers and streams with cobble, gravel, or sand bottoms in swift currents and usually is deeply buried in the substrate. Glochidia, the parasitic larval stage of the mussel, are released from May to mid-July. In Michigan, the only host fish known for snuffbox is the log perch (*Percina caprodes*). In other parts of their range the banded sculpin (*Cottus carolinae*) is also a known host. After completing the parasitic stage and reaching adulthood, snuffbox remain relatively sessile on the river bottom, living between 8-10 years. The best time to survey for snuffbox is April through September.

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

inherently linked with that of the logperch in Michigan, conservation and management of this fish species is needed to ensure that of the snuffbox.

Mitchell's satyr butterfly – there does not appear to be suitable habitat within 1.5 miles of the project. The federally endangered and state endangered Mitchell's satyr butterfly (*Neonympha mitchellii mitchellii*) is restricted to calcareous wetlands known as prairie fens. In Michigan, this habitat is characterized by scattered tamaracks, poison sumac, and dogwood with a ground cover of sedges, shrubby cinquefoil, and a variety of herbaceous species with prairie affinities. Adult Mitchell's satyr butterflies are active two to three weeks each summer, with males emerging before females. Adult flight dates are from mid-June to mid-July. Larvae hibernate near the bottom of a sedge. The larval food plant is thought to be several species of sedge. The caterpillar is green with white stripes.

Management and Conservation: the primary threat to the continued survival of this species is habitat loss and modification. Many of the wetland complexes occupied currently have been altered or drained for agriculture or development. Wetland alteration is responsible for extirpating the single known satyr population in Ohio. Wetland alteration also can lead to invasion by exotic plant species such as glossy buckthorn (*Rhamnus frangula*), purple loosestrife (*Lythrum salicaria*), common buckthorn (*Rhamnus cathartica*), and the common reed (*Phragmites australis*). In addition, landscape-scale processes that may be important for maintaining suitable satyr habitat and/or creating new habitat, such as wildfires, fluctuations in hydrologic regimes, and flooding from beaver (*Castor canadensis*) activity, have been virtually eliminated or altered throughout the species' range.

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

Although no known hibernacula or roost trees have been documented within 1.5 miles of the project area, this activity occurs within the designated WNS zone (i.e., within 150 miles of positive counties/districts impacted by WNS). In addition, there appears to be suitable habitat within the buffer. cause prohibited take of this bat.

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

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

Management and Conservation: when there are known roost trees or hibernacula in the project area, we encourage you to conduct tree-cutting activities and prescribed burns in forested areas during October 1 through March 31 when possible. When that is not possible, we encourage you to remove trees prior to June 1 or after July 31, as that will help to protect young bats that may be in forested areas but are not yet able to fly.

Federally Threatened

Eastern massasauga rattlesnake (EMR) – this project occurs within **EMR Tier 2 habitat** as designated by the US Fish & Wildlife Service. Tier 2 habitat is habitat where EMR may occur. The federally threatened and state special concern

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

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

Management and Conservation: any sightings of these snakes should be reported to the Michigan Department of Natural Resources, Wildlife Division. If possible, a photo of the live snake is also recommended.

Copperbelly water snake – there does not appear to be suitable habitat within 1.5 miles of the project. The federally threatened and state endangered copperbelly water snake (*Nerodia erythrogaster neglecta*) can grow to a length of 4-5 feet. Adult snakes are easily identified by their deep brown or black back which contrasts easily with the unmarked reddish-to-orange belly and chin.

Copperbelly water snakes are usually found in or near shrub swamps, ponds, lakes, oxbow sloughs, fens, and slow-moving streams. They can also be found in mature or second-growth woodlands and in more open habitats adjacent to wetland areas. In spring these snakes often inhabit the open edges of shallow ponds and buttonbush swamps and frequently bask on shoreline vegetation, muskrat lodges, or woody debris. When temperatures rise, and these seasonal waters begin to dry up in early summer, the snakes migrate to permanent waters (lake and stream edges), often using fairly dry wooded or grassy upland corridors. They may become largely nocturnal during hot weather. As excellent swimmers, they hunt aquatic species including tadpoles, frogs, salamanders, insect larvae, and crayfish. In the spring, tadpoles seem to be especially tasty to hungry copper-bellied water snakes.

Management and Conservation: a copperbelly water snake travels often during spring, summer, and fall. It moves to different wetlands as water levels and food availability change and then travels to and from its hibernation site. When moving to various locations, these snakes are vulnerable to predators (e.g., skunks, raccoons, raptors, and snapping turtles), especially if the snakes must travel across cleared areas, such as roads, mowed areas and farmlands. The decline of this species can be attributed to habitat loss and fragmentation, collection for the pet trade and predation. Conservation efforts should protect or create riparian corridors and habitat corridors between wetlands, protect existing and expand upland forest habitats, and reduce forest fragmentation. Permanently lowering water tables can cause seasonally inundated wetlands and hibernacula sites to become permanently dry which could lead to local population extirpations. Maintaining adequate prey base (i.e., mainly frogs) and shrub and log cover along the edge of wetlands for cover and thermoregulation also is crucial. Please inform field crews that snakes should not be killed, harmed, or harassed. Any copperbelly water snake sightings should be reported to this office.

Candidate Species

Monarch Butterfly (*Danaus plexippus*) on December 15, 2020, the U.S. Fish and Wildlife Service announced that listing the monarch as endangered or threatened under the Endangered Species Act is warranted but precluded by higher priority listing actions. The decision is the result of an extensive status review of the monarch that compiled and assessed the monarch's current and future status. The monarch is now a candidate under the Endangered Species Act; we will review its status annually until a listing decision is made.

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

USFWS Section 7 Consultation Technical Assistance can be found at:

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

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

Please let us know if you have questions.

Michael Sanders
Environmental Review Specialist/Zoologist
Michigan Natural Features Inventory

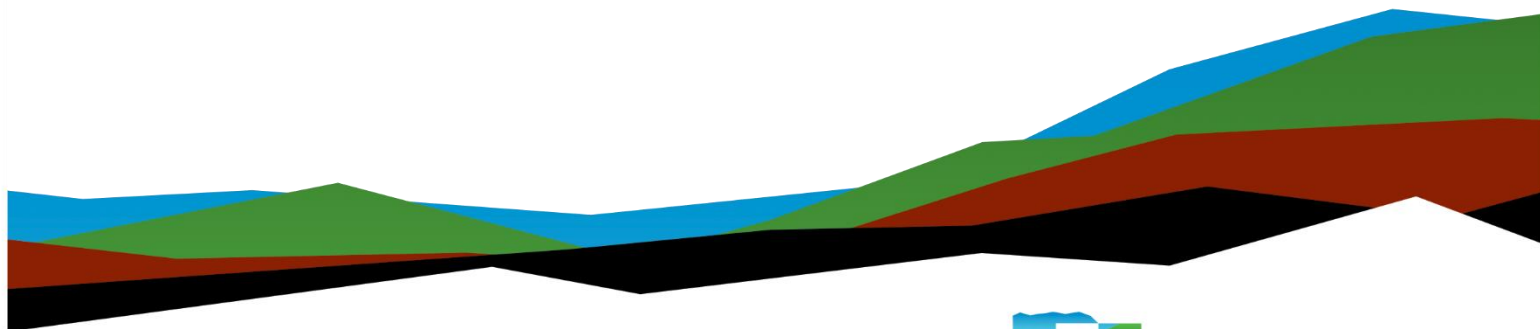
Relocated WWTP Items

Geotechnical Engineering Report

June 20, 2025 | Terracon Project No. CK255059

Prepared for:

Yates Engineers, LLC
1853 Data Drive
Birmingham, Alabama 35224



Nationwide
[Terracon.com](https://www.terracon.com)

- Facilities
- Environmental
- Geotechnical
- Materials

June 20, 2025

Yates Engineers, LLC
1853 Data Drive
Birmingham, Alabama 35224

Attn: Ms. Sabrina Hansen – Project Manager
P: 205.940.4101
E: SHansen@wgyates.com

Re: Geotechnical Engineering Report
Relocated WWTP Items
1500 North Pitcher Street
Kalamazoo, Michigan
Terracon Project No. CK255059

Dear Ms. Hansen:

We have completed the scope of Geotechnical Engineering services for the referenced project in general accordance with Terracon Proposal No. PCK245162-R2 dated April 21, 2025. This report presents the findings of the subsurface exploration and provides geotechnical recommendations concerning earthwork and the design and construction of foundations, floor slabs, and pavements for the proposed project.

We appreciate the opportunity to be of service to you on this project. If you have any questions concerning this report or if we may be of further service, please contact us.

Sincerely,

Terracon Consultants-MI, Inc.



Peter K. Parrilli
Staff Engineer



Prasad S. Rege, P.E.
Senior Principal

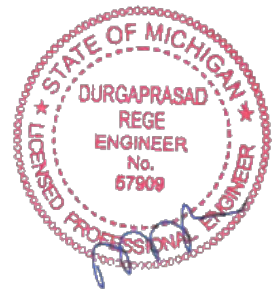


Table of Contents

Introduction	1
Project Description	1
Site Conditions	3
Geotechnical Characterization	4
Subsurface Profile.....	4
Groundwater Conditions.....	4
Seismic Site Class	5
Geotechnical Overview	5
Earthwork	6
Site Preparation.....	7
Existing Fill and Subgrade Preparation	7
Fill Material Types	8
Fill Placement and Compaction Requirements	9
Utility Trench Backfill	9
Grading and Drainage.....	10
Earthwork Construction Considerations	10
Construction Observation and Testing	11
Ground Improvement	12
Deep Foundations	14
Auger-Cast Pile Design Parameters	14
ACIP Pile Lateral Loading	22
ACIP Pile Construction Considerations	28
Specialty Foundations	29
Helical Piers	29
Floor Slabs	30
Below Grade Structures and Lateral Earth Pressures	30
Design Parameters.....	30
Pavements	32
General Pavement Comments	32
Pavement Design Parameters	32
Pavement Section Thicknesses	33
Pavement Drainage.....	34
Pavement Maintenance	34
Frost Considerations	35
Geophysical Survey	35
Exploration Methods.....	35
Findings	36
Limitations	37
General Comments	38

Figures

GeoModel


Attachments

Exploration and Testing Procedures

Site Location and Exploration Plans

Exploration and Laboratory Results

Supporting Information

Note: This report was originally delivered in a web-based format. **Blue Bold** text in the report indicates a referenced section heading. The PDF version also includes hyperlinks which direct the reader to that section and clicking on the  Terracon logo will bring you back to this page. For more interactive features, please view your project online at client.terracon.com.

Refer to each individual Attachment for a listing of contents.

Introduction

This report presents the results of our subsurface exploration and Geotechnical Engineering services performed for the relocated wastewater treatment plant items to be located at 1500 North Pitcher Street in Kalamazoo, Michigan. The purpose of these services was to provide information and geotechnical engineering recommendations relative to:

- Boring logs with field and laboratory data
- Stratification based on visual soil classification
- Groundwater levels observed during and after the completion of drilling
- Site Location and Exploration Plan
- Subsurface exploration procedures
- Description of subsurface conditions
- Recommended foundation options and engineering design parameters
- Estimated settlement of foundations
- Lateral earth pressures
- Recommendations for design and construction of interior floor slabs
- Earthwork recommendations including site/subgrade preparation
- Recommendations for pavement subgrade preparation
- Geophysical exploration procedures and results

The geotechnical engineering Scope of Services for this project included the advancement of soil borings, laboratory testing, engineering analysis, and preparation of this report.

Drawings showing the site and boring locations are shown on the [Site Location](#) and [Exploration Plan](#), respectively. The results of the laboratory testing performed on soil samples obtained from the site during our field exploration are included on the boring logs and as separate graphs in the [Exploration and Laboratory Results](#) section.

Project Description

Our initial understanding of the project was provided in our proposal, and our current understanding of the project conditions is as follows:

Item	Description
Information Provided	An email request for proposal was provided by Yates on March 31, 2025. The request included a proposed site plan and a description of the scope of work. Additional site information and an updated site plan was provided by Yates on June 3, 2025.
Project Description	The project includes relocating proposed wastewater treatment plant buildings to the southeast of the project site. The improvements include a new process building/control building, pre-engineered metal building which will cover the existing waste bunker, thickener feed tank, dissolved air flotation (DAF) feed tank, make-up air unit/pump house, air pressure units, and pipe bridge.
Proposed Structures	<p>Structures associated with the project include:</p> <ul style="list-style-type: none"> ■ Process building with dimensions of about 110 feet by 80 feet and 65 feet tall ■ Control building with dimensions of about 60 feet by 40 feet and 40 feet tall. ■ Pre-engineered metal building with dimensions of about 110 feet by 80 feet and 15 feet tall ■ Thickener feed tank with a diameter of about 20 feet and 24 feet tall ■ DAF feed tank with a diameter of about 13 feet and 29 feet tall ■ Make-up air unit/pump houses with dimensions of about 25 feet by 13 feet ■ Air pressure units with dimensions of about 10 feet by 8 feet ■ Pipe bridge spanning about 570 feet in four sections and about 20 feet tall
Building Construction	Steel framed building with slab-on-grade floors Steel storage tanks
Finished Floor Elevation	Per Yates, about 763 feet

Item	Description
Maximum Loads	The following anticipated structural loads were provided by Yates: <ul style="list-style-type: none"> ■ Process/control building columns: 13 to 1,035 kips ■ Pre-engineered metal building columns: 15 kips ■ Thickener feed tank contact pressure: 1,500 psf ■ DAF feed tank contact pressure: 1,800 psf ■ Make-up air unit/pump house/air pressure units contact pressure: 1,000 psf ■ Pipe bridge columns: 50 kips
Grading	Approximately 3 feet of cut and/or fill is anticipated to be required to develop final grade, excluding remedial grading requirements.
Below-Grade Structures	The new process/control building will contain a sump pit planned to bear about 10 feet below existing grade.
Pavements	Portland cement concrete is the preferred pavement surface for this project. Unless information is provided prior to the report, the anticipated daily truck traffic will be assumed to consist of: <ul style="list-style-type: none"> ■ Up to 12 HS20 trucks per day ■ Vehicles operating 7 days per week for 52 weeks per year ■ The pavement design period is 20 years.
Building Code	2018 IBC

Terracon should be notified if any of the above information is inconsistent with the planned construction as modifications to our recommendations may be necessary.

Site Conditions

The following description of site conditions is derived from our site visit in association with the field exploration and our review of publicly available geologic and topographic maps.

Item	Description
Parcel Information	The project is located at the GPI facility at 1500 North Pitcher Street in Kalamazoo, Michigan. Latitude/Longitude (approximate) 42.3057, -85.5731 See Site Location

Item	Description
Existing Improvements	Existing waste bunker
Current Ground Cover	Grass
Existing Topography (Kalamazoo Co. GIS)	Site grades generally increase while traversing southeast across the site and range from about 761 to 768 feet.

Geotechnical Characterization

Subsurface Profile

We have developed a general characterization of the subsurface conditions based upon our review of the subsurface exploration, laboratory data, geologic setting and our understanding of the project. This characterization, termed GeoModel, forms the basis of our geotechnical calculations and evaluation of the site. Conditions observed at each exploration point are indicated on the individual logs. The individual logs can be found in the [Exploration and Laboratory Results](#) and the GeoModel can be found in the [Figures](#) attachment of this report.

As part of our analyses, we identified the following model layers within the subsurface profile. For a more detailed view of the model layer depths at each boring location, refer to the GeoModel.

Model Layer	Layer Name	General Description
1	Topsoil and Existing Fill Materials	About 6 to 12 inches of topsoil overlying poorly graded sands with varying amounts of clay and sandy lean clay fill containing cinders, wood, concrete, and brick
2	Cohesionless Materials	Loose to medium dense poorly graded sands with varying amounts of clay, silt, and gravel and sandy silt with occasional layers of sandy lean clay

Groundwater Conditions

The borings were advanced using drilling techniques that allow short-term groundwater observations to be made while drilling. Groundwater was encountered in each boring between about 2 feet and 18.5 feet below existing grade during and after the completion

of drilling activities. Shallow groundwater was encountered in Boring B-8 at about 5 feet below existing grade after drilling activities and in Boring B-9 at about 2 feet below existing grade after drilling activities. Groundwater conditions may be different at the time of construction; however, the presence of shallow groundwater encountered at this site has the potential to negatively impact construction activities, especially for deep foundation construction. Temporary dewatering systems may be required to ensure the groundwater table is kept out of the drilled shafts during construction activities.

Groundwater conditions may change because of seasonal variations in rainfall, runoff, and other conditions not apparent at the time of drilling. Also, trapped or “perched” water could be present within the cohesionless soils (fill and native) above lower permeability clay or silt soil layers. Observation of long-term groundwater levels was outside the scope of services for this project.

Seismic Site Class

The seismic design requirements for buildings and other structures are based on Seismic Design Category. Site Classification is required to determine the Seismic Design Category for a structure. The Site Classification is based on the upper 100 feet of the site profile defined by a weighted average value of either shear wave velocity, standard penetration resistance, or undrained shear strength in accordance with Section 20.4 of ASCE 7 and the International Building Code (IBC). Based on the soil properties observed at the site and as described on the exploration logs and results, our professional opinion is for that a **Seismic Site Classification of D** be considered for the project. Subsurface explorations at this site were extended to a maximum depth of 80 feet. The site properties below the boring depth to 100 feet were estimated based on our experience and knowledge of geologic conditions of the general area. Additional deeper borings or geophysical testing may be performed to confirm the conditions below the current boring depth.

Geotechnical Overview

Based on the results of the subsurface exploration, laboratory testing, and our analyses, it is our opinion that this site is generally suitable for the planned wastewater treatment plant provided that the recommendations included in this report are followed during the design and construction phases of the project.

The subsurface profile at this site was generally comprised of existing fill materials overlying loose to medium dense sands and silts extending to the maximum extent of the borings. The existing fill materials were encountered in each boring at the site and extended to depths between about 12 feet and 22 feet below existing grade. The existing fill materials were generally composed of poorly graded sands or sandy lean

clays containing cinders, concrete and brick fragments, organic materials, and other debris. Existing fill materials may be encountered elsewhere onsite at locations not directly explored and to different depths than noted in this report.

Due to the presence of existing fill materials extending deep below existing grade, the anticipated relatively high settlement potential for the proposed structures (if foundations bear on existing fill materials), and the variability in the composition of the existing fill materials, this man-placed material is not considered suitable for direct support of new foundations or floor slabs. Ground improvement methods or a deep foundation system (consisting of auger-cast piles, associated pile caps and a system of reinforced concrete grade beams) should be considered to support the proposed improvement foundations as an alternative to mass earthwork efforts. This includes the two feeder tanks, control/process building, make-up air unit, pump house, air units, prefabricated metal building, and the pipe bridge. The **Ground Improvement**, **Deep Foundations**, and **Specialty Foundations** sections provide additional design recommendations and construction considerations.

Groundwater was encountered in each boring between about 2 feet and 18.5 feet below existing grade. Groundwater depths will present challenges during deep foundation construction, and a temporary dewatering system will likely be required for proposed deep foundation construction to ensure groundwater does not infiltrate into the drilled shafts as concrete is being poured/cured.

Our opinion of pavement section thickness design has been developed based on our understanding of the intended use, assumed traffic, and subgrade preparation recommended herein using methodologies contained in ACI 330 "Guide to Design and Construction of Concrete Parking Lots" and the AASHTO "Guide for Design of Pavement Structures" (1993). The **Pavements** section includes minimum pavement component thickness.

Results of the Geophysical Survey are presented in the **Geophysical Survey** section and in **Supporting Information**.

The recommendations contained in this report are based upon the results of field and laboratory testing (presented in the **Exploration and Laboratory Results**), engineering analyses, and our current understanding of the proposed project. The **General Comments** section provides an understanding of the report limitations.

Earthwork

Earthwork is anticipated to include clearing and grubbing, excavations, and structural fill placement. The following sections provide recommendations for use in the preparation of specifications for the work. Recommendations include quality criteria necessary to

render the site in the state considered in our geotechnical engineering evaluation for pavements.

Site Preparation

Prior to placing fill, existing vegetation, topsoil, and root mats should be removed. Complete stripping of the topsoil should be performed in the proposed parking/driveway areas.

Existing Fill and Subgrade Preparation

As noted in the **Geotechnical Overview** section, existing fill materials, which included organic materials, were encountered in each boring to depths between about 12 and 22 feet below existing grade. Fill materials could be found elsewhere on-site at locations not directly explored and to different depths than noted in this report. These materials are not considered suitable for reuse as structural fill below foundations or floor slabs at this site, and ground improvement methods or deep foundations should be considered to support foundations or floor slabs.

We recommend performing a limited undercut to partially remove the existing fill in the footprint of the parking/driveway area. The undercut should be undertaken such that a minimum thickness of about 2 feet of new properly compacted granular structural fill is established below the proposed design soil subgrade elevations for pavements. A geogrid with attached filter fabric should separate the granular structural fill materials from the existing fill materials.

After the completion of rough grading activities and undercutting, the subgrade should be proofrolled with an adequately loaded vehicle such as a vibratory smooth roller for sand subgrades or a fully loaded tandem-axle dump truck for clay subgrades. The proofrolling should be performed under the observation of the Geotechnical Engineer or their representative. Areas excessively deflecting under the proofroll should be delineated and subsequently addressed by the Geotechnical Engineer. Such areas should either be removed or modified by recompacting. Excessively wet or dry material should either be removed and replaced or moisture conditioned and recompacted.

Based upon the subsurface conditions determined from the geotechnical exploration, subgrade soils exposed during construction are anticipated to be difficult to work with. The workability of the subgrade may be affected by precipitation, repetitive construction traffic, or other factors. If unworkable conditions develop, workability may be improved by scarifying and drying, among other methods. Groundwater and seepage in excavations may create wet bottom conditions requiring stabilization prior to placement of structural fill.

Fill Material Types

Fill required to achieve design grade should be classified as structural fill and general fill. Structural fill is material used below, or within 10 feet of structures or pavements. General fill is material used to achieve grade outside of these areas.

Reuse of On-Site Soil: Excavated on-site soil may be selectively reused as fill below pavement areas. Excavated on-site fill materials are not suitable for reuse as structural fill and should not be placed beneath settlement-sensitive structures and within foundation bearing zones.

Material property requirements for on-site soil for use as general fill and structural fill are noted in the table below:

Property	General Fill	Structural Fill
Composition	Free of deleterious material	Free of deleterious material
Maximum particle size	6 inches (or 2/3 of the lift thickness)	3 inches
Fines content for Granular Soils	Not limited	Not limited
Plasticity for Cohesive Soils	Not limited	Maximum liquid limit of 45 Maximum plasticity index of 23
GeoModel Layer Expected to be Suitable ¹	2	2

1. Based on subsurface exploration. Actual material suitability should be determined in the field at time of construction.

Imported Fill Materials: Imported fill materials should meet the following material property requirements. Regardless of its source, compacted fill should consist of approved materials that are free of organic matter and debris. Frozen material should not be used, and fill should not be placed on a frozen subgrade.

Soil Type ¹	USCS Classification	Acceptable Parameters (for Structural Fill)
Granular	GW, GP, GM, GC, SW, SP, SM, SC	Less than 30% passing No. 200 sieve

Soil Type ¹	USCS Classification	Acceptable Parameters (for Structural Fill)
------------------------	---------------------	---

1. Structural and general fill should consist of approved materials free of organic matter and debris. Frozen material should not be used, and fill should not be placed on a frozen subgrade. A sample of each material type should be submitted to the Geotechnical Engineer for evaluation prior to use on this site. Additional geotechnical consultation should be provided prior to use of uniformly graded gravel on the site.

Fill Placement and Compaction Requirements

Structural and general fill should meet the following compaction requirements.

Item	Structural Fill	General Fill
Maximum Lift Thickness	8 inches or less in loose thickness when heavy, self-propelled compaction equipment is used 6 inches in loose thickness when hand-guided equipment (i.e. jumping jack or plate compactor) is used	Same as structural fill
Minimum Compaction Requirements ^{1,2}	98% of max.	95% of max.
Water Content Range ¹	Granular: -3% to +3% of optimum	As required to achieve min. compaction requirements

1. Maximum density and optimum water content as determined by the standard Proctor test (ASTM D 698).
2. If the granular material is a coarse sand or gravel, or of a uniform size, or has a low fines content, compaction comparison to relative density may be more appropriate. In this case, granular materials should be compacted to at least 70% relative density (ASTM D 4253 and D 4254). Materials not amenable to density testing should be placed and compacted to a stable condition observed by the Geotechnical Engineer or representative.

Utility Trench Backfill

Any soft or unsuitable materials encountered at the bottom of utility trench excavations should be removed and replaced with structural fill or bedding material in accordance

with public works specifications for the utility be supported. This recommendation is particularly applicable to utility work requiring grade control and/or in areas where subsequent grade raising could cause settlement in the subgrade supporting the utility. Trench excavation should not be conducted below a downward 1:1 projection from existing foundations without engineering review of shoring requirements and geotechnical observation during construction.

On-site existing fill materials are not considered suitable for backfill of utility and pipe trenches from 1 foot above the top of the pipe to the final ground surface. Granular soils are recommended for trench backfill in structural areas due to their relative ease of compaction in confined areas as opposed to cohesive soils.

Trench backfill should be mechanically placed and compacted as discussed earlier in this report. Compaction of initial lifts should be accomplished with hand-operated tampers or other lightweight compactors. Where trenches are placed beneath slabs or footings, the backfill should satisfy the gradation and expansion index requirements of engineered fill discussed in this report. Flooding or jetting for placement and compaction of backfill is not recommended.

Grading and Drainage

All grades must provide effective drainage away from the building and other structures during and after construction and should be maintained throughout the life of the structures. Water retained next to the building or structures can result in soil movements greater than those discussed in this report. Greater movements can result in unacceptable differential slab and/or foundation movements, cracked slabs and walls, and roof leaks. The roof of the building should have gutters/drains with downspouts that discharge onto splash blocks at a distance of at least 10 feet from the building.

Exposed ground should be sloped and maintained at a minimum 5 percent away from the building for at least 10 feet beyond the perimeter of the building. Locally, flatter grades may be necessary to transition ADA access requirements for flatwork. After improvement construction and landscaping have been completed, final grades should be verified to document effective drainage has been achieved. Grades around the structures should also be periodically observed and adjusted, as necessary, as part of the structure's maintenance program. Where paving or flatwork abuts the structures, a maintenance program should be established to effectively seal and maintain joints and prevent surface water infiltration.

Earthwork Construction Considerations

Shallow excavations for the proposed pavements are anticipated to be accomplished with conventional construction equipment. Upon completion of filling and grading, care

should be taken to maintain the subgrade water content prior to construction of grade-supported improvements such as pavements. Construction traffic over the completed subgrades should be avoided. The site should also be graded to prevent ponding of surface water on the prepared subgrades or in excavations. Water collecting over or adjacent to construction areas should be removed. If the subgrade freezes, desiccates, saturates, or is disturbed, the affected material should be removed, or the materials should be scarified, moisture conditioned, and recompacted prior to floor slab construction.

The groundwater table will affect deep foundation construction efforts. A temporary dewatering system will likely be necessary to complete foundation construction depending on groundwater conditions at the time of construction.

As a minimum, excavations should be performed in accordance with OSHA 29 CFR, Part 1926, Subpart P, "Excavations" and its appendices, and in accordance with any applicable local and/or state regulations.

Construction site safety is the sole responsibility of the contractor who controls the means, methods, and sequencing of construction operations. Under no circumstances shall the information provided herein be interpreted to mean Terracon is assuming responsibility for construction site safety or the contractor's activities; such responsibility shall neither be implied nor inferred.

Excavations or other activities resulting in ground disturbance have the potential to affect adjoining properties and structures. Our scope of services does not include review of available final grading information or consider potential temporary grading performed by the contractor for potential effects such as ground movement beyond the project limits. A preconstruction/ precondition survey should be conducted to document nearby property/infrastructure prior to any site development activity. Excavation or ground disturbance activities adjacent or near property lines should be observed or instrumented for potential ground movements that could negatively affect adjoining property and/or structures.

Construction Observation and Testing

The earthwork efforts should be observed by the Geotechnical Engineer (or others under their direction). Observation should include documentation of adequate removal of surficial materials (vegetation, topsoil, and pavements), evaluation and remediation of existing fill materials, as well as proofrolling and mitigation of unsuitable areas delineated by the proofroll.

Each lift of compacted fill should be tested, evaluated, and reworked, as necessary, as recommended by the Geotechnical Engineer prior to placement of additional lifts. Each lift of fill should be tested for density and water content at a frequency of at least one

test for every 5,000 square feet in pavement areas. Where not specified by local ordinance, one density and water content test should be performed for every 100 linear feet of compacted utility trench backfill and a minimum of one test performed for every 12 vertical inches of compacted backfill.

In areas of foundation excavations, the bearing subgrade should be evaluated by the Geotechnical Engineer. If unanticipated conditions are observed, the Geotechnical Engineer should prescribe improvement options.

In addition to the documentation of the essential parameters necessary for construction, the continuation of the Geotechnical Engineer into the construction phase of the project provides the continuity to maintain the Geotechnical Engineer's evaluation of subsurface conditions, including assessing variations and associated design changes.

Ground Improvement

We understand consideration is being given to placing lightly loaded structures on mat slab foundations bearing directly on existing fill materials. If the owner elects to construct the mat slab foundations on the existing fill to reduce initial construction costs in exchange for increased potential longer-term distress and settlement, the following protocol should be followed.

We recommend performing a limited undercut to partially remove the existing fill in the footprint of the proposed lightly loaded structures expected to bear directly on existing fill materials. The undercut should be undertaken such that a minimum thickness of about 2 feet of new properly compacted granular structural fill is established below the proposed design soil subgrade elevations for mat slab foundations. A geogrid with attached filter fabric should separate the granular structural fill materials from the existing fill materials. Following this process, the entire area, if space allows it, should be proofrolled with a heavy vibratory drum roller. The proofrolling should be performed under the observation of the Geotechnical Engineer or representative. Areas excessively deflecting under the proofroll should be delineated and subsequently addressed by the Geotechnical Engineer. Such areas should either be removed or modified by moisture conditioning and recompacting. Excessively wet or dry material should either be removed or moisture conditioned and recompacted.

Settlement cannot be accurately estimated due to variability in the composition of the existing fill materials; however, a maximum allowable bearing capacity of 500 psf may be used for the design of mat slab foundations bearing directly on existing fill materials. Supporting structures directly on existing fill materials should only be considered for structures with a total load (dead and live combined) of up to 20 kips.

Without any ground improvement at this project site, mat foundations of the make-up air unit, pump house, and air pressure units are expected to experience foundation settlement likely beyond the acceptable settlement tolerances of these structures.

As an alternative to supporting the structures on deep foundations or performing a mass undercut for the shallow foundations, the mat slab foundations could be supported on lower strength/lower density existing fill soils if ground improvement methods are utilized to improve their strength properties and settlement characteristics. Ground improvement methods are proprietary systems designed by licensed contractors who could provide further information regarding support options.

A possible ground improvement alternative that may allow more efficient shallow foundation support (i.e. higher allowable bearing pressures and/or lower estimated settlement) includes the installation of rammed aggregate piers. An aggregate pier consists of a stone-filled column constructed by excavating a cylindrical hole and backfilling it with crushed stone placed in lifts and applying a high degree of compactive effort resulting in stone filled piers. The aggregate pier construction process not only results in a rigid stone-filled column that lends support to structures, it also helps to densify the soils surrounding the pier. Aggregate pier foundations are a proprietary product and, if considered, should be designed and installed by a specialty contractor. Due to the specialty of this soil improvement procedure, we recommend that a performance specification be used for this system.

Anticipated ground improvement design parameters and settlement responses are summarized in the table below:

Boring Nos.	Structure	Anticipated Area to be Improved around Structure	Anticipated Settlement Response after Ground Improvement
B-2	Make-Up Air Unit/Pump House	35 feet by 35 feet (concentric pattern around mat slab dimension of 25-foot square)	Less than 1 inch
B-3	Air Pressure Units	20 feet by 20 feet (concentric pattern around mat slab dimension of 10-foot square)	Less than 1 inch

We understand if aggregate pier foundations are utilized, the aggregate pier design firm will be the geotechnical engineer of record for these foundations. As such, the design

firm would provide the necessary design parameters for the planned foundation system including, but not limited to, allowable bearing capacity, settlement estimates and foundation-specific earthwork recommendations.

Deep Foundations

Auger-Cast Pile Design Parameters

Due to the presence of existing fill materials extending deep below existing grade and the variability in the composition of the existing fill materials, we recommend the improvements at this site be supported with deep foundations. We anticipate that columns for the control/process building, prefabricated metal building, and pipe bridge as well as mat slab foundations for the thickener feed tank and DAF feed tank will be supported with deep foundation elements.

We recommend that the deep foundation elements consist of individual, continuous flight auger piles, commonly referred to as Augered and Cast-in-Place (auger-cast) piles. Due to the proximity of the proposed pipe bridge to the existing facility buildings supporting equipment that may be sensitive to vibrations caused by the pile driving operation, driving piles may not be acceptable for this project. Terracon has reviewed the use of drilled piers (also known as caissons). In our view, drilled caissons would require the installation of very deep casing or the use of a polymer drilling fluid due to potential water-bearing sand layers. Based on these reasons, we recommend consideration be given to using auger-cast piles to support the structures referenced in this section. The main advantage of auger-cast piles is they can be constructed without the driving noise and vibration inherent in the driven pile.

Auger-cast piles are installed by continuous flight augering into the overburden soil utilizing a hollow-stem auger with typical diameters varying from 12 to 18 inches, although larger sizes are available by some specialty contractors. Upon reaching the required depth, grout is pumped through the center of the auger as the auger is turned and withdrawn, resulting in a continuous column of cement grout. Reinforcement of auger-cast piles is achieved by immersing a vertical reinforcement bar or cage into the center of each pile, while the grout is still fluid.

There are several risks associated with the installation of auger cast piles since little of the operation can be seen. It is important that a continuous flow of grout be provided to the auger, and during the auger extraction, rotation and grout pumping not be interrupted. Interruption of any of these activities can cause discontinuities in the pile. There is also a risk that significantly higher grout pumping and pile enlargement could occur within the weak, organic soil/existing fill zone. The piles should be installed by using a drilled displacement method which will minimize spoils and avoid possible mining

of adjacent soils. If piles are installed improperly, it is also possible for soils below the water-table to be mined which can cause settlement of adjacent structures. We recommend that only experienced contractors with Automated Monitoring Equipment (AME) be considered for the project.

Due to the organic nature of the existing fill materials, the existing fill layer may settle throughout the life of the structure. If the fill materials settle substantially, downdrag forces may develop on the piles which would reduce the skin friction of the piles. To avoid substantial settlement of the existing fill materials, the site grading process should be such that no more than 2 feet of new fill should be added to achieve finished grades.

The estimated static end bearing and skin friction resistances for auger-cast piles are provided below. The estimated allowable resistances are for single auger-cast piles and auger-cast piles in a group with center-to-center spacing of at least three pile diameters. If a project-specific load test is performed, then a safety factor of 2.0 can be used for end bearing. If a load test is not performed, then a safety factor of 3.0 should be used to estimate the allowable end bearing resistance and a safety factor of 2.0 should be used to estimate the allowable unit side friction under compressive loads. Resistance to uplift will be provided by the dead weight of the auger-cast pile and the allowable skin friction resistance (based on a safety factor of 3.0) below a depth of 4 feet. If piles are being used to resist uplift, then full length steel reinforcement must be used in the design.

We recommend that all auger-cast piles be extended to an elevation of at least 680 feet or deeper for the control/process building and DAF feed tank to ensure that the piles are end-bearing in native granular soils of at least medium dense compactness (Borings B-1, B-2, and B-3). We also recommend that all auger-cast piles be extended to an elevation of at least 729 feet or deeper for the thickener feed tank, prefabricated metal building, and pipe bridge to ensure that the piles are end-bearing in native granular soils of at least medium dense compactness (Borings B-4, B-8, B-9, and B-10).

We expect that 18-inch auger-cast piles can achieve at least 45-ton allowable compression capacity based on an approximate pile tip elevation of 680 feet (or lower) for the control/process building and DAF feed tank. We expect that 18-inch auger-cast piles can achieve at least 10-ton allowable compression capacity based on an approximate pile tip elevation of 729 feet (or lower) for the thickener feed tank, prefabricated metal building, and pipe bridge. The following pile capacities are summarized in the table below.

Compression Pile Capacities for an 18-inch diameter Auger-Cast Pile:

Approximate Pile Tip Elevation (Feet)	Approximate Pile Length (Feet)	Allowable Compression Capacity (tons)	Allowable Compression Capacity ¹ (tons)	Boring No.	Proposed Structure
682	80	45	48	B-1	Control/process building, DAF feeder tank
681	80	45	48	B-2	
686	80	69	75	B-3	
729	35	17	22	B-4	Prefabricated metal building, thickener feed tank
732	30	12	14	B-8	Pipe bridge
732	30	15	18	B-9	
732	30	10	11	B-10	

1. Allowable compression capacity in tons using a Factor of Safety of 2.0 for skin friction and end bearing (only if project specific pile load test is performed).

The design parameters for each boring completed in a proposed improvement area are presented in the following design tables.

Boring B-1 ¹								
Depth Below Existing Grade (Feet)			Approximate Elevation (Feet)			General Soil/Rock Description (GeoModel Layer) ²	Allowable Side Friction ³ (psf) (FS = 2)	Allowable End Bearing ⁴ (psf) (FS = 3)
0	to	4	762	to	758	Frost Zone (1)		
4	to	17	758	to	745	Existing Fill (1)	---	---
17	to	27	745	to	735	Poorly Graded Sand (2)	125	3,500
27	to	47	735	to	715	Poorly Graded Sand (2)	300	8,000
47	to	62	715	to	700	Silty Sand/Sandy Silt (2)	175	2,500
62	to	80	700	to	682	Poorly Graded Sand (2)	400	6,500

1. Design capacities are dependent upon the method of installation, and quality control parameters. The values provided are estimates and should be verified after finalization of installation protocol.

2. See **Geotechnical Characterization** and the attached boring logs for more details on soil layers.
3. Applicable for compressive loading only. Reduce to 0.67 of the values shown for uplift loading. Effective weight of pile can be added to uplift load capacity.
4. Piles should extend at least 3 feet into the bearing stratum for end bearing to be considered.

Boring B-2 ¹									
Depth Below Existing Grade (Feet)			Approximate Elevation (Feet)			General Soil/Rock Description (GeoModel Layer) ²	Allowable Side Friction ³ (psf) (FS = 2)	Allowable End Bearing ⁴ (psf) (FS = 3)	
0	to	4	761	to	757	Frost Zone (1)			
4	to	17	757	to	744	Existing Fill (1)	---	---	
17	to	27	744	to	734	Poorly Graded Sand with Clay and Gravel (2)	225	8,500	
27	to	37	734	to	724	Sandy Silt (2)	200	4,000	
37	to	43	724	to	718	Silty Sand (2)	525	11,000	
43	to	57	718	to	704	Silty Sand/Sandy Silt (2)	250	4,000	
57	to	67	704	to	694	Sandy Silt (2)	425	7,500	
67	to	77	694	to	684	Sandy Silt (2)	200	3,000	
77	to	80	684	to	681	Sandy Lean Clay (2)	425	4,500	

1. Design capacities are dependent upon the method of installation, and quality control parameters. The values provided are estimates and should be verified after finalization of installation protocol.
2. See **Geotechnical Characterization** and the attached boring logs for more details on soil layers.
3. Applicable for compressive loading only. Reduce to 0.67 of the values shown for uplift loading. Effective weight of pile can be added to uplift load capacity.
4. Piles should extend at least 3 feet into the bearing stratum for end bearing to be considered.

Boring B-3 ¹									
Depth Below Existing Grade (Feet)			Approximate Elevation (Feet)			General Soil/Rock Description (GeoModel Layer) ²	Allowable Side Friction ³ (psf) (FS = 2)	Allowable End Bearing ⁴ (psf) (FS = 3)	
0	to	4	766	to	762	Frost Zone (1)			
4	to	22	762	to	744	Existing Fill (1)	---	---	
22	to	32	744	to	734	Poorly Graded Sand with Gravel (2)	200	5,500	
32	to	37	734	to	729	Sandy Lean Clay (2)	425	4,500	
37	to	52	729	to	714	Poorly Graded Sand (2)	575	12,500	
52	to	57	714	to	709	Clayey Gravel (2)	325	5,000	
57	to	62	709	to	704	Sandy Silt (2)	450	11,500	
62	to	72	704	to	694	Silty Sand (2)	375	5,500	
72	to	80	694	to	686	Sandy Silt (2)	550	12,500	

1. Design capacities are dependent upon the method of installation, and quality control parameters. The values provided are estimates and should be verified after finalization of installation protocol.
2. See [Geotechnical Characterization](#) and the attached boring logs for more details on soil layers.
3. Applicable for compressive loading only. Reduce to 0.67 of the values shown for uplift loading. Effective weight of pile can be added to uplift load capacity.
4. Piles should extend at least 3 feet into the bearing stratum for end bearing to be considered.

Boring B-4 ¹									
Depth Below Existing Grade (Feet)			Approximate Elevation (Feet)			General Soil/Rock Description (GeoModel Layer) ²	Allowable Side Friction ³ (psf) (FS = 2)	Allowable End Bearing ⁴ (psf) (FS = 3)	
0	to	4	764	to	760	Frost Zone (1)			
4	to	22	760	to	742	Existing Fill (1)	---	---	
22	to	27	742	to	737	Clayey Sand (2)	250	12,000	
27	to	35	737	to	729	Poorly Graded Sand (2)	300	10,000	

1. Design capacities are dependent upon the method of installation, and quality control parameters. The values provided are estimates and should be verified after finalization of installation protocol.
2. See [Geotechnical Characterization](#) and the attached boring logs for more details on soil layers.
3. Applicable for compressive loading only. Reduce to 0.67 of the values shown for uplift loading. Effective weight of pile can be added to uplift load capacity.
4. Piles should extend at least 3 feet into the bearing stratum for end bearing to be considered.

Boring B-8 ¹									
Depth Below Existing Grade (Feet)			Approximate Elevation (Feet)			General Soil/Rock Description (GeoModel Layer) ²	Allowable Side Friction ³ (psf) (FS = 2)	Allowable End Bearing ⁴ (psf) (FS = 3)	
0	to	4	762	to	758	Frost Zone (1)			
4	to	12	758	to	750	Existing Fill (1)	---	---	
12	to	17	750	to	745	Poorly Graded Sand with Clay and Gravel (2)	150	6,500	
17	to	27	745	to	735	Poorly Graded Sand (2)	250	11,000	
27	to	30	735	to	732	Poorly Graded Sand (2)	225	4,000	

1. Design capacities are dependent upon the method of installation, and quality control parameters. The values provided are estimates and should be verified after finalization of installation protocol.
2. See **Geotechnical Characterization** and the attached boring logs for more details on soil layers.
3. Applicable for compressive loading only. Reduce to 0.67 of the values shown for uplift loading. Effective weight of pile can be added to uplift load capacity.
4. Piles should extend at least 3 feet into the bearing stratum for end bearing to be considered.

Boring B-9 ¹									
Depth Below Existing Grade (Feet)			Approximate Elevation (Feet)			General Soil/Rock Description (GeoModel Layer) ²	Allowable Side Friction ³ (psf) (FS = 2)	Allowable End Bearing ⁴ (psf) (FS = 3)	
0	to	4	762	to	758	Frost Zone (1)			
4	to	12	758	to	750	Existing Fill (1)	---	---	
12	to	17	750	to	745	Poorly Graded Sand with Gravel (2)	125	4,500	
17	to	30	745	to	732	Poorly Graded Sand with Gravel (2)	225	8,000	

1. Design capacities are dependent upon the method of installation, and quality control parameters. The values provided are estimates and should be verified after finalization of installation protocol.
2. See **Geotechnical Characterization** and the attached boring logs for more details on soil layers.
3. Applicable for compressive loading only. Reduce to 0.67 of the values shown for uplift loading. Effective weight of pile can be added to uplift load capacity.
4. Piles should extend at least 3 feet into the bearing stratum for end bearing to be considered.

Boring B-10 ¹									
Depth Below Existing Grade (Feet)			Approximate Elevation (Feet)			General Soil/Rock Description (GeoModel Layer) ²	Allowable Side Friction ³ (psf) (FS = 2)	Allowable End Bearing ⁴ (psf) (FS = 3)	
0	to	4	762	to	758	Frost Zone (1)			
4	to	22	758	to	740	Existing Fill (1)	---	---	
22	to	30	740	to	732	Poorly Graded Sand (2)	225	6,000	

1. Design capacities are dependent upon the method of installation, and quality control parameters. The values provided are estimates and should be verified after finalization of installation protocol.
2. See [Geotechnical Characterization](#) and the attached boring logs for more details on soil layers.
3. Applicable for compressive loading only. Reduce to 0.67 of the values shown for uplift loading. Effective weight of pile can be added to uplift load capacity.
4. Piles should extend at least 3 feet into the bearing stratum for end bearing to be considered.

Piles should be adequately reinforced as designed by the Structural Engineer for both tension and shear to sufficient depths. Buoyant unit weights of the soil and concrete should be used in the calculations below the highest anticipated groundwater elevation.

Piles should have a minimum (center-to-center) spacing of three diameters. Closer spacing may require a reduction in axial load capacity. Axial capacity reduction can be determined by comparing the allowable axial capacity determined from the sum of individual piles in a group versus the capacity calculated using the perimeter and base of the pile group acting as a unit. The lesser of the two capacities should be used in design.

A minimum auger-cast pile diameter of 12 inches should be used. Auger-cast pile should have a minimum length of 30 feet and should extend into the bearing strata at least three feet for the allowable end-bearing pressures listed in the above table.

Post-construction settlements of auger-cast piles designed and constructed as described in this report are estimated to range from about ¾-inch to 1 inch. Differential settlement between individual auger-cast piles is expected to be ½ to ⅔ of the total settlement.

ACIP Pile Lateral Loading

The following table lists input values for use in LPILE analyses. Modern versions of LPILE provide estimated default values of k_h and E_{50} based on strength and are recommended for the project. Since deflection or a service limit criterion will most likely control lateral capacity design, no safety/resistance factor is included with the parameters.

Boring B-1								
Stratigraphy ¹		LPILE Soil Model	S_u (psf) ²	ϕ ²	γ' (pcf) ²	E_{50}	K (pci)	
Depth (ft)	Material						Static	Cyclic
0 to 4	Frost Zone	Sand (Reese)	---	---	40	Use Default Value		
4 to 17	Existing Fill	Sand (Reese)	---	---	40	Use Default Value		
17 to 27	Poorly Graded Sand	Sand (Reese)	---	32°	50	Use Default Value		
27 to 47	Poorly Graded Sand	Sand (Reese)	---	33°	55	Use Default Value		
47 to 62	Silty Sandy/Silt	Sand (Reese)	---	29°	50	Use Default Value		
62 to 82	Poorly Graded Sand	Sand (Reese)	---	33°	55	Use Default Value		

1. See **Subsurface Profile** in **Geotechnical Characterization** for more details on Stratigraphy.

2. Definition of Terms:

S_u : Undrained shear strength

ϕ : Internal friction angle

γ' : Effective unit weight

Boring B-2								
Stratigraphy ¹		LPILE Soil Model	S _u (psf) ²	φ ²	γ' (pcf) ²	E ₅₀	K (pci)	
Depth (ft)	Material						Static	Cyclic
0 to 4	Frost Zone	Sand (Reese)	---	---	40	Use Default Value		
4 to 17	Existing Fill	Sand (Reese)	---	---	40	Use Default Value		
17 to 27	Poorly Graded Sand with Clay and Gravel	Sand (Reese)	---	33°	55	Use Default Value		
27 to 37	Sandy Silt	Sand (Reese)	---	31°	50	Use Default Value		
37 to 43	Silty Sand	Sand (Reese)	---	33°	55	Use Default Value		
43 to 57	Silty Sand/Sandy Silt	Sand (Reese)	---	31°	50	Use Default Value		
57 to 67	Sandy Silt	Sand (Reese)	---	33°	55	Use Default Value		
67 to 77	Sandy Silt	Sand (Reese)	---	30°	50	Use Default Value		
77 to 80	Sandy Lean Clay	Stiff Clay w/o Free Water	1,500	---	55	Use Default Value		

1. See **Subsurface Profile** in **Geotechnical Characterization** for more details on Stratigraphy.
2. Definition of Terms:
 - S_u: Undrained shear strength
 - φ: Internal friction angle
 - γ': Effective unit weight

Boring B-3								
Stratigraphy ¹		LPILE Soil Model	S _u (psf) ²	φ ²	γ' (pcf) ²	E ₅₀	K (pci)	
Depth (ft)	Material						Static	Cyclic
0 to 4	Frost Zone	Sand (Reese)	---	---	40	Use Default Value		
4 to 22	Existing Fill	Sand (Reese)	---	---	40	Use Default Value		
22 to 32	Poorly Graded Sand with Gravel	Sand (Reese)	---	32°	50	Use Default Value		
32 to 37	Sandy Lean Clay	Stiff Clay w/o Free Water	1,500	---	55	Use Default Value		
37 to 52	Poorly Graded Sand	Sand (Reese)	---	33°	55	Use Default Value		
52 to 57	Clayey Gravel	Sand (Reese)	---	32°	50	Use Default Value		
57 to 62	Sandy Silt	Sand (Reese)	---	31°	55	Use Default Value		
62 to 72	Silty Sand	Sand (Reese)	---	31°	50	Use Default Value		
72 to 80	Sandy Silt	Sand (Reese)	---	31°	55	Use Default Value		

1. See **Subsurface Profile** in [Geotechnical Characterization](#) for more details on Stratigraphy.
2. Definition of Terms:
 - S_u: Undrained shear strength
 - φ: Internal friction angle
 - γ': Effective unit weight

Boring B-4								
Stratigraphy ¹		LPILE Soil Model	S _u (psf) ²	φ ²	γ' (pcf) ²	ε ₅₀	K (pci)	
Elevation	Material						Static	Cyclic
0 to 4	Frost Zone	Sand (Reese)	---	---	40	Use Default Value		
4 to 22	Existing Fill	Sand (Reese)	---	---	40	Use Default Value		
22 to 27	Clayey Sand	Sand (Reese)	---	31°	55	Use Default Value		
27 to 35	Poorly Graded Sand	Sand (Reese)	---	33°	50	Use Default Value		

1. See **Subsurface Profile** in [Geotechnical Characterization](#) for more details on Stratigraphy.

2. Definition of Terms:

S_u: Undrained shear strength

φ: Internal friction angle

γ': Effective unit weight

Boring B-8								
Stratigraphy ¹		LPILE Soil Model	S _u (psf) ²	φ ²	γ' (pcf) ²	ε ₅₀	K (pci)	
Elevation	Material						Static	Cyclic
0 to 4	Frost Zone	Sand (Reese)	---	---	40	Use Default Value		
4 to 12	Existing Fill	Sand (Reese)	---	---	40	Use Default Value		
12 to 17	Poorly Graded Sand with Clay and Gravel	Sand (Reese)	---	32°	55	Use Default Value		
17 to 27	Poorly Graded Sand	Sand (Reese)	---	33°	55	Use Default Value		
27 to 30	Poorly Graded Sand	Sand (Reese)	---	31°	50	Use Default Value		

1. See **Subsurface Profile** in **Geotechnical Characterization** for more details on Stratigraphy.

2. Definition of Terms:

S_u: Undrained shear strength

φ: Internal friction angle

γ': Effective unit weight

Boring B-9								
Stratigraphy ¹		LPILE Soil Model	S _u (psf) ²	φ ²	γ' (pcf) ²	ε ₅₀	K (pci)	
Elevation	Material						Static	Cyclic
0 to 4	Frost Zone	Sand (Reese)	---	---	40	Use Default Value		
4 to 12	Existing Fill	Sand (Reese)	---	---	40	Use Default Value		
12 to 17	Poorly Graded	Sand (Reese)	---	32°	50	Use Default Value		

Boring B-9								
Stratigraphy ¹		LPILE Soil Model	S _u (psf) ²	φ ²	γ' (pcf) ²	ε ₅₀	K (pci)	
Elevation	Material						Static	Cyclic
	Sand with Gravel							
17 to 30	Poorly Graded Sand with Gravel	Sand (Reese)	---	33°	55	Use Default Value		

1. See **Subsurface Profile** in **Geotechnical Characterization** for more details on Stratigraphy.
2. Definition of Terms:
 - S_u: Undrained shear strength
 - φ: Internal friction angle
 - γ': Effective unit weight

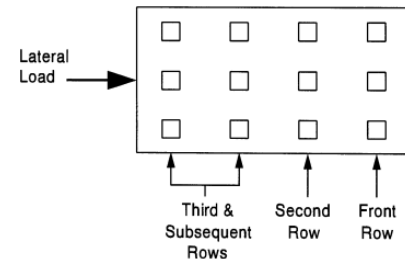
Boring B-10								
Stratigraphy ¹		LPILE Soil Model	S _u (psf) ²	φ ²	γ' (pcf) ²	ε ₅₀	K (pci)	
Depth (ft)	Material						Static	Cyclic
0 to 4	Frost Zone	Sand (Reese)	---	---	40	Use Default Value		
4 to 22	Existing Fill	Sand (Reese)	---	35°	40	Use Default Value		
22 to 30	Poorly Graded Sand	Sand (Reese)	---	30°	55	Use Default Value		

3. See **Subsurface Profile** in **Geotechnical Characterization** for more details on Stratigraphy.
4. Definition of Terms:
 - S_u: Undrained shear strength
 - φ: Internal friction angle
 - γ': Effective unit weight

When piles are used in groups, the lateral capacities of the piles in the second, third, and subsequent rows of the group should be reduced as compared to the capacity of a single, independent pile. Guidance for applying p-multiplier factors to the p values in the p-y curves for each row of pile foundations within a pile group are as follows:

Center to Center Pile Spacing ^{1,2}	P-Multiplier, P_m ³		
	Front Row	Second Row	Third and Subsequent Rows
3B	0.8	0.4	0.3
4B	0.9	0.65	0.5
5B	1.0	0.85	0.7
6B	1.0	1.0	1.0

1. Spacing in the direction of loading. B = pile diameter
2. For the case of a single row of piles supporting a laterally loaded grade beam, group action for lateral resistance of piles would need be considered when spacing is less than three pile diameters (measured center-to-center).
3. See adjacent figure for definition of front, second and third rows.



ACIP Pile Construction Considerations

Installation of adjacent piles with a clear distance spacing of less than ten pile diameters should be delayed until grout in the initial pile has set to avoid possible grout intrusion between the piles which could jeopardize pile integrity.

Proper ACIP pile installation is highly operator-dependent and requires a greater than average dependence on quality workmanship and quality control. In addition, the successful ACIP pile completion largely depends on the equipment and installation procedures. The auger should be withdrawn in a controlled manner and a sufficient head of grout should always be maintained in the augers to prevent necking of fluid grout due to hydrostatic pressures.

If practical drilling refusal is experienced above the planned termination depth, then a boulder or other obstruction may be present, and a replacement pile should be installed. The situation should be evaluated by the Geotechnical Engineer and the Structural Engineer during the pile driving operations. Continued "hard" drilling to attempt to extend through an obstruction should not be performed due to the possibility of excessive soil removal.

The ACIP pile installation process should be performed under observation of the Geotechnical Engineer. The Geotechnical Engineer should document the pile installation process including soil and groundwater conditions observed, consistency with expected conditions, and details of the installed pile.

Specialty Foundations

As an alternative to performing mass undercuts, utilizing ground improvement methods, or utilizing auger-cast piles, helical piers could be considered for support of the pipe bridge foundations.

Helical Piers

Helical piers consist of varying diameter helices (auger blades) welded to a section of steel rod. Rod extensions are used above the section with the helices. The piers are screwed into the ground with a calibrated torque-head either braced in position or mounted to a skid steer. Increased pier capacity (up to a limit) is achieved by advancing the pier to depths achieving increased applied torque during installation. Helical soil pier systems are capable of achieving allowable vertical compressive capacities of 25 to 50 kips, depending on the bearing soil strata, the number of helices, and the diameter of helices utilized. Helical piers are designed and installed by a specialty contractor. Due to the specialty of this foundation system, we recommend that a performance specification be used on the project.

Particulars regarding such items as pier spacing, pier length, and element capacity should be determined by an experienced and qualified specialty contractor familiar with this procedure in conjunction with the geotechnical and structural engineers for this project. Terracon recommends that the helical piers should extend to bear in the underlying medium dense granular soils. The axial capacity of helical piers is reviewed at the time of installation and helical piers are designed by licensed contractors. We recommend that settlement estimates and allowable load capacities be provided for the piers under the design loading conditions. The project structural engineer should review these estimates to determine if additional piers may be required to further reduce the anticipated movement.

We recommend that a Terracon representative be on site during pier installation to observe and document the installation procedures, and to note the torque applied to each pier. Terracon should review the proposed test procedures and load tests with the contractor prior to testing.

Floor Slabs

Due to the presence of existing fill materials extending deep below existing grade and the variability in the composition of the existing fill materials, we recommend that the floor slabs in the control/process building be supported with a structural slab. We anticipate that the structural slab will be supported by a system of grade beams which will in turn be supported by the deep foundation elements of the control/process building. Without the support of the structural slab, settlement of the floor slabs supported on existing fill materials cannot be accurately predicted and could result in slab cracking or failure.

Below Grade Structures and Lateral Earth Pressures

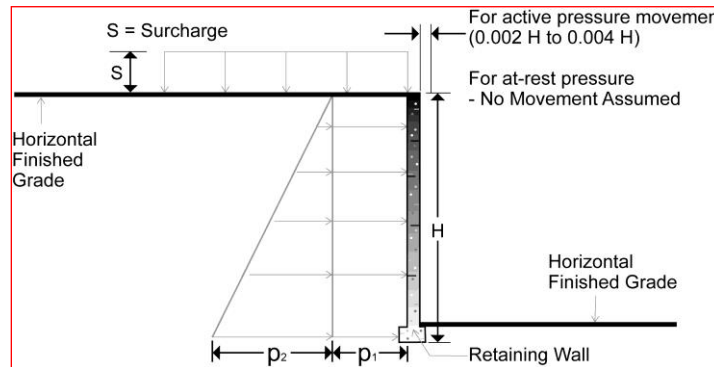
Design Parameters

We understand that a sump pit is planned to be constructed inside of the control/process building, extending about 10 feet below the finished floor elevation of about 763 feet. It will be located near Boring B-1. Groundwater was encountered at a depth of about 17 feet below existing grade (about Elev. 745) after drilling activities. Depending on the time of construction, temporary earth retention and dewatering may be required during construction of the sump pit. The loading characteristics of the sump pit elements typically result in no net increase in stress at the base level away from the foundations. We recommend that a layer of crushed stone or a lean concrete mud mat be placed at the base of the excavation to create a stable working surface for construction of the sump pit. This layer is anticipated to be about two feet in thickness.

The designer should design the sump pit to resist uplift by buoyant forces associated with design groundwater/flood levels. Uplift resistance of foundations can be developed from the effective weight of the footing and the overlying soils. The effective weight of the soil prism defined by diagonal planes extending up from the top of the perimeter of the foundation to the ground surface at an angle of 20 degrees from the vertical can be included in uplift resistance. The maximum allowable uplift capacity should be taken as a sum of the effective weight of soil plus the dead weight of the foundation, divided by an appropriate factor of safety. A maximum total unit weight of 110 pcf could be used for granular backfill at this site. This unit weight should be reduced to 50 pcf for portions of the backfill or natural soils below the design groundwater/flood elevation.

Structures with unbalanced backfill levels on opposite sides should be designed for earth pressures at least equal to values indicated in the following table. Earth pressures will be influenced by structural design of the walls, conditions of wall restraint, methods of

construction, and/or compaction and the strength of the materials being restrained. Two wall restraint conditions are shown in the diagram below. Active earth pressure is commonly used for design of free-standing cantilever retaining walls and assumes wall movement. The “at-rest” condition assumes no wall movement and is commonly used for basement walls, loading dock walls, or other walls restrained at the top. The recommended design lateral earth pressures do not include a factor of safety and do not provide for possible hydrostatic pressure on the walls (unless stated).



Lateral Earth Pressure Design Parameters

Earth Pressure Condition ¹	Coefficient for Backfill Type ²	Surcharge Pressure ³ p ₁ (psf)	Equivalent Fluid Pressures (psf) ^{2,4}	
			Unsaturated ⁵	Submerged ⁵
Active (K _a)	Granular - 0.36	(0.36)S	(14)H	(54)H
	Fine Grained - 0.41	(0.41)S	(16)H	(53)H
At-Rest (K _o)	Granular - 0.53	(0.53)S	(21)H	(50)H
	Fine Grained - 0.58	(0.58)S	(23)H	(49)H
Passive (K _p)	Granular - 2.77	(2.77)S	(111)H	(1)H
	Fine Grained - 2.46	(2.46)S	(99)H	(8)H

1. For active earth pressure, wall must rotate about base, with top lateral movements 0.002 H to 0.004 H, where H is wall height. For passive earth pressure, wall must move horizontally to mobilize resistance. Fat clay or other expansive soils should not be used as backfill behind the wall.
2. Uniform, horizontal backfill, with a maximum unit weight of 40 pcf for cohesive and granular soils.
3. Uniform surcharge, where S is surcharge pressure.
4. Loading from heavy compaction equipment is not included.
5. To achieve “Unsaturated” conditions, follow guidelines in **Subsurface Drainage for Below-Grade Walls** below. “Submerged” conditions are recommended when drainage behind walls is not incorporated into the design.

Backfill placed against structures should consist of granular soils or low plasticity cohesive soils. For the granular values to be valid, the granular backfill must extend out and up from the base of the wall at an angle of at least 45 degrees from vertical for the active case.

Foundations or other loads bearing on backfill behind walls may have a significant influence on the lateral earth pressure. Placing foundations within wall backfill and in the zone of active soil influence on the wall should be avoided unless structural analyses indicate the wall can safely withstand the increased pressure.

The lateral earth pressure recommendations given in this section are applicable to the design of rigid retaining walls subject to slight rotation (active case), such as cantilever, or gravity type concrete walls and walls not anticipated to be subject to rotation (at-rest case). These recommendations are not applicable to the design of modular block - geogrid reinforced backfill walls (also termed MSE walls). Recommendations covering these types of wall systems are beyond the scope of services for this assignment. However, we would be pleased to develop a proposal for evaluation and design of such wall systems upon request.

Pavements

General Pavement Comments

Pavement designs are provided for the traffic conditions and pavement life conditions as noted in **Project Description** and in the following sections of this report. A critical aspect of pavement performance is site preparation. Pavement designs noted in this section must be applied to the site which has been prepared as recommended in the **Earthwork** section.

As discussed in the **Earthwork** section, unsuitable existing fill materials were encountered in each boring at this site and these materials may behave unpredictably in the future. To help create a more uniform subgrade condition below the pavement, we recommend that the existing fill materials be undercut to a depth of 24 inches and replaced with a properly placed and compacted structural fill material. A geogrid with attached separation fabric should be placed before the structural fill to separate the existing fill and structural fill materials prior to pouring concrete.

Pavement Design Parameters

A modulus of subgrade reaction of 80 pci was used for the Portland cement concrete (PCC) pavement designs. The value was empirically derived based upon our experience with the sand subgrade soils and our expectation of the quality of the subgrade as

prescribed by the **Existing Fill and Subgrade Preparation** recommendations presented in **Earthwork**. A modulus of rupture of 580 psi was used in design for the concrete (based on correlations with a minimum 28-day compressive strength of 4,000 psi).

Pavement Section Thicknesses

Based on our expectation that the parking area will be subjected to HS20 truck traffic and that the drive areas will be subjected to a maximum twelve trucks per day, it is our opinion that the pavement section noted below is acceptable for this site.

Layer ¹	Pavement Section Thickness (inches)				
	Sections	Asphaltic Concrete ²		Portland Cement Concrete ²	Aggregate Base Course ³
		Surface Course	Binder Course		
All areas	PCC	---	---	8	6

1. See **Project Description** for more specifics regarding traffic assumptions.
2. All materials should meet the current MDOT Standard Specifications for Construction.
3. MDOT 21AA or an approved alternate gradation.

Areas for parking of heavy vehicles, concentrated turn areas, and start/stop maneuvers could require thicker pavement sections. Edge restraints (i.e. concrete curbs or aggregate shoulders) should be planned along curves and areas of maneuvering vehicles.

Although not required for structural support, a minimum 6-inch-thick base course layer is recommended to help reduce potential for slab curl, shrinkage cracking, and subgrade pumping through joints and for constructability considerations. Proper joint spacing will also be required to prevent excessive slab curling and shrinkage cracking. Joints should be sealed to prevent entry of foreign material and doweled where necessary for load transfer. PCC pavement details for joint spacing, joint reinforcement, and joint sealing should be prepared in accordance with ACI 330 and ACI 325.

Where practical, we recommend early-entry cutting of crack-control joints in PCC pavements. Cutting of the concrete in its “green” state typically reduces the potential for micro-cracking of the pavements prior to the crack control joints being formed, compared to cutting the joints after the concrete has fully set. Micro-cracking of pavements may lead to crack formation in locations other than the sawed joints, and/or reduction of fatigue life of the pavement.

Openings in pavements, such as decorative landscaped areas, are sources for water infiltration into surrounding pavement systems. Water can collect in the islands and migrate into the surrounding subgrade soils thereby degrading support of the pavement. Islands with raised concrete curbs, irrigated foliage, and low permeability near-surface soils are particular areas of concern. The civil design for the pavements with these conditions should include features to restrict or collect and discharge excess water from the islands. Examples of features are edge drains connected to the stormwater collection system, longitudinal subdrains, or other suitable outlets and impermeable barriers preventing lateral migration of water such as a cutoff wall installed to a depth below the pavement structure.

Pavement Drainage

Pavements should be sloped to provide rapid drainage of surface water. Water allowed to pond on or adjacent to the pavements could saturate the subgrade and contribute to premature pavement deterioration. In addition, the pavement subgrade should be graded to provide positive drainage within the granular base section. Appropriate sub-drainage or connection to a suitable daylight outlet should be provided to remove water from the granular subbase.

Pavement Maintenance

The pavement sections represent minimum recommended thicknesses and, as such, periodic upkeep should be anticipated. Preventive maintenance should be planned and provided for through an on-going pavement management program. Maintenance activities are intended to slow the rate of pavement deterioration and to preserve the pavement investment. Pavement care consists of both localized (e.g., crack and joint sealing and patching) and global maintenance (e.g., surface sealing). Additional engineering consultation is recommended to determine the type and extent of a cost-effective program. Even with periodic maintenance, some movements and related cracking may still occur, and repairs may be required.

Pavement performance is affected by its surroundings. In addition to providing preventive maintenance, the civil engineer should consider the following recommendations in the design and layout of pavements:

- Final grade adjacent to paved areas should slope down from the edges at a minimum 2%.
- Subgrade and pavement surfaces should have a minimum 2% slope to promote proper surface drainage.
- Install pavement drainage systems surrounding areas anticipated for frequent wetting.
- Install joint sealant and seal cracks immediately.

- Seal all landscaped areas in or adjacent to pavements to reduce moisture migration to subgrade soils.

Frost Considerations

The soils on this site are frost susceptible, and small amounts of water can affect the performance of slabs-on-grade and pavements. Exterior slabs should be anticipated to heave during winter months. If frost action needs to be eliminated in critical areas, we recommend the use of non-frost susceptible (NFS) fill or structural slabs (for instance, structural stoops in front of building doors). As an alternative to extending NFS fill to the full frost depth, consideration can be made to placing extruded polystyrene or cellular concrete under a buffer of at least 2 feet of NFS material.

Geophysical Survey

The Client requested Ground Penetrating Radar (GPR) and Frequency Domain Electro-Magnetic Induction (FDEMI) to determine if buried debris, foundations, and/or obstructions are present at the site.

Exploration Methods

A Terracon representative used two types of devices to scan the site, including the Multi-Channel Ground Penetrating Radar (MCGPR) and Frequency Domain Electro Magnetic Induction (FDEMI). Above ground debris, active construction, and parked vehicles caused gaps in data coverage. The MCGPR is useful within about 5 to 6 feet below the scanned surface. Under ideal site and subsurface conditions, FDEMI typically penetrates to depths of about 12 to 15 feet.

Multi-Channel Ground Penetrating Radar (MCGPR)

Terracon used a Kontur G2124 Multi-Channel Ground Penetrating Radar. The Kontur system is a single, towable, six-foot wide multichannel and multifrequency GPR antenna. The multichannel component scans both the horizontal and vertical dipoles with 24 channels and a frequency range of 150 MHz to 3000 MHz. The GPR data was georeferenced in real-time to allow for accurate location information for identified features. Data collection was performed in a single direction when using the Kontur system due to its use of both horizontal and vertical dipole antennas.

MCGPR data was post-processed using the Examiner software suite by Kontur.

Our MCGPR utilizes electromagnetic waves directed down into the subsurface to detect changes in the materials of the area being scanned. Changes in the return signal generally indicate changes in the physical properties of subsurface materials such as, but not limited to, electromagnetic conductivity and dielectric constant, which in some cases can be qualitatively linked to other material properties such as density material type, or moisture content.

MCGPR data was processed for position correction and background filtering. The MCGPR data is then evaluated in orthogonal and cross-section views for analysis. The MCGPR data was also processed to produce an overlay plan based on amplitude of the signal.

The MCGPR system is geo-referenced using a Leica GS-18 system with sub-meter horizontal accuracy. Upon completion of the field survey, the EM data was processed to yield a contour map of ground conductivity and magnetic susceptibility. Objects such as buried debris and foundations produce a higher amplitude than undisturbed soils.

Frequency Domain Electro-Magnetic Induction (FDEMI)

Terracon also used a FDEMI system consisting of a Geonics EM-31 system with a data logger to collect electromagnetic (EM) data. Frequency domain electromagnetic induction works by introducing a sinusoidally varying current at a specific frequency. The electromagnetic force is shifted in both the primary and secondary field. The terrain conductivity method provides information on the lateral variation of the electrical conductivity of the subsurface. These changes in conductivity can arise from natural changes in soil composition or from buried foreign objects. For measurement purposes the signal is also broken down into both quadrature (ground conductivity) and in-phase (magnetic susceptibility) components. The ground conductivity component is useful for detecting both metallic and non-metallic objects.

Findings

Exhibits 1 through 5 referenced in this section are provided in **Supporting Information**. A Terracon representative scanned unobstructed areas within the project boundary as shown in **Exhibit 1**.

Ground Penetrating Radar (Exhibits 2 and 3): GPR data showed anomalies consistent with potential debris, foundations, reinforced concrete, and utilities throughout the site. Apparent debris was encountered throughout the site and is highlighted with red polygons.

A possible buried slab was observed in the southeastern section of the property and is highlighted with a green polygon. This anomaly is observed as a bright reflective layer about seven ft bgs and could also be the result of contrasting soil from an excavation.

A reinforced concrete slab was located in the central west portion of the property running north to south direction. These were highlighted in the exhibit with an orange polygon.

Apparent abandoned utilities were located in the northwestern and central section of the property and are depicted as purple lines highlighting their locations. Examples of these features are shown in **Exhibit 3**.

Ground Conductivity (Exhibit 4): Ground conductivity showed small pockets of anomalies consistent with debris. These are highlighted on the exhibit with purple polygons. Anomalies on the eastern and southern parts of the property are consistent with debris located within the GPR data. Anomalies on the northern side of the property partially correlate with GPR data and boring logs and may be associated with some interference from above-ground objects such as vehicles or buildings.

Magnetic Susceptibility (Exhibit 5): Magnetic susceptibility showed small pockets of anomalies consistent with metallic debris. These are highlighted on the exhibit with purple polygons. The anomaly located at the center of the property is consistent with debris located within the GPR data. The northern anomaly is consistent with known debris recovered in boring B-10.

Please note that this geophysical exploration was not conducted in accordance with ASCE 38-22 for subsurface utility engineering. This was not an exhaustive utility survey and should not be used for construction purposes. Some utilities may not be detectable with geophysical methods due to material and soil types. Terracon is not responsible for undetectable utilities encountered during construction.

Limitations

It should be noted the non-destructive testing processes rely on instrument signals to indicate physical conditions in the field. Signal information can be affected by on-site conditions beyond the control of the operator, such as, but not limited to concrete/soil types, concrete/soil moisture and/or reinforcing steel spacing. Interpretation of those signals is based on a combination of known factors combined with the experience of the operator and geophysicist evaluating the results. Utilizing conventional observation, sampling, and testing (e.g., more intrusive methods such as test pits or borings) of select areas are recommended to confirm the results from the non-destructive testing surveys. As with all non-destructive methods, the results provide a level of confidence but should not be considered absolute. We cannot be responsible for the interpretation of results by others.

This report has been prepared for the exclusive use of our client for specific application to the project discussed and has been prepared in accordance with generally accepted geophysical practices. No warranties, either express or implied, are intended or made.

The results presented in this report are based upon the data obtained from the non-destructive testing surveys and from other information discussed in this report. This report does not reflect variations that may occur in areas inaccessible to the testing equipment, across the site, or due to the modifying effects of construction or weather. The nature and extent of such variations may not become evident until during or after construction.

General Comments

Our analysis and opinions are based upon our understanding of the project, the geotechnical conditions in the area, and the data obtained from our site exploration. Variations will occur between exploration point locations or due to the modifying effects of construction or weather. The nature and extent of such variations may not become evident until during or after construction. Terracon should be retained as the Geotechnical Engineer, where noted in this report, to provide observation and testing services during pertinent construction phases. If variations appear, we can provide further evaluation and supplemental recommendations. If variations are noted in the absence of our observation and testing services on-site, we should be immediately notified so that we can provide evaluation and supplemental recommendations.

Our Scope of Services does not include either specifically or by implication any environmental or biological (e.g., mold, fungi, bacteria) assessment of the site or identification or prevention of pollutants, hazardous materials or conditions. If the owner is concerned about the potential for such contamination or pollution, other studies should be undertaken.

Our services and any correspondence are intended for the sole benefit and exclusive use of our client for specific application to the project discussed and are accomplished in accordance with generally accepted geotechnical engineering practices with no third-party beneficiaries intended. Any third-party access to services or correspondence is solely for information purposes to support the services provided by Terracon to our client. Reliance upon the services and any work product is limited to our client and is not intended for third parties. Any use or reliance of the provided information by third parties is done solely at their own risk. No warranties, either express or implied, are intended or made.

Site characteristics as provided are for design purposes and not to estimate excavation cost. Any use of our report in that regard is done at the sole risk of the excavating cost estimator as there may be variations on the site that are not apparent in the data that could significantly affect excavation cost. Any parties charged with estimating excavation costs should seek their own site characterization for specific purposes to obtain the specific level of detail necessary for costing. Site safety and cost estimating including excavation support and dewatering requirements/design are the responsibility of others.

Geotechnical Engineering Report

Relocated WWTP Items | Kalamazoo, Michigan

June 20, 2025 | Terracon Project No. CK255059



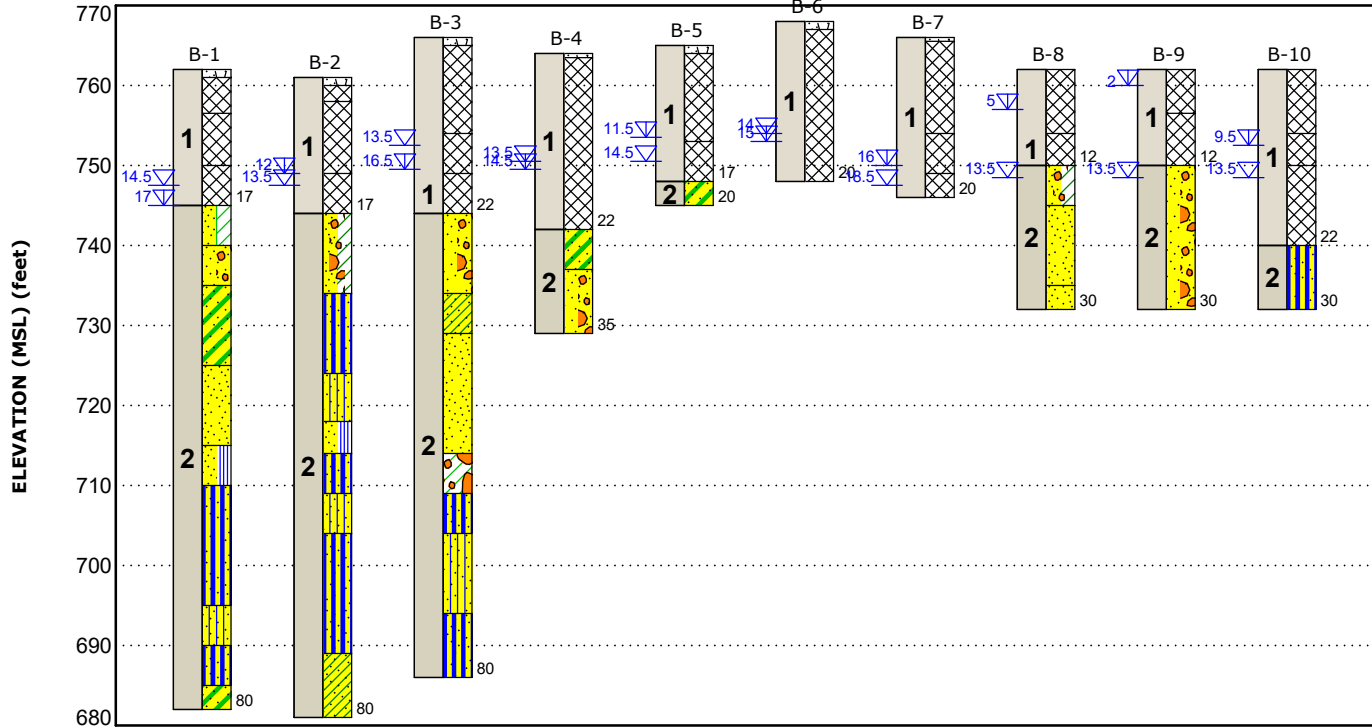
Construction and site development have the potential to affect adjacent properties. Such impacts can include damages due to vibration, modification of groundwater/surface water flow during construction, foundation movement due to undermining or subsidence from excavation, as well as noise or air quality concerns. Evaluation of these items on nearby properties are commonly associated with contractor means and methods and are not addressed in this report. The owner and contractor should consider a preconstruction/precondition survey of surrounding development. If changes in the nature, design, or location of the project are planned, our conclusions and recommendations shall not be considered valid unless we review the changes and either verify or modify our conclusions in writing.

Figures

Contents:

GeoModel

GeoModel



This is not a cross section. This is intended to display the Geotechnical Model only. See individual logs for more detailed conditions.

Model Layer	Layer Name	General Description	Legend	
1	Topsoil and Existing Fill Materials	About 6 to 12 inches of topsoil overlying poorly graded sands with varying amounts of clay and sandy lean clay fill containing cinders, wood, concrete, and brick	Topsoil	Fill
2	Cohesionless Materials	Loose to medium dense poorly graded sands with varying amounts of clay, silt, and gravel and sandy silt with occasional layers of sandy lean clay	Poorly-graded Sand with Clay	Poorly-graded Sand with Gravel
			Clayey Sand	Poorly-graded Sand
			Poorly-graded Sand with Silt	Sandy Silt
			Silty Sand	Poorly-graded Sand with Clay and Gravel
			Sandy Lean Clay	Clayey Gravel

NOTES:

Layering shown on this figure has been developed by the geotechnical engineer for purposes of modeling the subsurface conditions as required for the subsequent geotechnical engineering for this project. Numbers adjacent to soil column indicate depth below ground surface.

- First Water Observation
- Second Water Observation

Groundwater levels are temporal. The levels shown are representative of the date and time of our exploration. Significant changes are possible over time.
 Water levels shown are as measured during and/or after drilling. In some cases, boring advancement methods mask the presence/absence of groundwater. See individual logs for details.

Geotechnical Engineering Report

Relocated WWTP Items | Kalamazoo, Michigan

June 20, 2025 | Terracon Project No. CK255059



Attachments

Exploration and Testing Procedures

Field Exploration

Number of Borings	Approximate Boring Depth (feet)	Location
3 (B-1 through B-3)	80	Control/process building area
1 (B-4)	35	Prefabricated metal building area
3 (B-8 through B-10)	30	Pipe bridge area
3 (B-5 through B-7)	20	Area surrounding control/process building

Boring Layout and Elevations: Terracon personnel provided the boring layout using handheld GPS equipment (estimated horizontal accuracy of about ± 10 feet) and referencing existing site features. Approximate ground surface elevations were estimated from the Kalamazoo County GIS. If elevations and a more precise boring layout are desired, we recommend borings be surveyed.

Subsurface Exploration Procedures: We advanced the borings with a track-mounted rotary drill rig using continuous (hollow stem) flight augers. Four samples were obtained in the upper 10 feet of each boring with additional samples obtained at intervals of 5 feet thereafter. In the split-barrel sampling procedure, a standard 2-inch outer diameter split-barrel sampling spoon was driven into the ground by a 140-pound automatic hammer falling a distance of 30 inches. The number of blows required to advance the sampling spoon the last 12 inches of a normal 18-inch penetration is recorded as the Standard Penetration Test (SPT) resistance value. The SPT resistance values, also referred to as N-values, are indicated on the boring logs at the test depths. For safety purposes, all borings were backfilled with auger cuttings after their completion.

We also observed the boreholes while drilling and at the completion of drilling for the presence of groundwater. The groundwater levels are shown on the attached boring logs.

The sampling depths, penetration distances, and other sampling information were recorded on the field boring logs. The samples were placed in appropriate containers and taken to our soil laboratory for testing and classification by a geotechnical engineer. Our exploration team prepared field boring logs as part of the drilling operations. These field logs included visual classifications of the materials observed during drilling and our interpretation of the subsurface conditions between samples. Final boring logs were prepared from the field logs. The final boring logs represent the geotechnical engineer's

interpretation of the field logs and include modifications based on observations and tests of the samples in our laboratory.

Laboratory Testing

The project engineer reviewed the field data and assigned laboratory tests. The laboratory testing program included the following types of tests:

- Moisture Content
- Grain Size Analysis
- Organic Content Determination

The laboratory testing program included observation of soil samples by an engineer. Based on the results of our field and laboratory programs, we described and classified the soil samples in general accordance with the Unified Soil Classification System.

Site Location and Exploration Plans

Contents:

Site Location
Exploration Plan

Note: All attachments are one page unless noted above.

Site Location

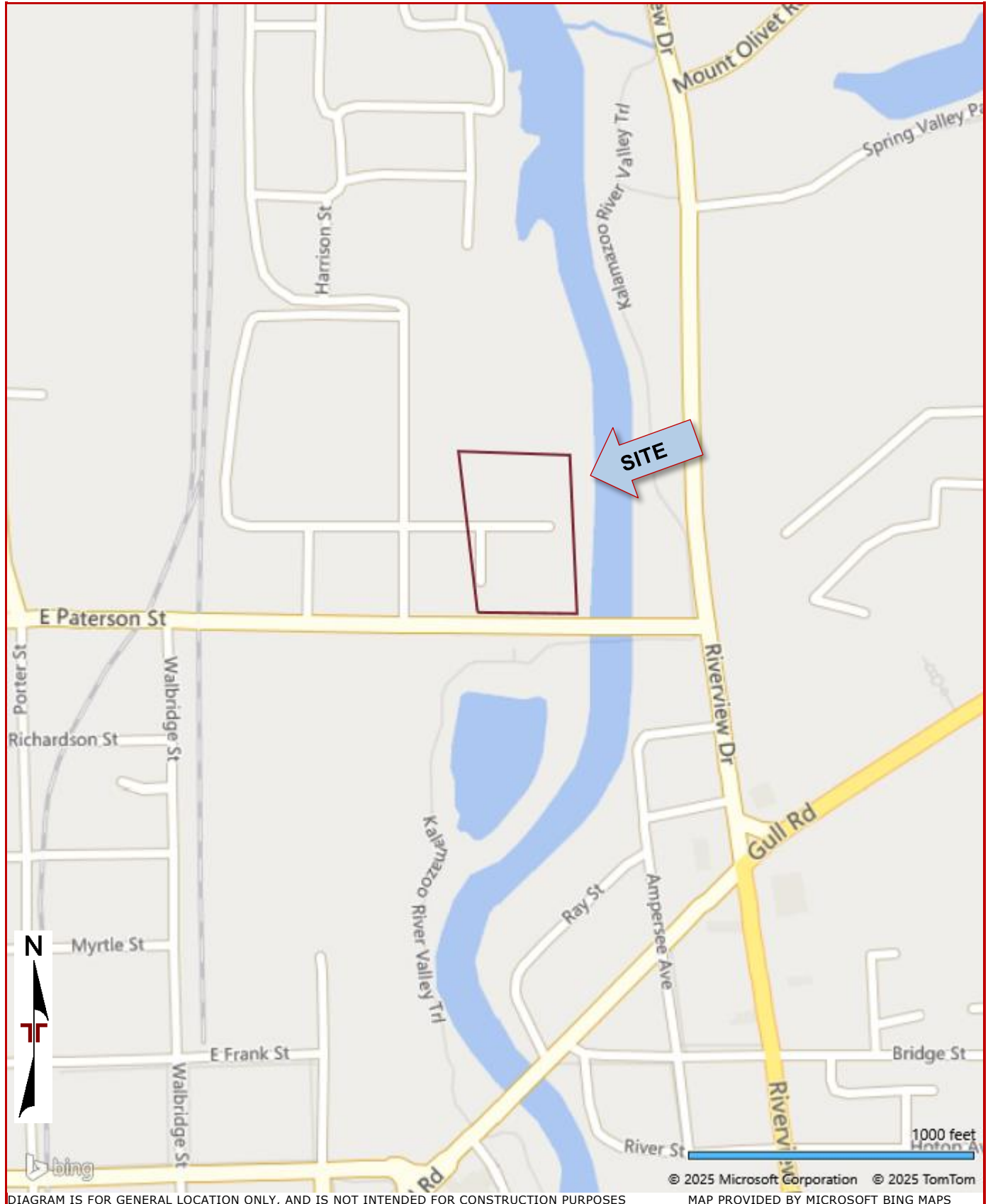
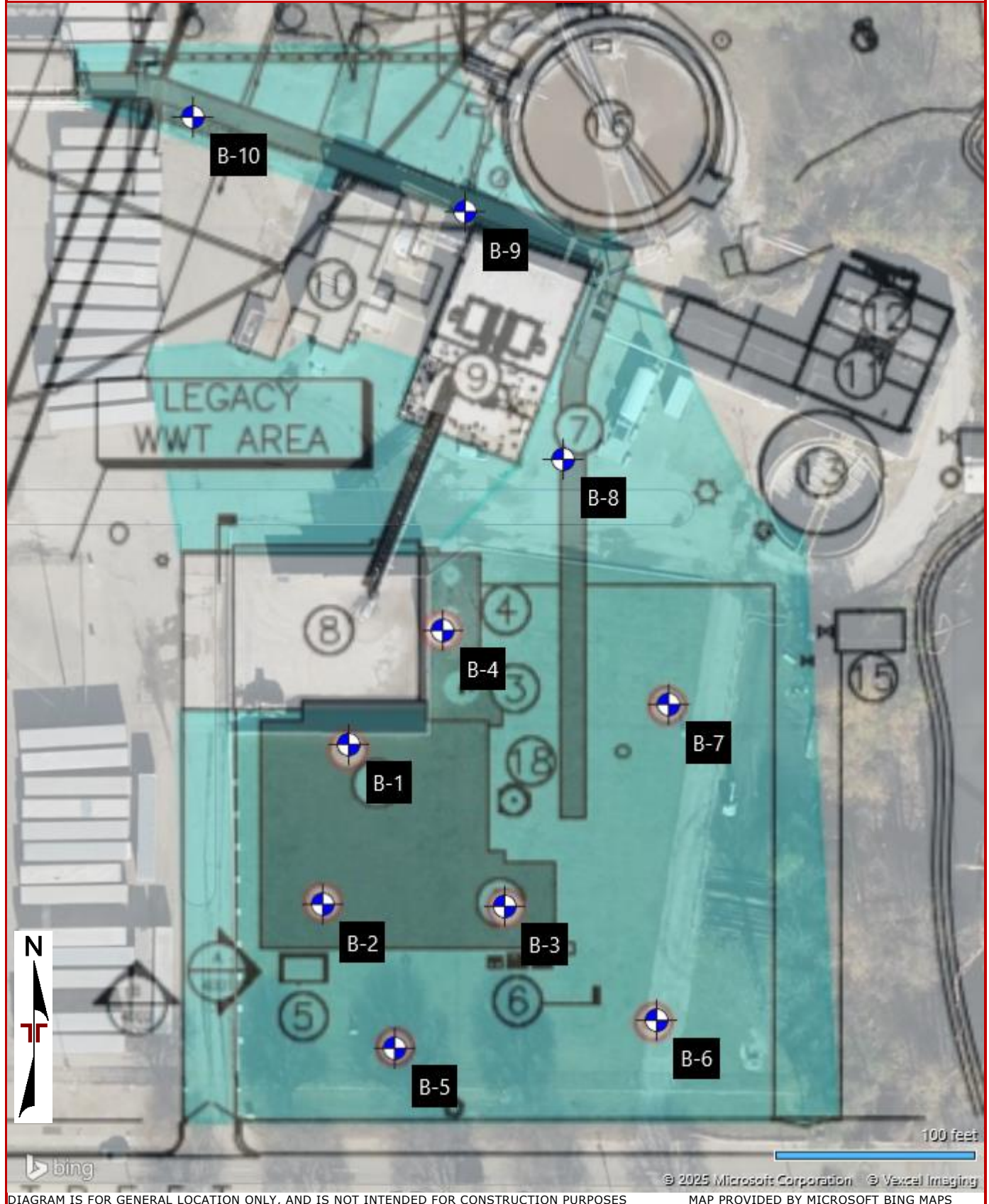


DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

© 2025 Microsoft Corporation © 2025 TomTom
MAP PROVIDED BY MICROSOFT BING MAPS

Exploration Plan



Exploration and Laboratory Results

Contents:

Boring Logs (B-1 through B-10)

Note: All attachments are one page unless noted above.

Boring Log No. B-1

Model Layer	Graphic Log	Location: See Exploration Plan Latitude: 42.3036° Longitude: -85.5726° Depth (Ft.) Approximate Elevation: 762 (Ft.)	Depth (Ft.)	Water Level Observations	Sample Type	Recovery (In.)	Field Test Results	Organic Content (%)	HP (tsf)	Water Content (%)	Percent Fines	
1		1.0 12" Topsoil FILL - POORLY GRADED SAND , brown	761				2-5-4 N=9			2.5		
		5.5 FILL - CLAYEY SAND , black	756.5				7-14-18 N=32			3.3		
		12.0 FILL - CLAYEY GRAVEL , black	750				10-11-11 N=22			17.9		
		17.0 POORLY GRADED SAND WITH CLAY (SP-SC) , fine to coarse grained, gray, loose	745	▽			5-4-6 N=10	3.4		18.3		
		22.0 POORLY GRADED SAND WITH GRAVEL (SP) , fine to coarse grained, gray, loose	740	▽			60-12-23 N=35			12.8		
2		27.0 CLAYEY SAND (SC) , fine to coarse grained, gray, medium dense With gravel in sample at about 28.5'	735	▽			2-3-1 N=4			19.4		
		37.0 POORLY GRADED SAND (SP) , fine to coarse grained, gray, medium dense	725	▽	☒			0-0-7 N=7			9.8	
							4-5-8 N=13			15.1		
							9-11-12 N=23			18.1		
							3-4-7 N=11			17.1		

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (If any).
 See [Supporting Information](#) for explanation of symbols and abbreviations.
 Elevation Reference: Elevations were interpolated from the Kalamazoo Co. GIS

Water Level Observations

▽ 14.5' while drilling
 ▽ 17' after drilling

☒ Cave in at 19'

Drill Rig
CME 55

Hammer Type
Automatic

Driller
Stearns/GG

Notes

Advancement Method
3/4" HSA

Abandonment Method

Boring backfilled with auger cuttings upon completion.

Logged by
Stearns/HT

Boring Started
05-15-2025

Boring Completed
05-15-2025

Boring Log No. B-1

Model Layer	Graphic Log	Location: See Exploration Plan Latitude: 42.3036° Longitude: -85.5726° Depth (Ft.) Approximate Elevation: 762 (Ft.)	Depth (Ft.)	Water Level Observations	Sample Type	Recovery (In.)	Field Test Results	Organic Content (%)	HP (tsf)	Water Content (%)	Percent Fines
		POORLY GRADED SAND (SP) , fine to coarse grained, gray, medium dense <i>(continued)</i>	45			18	5-6-7 N=13			16.1	
		POORLY GRADED SAND WITH SILT (SP-SM) , fine to medium grained, gray, very loose	50			7	1-1-1 N=2			19.4	
		SANDY SILT (ML) , fine to medium grained, gray, loose to medium dense	55			18	2-2-2 N=4			27.2	84.8
2			60			18	2-3-5 N=8			21.7	
			65			18	4-8-9 N=17			20.0	
		SILTY SAND (SM) , fine to medium grained, gray, medium dense	70			18	4-5-7 N=12			20.1	
		SANDY SILT (ML) , fine to medium grained, gray, medium dense	75			18	3-4-6 N=10			20.0	
		CLAYEY SAND (SC) , fine to medium grained, gray, medium dense	80			18	2-6-6 N=12			15.0	
		Boring Terminated at 80 Feet									

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (If any).
 See [Supporting Information](#) for explanation of symbols and abbreviations.
 Elevation Reference: Elevations were interpolated from the Kalamazoo Co. GIS

Water Level Observations

- 14.5' while drilling
- 17' after drilling

Cave in at 19'

Drill Rig

CME 55

Hammer Type

Automatic

Driller

Stearns/GG

Notes

Advancement Method

3/4" HSA

Abandonment Method

Boring backfilled with auger cuttings upon completion.

Logged by

Stearns/HT

Boring Started

05-15-2025

Boring Completed

05-15-2025

Boring Log No. B-2

Model Layer	Graphic Log	Location: See Exploration Plan Latitude: 42.3036° Longitude: -85.5721° Depth (Ft.) Approximate Elevation: 761 (Ft.)	Depth (Ft.)	Water Level Observations	Sample Type	Recovery (In.)	Field Test Results	Organic Content (%)	HP (tsf)	Water Content (%)	Percent Fines
		1.0 12" Topsoil	760								
1		FILL - POORLY GRADED SAND WITH CLAY , brown	760								
		FILL - CLAYEY SAND , black	758								
		12.0	749	▽							
		SANDY LEAN CLAY , black									
		17.0	744	▽							
2		POORLY GRADED SAND WITH CLAY AND GRAVEL (SP-SC) , fine to coarse grained, gray, medium dense	744								
		27.0	734								
		SANDY SILT (ML) , fine to medium grained, gray, loose									
		37.0	724								
		SILTY SAND (SM) , fine to medium grained, gray, medium dense									

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (If any).
 See [Supporting Information](#) for explanation of symbols and abbreviations.
 Elevation Reference: Elevations were interpolated from the Kalamazoo Co. GIS

Water Level Observations

- ▽ 13.5' while drilling
- ▽ 12' after drilling

Cave in at 17'

Drill Rig

CME 55

Hammer Type

Automatic

Driller

Stearns/GG

Advancement Method

3/4" HSA

Logged by

Stearns/HT

Abandonment Method

Boring backfilled with auger cuttings upon completion.

Boring Started

05-15-2025

Boring Completed

05-15-2025

Notes

Boring Log No. B-2

Model Layer	Graphic Log	Location: See Exploration Plan Latitude: 42.3036° Longitude: -85.5721° Depth (Ft.) Approximate Elevation: 761 (Ft.)	Depth (Ft.)	Water Level Observations	Sample Type	Recovery (In.)	Field Test Results	Organic Content (%)	HP (tsf)	Water Content (%)	Percent Fines
		POORLY GRADED SAND WITH SILT (SP-SM) , fine to medium grained, gray, loose	718			18	4-3-3 N=6			14.6	
		SANDY SILT (ML) , fine to medium grained, gray, loose	714			18	2-2-4 N=6			23.5	
		SILTY SAND (SM) , fine to medium grained, gray, loose	709			18	2-2-3 N=5			20.5	
		SANDY SILT (ML) , fine to medium grained, gray, medium dense to loose	704			18	3-5-8 N=13			19.7	
2		SANDY LEAN CLAY (CL) , gray, medium stiff to very stiff	689			18	3-4-7 N=11			23.0	
		SANDY LEAN CLAY (CL) , gray, medium stiff to very stiff	689			18	3-2-2 N=4			21.8	
		SANDY LEAN CLAY (CL) , gray, medium stiff to very stiff	689			3	1-2-4 N=6			13.7	
		SANDY LEAN CLAY (CL) , gray, medium stiff to very stiff	681			18	7-9-11 N=20		1.5	9.8	
		Boring Terminated at 80 Feet	80								

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (If any).
 See [Supporting Information](#) for explanation of symbols and abbreviations.
 Elevation Reference: Elevations were interpolated from the Kalamazoo Co. GIS

Water Level Observations

- 13.5' while drilling
- 12' after drilling

Cave in at 17'

Drill Rig

CME 55

Hammer Type

Automatic

Driller

Stearns/GG

Advancement Method

3/4" HSA

Logged by

Stearns/HT

Abandonment Method

Boring backfilled with auger cuttings upon completion.

Boring Started

05-15-2025

Boring Completed

05-15-2025

Notes

Boring Log No. B-3

Model Layer	Graphic Log	Location: See Exploration Plan Latitude: 42.3039° Longitude: -85.5726° Depth (Ft.) Approximate Elevation: 766 (Ft.)	Depth (Ft.)	Water Level Observations	Sample Type	Recovery (In.)	Field Test Results	Organic Content (%)	HP (tsf)	Water Content (%)	Percent Fines
	12" Topsoil		1.0								
	FILL - CLAYEY SAND , brown		765								
			5		X	14	2-5-11 N=16			9.1	
			5		X	3	7-4-5 N=9			4.5	
			10		X	1	6-6-7 N=13			9.9	
			10		X	8	4-4-3 N=7			9.8	
	12.0		754								
	FILL - CLAYEY GRAVEL , brown		15	▽	X	9	28-4-5 N=9			16.6	
			17.0	▽							
	FILL - SANDY LEAN CLAY , black		749								
1			20		X	16	1-1-2 N=3			24.7	
	22.0		744								
	POORLY GRADED SAND WITH GRAVEL (SP) , fine to coarse grained, gray, loose to medium dense		25	X	X	18	2-1-5 N=6			15.8	
			30		X	8	4-6-7 N=13			19.4	
2	32.0		734								
	SANDY LEAN CLAY (CL) , gray, stiff to very stiff		35		X	18	4-6-10 N=16		1.5	15.6	
			37.0								
	POORLY GRADED SAND (SP) , fine to medium grained, gray, medium dense		729		X	18	6-7-14 N=21			17.6	
			40								

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (If any).
 See [Supporting Information](#) for explanation of symbols and abbreviations.
 Elevation Reference: Elevations were interpolated from the Kalamazoo Co. GIS

Water Level Observations

- ▽ 13.5' while drilling
- ▽ 16.5' after drilling

~~23.0'~~ Cave in at 23'

Drill Rig
CME 55

Hammer Type
Automatic

Driller
Stearns/GG

Advancement Method
3/4" HSA

Logged by
Stearns/HT

Abandonment Method
Boring backfilled with auger cuttings upon completion.

Boring Started
05-16-2025

Boring Completed
05-16-2025

Notes

Boring Log No. B-3

Model Layer	Graphic Log	Location: See Exploration Plan Latitude: 42.3039° Longitude: -85.5726° Depth (Ft.) Approximate Elevation: 766 (Ft.)	Depth (Ft.)	Water Level Observations	Sample Type	Recovery (In.)	Field Test Results	Organic Content (%)	HP (tsf)	Water Content (%)	Percent Fines
	●●●●●	POORLY GRADED SAND (SP) , fine to medium grained, gray, medium dense <i>(continued)</i>	45	X		18	4-8-10 N=18			14.0	
	●●●●●		50	X		17	5-8-14 N=22			17.4	
	●●●●●	52.0 714 CLAYEY GRAVEL (GC) , fine to coarse grained, gray, loose	55	X		18	2-3-5 N=8			4.7	
	●●●●●	57.0 709 SANDY SILT (ML) , fine to medium grained, gray, medium dense	60	X		15	4-7-11 N=18			20.3	
2	●●●●●	62.0 704 SILTY SAND (SM) , fine to medium grained, gray, loose to medium dense	65	X		18	2-2-6 N=8			23.6	28.5
	●●●●●		70	X		11	2-5-6 N=11			17.3	
	●●●●●	72.0 694 SANDY SILT (ML) , fine to medium grained, gray, dense to medium dense	75	X		17	8-12-24 N=36			16.5	
	●●●●●	80.0 686 Boring Terminated at 80 Feet	80			18	5-5-5 N=10			20.7	

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (If any).
 See [Supporting Information](#) for explanation of symbols and abbreviations.
 Elevation Reference: Elevations were interpolated from the Kalamazoo Co. GIS

Water Level Observations

- 13.5' while drilling
- 16.5' after drilling

Cave in at 23'

Drill Rig
CME 55

Hammer Type
Automatic

Driller
Stearns/GG

Logged by
Stearns/HT

Boring Started
05-16-2025

Boring Completed
05-16-2025

Notes

Advancement Method
3/4" HSA

Abandonment Method
Boring backfilled with auger cuttings upon completion.

Boring Log No. B-4

Model Layer	Graphic Log	Location: See Exploration Plan Latitude: 42.3039° Longitude: -85.5723° Depth (Ft.) Approximate Elevation: 764 (Ft.)	Depth (Ft.)	Water Level Observations	Sample Type	Recovery (In.)	Field Test Results	Organic Content (%)	HP (tsf)	Water Content (%)	Percent Fines	
1		0.5 - 6" Topsoil 763.5										
		FILL - CLAYEY SAND , black										
					5	X	16	3-3-3 N=6			8.5	
					5	X	17	4-6-5 N=11			3.9	
					10	X	0	1-1-1 N=2				
2		22.0 742										
		CLAYEY SAND (SC) , fine to coarse grained, gray, medium dense										
					15	▽	3	1-1-2 N=3	0.5		28.6	
					20	X	3	7-9-11 N=20			30.9	
					25	X	17	7-10-10 N=20			18.1	
2		27.0 737										
		POORLY GRADED SAND WITH GRAVEL (SP) , fine to coarse grained, gray, loose to medium dense										
			30	X	6	4-5-4 N=9			9.7			
			35	X	18	8-12-12 N=24			12.4			
		Boring Terminated at 35 Feet 729										

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (If any).
 See [Supporting Information](#) for explanation of symbols and abbreviations.
 Elevation Reference: Elevations were interpolated from the Kalamazoo Co. GIS

Water Level Observations

- 13.5' while drilling
- 14.5' after drilling

Cave in at 11'

Drill Rig

CME 55

Hammer Type

Automatic

Driller

Stearns/GG

Notes

Advancement Method

3/4" HSA

Abandonment Method

Boring backfilled with auger cuttings upon completion.

Logged by

Stearns/HT

Boring Started

05-16-2025

Boring Completed

05-16-2025

Boring Log No. B-5

Model Layer	Graphic Log	Location: See Exploration Plan Latitude: 42.3035° Longitude: -85.5724° Depth (Ft.) Approximate Elevation: 765 (Ft.)	Depth (Ft.)	Water Level Observations	Sample Type	Recovery (In.)	Field Test Results	Organic Content (%)	HP (tsf)	Water Content (%)	Percent Fines	
1		1.0 12" Topsoil 764										
		FILL - CLAYEY SAND , black										
				5	X		18	7-10-9 N=19			11.9	
				5	X		17	6-3-1 N=4			14.5	
				5	X		18	3-1-2 N=3			7.3	
			10	X		3	2-2-2 N=4			13.3		
		12.0 753		▽								
		FILL - SANDY LEAN CLAY , gray										
			15	▽								
			15	X		18	1-4-8 N=12			22.9		
		17.0 748										
2		CLAYEY SAND (SC) , fine to medium grained, gray, medium dense										
		20.0 745	20	X		14	4-6-7 N=13			23.5		
		Boring Terminated at 20 Feet										

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (If any).
 See [Supporting Information](#) for explanation of symbols and abbreviations.
 Elevation Reference: Elevations were interpolated from the Kalamazoo Co. GIS

Water Level Observations

- ▽ 14.5' while drilling
- ▽ 11.5' after drilling

~~14.5'~~ Cave in at 14'

Drill Rig
CME 55

Hammer Type
Automatic

Driller
Stearns/GG

Notes

Advancement Method
3/4" HSA

Abandonment Method
Boring backfilled with auger cuttings upon completion.

Logged by
Stearns/HT

Boring Started
05-16-2025

Boring Completed
05-16-2025

Boring Log No. B-6

Model Layer	Graphic Log	Location: See Exploration Plan Latitude: 42.3035° Longitude: -85.5719°	Depth (Ft.)	Water Level Observations	Sample Type	Recovery (In.)	Field Test Results	Organic Content (%)	HP (tsf)	Water Content (%)	Percent Fines
		Depth (Ft.) Approximate Elevation: 768 (Ft.)									
	1	1.0 12" Topsoil FILL - CLAYEY SAND , black	767								
			5			18	5-7-8 N=15			10.0	
			5			6	1-1-1 N=2			8.5	
			10			14	1-2-2 N=4			13.9	
			10			12	3-3-3 N=6			9.6	
			15	▽ ▽		15	4-4-1 N=5			15.9	
			20	☒		18	2-1-2 N=3			16.6	
		Boring Terminated at 20 Feet	748								

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (If any).
 See [Supporting Information](#) for explanation of symbols and abbreviations.
 Elevation Reference: Elevations were interpolated from the Kalamazoo Co. GIS

Water Level Observations

- ▽ 14' while drilling
- ▽ 15' after drilling

☒ Cave in at 16.5'

Drill Rig

CME 55

Hammer Type

Automatic

Driller

Stearns/GG

Notes

Advancement Method

3/4" HSA

Abandonment Method

Boring backfilled with auger cuttings upon completion.

Logged by

Stearns/HT

Boring Started

05-16-2025

Boring Completed

05-16-2025

Boring Log No. B-7

Model Layer	Graphic Log	Location: See Exploration Plan Latitude: 42.3039° Longitude: -85.5719°	Depth (Ft.)	Water Level Observations	Sample Type	Recovery (In.)	Field Test Results	Organic Content (%)	HP (tsf)	Water Content (%)	Percent Fines	
		Depth (Ft.) Approximate Elevation: 766 (Ft.)										
1		0.5 - 6" Topsoil 765.5										
		FILL - CLAYEY SAND , black										
				5								
				10								
				15								
		12.0 754										
		FILL - SANDY LEAN CLAY , black										
		17.0 749		▽								
		FILL - CLAYEY SAND , black										
		20.0 746		▽								
		Boring Terminated at 20 Feet	20									

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (If any).
 See [Supporting Information](#) for explanation of symbols and abbreviations.
 Elevation Reference: Elevations were interpolated from the Kalamazoo Co. GIS

Water Level Observations

- ▽ 18.5' while drilling
- ▽ 16' after drilling

~~14.5'~~ Cave in at 14.5'

Drill Rig

CME 55

Hammer Type

Automatic

Driller

Stearns/GG

Notes

Advancement Method

3/4" HSA

Abandonment Method

Boring backfilled with auger cuttings upon completion.

Logged by

Stearns/HT

Boring Started

05-16-2025

Boring Completed

05-16-2025

Boring Log No. B-8

Model Layer	Graphic Log	Location: See Exploration Plan Latitude: 42.3043° Longitude: -85.5721° Depth (Ft.) Approximate Elevation: 762 (Ft.)	Depth (Ft.)	Water Level Observations	Sample Type	Recovery (In.)	Field Test Results	Organic Content (%)	HP (tsf)	Water Content (%)	Percent Fines	
1		FILL - CLAYEY SAND , black										
				5	12	7-6-5 N=11			13.3			
				5	7	2-3-4 N=7			34.3			
				5	6	2-1-1 N=2			23.7			
		8.0 754										
2		FILL - SANDY LEAN CLAY , black						6.9		40.5		
				10	12	1-1-1 N=2						
				12.0 750								
		POORLY GRADED SAND WITH CLAY AND GRAVEL (SP-SC) , fine to coarse grained, brown, medium dense										
				15	18	3-6-6 N=12			15.4			
				17.0 745								
		POORLY GRADED SAND (SP) , fine to coarse grained, gray, medium dense										
		20	18	6-7-9 N=16			11.7					
		25	12	4-8-12 N=20			32.1					
		27.0 735										
		POORLY GRADED SAND (SP) , fine to medium grained, gray, loose										
		30	12	1-2-5 N=7			13.8					
		30.0 732										
		Boring Terminated at 30 Feet										

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (If any).
 See [Supporting Information](#) for explanation of symbols and abbreviations.
 Elevation Reference: Elevations were interpolated from the Kalamazoo Co. GIS

Water Level Observations

- 13½' while drilling
- 5' after drilling
- Cave in at 8'

Drill Rig

CME 55

Hammer Type

Automatic

Driller

Stearns/GG

Notes

Advancement Method

3¼" HSA

Abandonment Method

Boring backfilled with auger cuttings upon completion.

Logged by

Stearns/HT

Boring Started

05-22-2025

Boring Completed

05-22-2025

Boring Log No. B-9

Model Layer	Graphic Log	Location: See Exploration Plan Latitude: 42.3046° Longitude: -85.5722° Depth (Ft.) Approximate Elevation: 762 (Ft.)	Depth (Ft.)	Water Level Observations	Sample Type	Recovery (In.)	Field Test Results	Organic Content (%)	HP (tsf)	Water Content (%)	Percent Fines	
1		FILL - CLAYEY SAND , black		▽		12	5-6-4 N=10			8.6		
			5			3	2-1-2 N=3			14.0		
		FILL - SANDY LEAN CLAY , black	5.5	756.5			6	2-1-1 N=2			11.7	
			10		18	1-1-1 N=2		37.8				
2		POORLY GRADED SAND WITH GRAVEL (SP) , fine to coarse grained, gray, loose to medium dense		▽		12	1-3-5 N=8					
			20			12	4-5-6 N=11			14.5	1.6	
			25			12	5-9-10 N=19			12.9		
			30			6	3-5-7 N=12			18.2		
		Boring Terminated at 30 Feet	30									

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (If any).
 See [Supporting Information](#) for explanation of symbols and abbreviations.
 Elevation Reference: Elevations were interpolated from the Kalamazoo Co. GIS

Water Level Observations

- ▽ 13½ while drilling
- ▽ 2' after drilling

Cave in at 9'

Drill Rig
CME 55

Hammer Type
Automatic

Driller
Stearns/GG

Notes

Advancement Method
3¼" HSA

Abandonment Method
Boring backfilled with auger cuttings upon completion.

Logged by
Stearns/HT

Boring Started
05-22-2025

Boring Completed
05-22-2025

Boring Log No. B-10

Model Layer	Graphic Log	Location: See Exploration Plan Latitude: 42.3047° Longitude: -85.5727° Depth (Ft.) Approximate Elevation: 762 (Ft.)	Depth (Ft.)	Water Level Observations	Sample Type	Recovery (In.)	Field Test Results	Organic Content (%)	HP (tsf)	Water Content (%)	Percent Fines	
1		FILL - CLAYEY SAND , black	8.0	754		17	5-3-3 N=6			5.8		
					12	2-2-2 N=4			8.6			
					3	4-2-2 N=4			15.7			
					8	3-1-2 N=3	7.2		57.6			
					10	12.0	750					
2		FILL - SANDY LEAN CLAY , black	12.0	750								
		FILL - CLAYEY SAND , gray				15	1-2-1 N=3			21.6		
		With crushed brick in sample at about 18.5'				20	8	17-11-8 N=19			23.3	
		SANDY SILT (ML) , fine to medium grained, gray, medium dense	22.0	740		25	0	4-5-6 N=11				
			30.0	732		8	4-5-5 N=10			18.7		
Boring Terminated at 30 Feet												

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (If any).
 See [Supporting Information](#) for explanation of symbols and abbreviations.
 Elevation Reference: Elevations were interpolated from the Kalamazoo Co. GIS

Water Level Observations

- 13½' while drilling
- 9½' after drilling
- Cave in at 12½'

Drill Rig

CME 55

Hammer Type

Automatic

Driller

Stearns/GG

Notes

Advancement Method

3¼" HSA

Abandonment Method

Boring backfilled with auger cuttings upon completion.

Logged by

Stearns/HT

Boring Started

05-22-2025

Boring Completed

05-22-2025

Supporting Information

Contents:






General Notes

Unified Soil Classification System

Geophysical Survey Exhibits (Exhibit 1 through 5)

Note: All attachments are one page unless noted above.

General Notes

Sampling	Water Level	Field Tests
 Standard Penetration Test	 Water Initially Encountered  Water Level After a Specified Period of Time  Water Level After a Specified Period of Time  Cave In Encountered Water levels indicated on the soil boring logs are the levels measured in the borehole at the times indicated. Groundwater level variations will occur over time. In low permeability soils, accurate determination of groundwater levels is not possible with short term water level observations.	N Standard Penetration Test Resistance (Blows/Ft.) (HP) Hand Penetrometer (T) Torvane (DCP) Dynamic Cone Penetrometer UC Unconfined Compressive Strength (PID) Photo-Ionization Detector (OVA) Organic Vapor Analyzer

Descriptive Soil Classification

Soil classification as noted on the soil boring logs is based Unified Soil Classification System. Where sufficient laboratory data exist to classify the soils consistent with ASTM D2487 "Classification of Soils for Engineering Purposes" this procedure is used. ASTM D2488 "Description and Identification of Soils (Visual-Manual Procedure)" is also used to classify the soils, particularly where insufficient laboratory data exist to classify the soils in accordance with ASTM D2487. In addition to USCS classification, coarse grained soils are classified on the basis of their in-place relative density, and fine-grained soils are classified on the basis of their consistency. See "Strength Terms" table below for details. The ASTM standards noted above are for reference to methodology in general. In some cases, variations to methods are applied as a result of local practice or professional judgment.

Location And Elevation Notes

Exploration point locations as shown on the Exploration Plan and as noted on the soil boring logs in the form of Latitude and Longitude are approximate. See Exploration and Testing Procedures in the report for the methods used to locate the exploration points for this project. Surface elevation data annotated with +/- indicates that no actual topographical survey was conducted to confirm the surface elevation. Instead, the surface elevation was approximately determined from topographic maps of the area.

Strength Terms

Relative Density of Coarse-Grained Soils (More than 50% retained on No. 200 sieve.) Density determined by Standard Penetration Resistance		Consistency of Fine-Grained Soils (50% or more passing the No. 200 sieve.) Consistency determined by laboratory shear strength testing, field visual-manual procedures or standard penetration resistance		
Relative Density	Standard Penetration or N-Value (Blows/Ft.)	Consistency	Unconfined Compressive Strength Qu (tsf)	Standard Penetration or N-Value (Blows/Ft.)
Very Loose	0 - 3	Very Soft	less than 0.25	0 - 1
Loose	4 - 9	Soft	0.25 to 0.50	2 - 4
Medium Dense	10 - 29	Medium Stiff	0.50 to 1.00	5 - 8
Dense	30 - 50	Stiff	1.00 to 2.00	9 - 15
Very Dense	> 50	Very Stiff	2.00 to 4.00	16 - 30
		Hard	> 4.00	> 30

Relevance of Exploration and Laboratory Test Results

Exploration/field results and/or laboratory test data contained within this document are intended for application to the project as described in this document. Use of such exploration/field results and/or laboratory test data should not be used independently of this document.

Unified Soil Classification System

Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests ^A				Soil Classification		
				Group Symbol	Group Name ^B	
Coarse-Grained Soils: More than 50% retained on No. 200 sieve	Gravels: More than 50% of coarse fraction retained on No. 4 sieve	Clean Gravels: Less than 5% fines ^C	$Cu \geq 4$ and $1 \leq Cc \leq 3$ ^E	GW	Well-graded gravel ^F	
		Gravels with Fines: More than 12% fines ^C	$Cu < 4$ and/or $[Cc < 1$ or $Cc > 3.0]$ ^E	GP	Poorly graded gravel ^F	
			Fines classify as ML or MH	GM	Silty gravel ^{F, G, H}	
		Sands: 50% or more of coarse fraction passes No. 4 sieve	Clean Sands: Less than 5% fines ^D	Fines classify as CL or CH	GC	Clayey gravel ^{F, G, H}
	$Cu \geq 6$ and $1 \leq Cc \leq 3$ ^E			SW	Well-graded sand ^I	
	Sands with Fines: More than 12% fines ^D	Sands with Fines: More than 12% fines ^D	$Cu < 6$ and/or $[Cc < 1$ or $Cc > 3.0]$ ^E	SP	Poorly graded sand ^I	
			Fines classify as ML or MH	SM	Silty sand ^{G, H, I}	
	Fine-Grained Soils: 50% or more passes the No. 200 sieve	Silts and Clays: Liquid limit less than 50	Inorganic:	PI > 7 and plots above "A" line ^J	CL	Lean clay ^{K, L, M}
				PI < 4 or plots below "A" line ^J	ML	Silt ^{K, L, M}
			Organic:	$\frac{LL \text{ oven dried}}{LL \text{ not dried}} < 0.75$	OL	Organic clay ^{K, L, M, N}
					Organic silt ^{K, L, M, O}	
Silts and Clays: Liquid limit 50 or more		Inorganic:	PI plots on or above "A" line	CH	Fat clay ^{K, L, M}	
			PI plots below "A" line	MH	Elastic silt ^{K, L, M}	
		Organic:	$\frac{LL \text{ oven dried}}{LL \text{ not dried}} < 0.75$	OH	Organic clay ^{K, L, M, P}	
					Organic silt ^{K, L, M, Q}	
Highly organic soils:	Primarily organic matter, dark in color, and organic odor			PT	Peat	

^A Based on the material passing the 3-inch (75-mm) sieve.

^B If field sample contained cobbles or boulders, or both, add "with cobbles or boulders, or both" to group name.

^C Gravels with 5 to 12% fines require dual symbols: GW-GM well-graded gravel with silt, GW-GC well-graded gravel with clay, GP-GM poorly graded gravel with silt, GP-GC poorly graded gravel with clay.

^D Sands with 5 to 12% fines require dual symbols: SW-SM well-graded sand with silt, SW-SC well-graded sand with clay, SP-SM poorly graded sand with silt, SP-SC poorly graded sand with clay.

^E $Cu = D_{60}/D_{10}$ $Cc = \frac{(D_{30})^2}{D_{10} \times D_{60}}$

^F If soil contains $\geq 15\%$ sand, add "with sand" to group name.

^G If fines classify as CL-ML, use dual symbol GC-GM, or SC-SM.

^H If fines are organic, add "with organic fines" to group name.

^I If soil contains $\geq 15\%$ gravel, add "with gravel" to group name.

^J If Atterberg limits plot in shaded area, soil is a CL-ML, silty clay.

^K If soil contains 15 to 29% plus No. 200, add "with sand" or "with gravel," whichever is predominant.

^L If soil contains $\geq 30\%$ plus No. 200 predominantly sand, add "sandy" to group name.

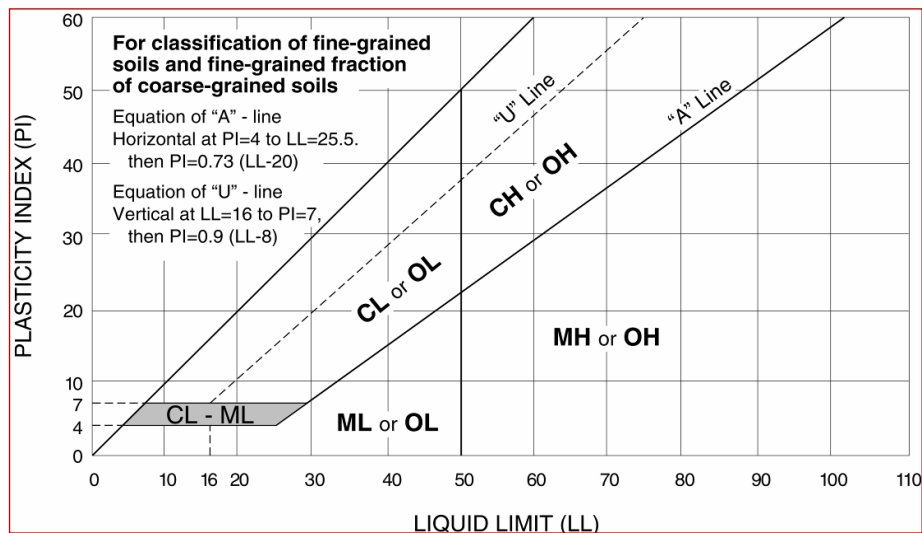
^M If soil contains $\geq 30\%$ plus No. 200, predominantly gravel, add "gravelly" to group name.

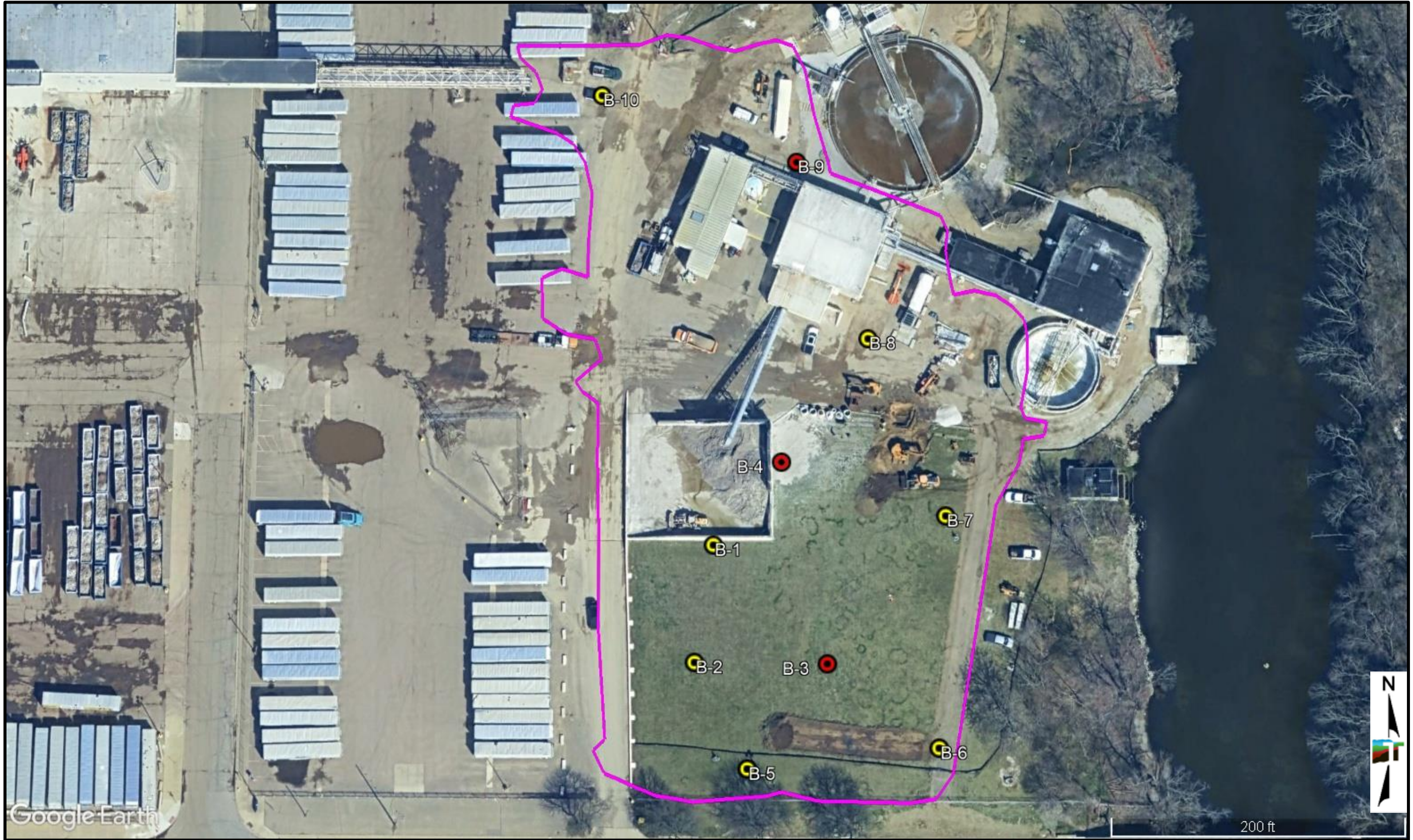
^N PI ≥ 4 and plots on or above "A" line.

^O PI < 4 or plots below "A" line.

^P PI plots on or above "A" line.

^Q PI plots below "A" line.



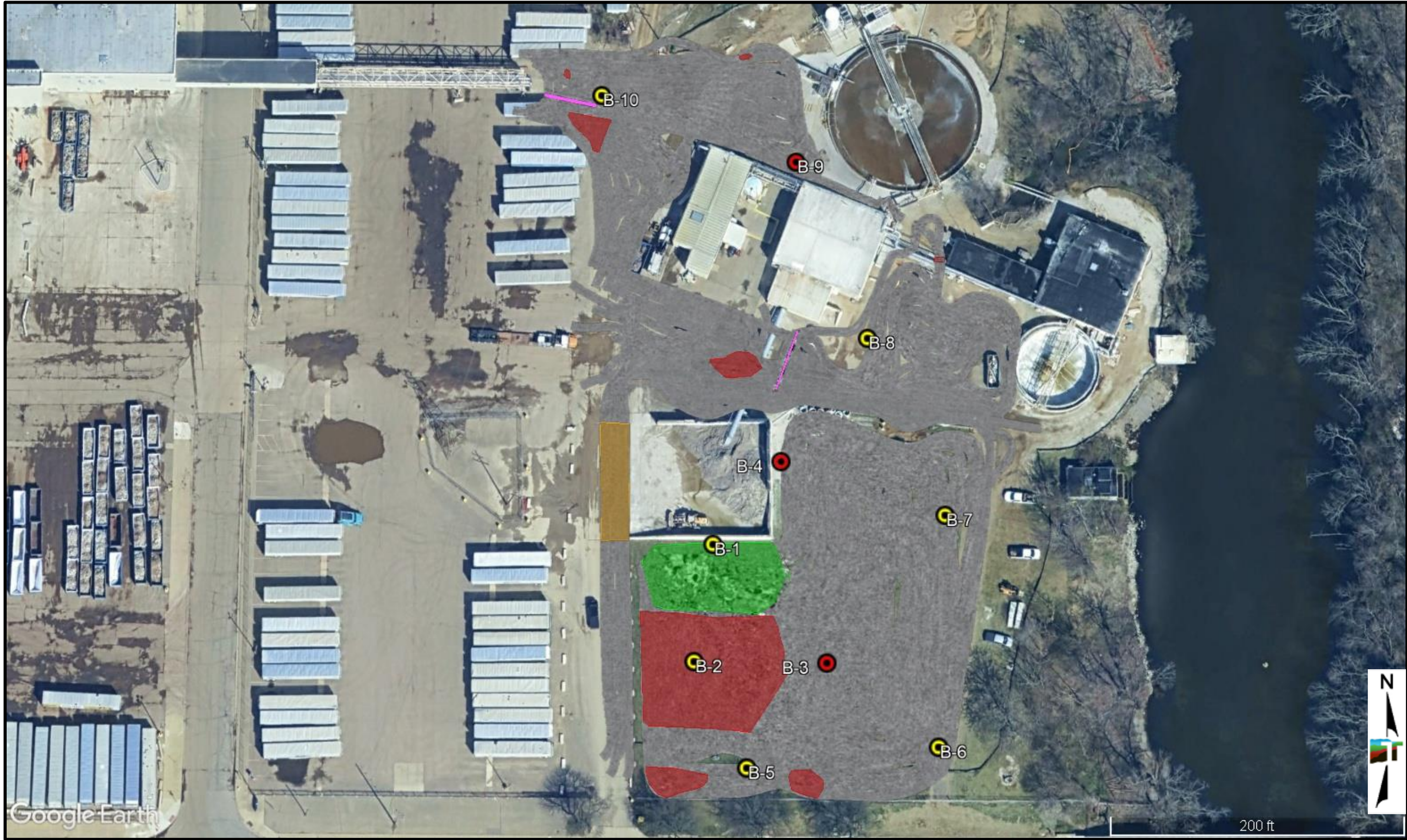


Legend

Area of Exploration

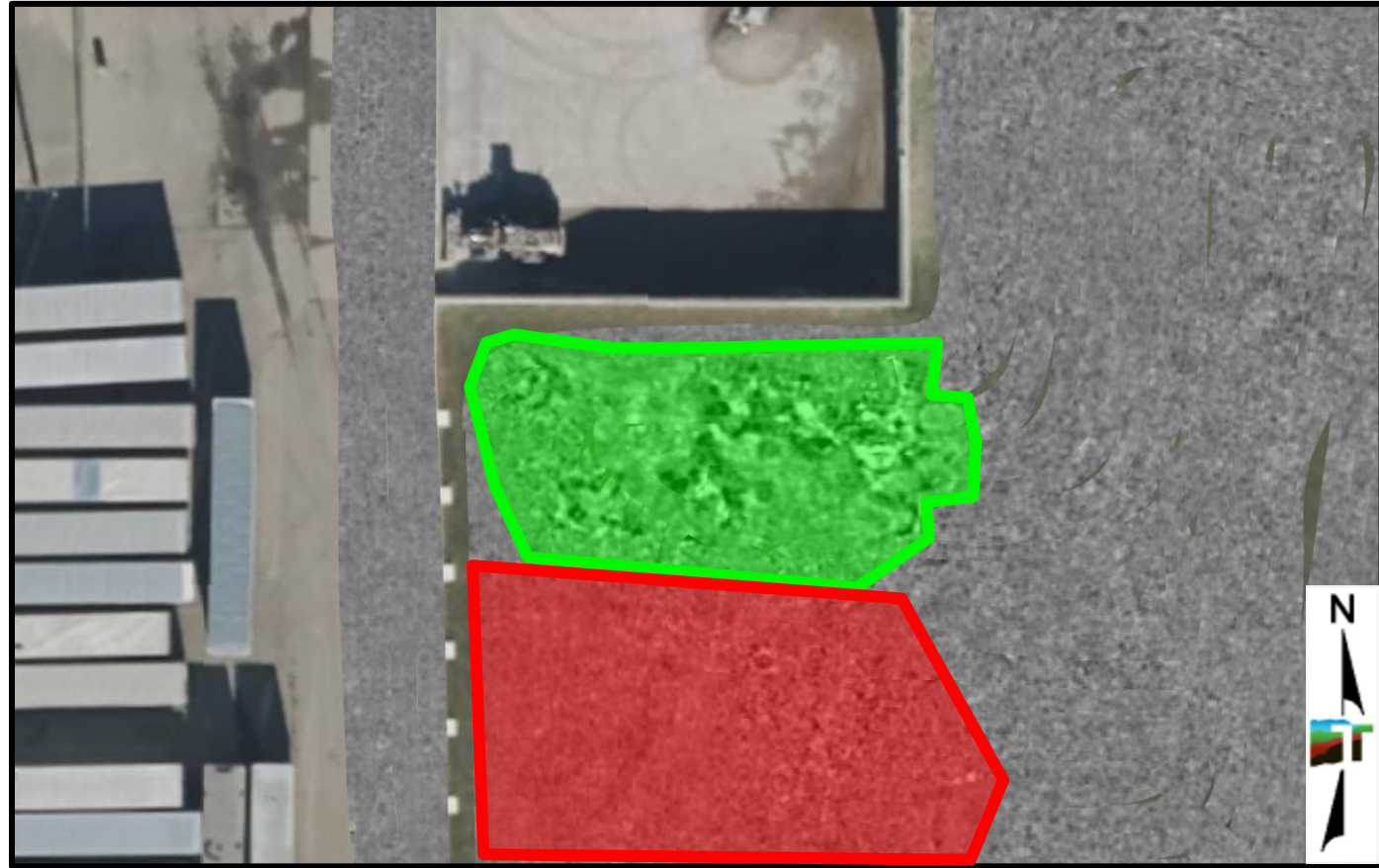
Boring

Boring with Debris

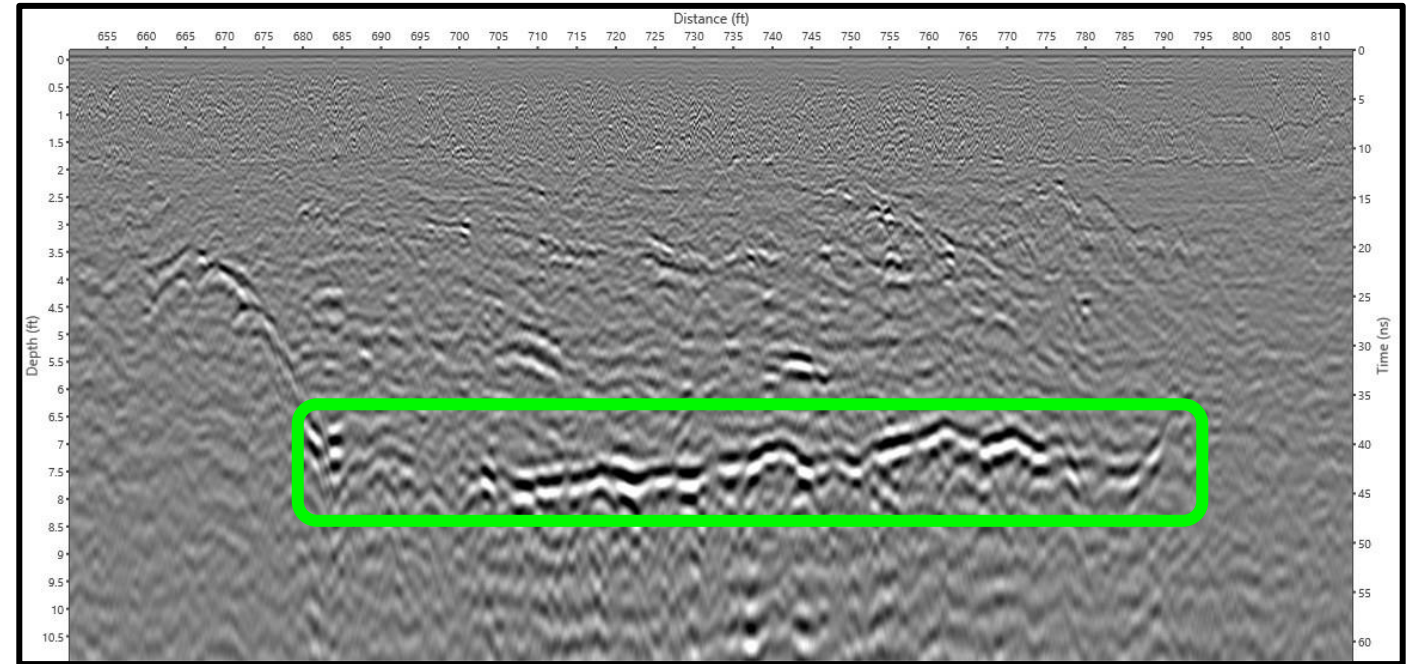


Legend

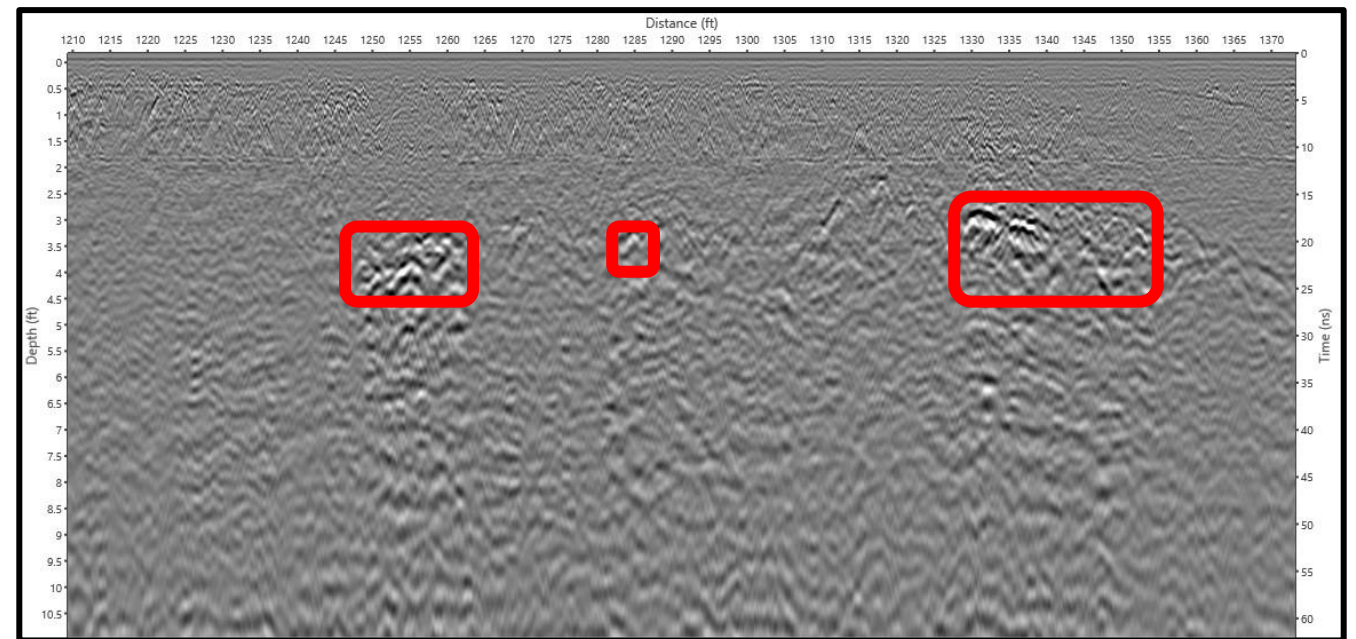
- | | | | |
|-----------------------------|--|---------------------|--|
| Debris | | Reinforced Pavement | |
| Possible Slab or Excavation | | Utilities | |
| Boring | | Boring with Debris | |





Foundation Located at Site

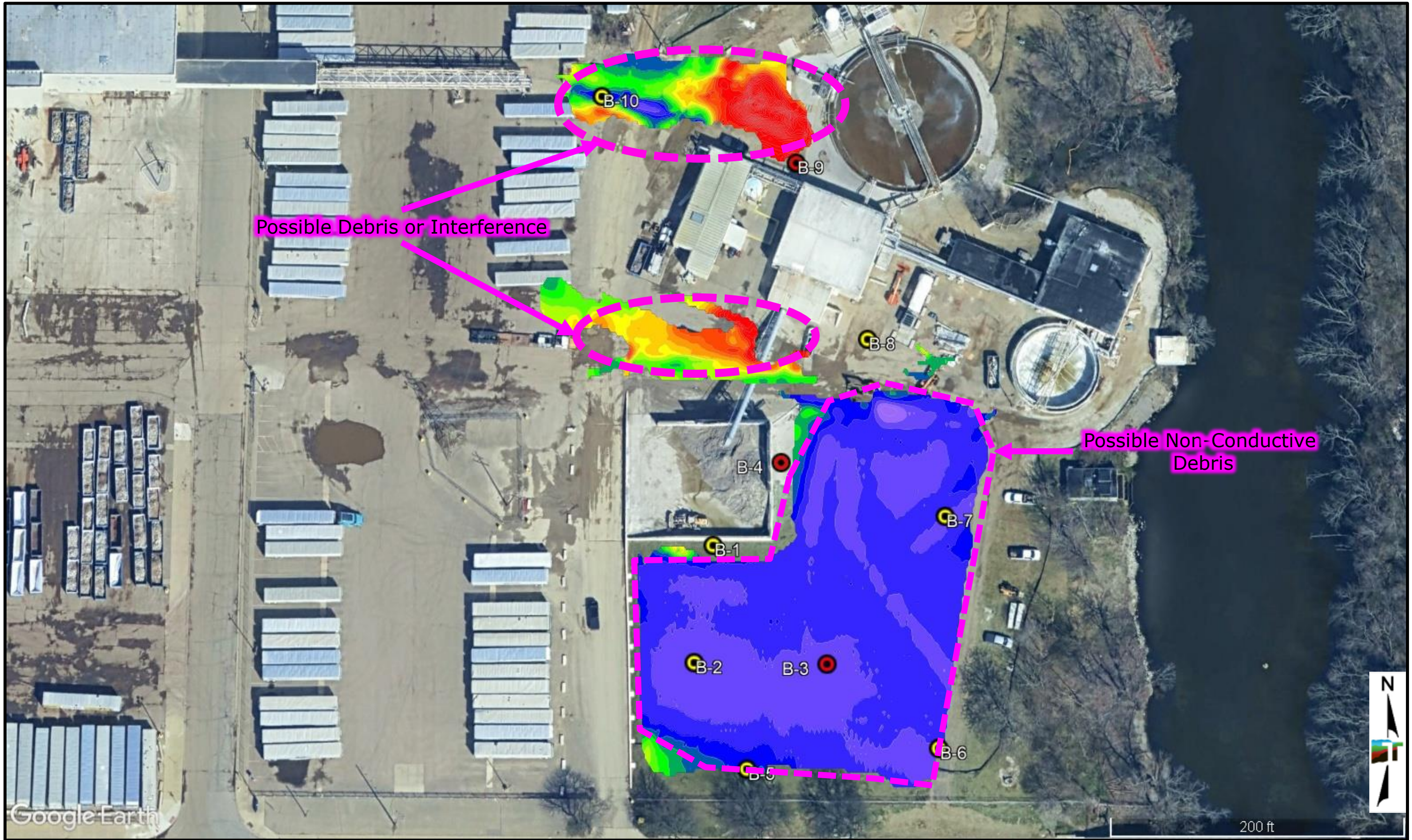


Debris Located at Site



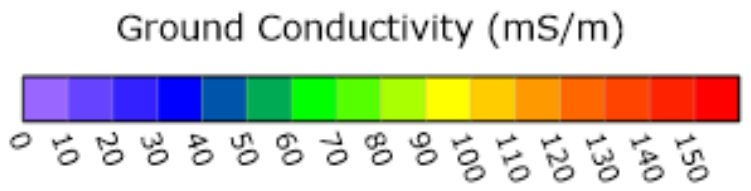
Legend

- Debris 
- Possible Slab or Excavation 

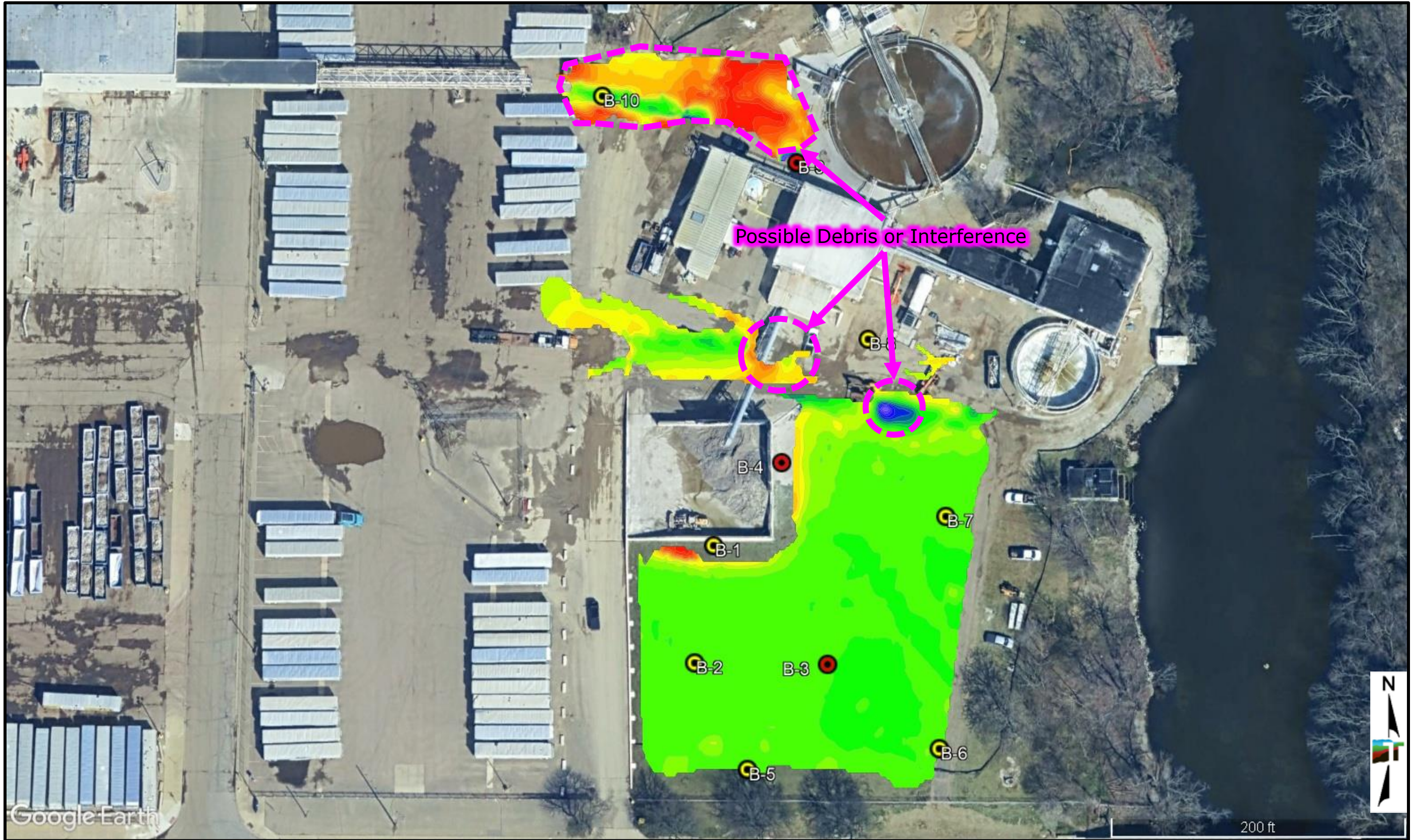


Legend

- Anomalies
- Boring
- Boring with Debris



Concentrations of buried metallic debris may be present near structures



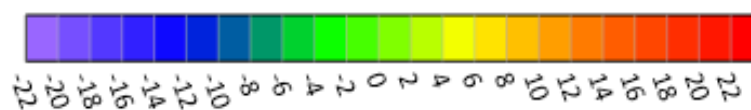
Legend

Anomalies

Boring

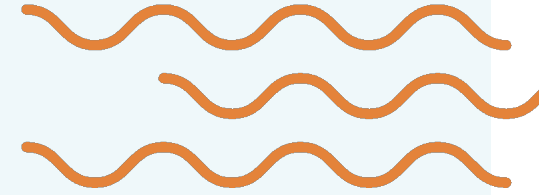
Boring with Debris

Magnetic Susceptibility (ppt)



Concentrations of buried metallic debris may be present near structures

IK2035



Strategic Vision Draft!

Fall 2025

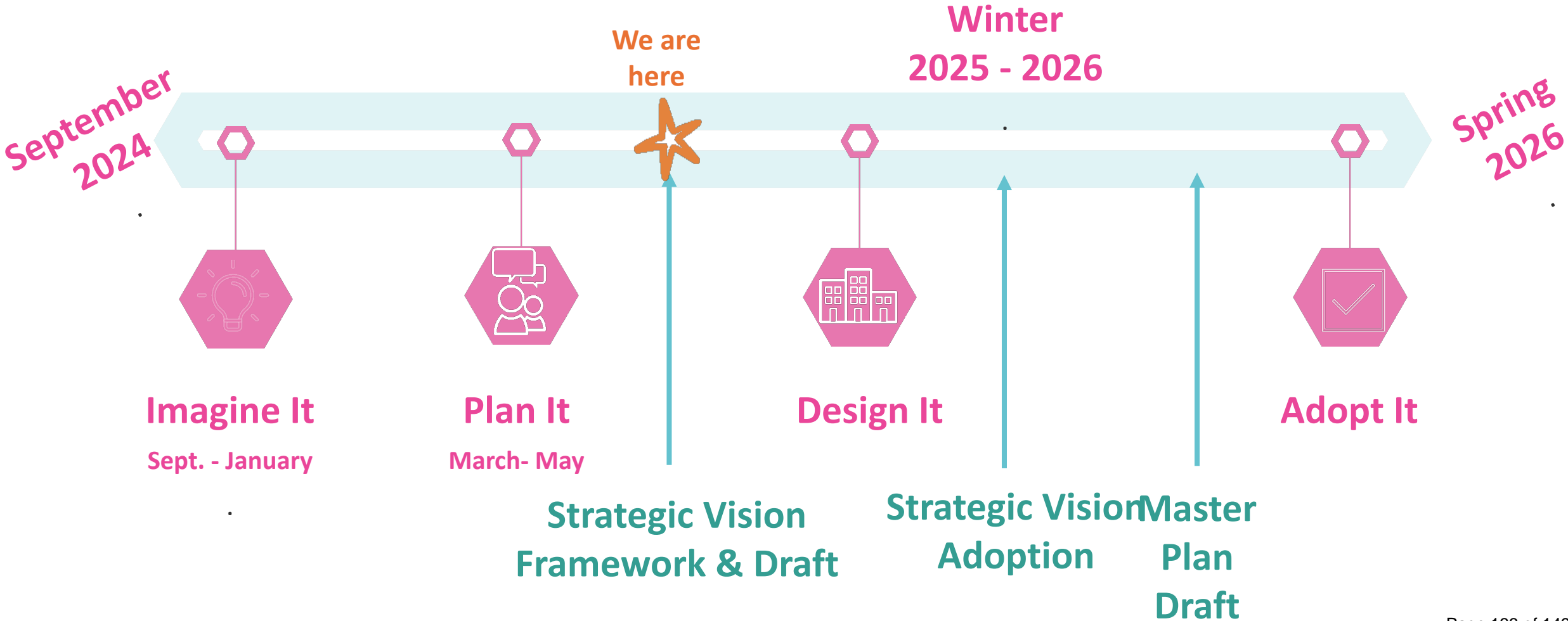


imagine
kalamazoo
2035

Agenda

- IK2035 Engagement & Outreach
- Analysis & Initial Results of the Input Received
- Strategic Framework: A Happy, Healthy City
- Next Steps

Imagine Kalamazoo



Imagine It!



**Meetings on the
Go!**



IK Reads!



**Community-wide Survey &
Virtual/In-person Input
Activities**



**Community
Roadshow**

Plan It!

Public Meetings



- 5 Public Meetings in March & April
- All were welcome!
- Small group discussions focusing on goals & outcomes
- ONLINE COMPANION SURVEY

Focus Groups



- 8 topic-specific focus groups with community subject matter experts
- 1 meeting with staff experts discussing goals & outcomes
- Report out summary: What we heard
- Peer-facilitated exercises



735

Meeting on the Go Participants



256

Pop Up Engagement Participants



199

Presentation Attendees



565

Public Meeting Attendees



1434

Surveys Completed



50

Partner Meeting Attendees



942

Happy City Book Read Participants



118

Youth Art Projects

=

4,299

Points of Contact



Impactful Data



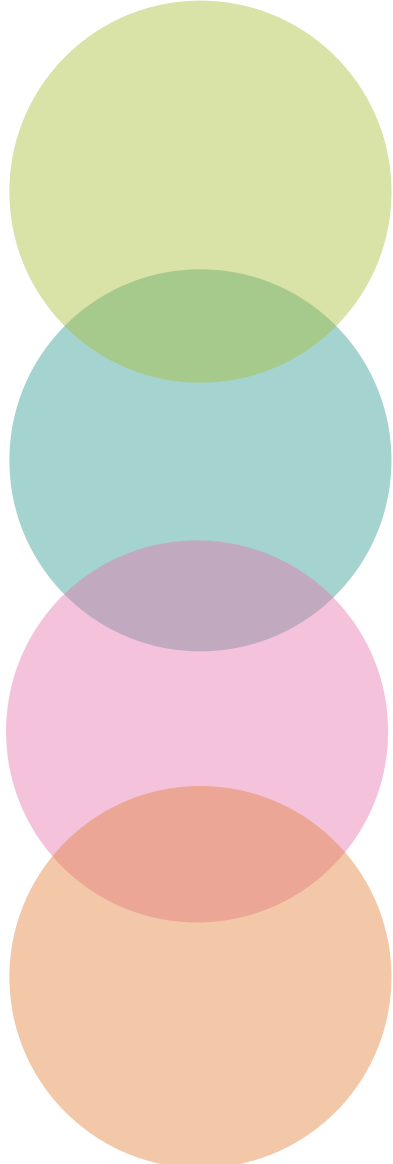
Analyzing & Reviewing Input

Every process starts with balancing what we know (data/staff) with what we want to learn (community).

**Best Practice
& Staff Expertise**

**Community
Voices**

VISION, PURPOSE, VALUES, GOALS



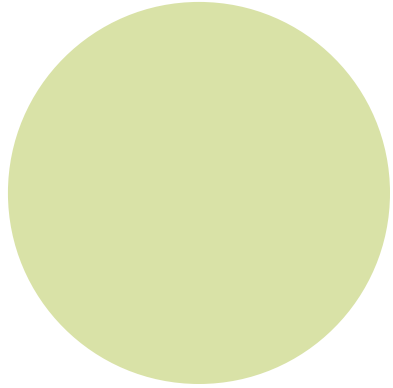
COMMUNITY VISION Describes what the community will look and feel like in the future. (City Staff & Community Collaboration)

ORG. PURPOSE It's WHY we do what we DO. (City Staff)

ORG. VALUES Shared expectations of ourselves and others; how we operationalize our purpose and implement the Community's Goals. (City Staff)

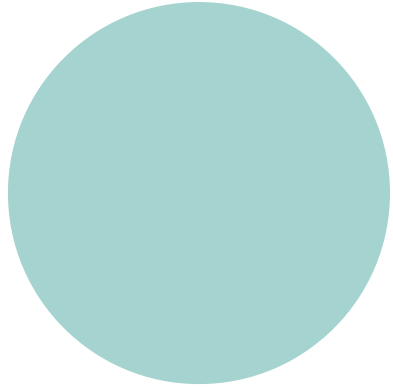
GUIDING PRINCIPLES & GOALS Define our future direction; direct resources and projects for the next 10 years. (City Staff & Community Collaboration)

Vision Statement



In 2035, all Kalamazoo neighborhoods are supported by sustainable, responsive, and accessible services that lift people up and bring our community together at every stage of life.

Organizational Purpose



Our purpose is to provide essential resources, services, and exceptional customer service to ensure the wellbeing of our residents and the sustainable growth of our city.

Org. Values

Integrity – Do the right thing, even when no one is looking.

Learning – A genuine desire to become better, recognizing growth comes from actively seeking improvement.

Inclusion – Ensure that everyone’s voice is heard and actively included in decision-making.

Customer Service – Center our work on our customers, both internal and external, to ensure our actions align with their needs and expectations.

Accountability – Stand firm behind our work, embrace responsibility, and acknowledge accolades and consequences.

Teamwork – Combine individual capabilities and work harmoniously to achieve common objectives.

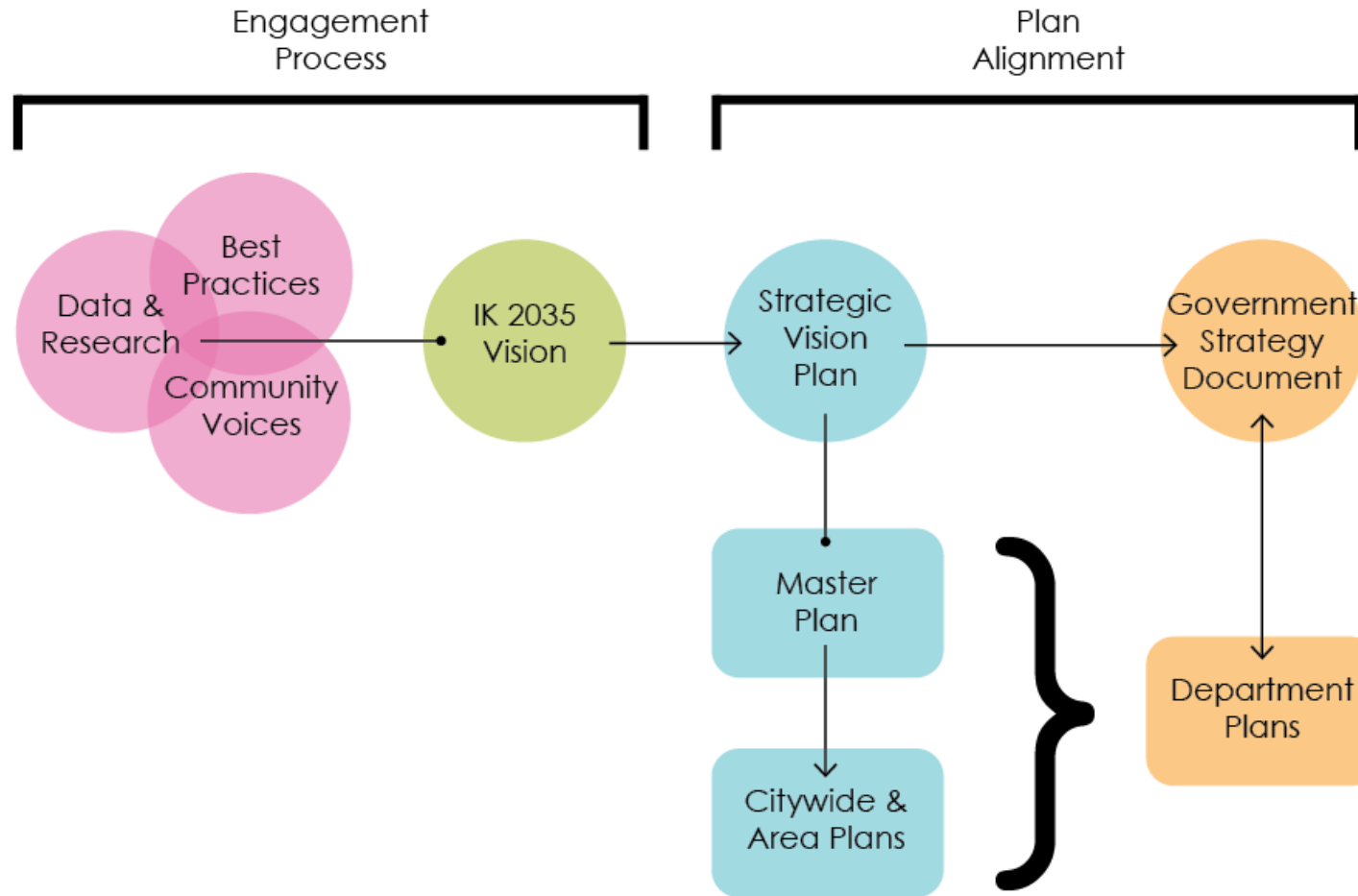
Safety – Look out for one another, intervene when someone is about to engage in actions to harm themselves or others.

Strategic Vision Framework

A Happy, Healthy City

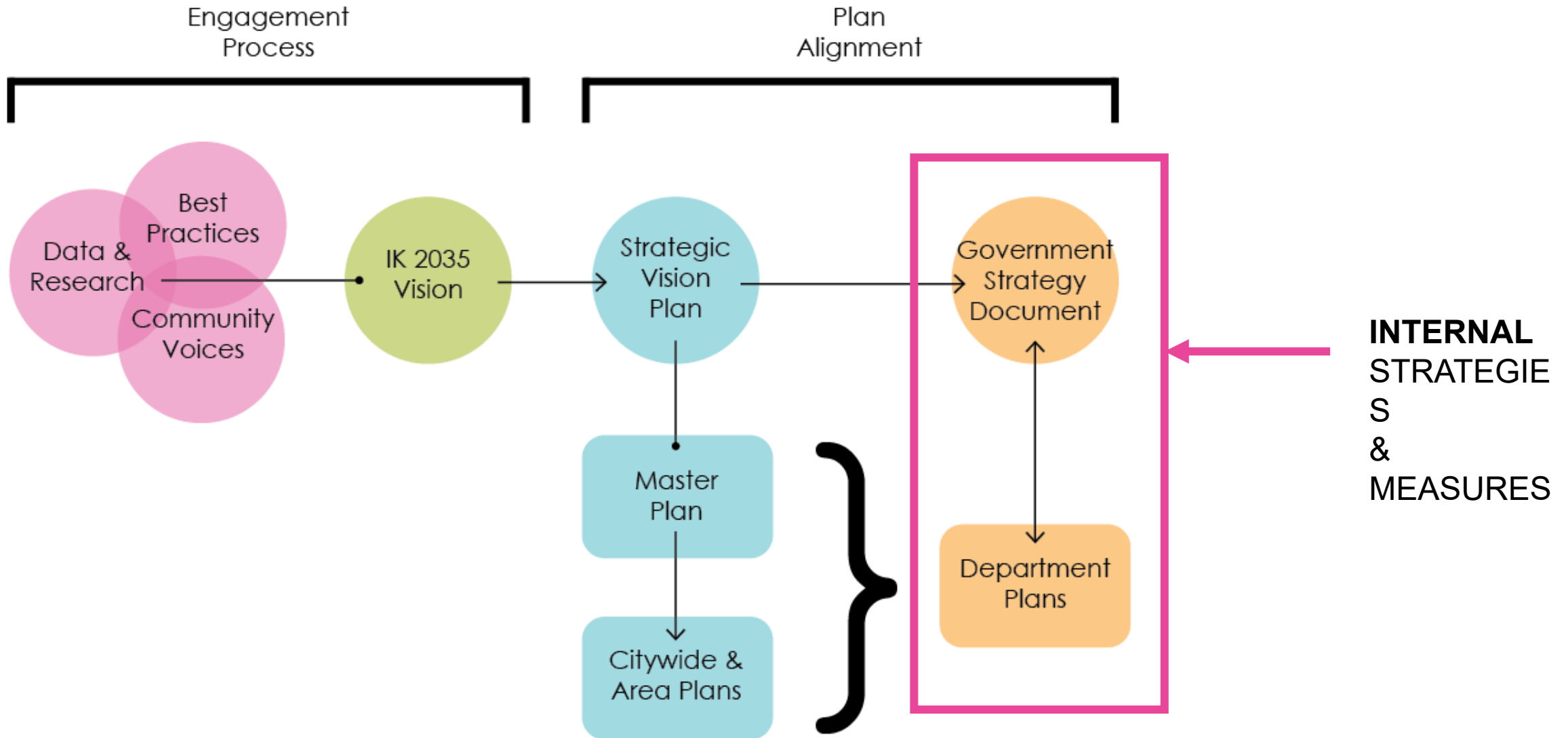


Aligning IK2035: Engagement to Plan Implementation



Aligning IK 2035

Engagement to plan implementation



Guiding Principles



**The City of Kalamazoo
is committed to:**

Diversity, Equity, Inclusion and Accessibility:

Advancing diversity, equity, inclusion, and accessibility (DEIA) through planning, services, and decision-making.

Economic Mobility:

Expanding access to pathways that lead to stability, opportunity, and prosperity for all residents.

Sustainability:

Supporting the long-term health and resiliency of community and environment.

Operational Excellence:

City services, amenities, and places that excel at compassionate customer service and delivery.

Continuous Engagement:

Prioritizing meaningful engagement with residents and community members in decisions that affect their lives.

Strategic Goals

Arts, Culture & Placemaking

Vibrant public spaces, arts, and culture create belonging and vitality making Kalamazoo a regional destination.

Community Trust & Safety

Everyone is safe and supported by the services they depend on and the community around them.

Economic Vitality

A thriving business ecosystem that advances economic growth and equitable community wealth building.

Effective City Operations

Ensure transparent, responsive and accountable City operations through internal collaboration, strategic resource management and consistent community engagement.

Environment

A healthy environment sustains community well-being today and for generations to come.

Housing

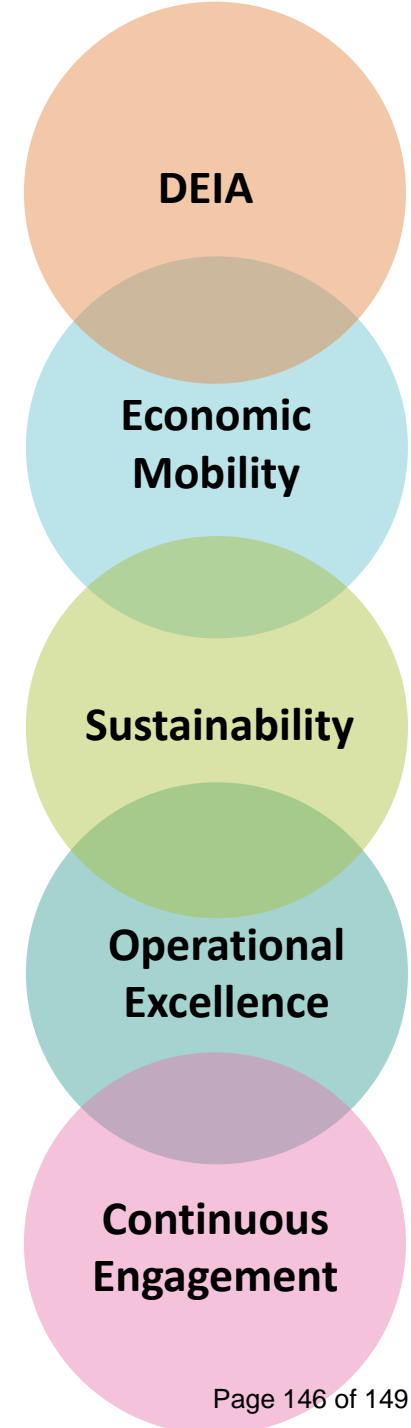
Accessible and affordable housing for all strengthens families, neighborhoods and community life.

Transportation

Safe, connected travel supports year-round and equitable mobility for all travelers.

Youth & Family

All young people and families have what they need to be healthy, to grow and to succeed.



Strategic Vision

Citywide guiding
document

Adopting the Strategic Vision

- Presentation of draft at City Commission
- Planning Commission presentation
- February approval of final document

Design It!

Starts this
winter



**13 to 15
Neighborhood
Meetings**



**IK Reads! Keep
growing and
learning with us!**



Online Activities



Focus Groups

Imagine Kalamazoo

