GENOA CHARTER TOWNSHIP
PLANNING COMMISSION
PUBLIC HEARING
JUNE 12, 2023
6:30 P.M.
AGENDA

CALL TO ORDER:

PLEDGE OF ALLEGIANCE:

APPROVAL OF AGENDA:

DECLARATION OF CONFLICT OF INTEREST:

CALL TO THE PUBLIC: (*Note: The Board reserves the right to not begin new business after 10:00 p.m.)*

OPEN PUBLIC HEARING # 1… Consideration of special land use application, environmental impact assessment and sketch plan to allow for a proposed Bed and Breakfast located at 7854 Collingwood Drive, just west of Grand River Avenue. The request is petitioned by Nazmiye Yapici.

A. Recommendation of Special Use.
B. Recommendation of Environmental Impact Assessment (5-14-23)
C. Recommendation of Sketch Plan (5-17-23)

OPEN PUBLIC HEARING #2…Consideration of a Planned Unit Development agreement, final PUD site plan and environmental impact assessment to allow for 204 apartment units. The property consists of two vacant parcels with parcel ID numbers 4711-11-300-014 and 4711-14-100-002 located on the southeast corner of Grand River and Dorr Road. The request is petitioned by Grand River Dorr, LLC.

A. Recommendation of Planned Unit Development agreement
B. Recommendation of Impact Assessment (5-3-23)
C. Recommendation of Final PUD Site Plan (5-30-23)

OPEN PUBLIC HEARING #3…Discussion regarding proposed solar ordinance.

ADMINISTRATIVE BUSINESS:

- *Staff Report*
- *Approval of May 8, 2023 Planning Commission meeting minutes*
- *Member discussion*
- *Adjournment*

GENOA CHARTER TOWNSHIP APPLICATION

Sketch Plan Review

TO THE GENOA TOWNSHIP PLANNING COMMISSION:

APPLICANT NAME & ADDRESS: Nazmiye Yapici & 7854 Collingwood Dr. Brighton, MI, 48114

If applicant is not the owner, a letter of Authorization from Property Owner is needed.

OWNER'S NAME & ADDRESS: Tolga Yapici& 7854 Collingwood Dr. Brighton,MI, 48114

SITE ADDRESS: 7854 Collingwood Dr.Brighton MI PARCEL #(s): SEC 13 T2N. R5E. BIRKWOOD HILLS LO

APPLICANT PHONE: (906) 281 4520 OWNER PHONE: (906) 281 2967

LOCATION AND BRIEF DESCRIPTION OF SITE: 7854 Collingwood Dr. Brighton.
Single Residence Home with Walk-out basement

BRIEF STATEMENT OF PROPOSED USE: We would like to use basement for bed and breakfast inn.

THE FOLLOWING IMPROVEMENTS ARE PROPOSED: Basement will be updated in order to provide quality, plesant stay for guests.

I HEREBY CERTIFY THAT ALL INFORMATION AND DATA ATTACHED TO AND MADE PART OF THIS APPLICATION IS TRUE AND ACCURATE TO THE BEST OF MY KNOWLEDGE AND BELIEF.

BY: Nazmiye Yapici

ADDRESS: 7854 Collingwood Dr.

Contact Information - Review Letters and Correspondence shall be forwarded to the following:

1.) Nazmiye Yapici (Name) of _____ (Business Affiliation) at nbyapici@gmail.com (Email Address)

FEE EXCEEDANCE AGREEMENT

All sketch plans are allocated one (1) consultant review and one (1) Planning Commission meeting. If additional reviews or meetings are necessary, the applicant will be required to pay the actual incurred costs for the additional reviews. If applicable, additional review fee payment will be required concurrent with submittal for a Land Use Permit. By signing below, applicant indicates agreement and full understanding of this policy.

SIGNATURE: [signature] DATE: 05/16/2023

PRINT NAME: Nazmiye Yapici PHONE: 906 281 4520

GENOA CHARTER TOWNSHIP
Special Land Use Application

This application **must** be accompanied by a site plan review application and the associated submittal requirements. (The Zoning Official may allow a less detailed sketch plan for a change in use.)

APPLICANT NAME & ADDRESS: Nazmiye Yapici & 7854 Collingwood Dr, Brighton, MI, 48114
Submit a letter of Authorization from Property Owner if application is signed by Acting Agent.

APPLICANT PHONE: (906)2814520 EMAIL: nbyapici@gmail.com

OWNER NAME & ADDRESS: Tolga Yapici & 7854 Collingwood Dr., Brighton, MI, 48114

SITE ADDRESS: 7854 Collingwood Dr, Brighton, MI PARCEL #(s): SEC. 13 T2N, R5E, BIRKWOOD HILLS LOT 44

OWNER PHONE: (906) 2812967 EMAIL: tyapici@gmail.com

Location and brief description of site and surroundings:
Property is in 7854 Collingwood Dr.Brighton, MI, 48114. It has driveway for off-site parking, 1.2 acre land. There are neighbors surrounding to properties land.

Proposed Use:
We would like to use walk-out basement as bed and breakfast inn.

Describe how your request meets the Zoning Ordinance General Review Standards (section 19.03):

a. Describe how the use will be compatible and in accordance with the goals, objectives, and policies of the Genoa Township Comprehensive Plan and subarea plans, and will promote the Statement of Purpose of the zoning district in which the use is proposed.

The use is compatible with Master Plan, section 3.03.02 b. Property proposed to be used as bed and breakfast in has its own door. It has off-street parking. Property is in septic and well. Therefore, it does not require any alteration to existing characteristics, public facilities and services. We do not anticipitate any negative impact due to proposed land use.

b. Describe how the use will be designed, constructed, operated, and maintained to be compatible with, and not significantly alter, the existing or intended character of the general vicinity.

We will update basement to have a nicer look. Then provide space to guests to sleep during their visit and breakfast. The space will be designed where upto 5 people sleep (means at most two cars) . As described above property characteristics have enough off-street parking. Policies will be in place to prevent existing character and to maintain existing character.

c. How will the use be served adequately by essential public facilities and services such as highways, streets, police and fire protection, drainage structures, water and sewage facilities, refuse disposal and schools?

Details will be explained in impact statement with calculation regarding trafic. Property is already in septic and well. Smoke detectors will be installed for fire protection.

d. Will the use involve any uses, activities, processes, or materials potentially detrimental to the natural environment, public health, safety, or welfare by reason of excessive production of traffic, noise, vibration, smoke, fumes, odors, glare, or other such nuisance? If so, how will the impacts be mitigated?

Since we are living in the house, we do not anticipate excessive noise due to our guest. However, it might happen sometimes as we heard from other owners. In those cases, best practice to ban those guest to come back. Furthermore, policy and user rules will be in place to prevent those possible situation. However, it is human, hard to control 100%.The worst case police might be needed.

e. Does the use have specific criteria as listed in the Zoning Ordinance (sections 3.03.02, 7.02.02, & 8.02.02)? If so, describe how the criteria are met.

Yes, section 3.03.02 b, Bed and Breakfast Inns. Required parking area is off-street, it will be the driveway of house next to garage. From the public listing, we do not see any bed-and-breakfast closer than 300 feet. Meals and other services will be provided by me.

The property s my primary home so we are in compliance with 3.03.02 (1 2 3 4 8g1) the rest is not applicable for purpose. We own 1 dog 2 cats. The place will be pet friendly no more than 2 dogs allowed

I HEREBY CERTIFY THAT ALL INFORMATION AND DATA ATTACHED TO AND MADE PART OF THIS APPLICATION ARE TRUE AND ACCURATE TO THE BEST OF MY KNOWLEDGE AND BELIEF. I AGREE TO DESIGN, CONSTRUCT AND OPERATE, AND MAINTAIN THESE PREMISES AND THE BUILDINGS, STRUCTURES, AND FACILITIES WHICH ARE GOVERNED BY THIS PERMIT IN ACCORDANCE WITH THE STATED REQUIREMENTS OF THE GENOA TOWNSHIP ZONING ORDINANCE, AND SUCH ADDITIONAL LIMITS AND SAFEGUARDS AS MAY BE MADE A PART OF THIS PERMIT.

THE UNDERSIGNED Nazmiye Yapici / Tolga Yapici STATES THAT THEY ARE THE FREE OWNER OF THE PROPERTY OF PROPERTIES DESCRIBED ABOVE AND MAKES APPLICATION FOR THIS SPECIAL LAND USE PERMIT.

BY: Nazmiye Yapici / Tolga Yapici

ADDRESS: 7854 Collingwood Dr., Brighton, MI, 48114

Contact Information - Review Letters and Correspondence shall be forwarded to the following:

Nazmiye Yapici	of	at nbyapici@gmail.com
Name	Business Affiliation	Email

FEE EXCEEDANCE AGREEMENT

As stated on the site plan review fee schedule, all site plans are allocated two (2) consultant reviews and one (1) Planning Commission meeting. If additional reviews or meetings are necessary, the applicant will be required to pay the actual incurred costs for the additional reviews. If applicable, additional review fee payment will be required concurrent with submittal to the Township Board. By signing below, applicant indicates agreement and full understanding of this policy.

SIGNATURE: [signature] DATE: 05/14/2023

PRINT NAME: Nazmiye Yapici PHONE: (906) 2814520

Revised 08-15-13, kasp

WAIVER NO. _____

LAND USE WAIVER

Genoa Township • 2911 Dorr Rd. • Brighton, MI 48116
Phone (810) 227-5225 • Fax (810) 227-3420

PROJECT INFORMATION

Site Address: 7854 Collingwood Dr.

OWNER/ CONTRACTOR INFORMATION

Owner Name: Tolga Yapici Phone/Email: 906-281-2967/ tyapici@gmail.com

Owner Address: 7854 Collingwood Dr City Brighton State MI Zip 48114

Contractor Name: _____ Phone/Email: _____

Contractor Address: _____ City _____ State _____ Zip _____

TYPE OF IMPROVEMENT

☐ Demolition ☐ Water Connection ☐ Sewer Connection ☐ Interior Work/Repairs
☐ Driveway ☐ Roofing ☐ Basement Finish ☐ Tent Sale / Temporary Event
☒ Other (please explain): Basement will be updated.

Total Project Cost (estimate, if cost unknown): $15000

If interior work is being done, complete the following:

Square Feet of Improved Area: 906 ; Full Baths (#) 1 ; Half Baths (#): ____ ; Fireplaces (Y/N): N

For Tent Sale or Temporary Event, provide date(s) and detailed description of activity proposed: None

I hereby certify that all information and data attached to and made part of this application are true and accurate and to the best of my knowledge and belief. I also certify that the proposed work is authorized by the owner of record and that I have been authorized by the owner to make this application as his/her authorized agent, and we agree to conform to all applicable laws, codes and ordinances of the State of Michigan and Genoa Township. Private covenants and restrictions are potentially enforceable by private parties. In signing of this application, I am permitting an official representative of Genoa Charter Township to do on-site inspections. A Land Use Waiver is valid for a period of 12 months from the date of issue. Any modification to location, size, or dimensions must be approved by Genoa Township.

Signature of Applicant _____ Date: 05/14/2023

Applicant is: ☒ Owner ☐ Contractor ☐ Lessee ☐ Architect/Engineer ☐ Other: _____

OFFICE USE ONLY

Parcel I.D.: _____ Zoning: _____

ASSESSING: ☐ Approved ☐ Disapproved **BY:** **Date:**

ZONING: ☐ Approved ☐ Disapproved **BY:** **Date:**

COMMENTS/CONDITIONS: _____

_____

_____ Date picked up: _____

Revised 10-09-14, kasp

June 6, 2023

Planning Commission
Genoa Township
2911 Dorr Road
Brighton, Michigan 48116

Attention:	Amy Ruthig, Planning Director
Subject:	Bed and Breakfast Inn – Special Land Use and Sketch Plan Review #1
Location:	7854 Collingwood Drive – south side of Collingwood Drive, west of Grand River Avenue
Zoning:	SR Suburban Residential District

Dear Commissioners:

At the Township's request, we have reviewed the submittal materials requesting special land use and sketch plan review for a new bed and breakfast inn as part of the existing single-family residence at 7854 Collingwood Drive (SLU application form dated 5/14/23).

A. Summary

1. **Special Land Uses (Section 19.03):**
   a. The special land use standards of Section 19.03 are generally met.
   b. We request the applicant provide the Township with their policies and rules to help mitigate disruptive guests.
   c. In order to make favorable findings related to compatibility and impacts, the use conditions of Section 3.03.02(b) need to be met to the Commission's satisfaction.
   d. The applicant must address any comments provided by the Township Engineer or Brighton Area Fire Authority regarding public facilities and services.
2. **Use Conditions (Section 3.03.02(b)):**
   a. The applicant must provide information demonstrating that the site can accommodate 4 parked vehicles outside of the required front yard setback (40').
   b. We were unable to identify any other bed and breakfast inns within 300' of the site; however, if there are concerns, the Commission may require additional information from the applicant.
   c. We request the applicant add a statement to the application form or Impact Assessment acknowledging that meals and other services are only available for residents, guests and/or employees.
3. **Sketch Plan Review:**
   a. We request the applicant explain how refuse removal will be managed.
   b. If the fencing depicted is proposed, we request the applicant provide details.
   c. If the fencing is proposed and the project is approved, the applicant will need to obtain a separate fence permit.

B. Proposal/Process

The applicant proposes to establish a bed and breakfast inn within the walkout basement portion of an existing single-family residence.

Table 3.03 lists bed and breakfast inns as a special land use in the SR District. Such uses are also subject to the use conditions of Section 3.03.02(b).

Procedurally, the Planning Commission is to review the special land use, sketch plan, and Environmental Impact Assessment, and put forth recommendations to the Township Board following a public hearing.

Aerial view of site and surroundings (looking north)

C. Special Land Use Review

Section 19.03 of the Zoning Ordinance identifies the review criteria for Special Land Use applications as follows:

1. **Master Plan.** The Township Master Plan identifies the subject site as Low Density Residential, which is intended for "single family residential development located between rural residential areas and the more developed areas of the Township."

   The Plan further states that "these areas are only intended for residential uses or small-scale neighborhood-serving non-residential uses."

   The proposal for a bed and breakfast inn accessory to a single-family residential is generally compatible with this classification.

2. **Compatibility.** The neighborhood is generally developed with single-family residences on roughly 1-acre lots. The surrounding area includes attached residential to the west and commercial/service/office uses to the east along Grand River Avenue.

   The submittal states that the applicant will still reside in the home and that they will have policies and rules in place to help prevent any disruptions caused by guests. We request the applicant provide the Township with a copy of these policies and rules.

   Additionally, the use conditions of Section 3.03.02(b) are intended to help ensure compatibility. Provided the use conditions are met to the Commission's satisfaction, we expect the proposal to be compatible with the surrounding area.

3. **Public Facilities and Services.** The submittal notes that the site has existing well and septic systems that will accommodate the residence and the proposed bed and breakfast inn.

   The applicant must address any comments provided by the Township Engineer and/or Brighton Area Fire Authority related to this criterion.

4. **Impacts.** Similar to comments above, provided the use conditions are met to the Township's satisfaction, surrounding properties are not expected to be adversely impacted by the proposal.

5. **Mitigation.** If further concerns arise as part of the review process, the Township may require additional efforts to mitigate potential adverse impacts.

D. Use Conditions

Bed and breakfast inns are subject to the use conditions of Section 3.03.02(b), as follows:

1. **Required parking areas shall be located off-street and shall not be located in any required front yard.**

Section 14.04 requires 1 space per guest room, plus 2 spaces. It appears that 2 guest rooms are proposed, though the submittal does not clearly state this. If this is accurate, the project requires 4 spaces, in addition to the 2 required for the residence.

The application form references a garage, which suggests that the required spaces for the residence are provided.

The submittal includes aerial photos of the site which show a relatively large driveway; however, it is not clear that there is area for 4 cars outside of the required 40-foot front yard setback (there are no dimensions provided).

The applicant must provide additional information demonstrating that this condition is fully met.

2. **No bed-and-breakfast inn shall be located closer than 300 feet to another bed-and breakfast inn.**

The application form states that "from the public listing, we do not see any bed-and-breakfast closer than 300 feet."

As part of this review, we conducted simple internet searches and found no listings of existing bed and breakfast inns within the Township boundary.

If the Commission is satisfied with the research conducted, they may find this standard to be met. If they are not satisfied, they may wish to request additional information from the applicant.

3. **Meals or other services provided on the premises shall only be available to residents, employees and overnight guests of the inn.**

The application form states that "meals and other services will be provided by me." We request the applicant add a statement to the application form or Impact Assessment acknowledging this condition.

4. **The dwelling unit in which the bed and breakfast establishment is located shall be the principal residence of the operator, and said operator shall live on the premises while the establishment is active.**

Based on the material submitted, this condition is met.

E. Sketch Plan Review

Given the nature of the project, there are relatively few site development regulations that apply (beyond the use conditions noted above).

With that being said, the applicant must address the parking comment previously noted. Additionally, we request the applicant provide the Township with an indication of how refuse removal will be managed.

The sketch plan also identifies 2 areas of fencing, though it is unclear if the fencing exists or is proposed.

If proposed, we request that details be provided. The applicant should also be aware that a separate fence permit will be required (if proposed).

Should you have any questions concerning this matter, please do not hesitate to contact our office.

Respectfully,
SAFEBUILT

Brian V. Borden, AICP
Michigan Planning Manager

TETRA TECH

June 7, 2023

Ms. Amy Ruthig
Genoa Township
2911 Dorr Road
Brighton, MI 48116

Re: Collingwood Drive Bed and Breakfast
Sketch Plan Review No. 1

Dear Ms. Ruthig:

Tetra Tech conducted a sketch plan review of the Collingwood Drive Bed and Breakfast Special Use application. The sketch plan and application, last dated May 14, 2023, was prepared Tolga and Nazmiye Yapici. The application proposes using the existing basement as a bed and breakfast. No site improvements are proposed. The property is located on the south side of Collingwood Drive, approximately 600-feet west of Grand River Avenue. We offer the following comments:

GENERAL

1. The sketch plan is missing the following required sketch plan contents: legal description of the property, existing building and parking dimensions, and setbacks.

UTILITIES

1. The application notes that the new use will use the existing well and septic on site. The Petitioner should provide documentation from the County Health Department documenting the suitability of the existing septic system for the increased use.

Contingent on the above comments being addressed, we have no engineering related concerns to the proposed special land use. Please call or email if you have any questions.

Sincerely,

Shelby Byrne

Shelby Byrne, P.E.
Project Engineer

Tetra Tech
3497 Coolidge Road, East Lansing, MI 48823
Tel 517.316.3930 Fax 517.484.8140 www.tetratech.com

BRIGHTON AREA FIRE AUTHORITY
615 W. Grand River Ave.
Brighton, MI 48116
o: 810-229-6640 f: 810-229-1619

June 5, 2023

Amy Ruthig
Genoa Township
2911 Dorr Road
Brighton, MI 48116

RE: Collingwood Dr. Bed & Breakfast
7854 Collingwood Drive
Genoa Twp., MI
SPECIAL LAND USE

Dear Amy,

The Brighton Area Fire Department has reviewed the above-mentioned site plan. The plans were received for review on May 25, 2023. The project is based on a proposed special land use to convert the basement of an existing single-family residential home to be used as a bed and breakfast. The plan review is based on the requirements of the International Fire Code (IFC) 2021 edition. **Unless modification of the proposed plan occurs under the design of an architect, and the residence provides a code compliant habitable space, the fire authority does not recommend approval of this special land use for the following reasons:**

1. The interior-most bedroom is too small to be considered a bedroom per code. The minimum square footage is 70 square feet for a habitable room.
MRC R304

2. The basement bedrooms are not provided with required emergency escape and rescue openings as required. There are no escape/rescue openings proposed on the sketch plan.
MRC R310

3. Smoke alarms shall be provided in each of the basement bedrooms as well as the common area outside the bedrooms. The alarms shall be hardwired with battery backup and interconnected the smoke alarms installed in the primary residence.
MRC R314

4. Carbon monoxide alarms shall be installed within the common area of the residence and shall be hardwired with battery backup.
MRC R315

5. A minimum of one 10lbs. ABC dry chemical fire extinguisher shall be provided in the basement for occupant use. It shall be installed in an open and conspicuous location.
IFC 906

If you have any questions about the comments on this plan review please contact me at 810-229-6640.

Cordially,

Rick Boisvert, CFPS
Fire Marshal

Environmental Impact Statement
FOR
Special Land Use
FOR
‘7854 Collingwood Dr. Brighton, MI, 48114’
GENOA TOWNSHIP, LIVINGSTON COUNTY
MICHIGAN

Prepared by Nazmiye Yapici

7854 Collingwood Dr.
Brighton, MI 48114
(906)281-4520

MAY 14, 2023

INTRODUCTION:

The purpose of this environmental impact statement to show effect of special use request.

LOCATION:

Property is at 7854 Collingwood Dr., Brighton, MI, which is in Genoa Township and Livingston County. Figure 1-Figure 4 shows existing structures and natural features.

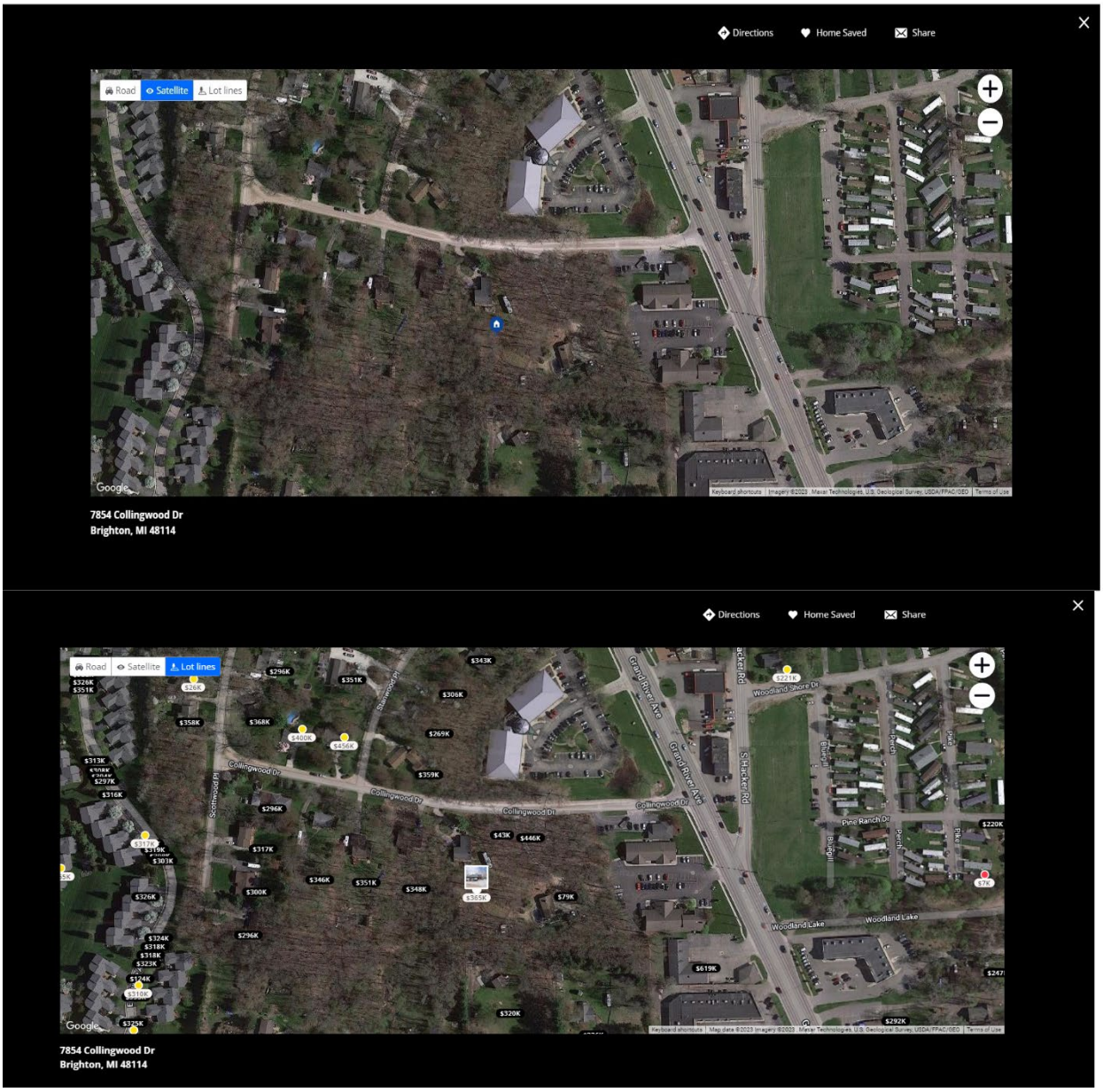


Figure 1. Satellite Top image shows satellite image of property labelled with blue home picture. Bottom image shows lot lines.

Figure 3. Picture of existing off-street parking.

Figure 2. Picture of patio from walk-out basement.

Figure 4 Picture of existing basement living room area with walk-out basement door. This area will be updated.

Impact on natural features:

The property is on 1.2-acre land. Livable area above ground is 2064 sq feet. The livable area underground is 910 sq feet. It is on well water (existing structure). Well water is defined as groundwater that is untreated. Well drillers drilled down to the aquifer, which is an underground layer of permeable rock containing water. Then, a pump system is installed to carry the water up from the ground and into our home. The property has a septic tank. Drain Field: Septic drain fields, also called leach fields or leach drains, are subsurface wastewater disposal facilities used to remove contaminants and impurities from the liquid that emerges after anaerobic digestion in a septic tank. The drain field is calculated to be 10’ X 45’. Inspection showed 1000 and 1500 gallons two septic tanks. Septic tanks recently pumped (09/30/2022, receipt shows 1000 gallons). Radon mitigation system installed to basement. There is no wetland in the property. There are mature trees and plants.

Impact on stormwater management:

There won’t be any change to existing drainage patterns by activity.

Impact on surrounding use:

Our property is very dark during the night. We plan to install solar lights in the driveway and back yard to increase lighting in our property to feel safer for our own use. Therefore, regardless of use as bed and breakfast, there would be increase in lighting. We do not anticipate an increase in lighting due to its special use.

We will not allow our guests to use our home as party hours, quiet hours will be applied between 10 pm to 8 am for ourselves and for our neighbors. Therefore, we do not anticipate any increase in noise that will affect surrounding neighborhoods.

Impact on Public Facilities and Services:

We expect up to 5 people at our bed and breakfast. It could be two adults and three kids or 4 adults who might need space to sleep during their visit. Since their visit will be short term, we do not expect any impact on Area Public Schools and very minimal impact on Fire and Police Departments (due to human nature).

We hope to attract people visiting the area for recreational purposes, college student parents who need space during graduation times, patient care takers whose relatives might be in treatment in dialysis area or cancer center.

Impact on Public Utilities:

Currently we are only using public waste containers. We might require an additional dumpster, but we do not know how much waste could be generated due to this operation.

There won't be construction to existing systems therefore, we do not anticipate any impact on septic or well.

Storage and Handling of Any Hazardous Materials:

During minor renavtion/update, we will produce paint cans. Also, there would be some disposed furniture, wood panels. We will use Bagster Bag which will collect all of our renovation/remodeling waste for 231$ with scheduled collection. There won't be any

hazardous material storage on site in quantities over 55 gallons. We do not plan to store any pesticides over 100 pounds or over 55 gallons.

Traffic Impact Study:

Since there might be only one or two additional cars visiting my home just like regular guest visit and since there is existing off-street parking. The impact on traffic will be minimal.

Historic and Cultural Resources:

There won’t be any alteration to the existing structure exterior, thus no impact on resources.

Special Provisions:

There is no existing deed restrictions.

Water Tech
A Testing Laboratory
718 S. Michigan Howell, MI 48843 (517) 548-2505 Fax (517) 548-3434
www.watertech-inc.com

WATER ANALYSIS RESULTS

To:
Fletcher Inspections
75 E. Henry St.
Saline, MI 48176

Date Sampled: 1/24/2023 11:00
Date Received: 1/24/2023
Collected By: Thomas M
Sample Point: Laundry Sink

Sample ID:
7854 Collingwood Dr
Brighton, MI 48114

Lab Sample Number: 166910-01

Test Parameter	Result	Units	RL	Method	Analysis Date	Analyst	Maximum Desired Limit
Total Coliform	Absent	Pres/Abs.		SM9223B	1/24/2023 16:20	CTM	MCL=Abs. Or 0
Nitrate-N	Not Detected	mg/L-N	0.1	SM4500NO3	1/24/2023 4:32	CTM	MCL=10
Total Arsenic	Not Detected	mg/L	0.001	EPA200.8	1/25/2023 0:00	CTM	MCL=0.010

Released By: _____ **Date:** 1/25/2023

Laboratory #0023 assigned by the Michigan Department of Environment and Great Lakes (EGLE) for the microbiological and chemical analysis of drinking water.

ABBREVIATIONS:
RL = Lowest reporting level
MCL = Maximum Contaminant Level - The maximum permissible level established by the USEPA and or EGLE for safe drinking water.
SMCL = Secondary Maximum Contaminant Level - Suggested maximum level established by the USEPA for desirableable water quality.
CFU/100 ml = Colony Forming Units/100 milliliter sample volume.
mg/L = Milligrams per liter (= parts per million).

Livingston County GIS Map

5/17/2023, 12:58:21 PM

1:1,129

0 0.01 0.01 0.02 mi

0 0.01 0.02 0.04 km

Tax Parcel

Parcel Dimensions

Subdivision / Condominium

Roads

Minor Road

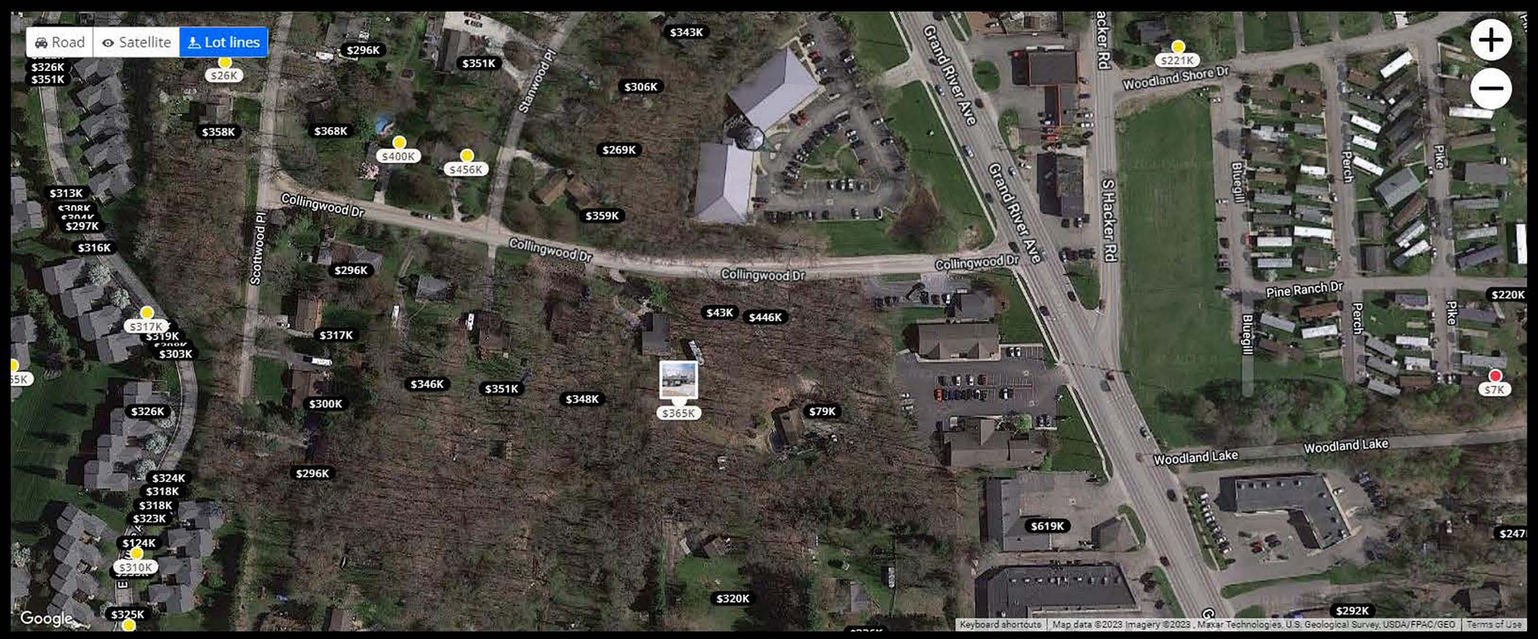
PLSS Section

Municipality

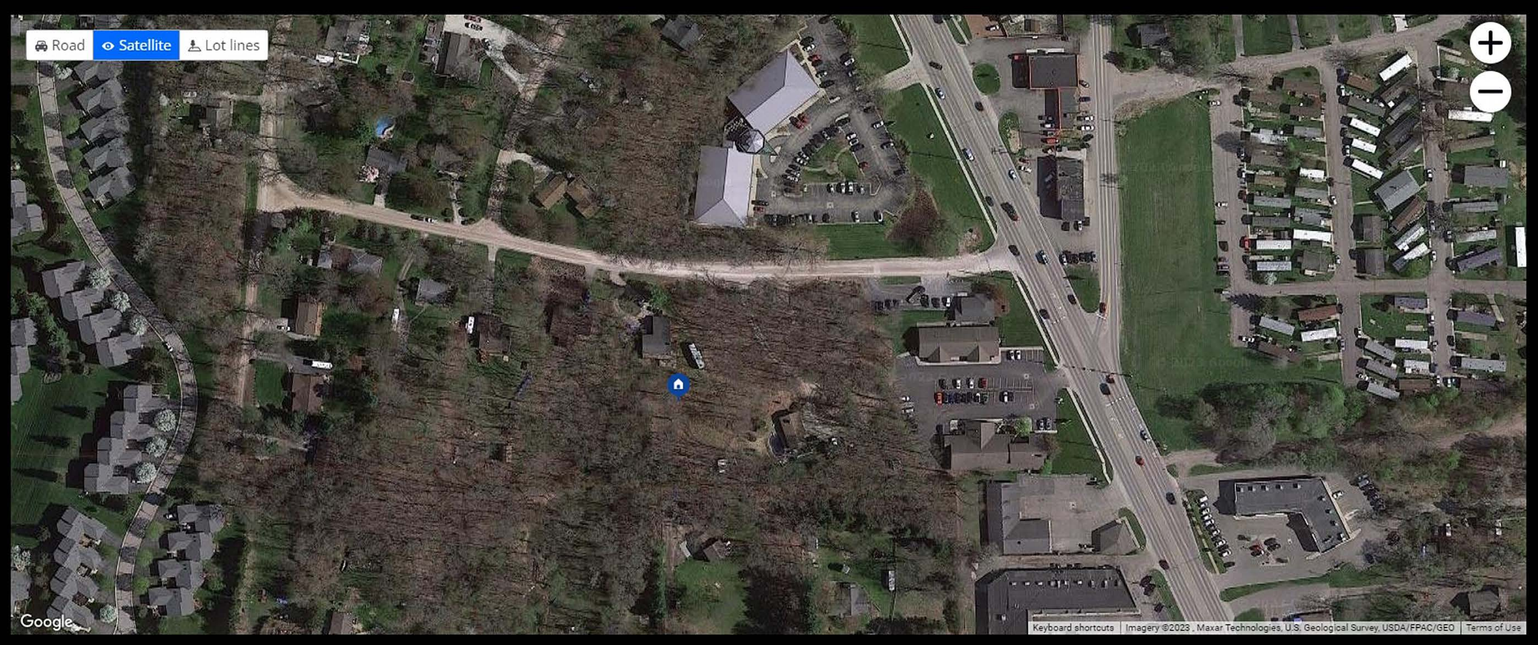
SEMCOG, Esri, HERE, Garmin, GeoTechnologies, Inc., USGS, EPA, Livingston County IT/GIS

Livingston County IT/GIS


RE/MAX Platinum



patio.jpg | livingroom.jpg | driveway.jpg | Art 12 Site Develo....pdf | Art 18 Site Plan Re...pdf | 01-14-13 pc.pdf | PC Packet 06-09-14.pdf | Show all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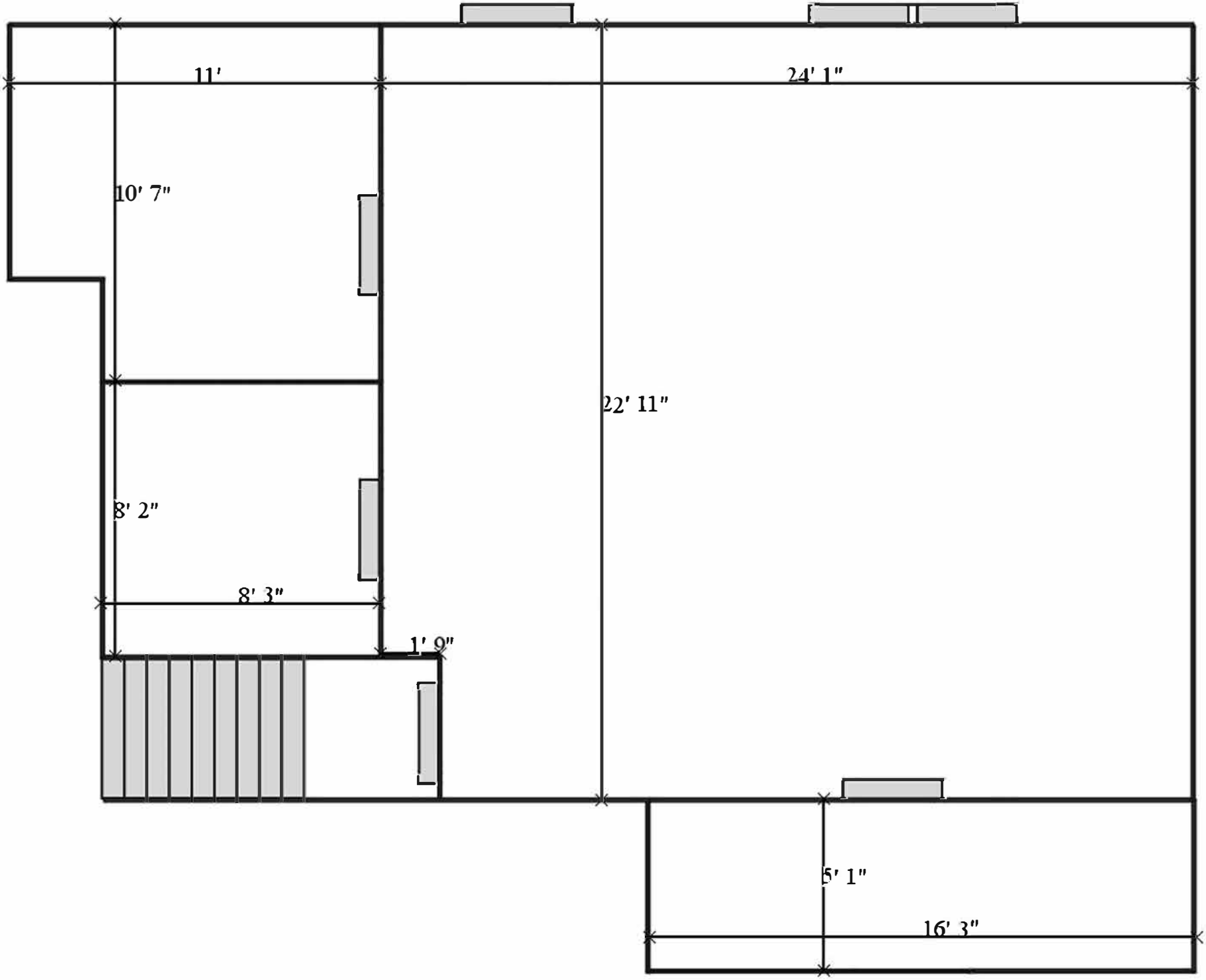
Imagery ©2023 , Maxar Technologies, U.S. Geological Survey, USDA/FPAC/GEO
Terms of Use


11'
24' 1"
10' 7"
22' 11"
8' 2"
8' 3"
1' 9"
5' 1"
16' 3"

GENOA CHARTER TOWNSHIP APPLICATION
Planned Unit Development (PUD)

APPLICANT NAME: GRAND RIVER DORR, LLC (Mark Kassab)

APPLICANT EMAIL: MKASSAB@MSHAPIROREALESTATE.COM

APPLICANT ADDRESS & PHONE: 31550 Northwestern Hwy, Suite 200 Farmington Hill, MI 48334 (248)865-0066

OWNER'S NAME: Grand River Dorr, LLC

OWNER ADDRESS & PHONE: same as above ( )

TAX CODE(S): ~~XXXXXXXXXX~~, 47-11-14-100-002 4711-11-300-014

QUALIFYING CONDITIONS (To be filled out by applicant)

1. A PUD zoning classification may be initiated only by a petition.

2. It is desired and requested that the foregoing property be rezoned to the following type of PUD designation:

   - [X] Residential Planned Unit Development (RPUD)
   - [ ] Planned Industrial District (PID)
   - [ ] Mixed Use Planned Unit Development (MUPUD)
   - [ ] Redevelopment Planned Unit Development (RDPUD)
   - [ ] Non-residential Planned Unit Development (NRPUD)
   - [ ] Town Center Planned Unit Development (TCPUD)

3. The planned unit development site shall be under the control of one owner or group of owners and shall be capable of being planned and developed as one integral unit.

EXPLAIN The development will be developed, owned and operated by a single ownership entity

4. The site shall have a minimum area of twenty (20) acres of contiguous land, provided such minimum may be reduced by the Township Board as follows:

   A. The minimum area requirement may be reduced to five (5) acres for sites served by both public water and public sewer.

   B. The minimum lot area may be waived for sites zoned for commercial use (NSD, GCD or RCD) where the site is occupied by a nonconforming commercial, office or industrial building, all buildings on such site are proposed to be removed and a new use permitted within the underlying zoning district is to be established. The Township Board shall only permit the PUD on the smaller site where it finds that the flexibility in dimensional standards is necessary to allow for innovative design in redeveloping the site and an existing blighted situation will be eliminated. A parallel plan shall be provided showing how the site could be redeveloped without the use of the PUD to allow the Planning Commission to evaluate whether the modifications to dimensional standards are the

minimum necessary to allow redevelopment of the site, while still meeting the spirit and intent of the ordinance.

C. The PUD site plan shall provide one or more of the following benefits not possible under the standards of another zoning district, as determined by the Planning Commission:

- preservation of significant natural or historic features
- a complementary mixture of uses or a variety of housing types
- common open space for passive or active recreational use
- mitigation to offset impacts
- redevelopment of a nonconforming site where creative design can address unique site constraints.

D. The site shall be served by public sewer and water. The Township may approve a residential PUD that is not served by public sewer or water, provided all lots shall be at least one (1) acre in area and the requirements of the County Health Department shall be met.

Size of property is 51.9+/- acres.

DESCRIBE BELOW HOW THE REQUESTED PUD DESIGNATION COMPLIES WITH AFOREMENTIONED MINIMUM LOT SIZE REQUIREMENTS.

The proposed development is over 51 acres. The development will preserve natural features and provided common open space opportunities for the residents, including walking trails, a community building and swimming pool. The site is constrained by regulated wetlands and create design is required to address the constraints. The site has access to public water supply and sanitary sewer.

STANDARDS FOR REZONING TO PLANNED UNIT DEVELOPMENT (RESPOND HERE OR WITHIN THE IMPACT STATEMENT)

1. How would the PUD be consistent with the goals, policies and future land use map of the Genoa Township Master Plan, including any subarea or corridor studies. If conditions have changed since the Master Plan was adopted, the consistency with recent development trends in the area;

The future land use map for Genoa Township identifies mixed use town center. However, a change in need for retail services has been observed in the market. There is a lack of ability to attract new retail to compete with the existing retail services already located in the area. The proposed use is consistent with the high intensity use along the Grand River Corridor. This is consistent with surrounding land use and provides a transition to the residential areas to the south.

2. The compatibility of all the potential uses in the PUD with surrounding uses and zoning in terms of land suitability, impacts on the environment, density, nature of use, traffic impacts, aesthetics, infrastructure and potential influence on property values;

The RPUD with an HDR underlying zoning is a transitional residential zoning that is typically found adjacent to high and medium intensity uses. This is consistent with this property and its surrounding uses. In this situation the property is surrounded by industrial, general business and office. There is residential to the north (higher density) and the south (lower density). The RPUD allows for additional open space, protection of natural features, and is supported by the existing infrastructure.

3. The capacity of infrastructure and services sufficient to accommodate the uses permitted in the requested district without compromising the "health, safety and welfare" of the Township;

The proposed development will be compatible with past planning efforts and therefore the infrastructure is present to support it. The township services planned for this area will not be overtaxed by the development.

4. The apparent demand for the types of uses permitted in the PUD;

Successful development area reaching various age demographics that seek amenities, less maintenance nature preservation and convenience to restaurants and shopping. This location is well located between Brighton and Howell where downtown shopping and restaurants are available as well as the Genoa retail and restaurant area at Latson and Grand River.

AFFIDAVIT

The undersigned says that they are the Owner (owner, lessee, or other specified interest) involved in this petition and that the foregoing answers and statements herein contained and the information herewith submitted are in all respects true and correct to the best of his/her knowledge and belief.

BY: Mark Kassab, Grand River Dorr, LLC

ADDRESS: 315550 Northwestern Hwy, ste 200 Farmington Hills 48334

Contact Information - Review Letters and Correspondence shall be forwarded to the following:

Jonathan Curry (*Name*) of PEA Group (*Business Affiliation*) at jcurry@peagroup.com (*E-mail*)

FEE EXCEEDANCE AGREEMENT

As stated on the site plan review fee schedule, all site plans are allocated two (2) consultant reviews and one (1) Planning Commission meeting. If additional reviews or meetings are necessary, the applicant will be required to pay the actual incurred costs for the additional reviews. If applicable, additional review fee payment will be required concurrent with submittal to the Township Board. By signing below, applicant indicates agreement and full understanding of this policy.

PROJECT NAME: Grand River Dorr

PROJECT LOCATON & DESCRIPTION: 6080 W Grand River (Grand River/Dorr)

SIGNATURE: DATE: 6/2/22

PRINT NAME: MARK KASSAB PHONE: 248-865-0066

COMPANY NAME & ADDRESS: 315550 Northwestern Hwy, ste 200 Farmington Hills 48334

GENOA CHARTER TOWNSHIP
Application for Site Plan Review

TO THE GENOA TOWNSHIP PLANNING COMMISSION AND TOWNSHIP BOARD:

APPLICANT NAME & ADDRESS: Grand River Dorr, LLC
If applicant is not the owner, a letter of Authorization from Property Owner is needed.

OWNER'S NAME & ADDRESS: Grand River Dorr, LLC

SITE ADDRESS: 6080 W Grand River PARCEL #(s): ~~47-11-11-200-014~~ 11-300-014
47-11-14-100-002

APPLICANT PHONE: (248) 865-0066 OWNER PHONE: ( )

OWNER EMAIL: mkassab@mshapriorealestate.com

LOCATION AND BRIEF DESCRIPTION OF SITE: 51.9 acres +/- at the South East Corner of Grand River and Dorr Road

BRIEF STATEMENT OF PROPOSED USE:
The proposed use will be a RPUD - multifamily development consisting of 204 apartment homes in 18 buildings, with a community clubhouse and pool.

THE FOLLOWING BUILDINGS ARE PROPOSED:
18 buildings in 12-plex or 6-plex configuration, and a community clubhouse.

I HEREBY CERTIFY THAT ALL INFORMATION AND DATA ATTACHED TO AND MADE PART OF THIS APPLICATION IS TRUE AND ACCURATE TO THE BEST OF MY KNOWLEDGE AND BELIEF.

BY: Mark Kassab

ADDRESS: 315550 Northwestern Hwy., Farmington Hills, MI 48334

Contact Information - Review Letters and Correspondence shall be forwarded to the following:

I.) Mark Kassab (Name) of Grand River Dorr, LLC (Business Affiliation) at mkassab@mshapirorealestate.com (E-mail Address)

FEE EXCEEDANCE AGREEMENT

As stated on the site plan review fee schedule, all site plans are allocated two (2) consultant reviews and one (1) Planning Commission meeting. If additional reviews or meetings are necessary, the applicant will be required to pay the actual incurred costs for the additional reviews. If applicable, additional review fee payment will be required concurrent with submittal to the Township Board. By signing below, applicant indicates agreement and full understanding of this policy.

SIGNATURE: _____ DATE: 6/2/22

PRINT NAME: Mark Kassab PHONE: 248-865-0066

ADDRESS: 315550 Northwestern Highway, ste 200 Farmington Hills 48334

2. Request to approve November 7, 2022 regular meeting minutes

3. Request Board approval to adjust the Refuse Special Assessment Roll, #X0012, and to adjust the 2022 Winter tax roll accordingly for parcel numbers 4711-09-201-243, 4711-19-300-008, ~~4711- 26-300-044~~ 4711-23-200-013, 4711-33-401-016, 4711-34-403-006, and 4711-34-403-007.

Regular Agenda

Moved by Hunt, supported by Lowe, to approve the Regular Agenda as presented. **The motion carried unanimously**.

4. Consideration of a recommendation for approval and adoption of rezoning ordinance number Z22-03 and associated Planned Unit Development (PUD) agreement, impact assessment and conceptual PUD site plan. The request is to rezone approximately 52 acres from the Neighborhood Service District, Medium Density Residential district and the Town Center Overlay district to a Residential Planned Unit Development overlay of the High Density Residential District (HDR) to allow for 204 apartments units with a net density of 6.23 units per acre. The property consists of two vacant parcels with parcel ID numbers 4711-11-300-014 and 4711- 14-100-002 located at the southeast corner of Grand River and Dorr Road. The request is petitioned by Grand River Dorr, LLC.
   A. Disposition of Rezoning Ordinance Z-22-03 (requires roll call vote)
   B. Disposition of PUD Agreement
   C. Disposition of Impact Assessment
   D. Disposition of Conceptual PUD Site Plan

Mr. Mark Kassab provided a history of the property as well as his company. They own many high-end apartment complexes in Michigan. He stated they will not be encroaching into the wetlands. The current zoning allows for a zero foot setback; however, they are proposing a 75 foot setback on Grand River and 68 feet on Dorr Road. They are proposing a less dense development than what would be allowed under the current zoning. They have discussed the expansion of Grand River with the Livingston County Road Commission and if it is needed, they will accommodate that. He cannot speak if these residents will be using Lake Chemung; however he has spoken to Mr. Wilson and he is in support of this project.

Mr. Kassab showed a colored photo rendering of the proposed buildings and explained the floor plans. He also showed the site plan and what the views will be from both Grand River and Dorr Road.

Mr. Mortensen is concerned with the amount of brick facing the roads. Mr. Kassab stated that nearly 100 percent of the front of the buildings will be brick or stone.

Ms. Skolarus questioned the location of the mailboxes. Mr. Kassab stated the clubhouse will have an area for both mail and parcel deliveries.

Ms. Ledford questioned the results of the traffic study. Ms. Jill Bauer, the traffic engineer, stated they have done a traffic study to include the hospital expansion. She stated there were no significant changes when it was included.

Ms. Hunt clarified that the water and sewer system has capacity for this development. Mr. Kassab will confirm again with MHOG that there is capacity. If there is not, then they will not be able to build what they are proposing

Ms. VanMarter noted that more details, such as building elevations and materials, environmental impacts, etc. will need to be developed and presented to the Planning Commission and Township Board for final review and approval.

Moved by Hunt, supported by Mortensen to approve and adopt Ordinance Z-22-03. This approval is made because the proposed amendment to the Zoning Map and reclassification as a Residential Planned Unit District (RPUD) /High Density Residential (HDR) with the related development agreement, impact assessment and conceptual plan has been found to comply with the qualifying conditions and the criteria stated in 10.03.01, 10.07.01 and 22.04 of the Township Zoning Ordinance. **The motion carried unanimously with a roll call vote (Ledford - yes, Croft - yes, Hunt - yes, Lowe - yes, Mortensen - yes, Skolarus - yes, and Rogers - yes).**

Moved by Hunt, supported by Lowe to approve the PUD Agreement revised on November 1, 2021 with the following conditions:

1. The revised PUD agreement submitted, made revisions to an outdated earlier version of the agreement. The applicant must work with staff and the Township attorney to blend the agreements and revisions must be made to the satisfaction of Township staff.
2. All deviations requested must be specifically detailed including setbacks requested outlined in the PUD Agreement.
3. The applicant must address any comments provided by the Township Planner and Engineer, Utilities Director and/or Brighton Area Fire Authority.

The motion carried unanimously.

Moved by Ledford, supported by Lowe, to approve the Environmental Impact Assessment dated May 25, 2022 as submitted. **The motion carried unanimously.**

Moved by Hunt, supported by Lowe, to approve the Conceptual PUD Plan dated November 4, 2022 with the following conditions:

1. The final site plan shall include all items as required by Section 10.06 as required by ordinance.

2. The deviations along Grand River for building and parking setbacks shall be reviewed to determine if they can be moved further south to decrease the 25-foot deviation.

The motion carried unanimously.

5. Request to approve the proposal from Douglas Electric dated November 4, 2022 for the Township Hall parking lot and driveway lighting improvements excluding and deducting both alternates for a total construction project cost not to exceed $145,325.50 ($126,370 + 15% contingency).

Ms. Hunt asked if this proposal includes lighting for the basketball courts as requested by a resident, whose letter is in this evening's packet. Ms. VanMarter stated that was Alternate Proposal #2, which was removed from her recommendation. It can be done at a later date. Supervisor Rogers requested the Board discuss adding lighting to the court.

Moved by Lowe, supported by Mortensen, to approve the proposal from Douglas Electric dated November 14, 2022 with removal and deductions for alternate proposals 1 and 2 for a project total not to exceed $145,325.50 ($126,370 plus 15% contingency). **The motion carried unanimously.**

6. Consideration of Resolution 221121 for Censure and Reprimand of the Township Clerk, Paulette Skolarus. (requires roll call vote)
   A. If necessary, consider motion to enter into closed session under the Open Meetings Act, MCL 15.268(h) to consider material exempt from discussion or disclosure by state or federal statute (attorney-client communications). (requires roll call vote and 2/3 majority)
   B. Consider motion to adjourn the closed session and reconvene in open session. (roll call)

Ms. VanMarter distributed the Resolution for Censure and Reprimand of the Township Clerk for all Board Members to read.

Ms. Skolarus asked to make a presentation. Mr. Rogers stated he requested at the last Board Meeting that any further discussion regarding the investigation be placed as an agenda item and that the Clerk submit that request as required by policy. She did not provide it as required therefore, that item is not on tonight's agenda. Ms. Lowe asked if Ms. Skolarus read the entire resolution. Ms. Skolarus responded that she did not. Ms. Lowe encouraged Ms. Skolarus to read the entire resolution.

Ms. Skolarus would like to present data to the Board regarding her and Mr. McCririe's payroll from 2016. Ms. Hunt stated a motion was approved at the October 26, 2022 Special Board Meeting that no more Township funds or resources shall be used regarding this payroll issue, and asked if Ms. Skolarus used the Township copier to make copies of the data to present to each of the Board Members this evening. Ms. Skolarus indicated that she did make copies on the Township copier.

GENOA CHARTER TOWNSHIP BOARD
Regular Meeting & Public Hearing
November 7, 2022

MINUTES

Supervisor Rogers called the regular meeting of the Genoa Charter Township Board to order at 6:30 pm at the Township Hall. The following members were present constituting a quorum for the transaction of business: Bill Rogers, Paulette Skolarus, Jean Ledford, Terry Croft, Jim Mortensen, Diana Lowe and Robin Hunt. Also present were Township Manager Kelly VanMarter, Township Attorney Joe Seward, Human Resources Director Kim Lane and William Tucker of Maner Costerisan and five persons in the audience.

The Pledge of Allegiance was recited.

The call to the public was opened at 6:31 pm

Ms. Eda Biegas of 1950 Genoa Circle questioned the traffic study that was submitted for the apartments on the corner of Dorr and Grand River only included the traffic from the new hospital or included the summer lake traffic also. If not, she would like it to include it. Ms. VanMarter advised she can review the study and provide that information to Ms. Biegas.

Ms. Biegas wants to ensure that the setbacks are far enough that if Grand River needs to be expanded, it won't be the homes on the other side of the road that will be affected. She feels the proposal is too dense.

Mr. Wayne Brewer who lives in Sunrise Park has concerns about the Dorr Road development. He is against it. It is not needed. There is already a lot of congestion in that area. The farmland should remain farmland.

Mr. Andy Beaudry of 3631 Woodridge is opposed to the rezoning for the apartments. It is not a good fit for the Township, it will increase traffic, and the property is very close to one of the largest egret populations in the County.

The call to the public was closed at 6:37 pm.

Consent Agenda

Moved by Ledford, supported by Mortensen, to approve the Consent Agenda as presented. **The motion carried unanimously**.

1. Payment of Bills: November 7, 2022

2. Request to approve October 17, 2022 regular meeting and October 26, 2022 special meeting minutes

- The applicant shall comply with the conditions of the Planning Commission.
- The applicant shall comply with the conditions of the Township Engineer's letter dated March 8, 2022 prior to land use permit issuance. The stormwater comments can be addressed by the Livingston County Drain Commissioner's Office as part of the SESC review and permit process.
- The applicant shall comply with the conditions of the Brighton Area Fire Authority Fire Marshal's letter dated March 9, 2022 prior to land use permit issuance.
- Future parking lot lighting shall comply with the Township Exterior Lighting Standards (Section 12.03).
- In order to connect to the public utilities, all REU fees must be paid at land use permit issuance.
- There shall be a limit of four to six trailers on the property.

The motion carried unanimously.

8. Request for introduction of the proposed rezoning ordinance number Z-22-03 and to set the meeting date for the purpose of considering the proposed ordinance for adoption before the Township Board on Monday, November 21, 2022. The request is to rezone approximately 52 acres from the Neighborhood Service District, Medium Density Residential District and the Town Center Overlay District to Residential Planned Unit Development. The property consists of two vacant parcels with a combined total of approximately 52 acres with parcel ID numbers 4711-11-300-014 and 4711-14-100-002 located at the southeast corner of Grand River and Dorr Road.

Moved by Hunt, supported by Ledford, to introduce proposed rezoning ordinance number Z-22-03 and to set the meeting date to consider adoption before the Township Board on Monday, November 21, 2022 for the purpose of considering the proposed zoning map Amendment. **The motion carried unanimously.**

9. Request for approval to appoint Kelly VanMarter as the FOIA Coordinator for the remainder of the current term, to re-appoint Diana Lowe to the Planning Commission with a term ending 11/20/23, to re-appoint Jean Ledford to the Zoning Board of Appeals with a term ending 11/20/23 and to re-appoint Chris Grajek, Ron Matkin, Marianne McCreary, and Lindsay MacFarlane (alternate) to the Board of Review with terms ending 12/31/24 as recommended by the Township Supervisor.

Moved by Lowe, supported by Mortensen, to appoint Kelly VanMarter as the FOIA Coordinator for the remainder of the current term, to re-appoint Diana Lowe to the Planning Commission with a term ending 11/20/23, to re-appoint Jean Ledford to the Zoning Board of Appeals with a term ending 11/20/23 and to re-appoint Chris Grajek, Ron Matkin, Marianne McCreary, and Lindsay MacFarlane (alternate) to the Board of Review with terms ending 12/31/24. **The motion carried unanimously**.

Commissioner Dhaenens asked Ms. Kline-Hudson how Genoa Township as well as other communities can meet to open the dialogue to discuss traffic issues in the county. She stated she can definitely facilitate a discussion between the appropriate municipalities.

OLD BUSINESS:

OPEN PUBLIC HEARING #1...Consideration of a rezoning application, PUD Agreement, Environmental Impact Assessment and conceptual PUD Plan for a proposed rezoning and conceptual plan approval for a proposed development of 204 apartment units. The proposed rezoning is to go from Neighborhood Service District (NSD)/Medium Density Residential (MDR) with Town Center Overlay (TC) to High Density Residential (HDR) with a Residential Planned Unit Development (RPUD) overlay. The request involves parcels 4711-11-300-014 and 4711-14-100-002 located on the southeast corner of Grand River Avenue and Dorr Road. The request is petitioned by Grand River Dorr, LLC.

A. Recommendation of Rezoning to HDR/RPUD
B. Recommendation of PUD Agreement (dated 6-22-22)
C. Recommendation of Environmental Impact Assessment (file dated 5-25-22)
D. Recommendation of Conceptual PUD Plan (dated 8-22-22)

Mr. Mark Kassab and Mr. James Galbraith of Grand River Dorr, LLC, Mr. Jonathan Curry, the architect, and Ms. Jill Bauer, the traffic engineer, were present.

Mr. Kassab reviewed the requests that were made at the previous Planning Commission meeting. They have increased the setbacks on Grand River from 50 feet to 75 feet and on Dorr Road from 46 feet to 77 feet.

They have done a lot of research and called MISS Dig and there is no fiber optic line through the property.

Ms. Bauer stated she has received a copy of the traffic study that was done for the hospital and that proposed expansion did not negatively affect the traffic for this project. The study included the intersections at Dorr and Grand River & Hughes and Grand River. Most of the trips for the hospital are from and toward the east so they do not affect their project.

Mr. Borden reviewed his letter dated August 31, 2022

1. PUD Qualifying Conditions
    - Based upon his review, the qualifying conditions of Section 10.02 are satisfied. The applicant must address any comments provided by the Township Engineer, Utilities Director and/or Brighton Area Fire Authority.

2. Rezoning Criteria
    - As a PUD project, the request may be viewed as consistent with the intent and goals/objectives of the Master Plan.
    - HDR rezoning may be viewed as appropriate given the inclusion of the RPUD and the site amenities provided by the proposal.
    - His belief is that the RPUD is reasonable provided the provisions of Section 10.03.01 are met to the Township's satisfaction.
3. Conceptual PUD Plan
    - Deviations are sought for side and rear parking setbacks, excess parking spaces, grading (but not structures) within the natural feature setback, and from the requirement for a 100-foot open space depth along exterior public roadways. He noted they improved this to 75 feet; however, it still requires a deviation.
    - Revisions to the plan have improved upon the parking setback and open space depth deviations previously discussed.
    - Per the previous meeting, the applicant is working on building material calculations to determine whether deviations are necessary or not. This would need to be determined at the time final site plan approval is requested.
4. Draft PUD Agreement
    - The Agreement must identify the deviations sought as part of the PUD.
    - He suggests additional language be provided with respect to the preservation and maintenance of open space/conservation areas.
    - If a phased project is proposed, each phase must be described and outlined.
    - The applicant must address any comments provided by staff and/or the Township Attorney.

Ms. Byrne reviewed her letter dated September 7, 2022. Two significant items are:

1. The Livingston County Road Commission will need to approve both access drives to the site, and this approval should be provided to Genoa Township prior to final approval.
2. The response letter provided by Grand River Dorr, LLC., dated August 22, 2022, provided modified setbacks on Grand River Avenue and Dorr Road, and referenced communication with the Livingston County Road Commission. Communication with the Road Commission regarding the suitability of the proposed setbacks for future ROW needs should be provided to the Township for their records.

The remaining items in her letter were for informational purposes or will be addressed at final site plan approval.

The letter from the Brighton Area Fire Authority Fire Marshal, Rick Boisvert, dated August 25, 2022 states the following:

- A minimum vertical clearance of 13½ feet shall be maintained along the length of all apparatus access drives. This includes but is not limited to porte-cochere, lighting, and large canopy trees. A number of trees must be relocated, the species modified, or the

road width increased to not overhang the roadways. **(A note was provided to address plantings at final site and construction review on the previous submittal, however the artist rendering indicates over 400 large canopy trees lining the roadways throughout the development. As they grow and reach full growth, nearly all species will either partially or completely encroach the roadway. Additional consideration shall be made to placement and species, and will require the ownership to include the overhead clearance requirement in the facility maintenance plan.)**

Mr. Kassab provided the type of trees that will be planted and how they grow, noting that they will not encroach into the roadway.

The call to the public was opened at 7:04 pm.

Ms. Janine Deaton of 699 Sunrise Park stated the corner at Grand River and Dorr Road is a blind spot. She asked how this traffic is going to affect the traffic on Grand River to Bendix, to Hacker, and further. She is also concerned about the power grid. She recently had a five-day power outage.

Ms. Serena Anzalone of 5964 Glen Echo stated the traffic light at Dorr Road does not function properly.

Mr. Ed Loft of 6055 East Grand River stated there will be over 300 cars entering and exiting this complex each day. He asked about the detention pond and how it will drain. Mr. Curry explained that the Road Commission has restricted how much they can send out of this pond and into the lake. Mr. Loft asked if there will be a light installed on Dorr Road at the entrance.

Ms. Irene Loft stated that her view is beautiful now and if this is developed, it will then be of all of these buildings and garage doors.

Ms. Susan Nichols of 4935 Fairways Drive is concerned about immigrants coming into our community. She saw a group of approximately 25 immigrant men at Marshalls. She is not sure how they are getting here. They are a danger. A woman was cornered at Target by two Mexican men recently. She wants to ensure these are high-end apartments and they will not be subsidized.

The call to the public was closed at 7:15 pm.

Mr. Kassab stated this is not a subsidized complex. With their targeted rent, the household income of the residents would need to be approximately $150,000 per year. He understands the traffic concerns; however, as the planner stated, this property is currently zoned to allow for 28

units per acre and they are proposing 6 units per acre. This PUD would benefit the Township and the developer. This is proper and sustainable development.

Commissioner Rauch thanked the public for their comments and understands their concerns. The applicant has provided all of their information from their professionals and it has been reviewed by the Township's professionals. He questioned if there was anything that the applicant can do to improve the outlet of their stormwater into the lake. Ms. Kassab stated that when they develop the property and install the retention ponds, it will improve the quality of the water that is coming off of their property.

There was a discussion regarding the current ROW and any possible increases to the ROW at this intersection and how that would affect the setbacks proposed for this development. Commissioner Rauch noted that while the setbacks have been increased with the new plan, they still do not meet the requirements. He would like to see the two buildings on Grand River meet the 100 foot setback requirements.

Commission Dhaenens would like to see the 100 foot setback met on Grand River and Dorr Road. Mr. Kassab stated they cannot increase the setback and decrease the size of the units. To accommodate the smaller setback, they have increased the landscaping and buffer along both roadways. Commissioner Dhaenens agrees with that for Dorr Road; however, he agrees with Commissioner Rauch. He would like the setback to be 100 feet on Grand River. Mr. Kassab provided his reasoning for requesting the deviation, which included the integrity of the product he is developing, the preservation of the wetlands on the property, as well as the financial feasibility of the project.

Chairman Grajeck asked for the setback requirements as it is zoned now. Mr. Boarden stated they are allowed a zero lot line setback. Commissioner Rauch stated this would be if this were a commercial development, and this is residential. Ms. VanMarter stated she has met with the Road Commission about traffic calming in this area and they were not in favor of that. She questioned the applicant if they have met with the Road Commission to determine if they have plans to increase the ROW. Mr. Kassab is not aware of any plans that the Road Commission has with increasing the road width. He noted that there is very little market for commercial development.

Commissioner Chouinard would like to see the 100 foot setback on Grand River, but noted that this project will develop this site and it is difficult to develop it as it is currently zoned commercial. If it was developed as commercial, the setback could be zero. The applicant's product is "top-notch".

Ms. VanMarter stated the standard setback along Grand River is 35 feet and if there is parking in the front, then the setback would be 70 feet. The Grand River setback for the condos off of Cortland Avenue is 35 feet.

Mr. Kassab showed and reviewed the Google Maps view of their development in Novi, which is on Grand River also, and is very similar to what they are proposing in Genoa Township.
Ms. VanMarter advised the public that she will contact the Road Commission tomorrow to alert them of the signal trouble at Glen Echo as noted in the call to the public.

Moved by Commissioner Rauch, seconded by Commissioner Dhaenens, to recommend to the Township Board approval of the rezoning from Neighborhood Service District (NSD)/Medium Density Residential (MDR) with Town Center Overlay (TC) to High Density Residential (HDR) with a Residential Planned Unit Development (RPUD) overlay for Parcels 4711-11-300-014 and 4711-14-100-002 located on the southeast corner of Grand River Avenue and Dorr Road, per the following

- The Planning Commission finds this request is consistent with the intent and goals/objectives of the Master Plan.
- HDR rezoning is appropriate given the inclusion of the RPUD and the site amenities provided by the proposal.
- The provisions of Section 10.03.01 of the Zoning Ordinance are met to the Planning Commission's satisfaction.

The motion carried unanimously.

Moved by Commissioner Rauch, seconded by Commissioner Lowe, to recommend to the Township Board approval of the PUD Agreement dated June 22, 2022 for a proposed development of 204 apartment units for Grand River Dorr, LLC. per the following:

- The qualifying conditions of Section 10.02 of the Zoning Ordinance are satisfied.
- The applicant must address any comments provided by the Township Engineer, Utilities Director and/or Brighton Area Fire Authority.

The motion carried unanimously.

Moved by Commissioner Rauch, seconded by Commissioner Dhaenens, to recommend to the Township Board approval of the Environmental Impact Assessment dated May 25, 2022 for a proposed development of 204 apartment units for Grand River Dorr, LLC. **The motion carried unanimously.**

Moved by Commissioner Rauch, seconded by Commissioner Lowe, to recommend to the Township Board approval of the Conceptual PUD Plan dated August 22, 2022 for a proposed development of 204 apartment units for Grand River Dorr, LLC. per the following:

- The deviations for building and parking setbacks along Dorr road are appropriate.
- The deviations along Grand River for building and parking setbacks shall be reviewed to determine if they can be moved further south to decrease the 25-foot deviation.
- As a concept plan the Planning Commission finds this appropriate.

The motion carried unanimously.

1. The response letter from the Petitioner, dated June 22, 2022, notes that the proposed additional flow to the existing detention basin was designed in accordance with conversations with the Livingston County Drain Commissioner (LCDC). The provided plans do not include information on any infiltration testing or calculations as required by the updated LCDC standards and an approval letter should be provided from the LCDC to ensure this requirement is being waived prior to approval.
2. The detention basin outlet detail shows the 100-year detention and channel protection orifice at 958.75 and 958.5 respectively, but the design storm elevation calculations show the 100-year elevation at 960.70 and the channel protection elevation at 960.43. The outlet detail should be revised to show the correct orifice elevations.

The Brighton Area Fire Authority letter dated July 5, 2022 states that all of the previous concerns have been addressed.

A cal to the public was made at 8:41 p.m. with no response.

Commissioner McCreary asked if this a medical use or general office. Mr. Crane stated that there will be a small lab with medical staff and they would have nurses on staff, may also include physical therapy.

Commission Rauch stated that there is residential backing up the parking lot. He asked if the petitioiner would be agreeable to add more of a screen for the houses. Mr. Crane stated that they will add more landscaping to fill in the gaps of the existing screen.

Moved by Commissioner Rauch, seconded by Commissioner Dhaenens to recommend to the Township Board approval of the Environmental Impact Assessment dated June 1, 2022 for the expansion of a parking lot for an existing office/medical building located at 3399 E. Grand River Avenue on the north side of Grand River Avenue, west of Grand Oaks Drive. **The motion carried unanimously.**

Moved by Commissioner Rauch, seconded by Commissioner Lowe, to approve the site plan dated June 21, 2022 for the expansion of a parking lot for an existing office/medical building located at 3399 E. Grand River Avenue on the north side of Grand River Avenue, west of Grand Oaks Drive with the following conditions:

- The Planning Commission finds the 121% parking is sufficient.
- Replacement of the 4 evergreen trees with 4 canopy trees.
- Lighting fixtures and details will comply with the Township Zoning Ordinance and must receive staff approval.
- Petitioiner will incorparate additional plantings along the north property line to fill in the gaps in the landscaping.
- Landscaping plan discrepencies will be corrected.
- The applicant must address any comments provided by the Township Engineer and/or Brighton Area Fire Authority.

The motion carried unanimously.

OPEN PUBLIC HEARING #4...Consideration of a rezoning application, PUD Agreement, Environmental Impact Assessment and conceptual PUD Plan for a proposed rezoning and conceptual plan approval for a proposed development of 204 apartment units. The proposed rezoning is to go from Neighborhood Service District (NSD)/Medium Density Residential (MDR) with Town Center Overlay (TC) to High Density Residential (HDR) with a Residential Planned Unit Development (RPUD) overlay. The request involves parcels 4711-11-300-014 and 4711-

14-100-002 located on the Southwest corner of Grand River Avenue and Dorr Road. The request is petitioned by Grand River Dorr, LLC.

A. Recommendation of Rezoning to HDR and PUD application for RPUD
B. Recommendation of PUD Agreement (dated 6-22-22)
C. Recommendation of Environmental Impact Assessment (file dated 5-25-22)
D. Recommendation of Conceptual PUD Plan (dated 6-23-22)

Mark Kassab and Jim Galbraith, with Grand River Dorr LLC., Jon Curry with PEA Group, and Jill Bauer, with Fishbeck, Thompson were present for the petitioner.

Mr. Kassab gave a presentation on the company and the project. The project is proposed to consists of 204 high-end apartment units with two car attached garages, direct access to the units, 2-3 bedrooms, 1480-1630 sq. ft. units. The rent would range from $2400-$2800 per unit. The market studies that they have conducted support this type of project. The current property is zoned NSD and MDR with a TC overlay. The Township no longer in interested in pursuing the Town Center overlay. The current zoning is 14 units per acre based on the current zoning and with the TC overlay it would be 28 units per acre by special use. They are proposing 6.2 units per acre. He stated that they do not believe that this is a strong site for retail use. Some of the amenities will include EV stations, pet wash, pet park, resort style park, pool and amazon station and walking paths. They are not proposing any impact to the wetlands and the natural features setback buffer.

Mr. Borden reviewed his letter dated July 7, 2022:

1. PUD Qualifying Conditions: based upon our review, the qualifying conditions of Section 10.02 are satisfied. The applicant must address any comments provided by the Township Engineer, Utilities Director and/or Brighton Area Fire Authority.
2. Rezoning Criteria:
    a. As a PUD project, the request may be viewed as consistent with the intent and goals/objectives of the Master Plan.
    b. HDR rezoning may be viewed as appropriate given the inclusion of the RPUD and the site amenities provided by the proposal.
    c. We believe the RPUD is reasonable provided the provisions of Section 10.03.01 are met to the Township's satisfaction.
3. Conceptual PUD Plan:
    a. Deviations are sought for side and rear parking setbacks, excess parking spaces, grading (but not structures) within the natural feature setback, and from the requirement for a 100-foot open space depth along exterior public roadways.
    b. At the time of this review letter, the applicant is working on building material calculations to determine whether deviations are necessary (or not).
4. Draft PUD Agreement:
    a. The Agreement must identify the deviations sought as part of the PUD.
    b. If the Township is amenable to reducing the 100-foot open space along both exterior roadways, we suggest the applicant be required to provide enhanced landscaping and screening along both
    frontages. This should include appropriate screening for vehicle parking and/or garage doors.
    c. We suggest additional language be provided with respect to the preservation and maintenance of open space/conservation areas.
    d. If a phased project is proposed, each phase must be described and outlined.
    e. The applicant must address any comments provided by staff and/or the Township Attorney.

Ms. Byrne reviewed her letter dated July 6, 2022:

1. The Livingston County Road Commission will need to approve both access drives to the site, and this approval should be provided to Genoa Township prior to final approval.
2. A Traffic Impact Study was completed for the proposed development and was included in the impact assessment. The study concludes that left turn passing lanes will be needed at both site drives, and this is included on the site plans. The development will increase traffic in the localized area however the improvements presented in the traffic study should mitigate the impacts.
3.The detention calculations shown on sheet C3.1 should be updated to the new Livingston County Drain Commissioner standards as part of the final site plan submittal.
4.The petitioner is proposing multiple connections to the existing storm sewer on Grand River Avenue. The Livingston County Road Commission will need to approve all proposed connections to their storm sewer system and said approval should be provided to Genoa Township prior to final site plan approval.
5.The Petitioner is proposing grading within the 25-foot wetland setback. This will require a special land use permit or should be addressed in the PUD Agreement.
6. A utility impact study should be completed by MHOG for the proposed development, as it will account for more than 100 new residential units. The downstream sanitary sewer pump stations have known capacity concerns, and improvements will need to be considered as part of this development.
7. The final site plan should include MHOG standard details.
8. After final site plan approval, the Petitioner will be required to submit construction plans to MHOG Sewer and Water Authority for review and approval.

The biggest issue of concern is the connection of the storm system to the public road system. The applicant should ensure that the Road Commission will agree to this proposed design.

Chairman Grajek asked if the petitioner has reviewed the Brighton Area Fire Authority letter dated July 5, 2022. Mr. Kassab stated that they have and will comply with the letter.

For the benefit of the residents in attendance, Chairman Grajek asked Mr. Borden to go over the steps in the process. Mr. Borden stated that this is here for rezoning and conceptual review. The project will need to go to the Board for conceptual approval and then the final approval process would be back before the Planning Commission before going to the Board again for the final approval.

Commissioner Dhaenens asked about parking and that he has an issue with not requiring the 100-foot open space setback from the roads. Mr. Kassab stated that there are two spots in the garage and two spots outside of the garage for parking. They have designed the units to have two front elevations with substantial landscaping to where you will not see the buildings.

Mr. Borden stated that the current zoning allows for zero lot line setbacks.

Commissioner Rauch asked why the applicant is asking for the PUD. Mr. Borden responded that it is because they are not proposing a mixed-use component. Mr. Kassab stated that they looked at a project with commercial along Grand River with 400 units behind but they felt that commercial wouldn't work in this location and they felt like this was a better project.

Chairman Grajek asked for a review of the traffic. Ms. Bauer gave a review of the traffic impact study stating that it was determined that there would be no impact. Chairman Grajek asked how it was possible that this would have no impact. Ms. Bauer stated that the signalized intersections

are operating at acceptable levels and the added units would not reduce the level of service at all three major intersections. There will be more traffic, but not so much that it would cause a significant reduction in the current level of service.

Chairman Grajek asked if the proposed hospital project would impact their traffic counts. Ms. Bauer stated that they would update their traffic study to include the hospital project.

Commissioner Chouinard asked the applicant have they are going to handle the fiber line that runs through the property. Mr. Gilbraith stated that they would move it.

Commission McCreary stated that she is concerned with the boat traffic on Dorr Road since there are three boat businesses located in the immediate area.

Commission McBain stated that she struggles with this conversation on traffic since it is less than what is allowed on the site. Why are they concerned with traffic when they have not been concerned about it elsewhere?

Commissioner Rauch stated that he is struggling with the reduction of the RPUD 100-foot open space buffer requirement from the roads.

A call to the public was made at 9:44 p.m. with the following responses:

Robert Biegas, 1950 Genoa Circle, stated he has concerns with the 100-foot buffer reduction and the impact on Grand River Avenue. There would be no room for a right turn lane.

Joe Mahalak, 5259 Pentwater Drive, has concerns with the south bound traffic on Dorr Road turning left.

Robert Kuikhi, 6035 E. Grand River Avenue, stated that he has lost a loved one to a car accident. He has concerns with the traffic and the people pulling boats. He would like to see something to accommodate the Grand River residents in the Hughes and Dorr Road area.

Judy Moses, 5251 Pentwater Drive, stated that she has concerns about the electricity in the area. They have weekly outages all the time. Does DTE work the Township when a development is proposed.

Laura Wildman, 658 Pathway, she does not know how Wilson Marine gets out of their business due to the traffic. She has concerns about the runoff going into Lake Chemung. She asked how the project would benefit the Township.

Bruce Kimball, 1189 Catherine's Way, stated south bound Hughes Road traffic is bad. There is an incline in the grade at the light on Hughes and only 2 cars can make it through the light in the winter to turn left. Traffic is the main issue.

Ron Wilson, 6095 Grand River Avenue, he is the owner of Wilson Marine, in the summer months there are 65-70 boats on trailer coming and going and semi-trucks delivering. Dorr Road is a raceway. He is concerned with safety and sight lines along Dorr Road. His business produces a lot of light and noise and work from 7 a.m. to 9 p.m. so they might consider more screening for the buildings across Grand River.

Frank Keresztes-Fischer, 5859 Griffith, stated that he is concerned about food security. Millions of acres of farm land are being lost to developments. The productive farm land needs to be protected.

Edward Luff, 6055 E. Grand River Avenue, is concerned about a loss of visibility for drivers on Dorr Road. It is all open now and you can see 1/8 mile towards Hughes Road. Once they build the loss of visibility will be more dangerous. He is concerned about the detention pond at the corner of Dorr Road and Grand River Avenue. Where does it drain to? Does it drain into Lake Chemung?

David Cary, 1813 S. Hughes Road, The Shaved Ice business has had to replace two tables located outside due to cars hitting them. Everybody tries to use the right turn lane that does not exist to turn on to Grand Rive Avenue. There needs to be a right turn lane on Hughes Road northbound at Grand River. The Township owns the property on Hughes Road with a 10-foot drain easement. The agreement states that the Township can increase the easement to 20-feet wide if needed. What is planned for that easement? The drainage into the lake is a huge issue.

Serena Anzalone, 5964 Glen Echo Drive, stated that Glen Echo gets 6 to 8-inch divots in their road due to the drainage from Grand River Avenue. The rainwater brings dirt and debris. She is also concerned about the noise and traffic.

Eda Biegas, 1950 Genoa Circle, stated that there is overall traffic congestion without lights. They chose Genoa Township because it is less congested. There is no room for the roads to be widened if the 100-foot setback is not required. Maybe construct single story homes with less units to make the traffic more manageable.

The call to the public closed at 10:06 p.m.

Mr. Curry stated that the majority of the drainage goes to the back of the parcel into the wetlands. The front drainage goes into Grand River Avenue which is under the Livingston County Road Commission control.

Commissioner Rauch stated that he has trouble visualizing the 100-foot open space reduction along Grand River Avenue. This section of the road right of way is a variable mix in width. Typically for a 5-lane road, the right of way would be 125 feet wide not 90 feet wide. It would make it difficult to expand the road. Commissioner Dhaenens agreed that he has issues with the 100-foot open space buffer reduction, traffic and the location of the fiber lines.

Mr. Kassab stated that they understand the concerns with the traffic and would like to be postponed to make adjustments and see if they can locate the buildings further back from Grand River and Dorr Roads.

Moved by Commission Dhaenens, seconded by Commissioner Lowe to postpone public hearing #4, consideration of a rezoning application, PUD Agreement, Environmental Impact Assessment and conceptual PUD Plan for a proposed rezoning and conceptual plan approval for a proposed development of 204 apartment units. The proposed rezoning is to go from Neighborhood Service District (NSD)/Medium Density Residential (MDR) with Town Center Overlay (TC) to High Density Residential (HDR) with a Residential Planned Unit Development (RPUD) overlay. The request involves parcels 4711-11-300-014 and 4711-14-100-002 located on the Southwest corner of Grand River Avenue and Dorr Road to the applicant the ability to address the setbacks from Grand River and Dorr Roads, location of fiber lines and to update the traffic study with the proposed hospital addition. **The motion carried unanimously.**

June 6, 2023

Planning Commission
Genoa Township
2911 Dorr Road
Brighton, Michigan 48116

Attention:	Amy Ruthig, Planning Director
Subject:	Legacy Apartment Homes – Final PUD Plan Review #2
Location:	Southeast corner of Grand River Avenue and Dorr Road
Zoning:	RPUD Residential Planned Unit Development

Dear Commissioners:

At the Township's request, we have reviewed the revised submittal from Grand River Dorr, LLC requesting review and approval of a final PUD site plan for a multiple-family development on 51.9 acres of land at the southeast corner of Grand River and Dorr (plans dated 5/30/23).

A. Summary

1. The applicant must provide a revised PUD Agreement addressing comments provided to date.
2. Building design, materials, and colors are subject to review and approval by the Planning Commission; however, they are generally consistent with approved conceptual PUD plan.
3. We request the applicant add the Dorr Road sidewalk connection and crosswalk to the overall site plan (it is depicted on the landscape plan).
4. The applicant must address any additional comments provided by the Township Engineer and/or the Brighton Area Fire Authority with respect to vehicular circulation and site engineering.

B. Proposal/Process

The proposal entails 204 apartment units within 18 buildings. The development also includes several resident amenities:

- A clubhouse/community center with an outdoor pool;
- Open space and park areas with benches and trash receptacles throughout;
- A dog park and pet waste stations;
- Pedestrian paths and bike racks throughout the property; and
- Electric vehicle charging stations;
- Decorative entrance features, including masonry walls/piers and metal fencing; and
- Preservation of a significant wetland area.

Procedurally, the Planning Commission is to review the final PUD site plan, Environmental Impact Assessment, and edited PUD Agreement, and put forth a recommendation on each to the Township Board.

Aerial view of site and surroundings (looking north)

C. Final PUD Site Plan Review

1. **PUD Agreement.** At the time of this review, the applicant is still editing the PUD Agreement to address comments put forth during the initial review.

   The document previously submitted addressed the comments raised during our review of the conceptual PUD site plan and rezoning.

   In addition to addressing comments provided by staff and the Township Attorney, the applicant is also adding language to incorporate signage along the limits of disturbance around the wetland areas, as requested.

   The plan itself identifies 10 signs along the wetland areas stating, "protected area/do not mow beyond this sign."

2. **Consistency with PUD.** The final PUD site plan is consistent with the approved conceptual PUD site plan with respect to use, number of units/density, number/types of buildings, development amenities, and the dimensional deviations granted by the Township.

3. **Dimensional Requirements.** As noted in Section 1.3 of the PUD Agreement and on Sheet C-2.1 of the final PUD site plan, the approved RPUD includes dimensional and design deviations from conventional Ordinance requirements.

   Of note, the deviations include reduced open space areas along public roadways, allowance for site grading into the 25' natural features setback, increase in the amount of parking, and building material modifications.

   Based on our review, the final PUD site plan is consistent with the dimensional requirements granted for this RPUD.

4. **Buildings.** The building drawings include 2 elevations with slight variations in materials. Overall, materials include brick and 2 types of siding (horizontal and shake-style).

The approved RPUD included deviations to reduce the percentage of brick and increase the percentage of siding on the garage facades.

Building materials and colors are subject to review and approval by the Planning Commission. The applicant should be prepared to present building material and color samples (and/or a color rendering) to the Commission as part of its review.

5. **Pedestrian Circulation.** The plan includes 5' public sidewalks within the Grand River and Dorr Road rights-of-way.

   The Dorr Road sidewalk includes a connection and crosswalk across the roadway to the public sidewalk on the west side of the roadway. It should be noted, however, that the connection and crosswalk are depicted on the landscape plan, but not the overall site plan. We request the applicant add this detail to the overall site plan.

   Internally, the plan includes 5' sidewalks along the drives, around and between buildings, as well as a 5' pathway through the open space and park areas, consistent with the approved conceptual PUD plan.

6. **Vehicular Circulation.** Vehicular access is provided via 2 new drives, with access to/from both Grand River Avenue and Dorr Road.

   The drives are aligned with existing roadways (Hughes for Grand River and Sterling Drive for Dorr).

   The traffic study recommends an upgraded traffic signal at the Grand River and Hughes intersection. A note on Sheet C-2.2 indicates that design and installation of the new signal will be completed by the Road Commission.

   The applicant must address any additional comments provided by the Township Engineer and/or the Brighton Area Fire Authority with respect to vehicular circulation (including any comments on the traffic study).

6. **Parking.** Section 14.04 requires 2 spaces per unit with 2 bedrooms or more. Each of the 204 units proposed contains at least 2 bedrooms; as such, the project requires 408 parking spaces.

   The site plan provides a total of 703 parking spaces – 408 garage spaces, 204 driveway spaces, and 91 additional spaces for guest, clubhouse, and mailbox parking.

   Guest, clubhouse, and mailbox parking spaces meet the dimensional and design standards of Section 14.06.

   The approved PUD granted an increase in the amount of parking provided, per Section 14.02.06. While the final site plan has 2 additional spaces beyond the conceptual site plan, the request is in keeping with the approved PUD.

7. **Landscaping.** Plantings are located throughout the development, with an emphasis on the road frontages and entranceways, along internal drives, and around buildings and storm water areas.

   Overall, the plan includes 374 deciduous trees, 284 evergreen trees, and 2,494 shrubs, as well as ornamental grasses and perennials.

   It is also worth noting that the revised landscape plan incorporates previous review comments from the Fire Authority regarding tree overhang along roadways.

8. **Exterior Lighting.** The lighting plan includes a variety of fixtures - ornamental light poles/fixtures, decorative sconces, bollard lights, and decorative and conventional wall-mounted fixtures.

   The plan and details depict compliant fixture styles and light intensities throughout the development.

9. **Refuse Removal.** A note on Sheet C-2.1 states that "trash collection will be provided via individual trash carts for each unit with curb side trash collection."

10. **Impact Assessment.** In summary, the Assessment notes that the proposed project is not expected to have an adverse impact upon natural features, stormwater, surrounding land, public services/utilities, or traffic and pedestrians.

    As previously referenced, the traffic study recommends signal improvements at the Grand River/Hughes intersection and the plan reflects such.

Should you have any questions concerning this matter, please do not hesitate to contact our office.

Respectfully,
SAFEBUILT

Brian V. Borden, AICP
Michigan Planning Manager

TETRA TECH

June 7, 2023

Ms. Amy Ruthig
Genoa Township
2911 Dorr Road
Brighton, MI 48116

Re: Legacy Apartments
Final Site Plan Review No. 2

Dear Ms. Ruthig,

Tetra Tech conducted a second review of the proposed Legacy Apartment Homes final site plan and accompanying documents last dated May 30, 2023. The plans were prepared by PEA Group on behalf of Grand River Dorr, LLC. The site is located on the southeast quadrant of the Grand River Avenue and Dorr Road intersection. The proposed development consists of 204 multi-family units and includes sanitary sewer and water main improvements, on-site storm sewer and detention, and private road improvements. We offer the following comments:

TRAFFIC/PAVEMENT

1. A private road is proposed. After final site plan approval, private road construction plans should be submitted to the Township for review and approval.

DRAINAGE AND GRADING

1. The petitioner has submitted plans to the Livingston County Drain Commissioner (LCDC) for review and approval. Comments in their letter dated May 9, 2023, should be addressed and approval from the LCDC should be obtained. Since remaining comments from LCDC are not major, we believe the drainage plan is adequate for Planning Commission and Board approval. Approval from the LCDC should be provided to the Township prior to a Land Use permit being issued.

2. The petitioner is proposing multiple connections to the existing storm sewer on Grand River Avenue. The LCRC will need to approve all proposed connections to their storm sewer system and said approval should be provided to Genoa Township prior to a Land Use permit being issued.

3. The grading plan shows areas with slopes exceeding 1:4. Planning Commission approval is required for 1:3 slopes. Steeper slopes are required on this site due to the large change in grade across the site and the SESC plan shows soil erosion control blankets on all slopes exceeding 1:4; therefore, we have no objection to the 1:3 slopes.

4. The petitioner is proposing multiple retaining walls up to 14-feet high. Genoa Township's Zoning Ordinance requires that retaining walls over three feet tall be designed by a professional engineer, with

Tetra Tech
3497 Coolidge Road, East Lansing, MI 48823
Tel 517.316.3930 Fax 517.484.8140 www.tetratech.com

design calculations demonstrating its structural stability being submitted as part of the site plan. This should be provided prior to a Land Use permit being issued.

UTILITIES

1. Tetra Tech completed a utility study for the proposed development and recommended connection locations and necessary system improvements for both the proposed water main and sanitary sewer. The petitioner has included our recommendations in their utility plan and has agreed to pay for a portion of the recommended sewer collection system upgrades.

2. After final site plan approval, the Petitioner will be required to submit construction plans to MHOG Sewer and Water Authority for review and approval of the proposed water main and sanitary sewer.

The petitioner has addressed our previous comments and we have no further engineering related concern with the proposed final site plan. We recommend the above comments be considered as part of the final site plan approval process and that the Township obtain necessary documents and approvals prior to Land Use Permit issuance. Please call or email if you have any questions.

Sincerely,

Shelby Byrne

Shelby Byrne, P.E.
Project Engineer

BRIGHTON AREA FIRE AUTHORITY
615 W. Grand River Ave.
Brighton, MI 48116
o: 810-229-6640 f: 810-229-1619

May 16, 2023

Kelly VanMarter
Genoa Township
2911 Dorr Road
Brighton, MI 48116

RE: Legacy Apartments PUD
6080 W. Grand River
Genoa Twp., MI

Dear Kelly:

The Brighton Area Fire Department has reviewed the above-mentioned site plan. The plans were received for review on May 12, 2023 and the drawings are dated April 10, 2023. The plan review is based on the requirements of the International Fire Code (IFC) 2021 edition.

1. A minimum vertical clearance of 13½ feet shall be maintained along the length of all apparatus access drives. This includes but is not limited to porte-cochere, lighting, and large canopy trees. A number of trees must be relocated, the species modified, or the road width increased to not overhang the roadways. *(A note was provided to address plantings at final site and construction review on the previous submittal, however the artist rendering indicates over 400 large canopy trees lining the roadways throughout the development. As they grow and reach full growth, nearly all species will either partially or completely encroach the roadway. Additional consideration shall be made to placement and species, and will require the ownership to include the overhead clearance requirement in the facility maintenance plan.)***(The applicant remains committed to addressing the tree canopy concerns prior to construction approval through modification of locations and species of the trees. The Fire Authority did present an increase in drive width to 32 feet as an alternative.)**

IFC 503.2.1

Additional comments will be given during the building plan review process (specific to the building plans and occupancy). The applicant is reminded that the fire authority must review the fire protection systems submittals (sprinkler & alarm) prior to permit issuance by the Building Department and that the authority will also review the building plans for life safety requirements in conjunction with the Building Department.

If you have any questions about the comments on this plan review please contact me at 810-229-6640.

Cordially,

Rick Boisvert, FM, CFPS
Fire Marshal

cc:Amy Ruthig amy@genoa.org

Livingston County Road Commission

3535 Grand Oaks Drive • Howell, Michigan 48843-8575
Telephone: (517) 546-4250 • Facsimile: (517) 546-9628
Internet Address: www.livingstonroads.org

April 21, 2023

Jacob Holda, P.E.
PEA Group
7927 Nemco Way, Suite 115
Brighton, MI 48116

Re: Legacy Apartment Homes, Genoa Township, Sections 11 and 14
LCRC# P-23-01

Dear Jacob:

I have completed the review of the construction plans, dated April 10, 2023, for the above-referenced project and offer the following comments.

1. The private road names Waters Drive, Woody Trail, and Chemung Hill Circle have been reserved for this development.
2. A contractor will need to be selected and the selected contractor must submit a certificate of insurance to the LCRC with the following language: "The Board of Livingston County Road Commissioners, the Livingston County Road Commission, and their officers, agents, and employees are listed additional insured parties with respects to General Liability." Please note this is not required for plan approval.
3. The attached red lined plans contain our comments.
4. We are working on a conceptual design for the traffic signal at Grand River and Hughes Road, the approach and/or sidewalk may need to be modified to accommodate poles, appurtenances, etc. We are also working on a cost share agreement to present to the developer.
5. Approval from the Livingston County Drain Commission will need to be obtained and submitted for the proposed storm water system.

Please email the revised plans to me for review at khiller@livingstonroads.org. If you have any questions, please do not hesitate to contact me.

Sincerely,

Kim Hiller

Kim Hiller, P.E.
Utilities and Permits Engineer

Cc: File
Amy Ruthig, Genoa Township (via email)
Ken Recker, LCDC (via email)
Don Cucco, Property Owner (via email)

Brian Jonckheere

Livingston County Drain Commissioner
2300 E. Grand River Ave., Ste. 105
Howell, MI 48843-7581
Phone: 517-546-0040 FAX: 517-545-9658
Website: www.livgov.com/drain Email: drain@livgov.com

May 9, 2023

Mr. Jacob Holda
PEA Group
7927 Nemco Way
Brighton, Michigan 48116

Re: The Legacy Apartment Homes Preliminary Site Plans
Southwest 1/4 of Sec. 11 & Northwest 1/4 of Sec. 14
Genoa Charter Township

Dear Mr. Holda:

We received Preliminary Site Plans and Infiltration Test Results for the above referenced development on April 19, 2023. The submitted information has been reviewed for conformance with the recently updated L.C.D.C. "Procedures and Design Criteria for Stormwater Management Systems." My comments on the proposed drainage design are as follows:

1.) Drainage System Ownership – The plans should include a general note stating that "The proposed drainage system shall be owned and properly maintained by the property owner." If required by local ordinance, a stormwater maintenance agreement, similar to that found in Appendix K of the current L.C.D.C. Design Criteria, should be executed with Genoa Township prior to final project approval.

2.) Overall Drainage Concept – The 51.94 acre development site located on the southeast corner of Grand River Avenue and Dorr Road is proposed to include 15 apartment buildings containing 204 residential units, a clubhouse, their associated roadways, parking areas and two stormwater management basins. Currently runoff from the northerly 13.80 acres of the site sheet flows to the Grand River Ave. storm sewer system which directs it north to Lake Chemung. Runoff from the remainder of the site currently sheet flows south to an onsite wetland area which outlets through the Grand Beach County Drain to Lake Chemung.

The runoff from the northerly 9.00 acres of the developed site is to be routed by proposed storm sewers to a stormwater

detention/infiltration basin located in the northwest corner of the property, which will discharge to the Grand River Ave. drainage system. Runoff from the remainder of the developed site is to be directed to a proposed stormwater detention basin located adjacent to the onsite wetland, which will also serve as its outlet. This proposed drainage design configuration will require 4.80 acres of the site to be shifted to the Grand Beach County Drain drainage district, which is discussed further in Item 8 below.

3.) Topographic Survey – The existing underground gas and electric utilities located within the proposed forebay area of the South Detention Basin should be identified on the Topographic Survey sheets and noted to be removed or relocated.

4.) Drainage Area Plans – Sheets C-6.5 and C-6.6 should show the drainage area boundaries and acreages of the tributary areas encompassing the North and South Detention Basins. It appears that part of the tributary area containing the South Basin has not been accounted for in its design. It also appears that the drainage boundary lines along Dorr Road should be shifted to its Master Planned Right-of-Way line and the scale noted on Sheet C-6.5 should be corrected.

5.) Stormwater Detention/Infiltration – Our calculations confirm that the North Detention/Infiltration Basin has been properly designed based on the indicated tributary area of 9.00 acres, the weighted runoff coefficient of 0.54 and a maximum discharge rate of 0.15 CFS/acre. However, as previously mentioned, at least part of the drainage area containing the South Detention Basin has been omitted from its design. The area surrounding this basin should be confirmed and its design calculations revised as necessary to include its entire tributary area and reflect its permanent pool in the weighted runoff calculation. The following additional stormwater detention/infiltration related items should also be addressed on the plans:

   a.) The proposed outlet control structure details provided on Sheet C-6.2 should include an anti-seep collar on the outlet pipes.
   b.) The proposed inverts shown on the Water Quality Unit detail found on Sheet C-68 don’t match those shown

elsewhere in the plans. The treatment capacity of the proposed Cascade CS-8 stormwater structure should be noted on the plans and must exceed 9.7 CFS.

c.) A Land Use Summary Table, similar to that found in Appendix J of the current L.C.D.C. Design Criteria, should be included on the Cover Sheet of the plans.

6.) Storm Sewers – The runoff flowing to IN 30C is currently missing from the storm sewer design calculations. A complete review of the proposed storm sewer design will be performed at the time of the project's Construction Plan submittal which should address the following additional storm sewer related items:

a.) The proposed rim elevations of CB 22 and CB 23 should be above the 982 freeboard elevation of the South Detention Basin.

b.) Rip-rap aprons should be shown and noted on the plans and profiles at all discharge end sections. The rip-rap detail found on Sheet C-9.3 should be revised to specify a minimum of 10 S.Y. of angular stone.

c.) The roof drainage from the entire east side of Building #11 must be routed to the storm sewer system. The intended purpose of the 6" storm leads shown near each building should be noted on the plans, as they do not appear to be for roof drainage.

d.) The end section symbols for ES 37 and ES 51 shown on Sheets C-5.1 and C-5.5 should be shifted to their proper position.

e.) The proposed drainage structure locations should be clearly defined on the plans using road stationing with offsets, dimensions from property lines or a project coordinate system. If a coordinate system is used for this purpose, coordinates should also be provided for the parcel's property corner.

7.) Site Grading – A pavement high point elevation should be shown between CB 30E and CB 32A on Sheet C-3.2. A complete review of the proposed site grading design will be performed at the time of the project's Construction Plan submittal which should address the following additional grading related items:

a.) A Typical Building Grading Detail should be included on the plans showing the proposed grading of the porches and walks in relationship to the indicated building finished grade elevation.
b.) The retaining wall detail shown on Sheet C-9.2 which specifies a maximum height of 6'-0" should be revised to reflect the proposed 8' height near the west end of the South Detention Basin and 14' height along the south side of the North Detention Basin.

8.) Addition of Lands to Grand Beach Drainage District – MCL 280.433 (2) addresses the addition of lands to the drainage district. Attached is an agreement pursuant to MCL 280.433 to effectuate same. The original assessment roll spread $220,000 over 353 acres, for a cost per acre of $623.23. Based on the addition of 4.8 acres, the attached agreement requires a deposit of $2991.50, in order to fulfill the requirement that the added lands pay their pro-rata share of the construction costs of the Grand Beach Drain.

I am withholding approval of the Construction Plans for the Legacy Apartment Homes until the above-mentioned items have been addressed.

Very truly yours,

Kenneth E. Recker, II, P.E.
Chief Deputy Drain Commissioner

Enclosure (Agreement)

C: Kelly VanMarter, Genoa Twp. Manager
Amy Ruthig, Genoa Twp. Planning Director
Bill Rogers, Genoa Twp. Supervisor
Kim Hiller, Livingston County Road Commission
Paul Lewsley, SDA
Shelby Byrne, Tetra Tech
Mark Kassab, Grand River LLC

Grand River Dorr LLC

DBA

The Legacy Apartment Homes

Owner:

Grand River Dorr LLC

Prepared by:

Mark Kassab

31550 Northwestern, ste 220

Farmington Hills, MI 48334

248-865-0066

The Legacy Apartment Homes

Final PUD Site Plan

Application & Community Impact Statement

COMMUNITY IMPACT STATEMENT

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COMMUNITY IMPACT STATEMENT

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Exhibit B	PUD Final Site Plans
Exhibit C	Traffic Impact Study
Exhibit D	Soils Investigation Report
Exhibit E	Infiltration Testing Report
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SECTION 1: GENERAL PROJECT INFORMATION

1.1 Project Overview

The Legacy Apartment Homes is a proposed residential community consisting of 204 attached apartments with an associated clubhouse and pool. The project shall include open space and other elements as set forth in this Agreement and the PD plan. The project will include approximately 22 acres of total open space (35 acres when including all wetlands). This site is currently vacant and was zoned Neighborhood Services District (NSD) and Medium Density Residential (MDR) with Town Overlay and has been rezoned to High-Density Residential (HDR), and Residential Planned Unit Development (RPUD).

The proposed land use consists of multi-family apartment homes. The project will have 3.92 units per acre based on 51.94 gross acreage and 6.18 units per acre based on 33.03 net acreage. The proposed development will be compatible with past planning efforts and therefore the infrastructure is present to support it. The township services planned for this area will not be overtaxed by the development.

Unit counts and densities for the proposed The Legacy Apartment Homes are as follows:

204 Multi-Family Dwelling Units (51.94 gross Acres/33.03 Net Acres):

3.92 DU/Gross Acre
6.18 DU/Net Acre

Refer to **Exhibit B** for the PUD Final Site Plans.

1.2 Master Plan Analysis

- **Value communities and neighborhoods –** The Legacy Apartment Homes will be an exclusive neighborhood community targeting demographics of multiple ages. The development will focus on quality building materials and attention to architecture details. This location is well located between Brighton and Howell where downtown shopping and restaurants are available as well as the Genoa retail and restaurant area at Latson and Grand River.

- **Walkable neighborhoods –** In addition to sidewalk proposed on both sides of the planned internal roadways, the development will also have a system of pathways within the extensive open space areas.

- **Variety of recreational facilities –** The Legacy Apartment Homes proposes a successful development area reaching various age demographics that seek amenities, less maintenance, nature preservation and convenience to restaurants and shopping. sidewalks and interconnectivity within the community, dog park, gazebo, EV Charging Stations throughout, benches, clubhouse, Amazon Hub station, pool and fitness center consisting of a Yoga room, business center, dog wash to accommodate residents of all ages, interests, and physical abilities.

  Refer **Exhibit B**, PUD Final Site Plans for additional information of the neighborhood layout and representative architectural details.

1.3 Existing Surrounding Uses

As shown within the attached zoning map, the existing surrounding uses for the subject site are uses of varying densities. These existing uses are as follows:

- **North**: GCD- General Commercial District
- **East:** OSD
- **West:** Industrial
- **South**: Rural Residential

SECTION 2: COMMUNITY AND FACILITY SERVICES

2.1 Police and Fire Demand

The Livingston County Sheriff in addition to the Michigan State Police will be providing Public Safety services required to accommodate the proposed use.

The Brighton Area Fire Department, as part of an existing Governmental agreement will provide fire protection services. There will be numerous fire hydrants located on the subject property. Fire Department Connections (FDC's) will be located on each building in addition to the buildings having an internal fire suppression system. Station 34 on Dorr Road is located approximately¼ mile away from the subject property.

The property is accessed from Grand River and Dorr Road. Both entrances are designed to accommodate emergency vehicle access.

A fiscal impact statement is prepared and attached to the CIS to determine the annual tax revenue. The additional net annual tax revenue at full buildout will be approximately $836,662. The additional tax revenues are in addition to the one-time utility connection charges in the amount of $3,080,400.

2.2 Utilities

Utility services will be provided by existing public water and sewer systems in the area. The development proposes a total of 204 apartment unit connections to the existing public utilities. We estimate an average daily usage of 36,500 gallons per year per person with an annual usage of approximately 19,000,000 gallons per year.

All Utility lines, structures, and trenches shall be constructed in accordance with the standards and requirements of Genoa Township, MHOG, Livingston County and MDOT. All hydrants will be a minimum of 4.5' from back of curb.

A utility capacity study undertaken by TetraTech for Genoa Township determined that the water supply system adjacent to the site is more than adequate to serve the proposed population and suggested connection locations which have been followed in the latest plan.

Water main connections to the existing mains will be completed to provide for a looped system in accordance with the Township standards and placed within public easements. The proposed site water mains will be 8" in diameter and connect to the existing 12" main on Dorr Road 16' main on Grand River Rd.

The Tetratech study identified one downstream sanitary sewer pump station which would need to be upgraded for additional capacity prior to occupancy of all units of the proposed development. The downstream gravity and pressure sewers all have adequate capacity for the designed flows. The developer is assisting the Township to fund the pump station improvements as is documented in the development agreement.

2.3 Stormwater Management

Stormwater management for quality treatment and flood storage will be provided in two (2) proposed stormwater basins on the site. These basins will be designed and approved in accordance with the Livingston County Drain Commissioner's

(LCDC) standards to accommodate the 100-year frequency storm runoff from the proposed development.

The stormwater basin proposed at the corner of Grand River and Dorr ("North Basin") was designed as an infiltration basin pursuant to LCDC rules and based on favorable soils discovered at this location. Refer to **Exhibit E** for the Infiltration Testing Report. Furthermore, based on the Livingston County Road Commission's (LCRC) rules, no increase in runoff volume or flow is allowed to the Grand River Avenue storm sewer system. Additional infiltration volume beyond what is required by LCDC is provided, preventing any increase in runoff from the site to Grand River Avenue and the downstream outlet to Lake Chemung. A manufactured stormwater treatment unit will remove sediment from the site stormwater prior to entering the infiltration basin.

The stormwater basin located at the southern end of the development ("South Basin") is restricted to a lower flow than typically required for detention basins in Livingston County due to its location in the Grand Beach Drainage District. Discharge from the southern portion of the site to the wetlands and ultimate outlet at Lake Chemung is designed with a restriction of 0.06 cfs per acre, compared to the standard design requirement of 0.15 cfs/acre. The outlet rate from the basin will be less that the undeveloped agricultural runoff rate of its tributary area.

Refer to the full PUD Final Site Plan Drawing Set for detailed stormwater calculations

SECTION 3: ECONOMICS

3.1 Tax Revenue Analysis

A fiscal impact analysis was prepared to determine the anticipated annual tax revenue to be generated as a result of the development. Based on this analysis, we anticipate Legacy Apartment Homes will have a taxable value of approximately $22,950,000 and will generate an annual revenue gain of approximately $911,139. Currently the property is generating $24,659 in annual taxes.

3.2 Jobs Created

Legacy Apartment Homes will be a residential development. Legacy Apartment Homes will create 100 +/- construction jobs during the installation of the

infrastructure and the building of the apartment buildings on the site. In addition, The Legacy Apartments will employ 5-6 permanent leasing and maintenance staff.

Refer to **Exhibit A** for the Fiscal Impact Analysis Calculations

SECTION 4: ENVIRONMENT

4.1 Natural Resources Analysis

The proposed development is +/- 52 acres. The development will preserve natural features and provided common open space opportunities for the residents, including walking trails, a community building and swimming pool. The site is constrained by regulated wetlands to the South and Southeast portion of the property. Refer to **Exhibit F** for the Wetland Report. The area of proposed development is primarily vacant farmed land with minimal tree removal required.

Storm water runoff for the site will be treated, infiltrated, and detained in accordance with applicable Township, County and State requirements prior to discharge from the site. No significant impact or pollution to offsite water bodies is anticipated with the development.

The proposed development will seek to preserve existing wooded areas around the perimeter of the development where grading would allow, to serve as a buffer between the development and neighboring properties. New trees will be planted in the proposed development in accordance with an approved Landscaping Plan.

4.2 Hazardous Materials

No hazardous materials are planned to be manufactured, used, or stored on site.

4.3 Air Quality Impact

Legacy Apartment Homes is a residential development that does not plan to have any significant impact to the air quality of the area. No quantifiable type or quantities of pollutants are expected to be released in the air. During construction, special measures will be included within the Soil Erosion and Sedimentation (SESC) Plan to mitigate any potential dust creation during dryer site conditions, including the use of water trucks.

4.4 Groundwater Impact

Legacy Apartment Homes is a residential development that will utilize connections to the existing public utilities in the area. The development fits within the master planned unit density for the area and does not plan to have any significant impact to the groundwater levels within the area.

Surface water on the site flows toward the north and south from a ridge line running east and west through the site. The inclusion of significant stormwater infiltration in the northern site stormwater basin will assist with groundwater recharge, as will the large areas of open space and undisturbed wetlands on the southern portion of the site.

Based on the results of the geotechnical investigation and infiltration testing on site, perched ground water was located in isolated sand seams at depths of 4 to 19 feet. Groundwater flow within sand seams is anticipated to generally follow the surface flow on site. Only one location on site was found with groundwater following completion of a test boring, near the wetlands at the south end of the site.

Refer to **Exhibit D** for the Soils Investigation Report, and **Exhibit E** for the Infiltration Testing Report.

4.5 Noise

Legacy Apartment Homes is a residential development that does not plan to have any significant impact to the increased noise in the area. During construction, the development intends to minimize noise as reasonable and follow the Township's ordinance regarding hours of allowed construction operation.

SECTION 5: TRAFFIC

Legacy Apartment Homes is a residential project consisting of a multi-family dwelling units that are proposed to have access off Grand River Road in addition to Dorr Road. The main access to the community will be from Grand River Road which is a State Road. There is a secondary access off Door Road.

A Traffic Impact Study (TIS) has been prepared by Rowe Engineering in accordance with the Township Ordinance and was coordinated with the traffic study completed for the hospital expansion to the east. The report was completed in accordance with the requirements specified by the Michigan

Department of Transportation (MDOT), the Livingston County Road Commission (LCRC), and Genoa Township.

A copy of the TIS attached as **Exhibit C.**

DEVELOPER'S STATEMENT

After a five decades of residential building in Michigan, MJC Companies® is proud to be one of the state's largest privately-owned and operated builders, as well as one of the top 100 builders in the nation. Since 1972, the company has garnered a reputation of value and innovation with single-family homes and condominiums that offer a carefree lifestyle in desirable neighborhoods.

And that reputation still holds true today. With deep roots in an array of communities in Livingston, Macomb, Oakland and Wayne counties, MJC Companies® is excited to be a part of Michigan's rich history and is confident in the future of the state and dedicated to the families who live here.

Specializing in new construction, MJC Apartment homes and condominiums offer a wide choice of locations, flexible floor plans, and an abundance of the most desired amenities within pleasant communities including some with pools, walking trails and ponds.

MJC Companies® looks forward to enduring its longstanding presence in Southeast Michigan as it continues to develop communities of choice for generations to come.

Charities, Sponsorships & Clubs

- Alzheimer's Association
- Building Industry Association - Charitable and Education Foundation
- Capuchin Soup Kitchen
- Cardinal Mooney Catholic High School
- Children's Charities at Adios
- Club Calabria
- Club Terrasini
- Club Di Santa Fara
- De La Salle Collegiate High School
- Fraternal Order of Police
- Interfaith Volunteer Caregivers
- Italian American Culture Society
- Karmanos Cancer Institute
- Mackinac Island Historical Preservation
- March of Dimes
- Men of the Sacred Heart
- Michigan Historical Society
- Mat Gaberty Heart Fund
- Macomb Foundation
- Mt. Clemens General –Board Member
- Mt. Clemens Regional Oncology
- Multiple Sclerosis Foundation
- MPURE – Department of Urology at William Beaumont Hospital
- Muscular Dystrophy Association
- National Italian American Foundation
- Northville Park & Recreation
- Nothdurft Pediatric Endowment
- Special Olympics
- St. John Health Foundation
- St. John Hospital Guild
- St. Lawrence Athletics
- St. Louis Center– (helping to raise, $800,000 dollars in the last 10 years)
- Utica Community Schools
- USC Shoah Foundation

EXHIBIT A

FISCAL IMPACT STATEMENT

The Legacy Apartments Homes - 204-Unit Community
Fiscal Impact

Property Development

Property Tax Revenue

Housing Type	Market Value Per Unit	State Equalized Value Per Unit	Taxable Value Per unit	Total Units	Estimated Market Value	Estimated Taxable Value
Apartment Homes	$ 225,000	$ 225,000	$ 112,500	204	$ 45,900,000	$ 22,950,000
				204		**$ 22,950,000**

	Current Millage Rate	Estimated Taxable Value	Tax Generated
SUMMER TAX REVENUE GENERATION			
State Ed Tax	6.0000	$ 22,950,000	$ 137,700
County Tax	3.2391	$ 22,950,000	$ 74,337
HO School Oper	18.0000	$ 22,950,000	$ 413,100
HO School Debt	2.7500	$ 22,950,000	$ 63,113
Livingston ISD	3.2315	$ 22,950,000	$ 74,163
BR Fire Auth	0.8733	$ 22,950,000	$ 20,042
WINTER TAX REVENUE GENERATION			
County Ambulance	0.2863	$ 22,950,000	$ 6,571
HCMA-Parks	0.2089	$ 22,950,000	$ 4,794
Veterans Relief	0.1127	$ 22,950,000	$ 2,586
Genoa Alloc	0.7855	$ 22,950,000	$ 18,027
HO School Debt	2.7500	$ 22,950,000	$ 63,113
HO Library	1.0382	$ 22,950,000	$ 23,827
BR Fire Auth	1.5000	$ 22,950,000	$ 34,425
Total Estimated Annual Revenue from Property Taxes			$ 935,798
Less Current Propety Tax Revenue Generation			$ 24,659
Total Net annual Revenue from Property Taxes			**$ 911,139**

Estimated Residents

Land Use	Units	Unit Factor Per Us Census	Projected Population
Residential	204	2.55	520

Utility Revenue

Water and Sewer Capital Connection Fee	Water Capital Fee	Sewer Capital Fee	Total Capital Charges	Total Units	Total Estimated Fee
Building Type					
Units	$ 7,900.00	$ 7,200.00	$ 15,100	204	$ 3,080,400
					$ -
Total Estimated Connection Fee		(Fees per. DPS)		**204**	**$ 3,080,400**

Annual Water/Sewer Usage Fees	Estimated Population	Annual Usage (Gal); Assume 36,500 gal/yr/person	Usage fee/1000 Gal.	Total Estimated Fees
Apartments	520	18,987,300	$11.28	$ 214,177
		Annual Water Usage Fees		$ 214,177
Total Utility-Related Fees				**$ 214,177**

Township Expenditures Per Budget

Total Expenditures - 2022 Budget (per Genoa.org)	$ 6,412,166
Township Population (per 2020 SEMCOG)	20,692
Township Expenditures Per Resident	**$ 309.89**

	# Residents	Expenditure per Resident	Total
Total Annual Expenditures for Legacy Apartment	**520**	**$ 309.89**	**$ 161,202.82**

The Legacy Apartment - One-Time Utility Connection Revenue	**$ 3,080,400**
The Legacy Apartment - Annual Revenue Gain (Loss)	**$ 964,113**

EXHIBIT B

FINAL PUD PLANS

PUD FINAL SITE PLAN

THE LEGACY APARTMENT HOMES

6080 W. GRAND RIVER

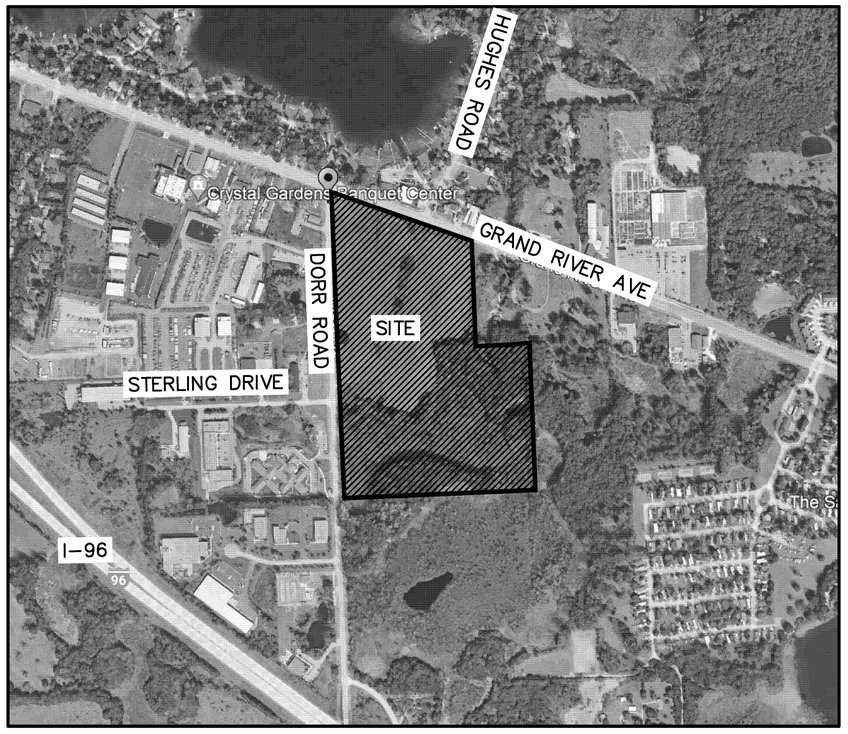
GENOA TOWNSHIP, LIVINGSTON COUNTY, MICHIGAN

PERMIT / APPROVAL SUMMARY		
DATE SUBMITTED	DATE APPROVED	PERMIT / APPROVAL

PROPERTY DESCRIPTION:

BEING A PART OF THE SOUTHWEST QUARTER (SW 1/4) OF SECTION 11, AND A PART OF THE NORTHWEST QUARTER (NW 1/4) OF THE NORTHWEST QUARTER (NW 1/4) OF SECTION 14, TOWN 2 NORTH, RANGE 5 EAST, GENOA TOWNSHIP, LIVINGSTON COUNTY, MICHIGAN, DESCRIBED AS:

BEGINNING AT THE SOUTHWEST CORNER OF THE SOUTHWEST QUARTER OF THE SOUTHWEST QUARTER OF SAID SECTION 11 SAME BEING THE NORTHWEST CORNER OF THE NORTHWEST QUARTER OF THE NORTHWEST QUARTER OF SAID SECTION 14; THENCE, ALONG THE WEST LINE OF SAID NORTHWEST QUARTER OF THE NORTHWEST QUARTER OF SECTION 14, SAME BEING THE CENTERLINE OF DORR ROAD (66 FOOT RIGHT OF WAY), SOUTH 00 DEGREES 15 MINUTES 00 SECONDS EAST, A DISTANCE OF 1340.74 FEET TO THE SOUTHWEST CORNER OF SAID NORTHWEST QUARTER OF THE NORTHWEST QUARTER OF SECTION 14; THENCE ALONG THE SOUTH LINE OF SAID NORTHWEST QUARTER OF THE NORTHWEST QUARTER OF SECTION 14, NORTH 89 DEGREES 50 MINUTES 12 SECONDS EAST, A DISTANCE OF 1335.60 FEET TO THE SOUTHEAST CORNER OF SAID NORTHWEST QUARTER OF THE NORTHWEST QUARTER OF SECTION 14; THENCE ALONG THE EAST LINE OF SAID NORTHWEST QUARTER OF THE NORTHWEST QUARTER OF SECTION 14, NORTH 00 DEGREES 02 MINUTES 14 SECONDS WEST, A DISTANCE OF 1029.24 FEET TO THE SOUTHEAST CORNER OF A PARCEL DESCRIBED IN WARRANTY DEED RECORDED IN LIBER 777, PAGE 269, LIVINGSTON COUNTY RECORDS; THENCE ALONG THE SOUTHERLY LINE OF SAID PARCEL, SOUTH 86 DEGREES 34 MINUTES 33 SECONDS WEST, A DISTANCE OF 140.24 FEET TO THE SOUTHWEST CORNER OF SAID PARCEL; THENCE ALONG THE SOUTHERLY LINE OF S PARCEL DESCRIBED IN WARRANTY DEED RECORDED IN LIBER 2443, PAGE 454, LIVINGSTON COUNTY RECORDS, NORTH 89 DEGREES 56 MINUTES 58 SECONDS WEST, A DISTANCE OF 235.00 FEET TO A POINT BEING 375.00 FEET WEST OF THE EAST LINE OF SAID NORTHWEST QUARTER OF THE NORTHWEST QUARTER OF SECTION 14; THENCE ALONG A LINE BEING 375.00 FEET WEST OF AND PARALLEL TO THE EAST LINE OF SAID NORTHWEST QUARTER OF THE NORTHWEST QUARTER OF SECTION 14, NORTH 00 DEGREES 02 MINUTES 14 SECONDS WEST, A DISTANCE OF 315.00 FEET TO A POINTON THE NORTH LINE OF SAID NORTHWEST QUARTER OF THE NORTHWEST QUARTER OF SECTION 14 SAME BEING THE SOUTH LINE OF SAID SOUTHWEST QUARTER OF THE SOUTHWEST QUARTER OF SECTION 11; THENCE ALONG A LINE BEING 375.00 WEST AND PARALLEL TO THE EAST LINE OF SAID SOUTHWEST QUARTER OF THE SOUTHWEST QUARTER OF SECTION 11, NORTH 00 DEGREES 07 MINUTES 24 SECONDS EAST, A DISTANCE OF 420.56 FEET TO THE SOUTHERLY LINE OF GRAND RIVER AVENUE (100 FOOT RIGHT OF WAY); THENCE ALONG SAID SOUTHERLY LINE, NORTH 68 DEGREES 20 MINUTES 00 SECONDS WEST, A DISTANCE OF 1037.63 FEET TO A POINT ON THE WEST LINE OF SAID SOUTHWEST QUARTER OF THE SOUTHWEST QUARTER OF SECTION 11 SAME BEING THE CENTERLINE OF SAID DORR ROAD; THENCE ALONG SAID WEST LINE OF THE SOUTHWEST QUARTER OF THE SOUTHWEST QUARTER OF SECTION 11, SOUTH 00 DEGREES 04 MINUTES 32 SECONDS WEST A DISTANCE OF 800.00 FEET TO THE POINT OF BEGINNING. CONTAINING 2,262,563 +– SQUARE FEET OR 51.941 +– ACRES OF LAND.



NORTH

LOCATION MAP
1"=500'

SHEET INDEX	
SHEET NO.	TITLE
	COVER
C-1.1	TOPOGRAPHIC SURVEY OVERALL
C-1.2	TOPOGRAPHIC SURVEY NORTH
C-1.3	TOPOGRAPHIC SURVEY SOUTH
C-1.4	TREE LIST
C-2.1	OVERALL SITE PLAN
C-2.2	SITE PLAN NORTH
C-2.3	SITE PLAN SOUTH
C-3.1	GRADING PLAN NORTH
C-3.2	GRADING PLAN SOUTH
C-4.1	UTILITY PLAN NORTH
C-4.2	UTILITY PLAN SOUTH
C-5.1	STORM SEWER PROFILES
C-5.2	STORM SEWER PROFILES
C-5.3	STORM SEWER PROFILES
C-5.4	STORM SEWER PROFILES
C-5.5	STORM SEWER PROFILES
C-6.1	OVERALL STORMWATER MANAGEMENT PLAN
C-6.2	POND DESIGN DETAILS
C-6.3	NORTH POND DESIGN CALCULATIONS
C-6.4	SOUTH POND DESIGN CALCULATIONS
C-6.5	NORTH STORM SEWER DRAINAGE AREAS
C-6.6	SOUTH STROM SEWER DRAINAGE AREAS
C-6.7	STORM DESIGN CALCULATIONS
C-6.8	WATER QUALITY UNIT
C-7.1	SESC PLAN NORTH
C-7.2	SESC PLAN SOUTH
C-8.1	VEHICLE TRACKING
C-9.1	CONSTRUCTION NOTES
C-9.2	NOTES & DETAILS I
C-9.3	NOTES & DETAILS II
C-9.4	NOTES & DETAILS III
MHOG - 1.0	MHOG STANDARD DETAILS
MHOG - 2.0	MHOG STANDARD DETAILS
MHOG - 3.0	MHOG STANDARD DETAILS
LS-1	OVERALL LANDSCAPE PLAN VIEW
LS-2	GENERAL PLANTING DETAIL PLAN
LS-3	GENERAL PLANTING DETAIL PLAN
LS-4	MATERIAL LIST, PLANT DETAILS & LANDSCAPE NOTE
LS-5	ENTRANCE PLANTING DETAIL PLAN
LS-6	CLUBHOUSE & BUILDING FOUNDATION PLANTING DETAIL PLAN
LS-7	DETENTION PLANTING DETAIL PLAN
LS-8	ENTRY DETAIL PLAN
LS-9	SITE AMENITY PLAN
---	ARCHITECTURAL COVER SHEET
1	FOUNDATION PLAN
2	FIRST FLOOR PLAN
3-A	SECOND FLOOR
4-A	ELEVATIONS
4-B	ELEVATIONS

DESIGN TEAM

OWNER/APPLICANT/DEVELOPER

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FARMINGTON HILLS, MI 48334
CONTACT: MARK KASSAB
PHONE:248.865.0066
EMAIL: MKASSAB@MSHAPIROREALESTATE.COM

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EMAIL: GREATARCHITECTS@CHARTER.NET

SURVEYOR

HUBBELL ROTH AND CLARK
555 HULET DRIVE
BLOOMFIELD HILLS, MICHIGAN 48303
CONTACT: MELISSA COATTE, P.E.
PHONE:248-454-6300
EMAIL: mcoatta@hrcengr.com

LANDSCAPE ARCHITECT/PLANNER

FELINO A. PASCUAL AND ASSOCIATES
24333 ORCHARD LAKE ROAD SUITE G
CONTACT: FELINO A. PASCUAL, RLA, CLARB
PHONE: 248.557.5588

PEA GROUP

REVISIONS	
DESCRIPTION	DATE
PUD FINAL SITE PLAN SUBMITTAL	4/10/2023

STATE OF MICHIGAN — JILL M. ANCHARSKI — License No. 6201048141 — PROFESSIONAL ENGINEER

NOT FOR CONSTRUCTION

PEA GROUP | THE LEGACY APARTMENT HOMES | PEA JOB NO. 2021-0578 | PUD FINAL SITE PLAN

SITE DATA TABLE:

SITE AREA		ORDINANCE 20.0 ACRES MIN.	PROPOSED 51.94 ACRES GROSS (Wetland 17.29 ac, ROW 1.62 ac) 33.03 ACRES NET
DENSITY		8 UNITS/ACRE	6.18 UNITS/ACRE (NET)
ZONING:	EXISTING:	NSD AND MDR WITH TOWN CENTER OVERLAY	
	PROPOSED:	HDR, RPUD	
USE:	EXISTING:	VACANT	
	PROPOSED:	204 MULTI-FAMILY DWELLING UNITS, CLUBHOUSE AND POOL	

BUILDING INFORMATION:
MAXIMUM ALLOWABLE BUILDING HEIGHT = 40 FEET (3 STORIES)
PROPOSED BUILDING HEIGHT = 27 FEET (2 STORIES)

BUILDING FOOTPRINT AREA = 5,898 – 11,981 SQ.FT.
CLUBHOUSE – 6,658 SQ. FT.
TOTAL BUILDING FOOTPRINT AREA = 203,492 SQ.FT.

UNIT	LIVING AREA	BEDROOMS	NUMBER OF UNITS
A	1,471 SFT	2	68
B	1,829 SFT	2	68
C	1,585 SFT	3	68

	REQUIRED	PROPOSED (BASED ON NET ACRES)
LOT COVERAGE	35% MAX	14.3%
PERCENT IMPERVIOUS	50% MAX	45.4%

SETBACK REQUIREMENTS:	REQUIRED	PROPOSED
FRONT:		
INTERIOR	20'	20'
EXTERIOR	35'	75.4' MIN (Grand River), 77.9' (Dorr)
SIDE:	15'	30.0' MIN
REAR:	30'	769'

DENSITY CALCULATION:

ALLOWED	PROPOSED OVERALL ACREAGE	PROPOSED USEABLE ACREAGE
8 UNITS/AC	3.92 UNITS/AC	6.18 UNITS/AC

PARKING CALCULATIONS:
TOTAL REQUIRED PARKING — REQUIRED 2 SPACES PER 2 BEDROOM OR MORE UNIT = 408 SPACES

TOTAL PROPOSED PARKING SPACES = 703
SPACES (408 GARAGE + 204 IN DRIVEWAYS + 91 ADDITIONAL SPACES INCLUDING 1 H/C SPACE)

OPEN SPACE:
MINIMUM OPEN SPACE REQUIRED = 25%
PROVIDED OPEN SPACE =22.98 AC, = 45.7% (33.03 – 12.57 (impervious) – 1.80 (ponds) + 4.32 (25% Wetland))

SITE SOILS INFORMATION:
ACCORDING TO THE USDA NATURAL RESOURCES CONSERVATION SERVICE WEB SOIL SURVEY FOR LIVINGSTON COUNTY, THE SITE CONSISTS OF THE FOLLOWING SOIL TYPES:

FrB, MoB, MoC, MoD, Rf, W, Wh

APPROVED ORDINANCE MODIFICATIONS:

ZONING

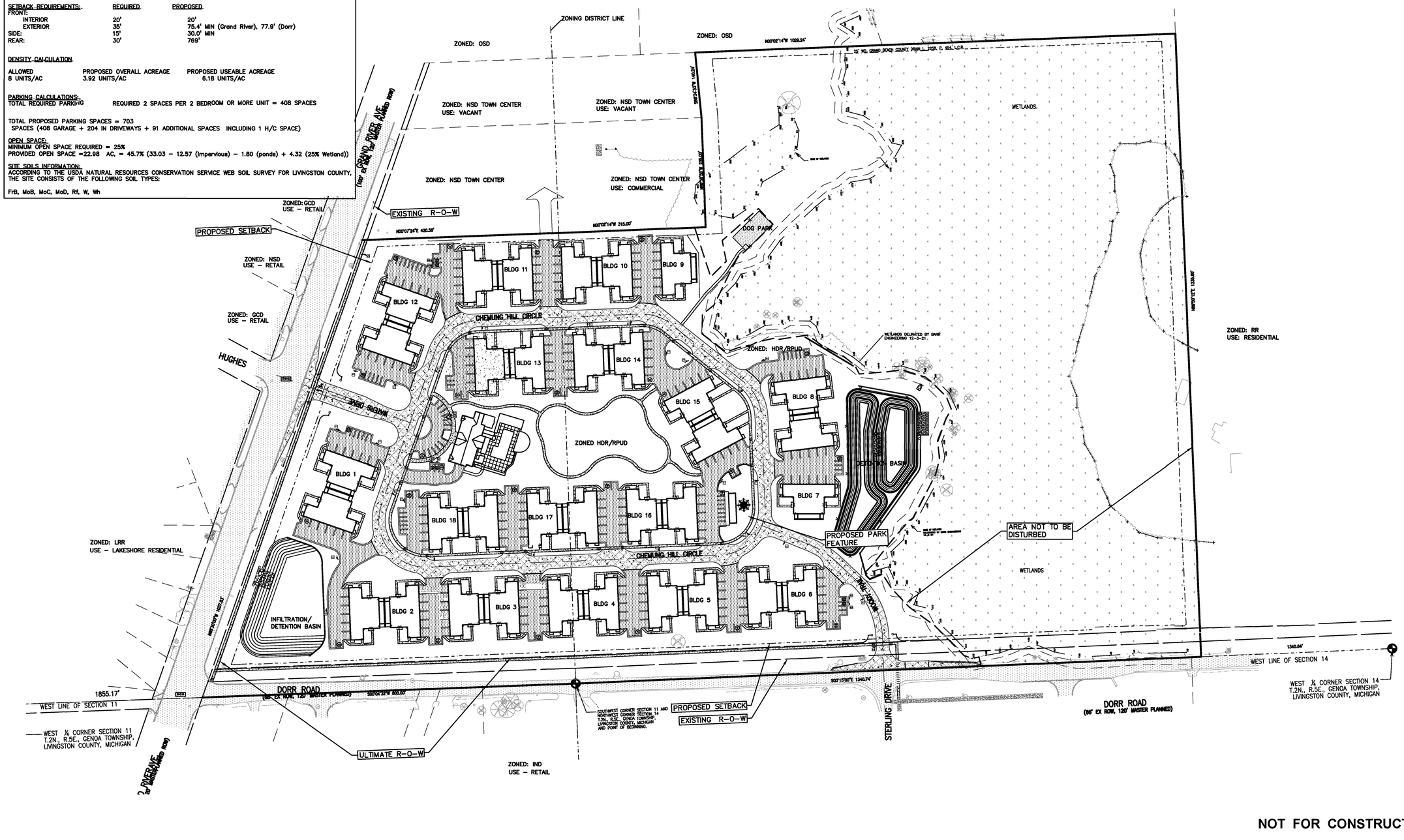
3.05.02 (e)/ 15.05.03	MODIFICATION OF THE HORIZONTAL MINIMUM CURVE RADIUS FROM 150' TO 100', AND CURB RADII FROM ROAD TO GARAGE AND PARKING DRIVEWAYS LESS THAN 30' RADIUS.
10.03.01 (C)	THE OPEN SPACE ALONG THE EXTERIOR PUBLIC ROADS SHALL GENERALLY HAVE A DEPTH OF AT LEAST ONE HUNDRED (100) FEET EITHER LANDSCAPED OR PRESERVED IN A NATURAL WOODED CONDITION.
12.01.03	REDUCTION IN THE PERCENTAGE OR BRICK REQUIRED ON BUILDING WALLS EXPOSED TO PUBLIC AND AN INCREASE IN PERCENTAGE OF VINYL OR FIBER CEMENT SIDING AND WOOD SIDING.
13.02.04 d.	REQUEST FOR GRADING UPTO 10' FROM REGULATED WETLAND.
14.02.06	REQUEST TO EXCEED PARKING SPACE REQUIREMENT MORE THAN 20%
14.06.09	PARKING LOTS AND RELATED MANEUVERING AISLES SHALL MEET MINIMUM SETBACKS FROM ADJACENT STREET R-O-W AS SHOWN IN THE SCHEDULE OF REGULATIONS AND HAVE PARKING LOT LANDSCAPING
14.06.10	PARKING LOTS SHALL HAVE MINIMUM REAR AND SIDE YARD SETBACKS INCLUDING BERMING AND LANDSCAPING.

NOTE::

1. PROPERTY WILL BE DEVELOPED OWNED AND OPERATED BY A SINGLE OWNERSHIP ENTITY.
2. TRASH COLLECTION WILL BE PROVIDED VIA INDIVIDUAL TRASH CARTS FOR EACH UNIT WITH CURB SIDE TRASH COLLECTION.

LEGEND:

- CONCRETE PAVEMENT (STD DUTY, HEAVY DUTY, 4 CY/YD ONLY)
- ASPHALT PAVEMENT (STD DUTY, HEAVY DUTY, DEEP STRENGTH)
- GRAVEL
- WETLAND
- CONCRETE CURB AND GUTTER
- REVERSE GUTTER PAN
- SETBACK LINE
- SIGN
- LIGHTPOLE
- FENCE
- GUARD RAIL



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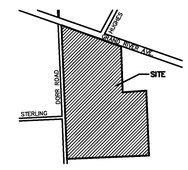

CLIENT
GRAND RIVER DORR LLC.
315550 NORTHWESTERN HIGHWAY
FARMINGTON HILLS, MI 48334

PROJECT TITLE
THE LEGACY APARTMENT HOMES
6080 W GRAND RIVER
GENOA TOWNSHIP, LIVINGSTON COUNTY, MICHIGAN

REVISIONS
-

ORIGINAL ISSUE DATE:
APRIL 10, 2023

DRAWING TITLE
OVERALL SITE PLAN

PEA JOB NO. 2021-0578
P.M. JEC
DN. JMR
DES. JMR
DRAWING NUMBER:

NOT FOR CONSTRUCTION

C-2.1

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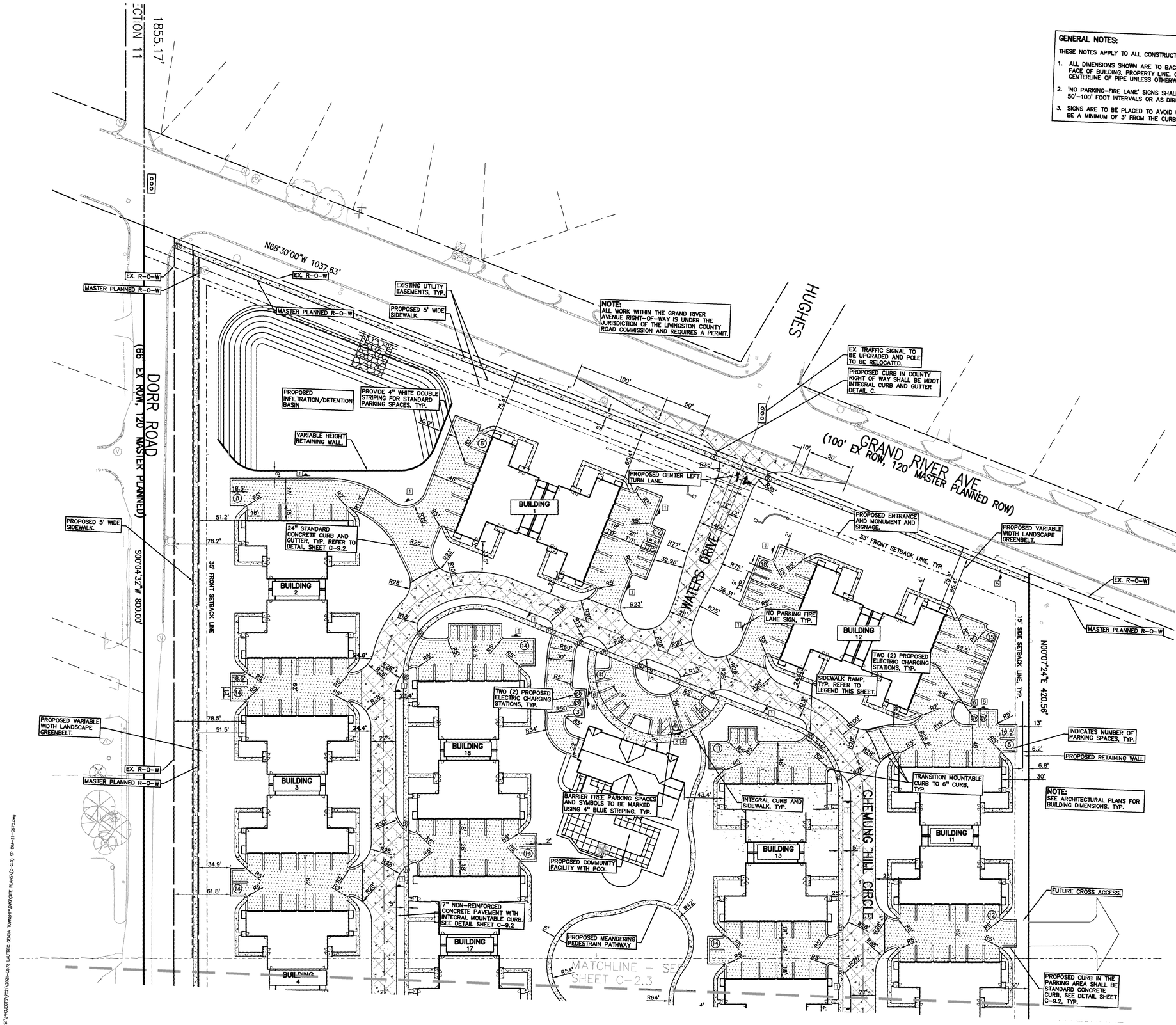

GENERAL NOTES:

THESE NOTES APPLY TO ALL CONSTRUCTION ACTIVITIES ON THIS PROJECT.

1. ALL DIMENSIONS SHOWN ARE TO BACK OF CURB, FACE OF SIDEWALK, OUTSIDE FACE OF BUILDING, PROPERTY LINE, CENTER OF MANHOLE/CATCH BASIN OR CENTERLINE OF PIPE UNLESS OTHERWISE NOTED.
2. 'NO PARKING-FIRE LANE' SIGNS SHALL BE POSTED ALONG ALL FIRE LANES AT 50'-100' FOOT INTERVALS OR AS DIRECTED BY THE FIRE OFFICIAL.
3. SIGNS ARE TO BE PLACED TO AVOID UTILITIES. IN GENERAL SIGN POST ARE TO BE A MINIMUM OF 3' FROM THE CURB. REFER TO UTILITY SHEET.

LEGEND:

- CONCRETE PAVEMENT (STD DUTY, HEAVY DUTY, R.O.W. ONLY)
- ASPHALT PAVEMENT (STD DUTY, HEAVY DUTY, DEEP STRENGTH)
- GRAVEL
- WETLAND
- CONCRETE CURB AND GUTTER
- REVERSE GUTTER PAN
- SETBACK LINE
- SIGN
- LIGHTPOLE
- FENCE
- GUARD RAIL

SIGN LEGEND:

'NO PARKING FIRE LANE' SIGN	[1]
'STOP' SIGN	[2]
'BARRIER FREE PARKING' SIGN	[3]
'VAN ACCESSIBLE' SIGN	[4]
'SIDEWALK ENDS' SIGN	[5]
ELECTRIC VEHICLE SIGN	[6]

REFER TO DETAIL SHEET FOR SIGN DETAILS

SIDEWALK RAMP LEGEND:

SIDEWALK RAMP 'TYPE R'	(R)
CURB DROP ONLY	(X)

REFER TO LATEST MDOT R-28 STANDARD RAMP AND DETECTABLE WARNING DETAILS

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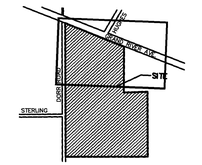

CLIENT
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31550 NORTHWESTERN HIGHWAY
FARMINGTON HILLS, MI 48334

PROJECT TITLE
THE LEGACY APARTMENT HOMES
6080 W GRAND RIVER
GENOA TOWNSHIP, LIVINGSTON COUNTY, MICHIGAN

REVISIONS
-

ORIGINAL ISSUE DATE:
APRIL 10, 2023

DRAWING TITLE
SITE PLAN NORTH

PEA JOB NO.	2021-0578
P.M.	JEC
DN.	JMR
DES.	JMR

DRAWING NUMBER:
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SIGN LEGEND:

'NO PARKING FIRE LANE' SIGN	1
'STOP' SIGN	2
'BARRIER FREE PARKING' SIGN	3
'VAN ACCESSIBLE' SIGN	4
'SIDEWALK ENDS' SIGN	5
ELECTRIC VEHICLE SIGN	6

REFER TO DETAIL SHEET FOR SIGN DETAILS

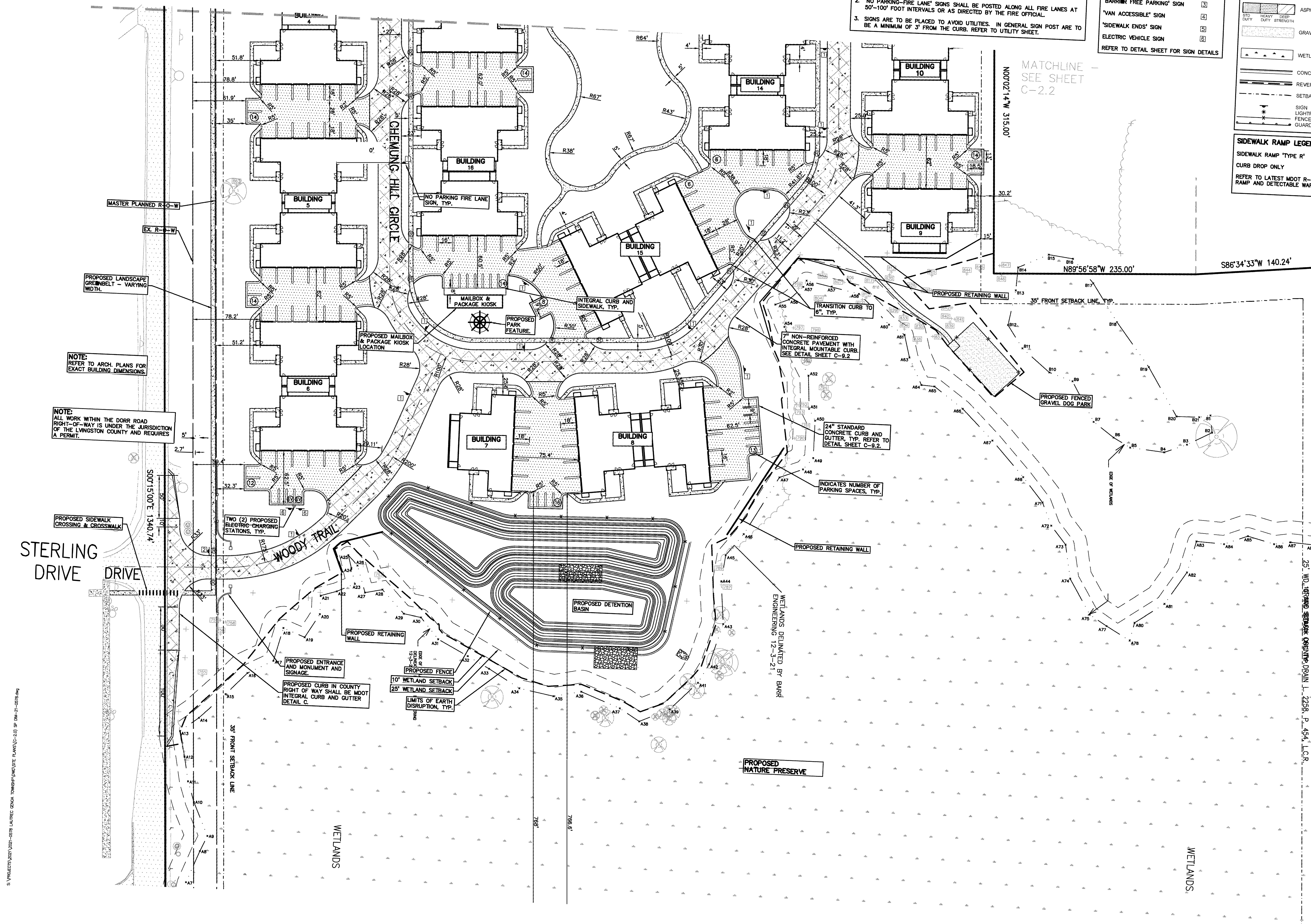
LEGEND:

- STD DUTY / HEAVY DUTY / R.O.W. ONLY — CONCRETE PAVEMENT
- STD DUTY / HEAVY DUTY / DEEP STRENGTH — ASPHALT PAVEMENT
- GRAVEL
- WETLAND
- CONCRETE CURB AND GUTTER
- REVERSE GUTTER PAN
- SETBACK LINE
- SIGN
- LIGHTPOLE
- FENCE
- GUARD RAIL

SIDEWALK RAMP LEGEND:

SIDEWALK RAMP 'TYPE R'	Ⓡ
CURB DROP ONLY	ⓧ

REFER TO LATEST MDOT R-28 STANDARD RAMP AND DETECTABLE WARNING DETAILS



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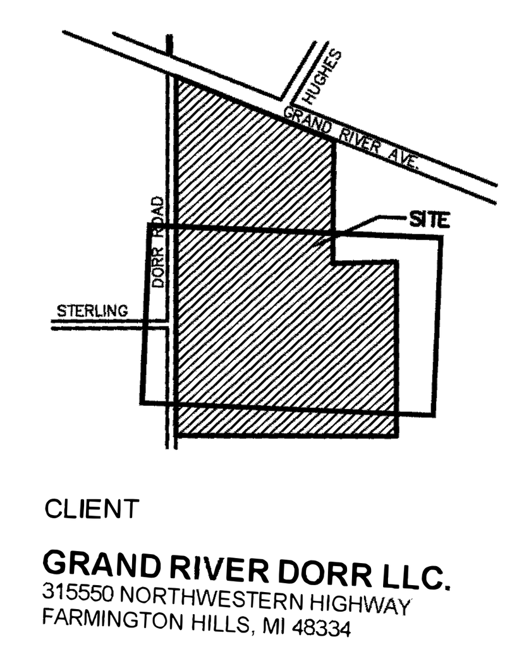

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PROJECT TITLE

THE LEGACY APARTMENT HOMES
6080 W GRAND RIVER
GENOA TOWNSHIP, LIVINGSTON COUNTY, MICHIGAN

REVISIONS

ORIGINAL ISSUE DATE:
APRIL 10, 2023

DRAWING TITLE

SITE PLAN SOUTH

PEA JOB NO.	2021-0578
P.M.	JEC
DN.	JMR
DES.	JMR

DRAWING NUMBER:

C-2.3

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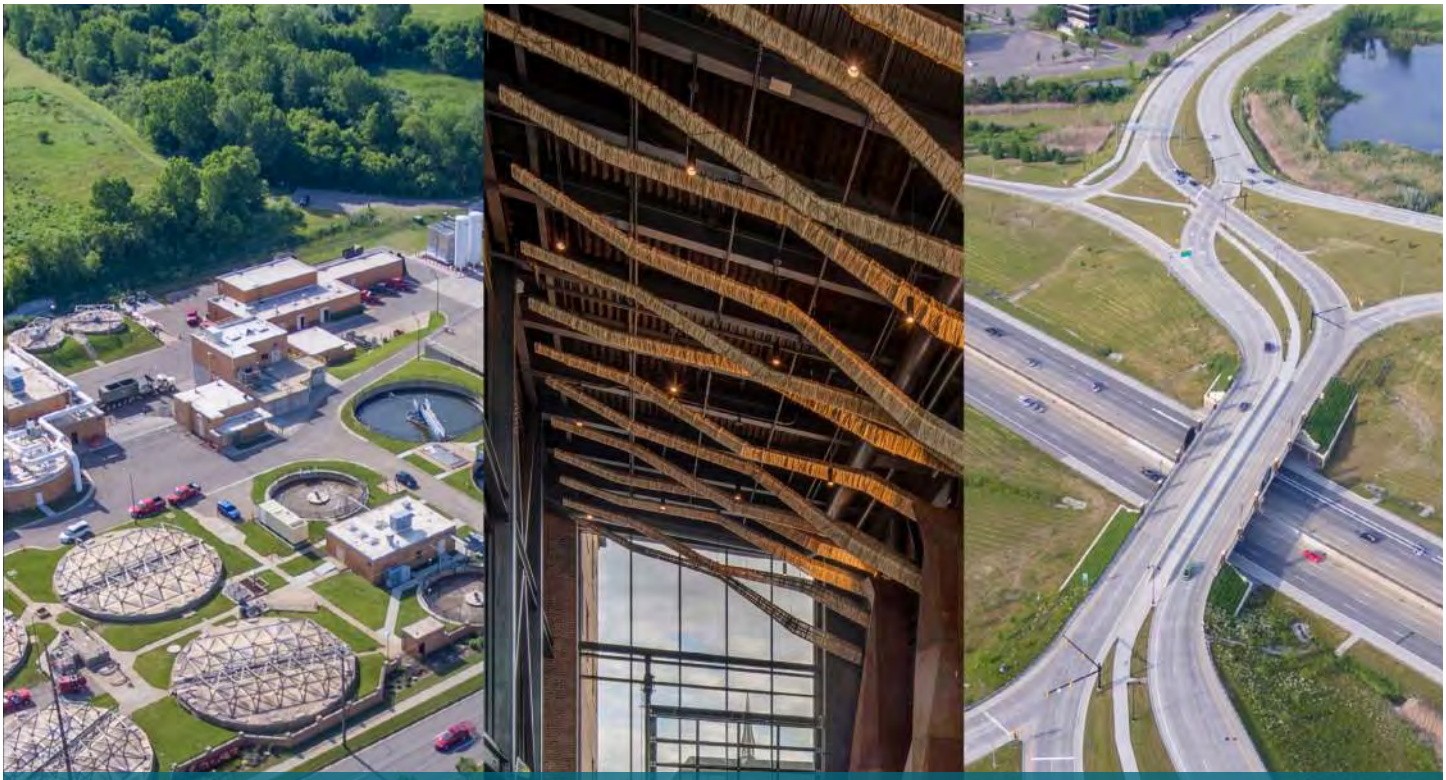
EXHIBIT C

TRAFFIC IMPACT STUDY



Legacy Apartment Homes
Traffic Impact Study

Project No. 221380
November 2, 2022

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Legacy Apartment Homes

Traffic Impact Study

Prepared For:
Grand River Dorr LLC
Farmington Hills, Michigan

November 2, 2022
Project No. 221380

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List of Abbreviations/Acronyms

AASHTO	American Association of State Highway and Transportation Officials
HCM	Highway Capacity Manual
ITE	Institute of Transportation Engineers
LOS	Level of Service
LUC	Land Use Code
LCRC	Livingston County Road Commission
NB	Northbound
SB	Southbound
SEMCOG	SE Michigan Council of Governments
TDMS	Transportation Data Management System
TIS	Traffic Impact Study
TMC	Turning Movement Count
Township	Genoa Township
TWLTL	Two-Way Left Turn Lane
WB	Westbound

References

The Highway Capacity Manual, 6th Edition. (2016). Washington, DC.
The Highway Capacity Manual: 2000. (2000). Washington, DC.
Trip Generation Handbook, 3rd Edition. (2017). Washington DC.
Trip Generation Manual, 11th Edition. (2021). Washington DC.

Executive Summary

Fishbeck has completed a traffic impact study (TIS) related to the development of Legacy Apartment Homes located in the southeast (SE) quadrant of Grand River Avenue and Dorr Road in Genoa Township (Township), Livingston County, Michigan. The vacant lot is proposed to be developed into multifamily residential with 204 dwelling units (DU) proposed. The development will be open and fully operational in 2025.

The proposed site plan includes a driveway on Grand River Avenue that will be the south approach of the signalized intersection of Grand River Avenue and Hughes Road and a driveway on Dorr Road that will be the east approach of the unsignalized intersection of Dorr Road and Sterling Drive.

This study was conducted according to the methodologies and guidance published by Institute of Transportation Engineers (ITE), American Association of State Highway and Transportation Officials (AASHTO), Livingston County Road Commission (LCRC) and the Township.

Vehicular, Turning Movement Counts (TMCs) were collected at the study intersections on December 14, 2021, during the weekday a.m. (7 a.m. to 9 a.m.) and p.m. (4 p.m. to 6 p.m.) time frames of the roadway network. Due to the impact of COVID-19, historical traffic data from the SE Michigan Council of Governments (SEMCOG) website was reviewed. Based on this review, an adjustment factor of 1.16 and 1.11 was determined for the a.m. and p.m. peak hours, respectively to adjust the completed TMCs to "Pre-COVID-19 levels".

There is one known project in the site vicinity that could add additional traffic volumes to the study network. The following development was included:

- St. Joseph Mercy Brighton Health Center Expansion.

Site-generated traffic was forecast using the information and methodologies specified in the latest version of Trip Generation, Trip Generation Manual, 11th Edition, 2021. The existing traffic volumes, site layout, and engineering judgement were used to develop a trip distribution model for the a.m. and p.m. peak hours for the new traffic generated by the proposed development. Additionally, directions of origin, surrounding residential densities, and commuting patterns were considered.

Level of Service (LOS) analyses were conducted for existing, background, and two total future conditions based on Highway Capacity Manual (HCM) 6th Edition, methodologies using Synchro traffic analysis software. One future condition analyzed included a scenario for the signalized driveway at Grand River Avenue and Hughes Road that would require widening of Hughes Road to accommodate a southbound (SB) left and right/through lane. The other future condition analyzed was a scenario that would create split phasing of the traffic signal operation for the northbound (NB) and SB approaches of the Grand River Avenue and Hughes Road intersection and not require widening of Hughes Road. Synchro network models were also simulated using SimTraffic to evaluate network operations including intersection queueing.

Based on findings of the HCM operational analyses and site traffic generation, the proposed development, including trips generated by the expansion of the St. Joseph Mercy Brighton Health Center, will not result in any significant impact to the adjacent road network. The proposed alternative that provides split phasing of the traffic signal operation for the NB and SB approaches of the Grand River Avenue and Hughes Road intersection and will not require widening of Hughes Road is the preferred alternative. Driveway 1 is to be constructed with a left turn lane and right/through lane.

The opinions, findings, and conclusions expressed in this TIS are those of Fishbeck and not necessarily those of the Owner/Applicant, LCRC, or the Township.

Prepared By:

Jill Bauer, PE, PTOE
Project Manager – Fishbeck

1.0 Introduction

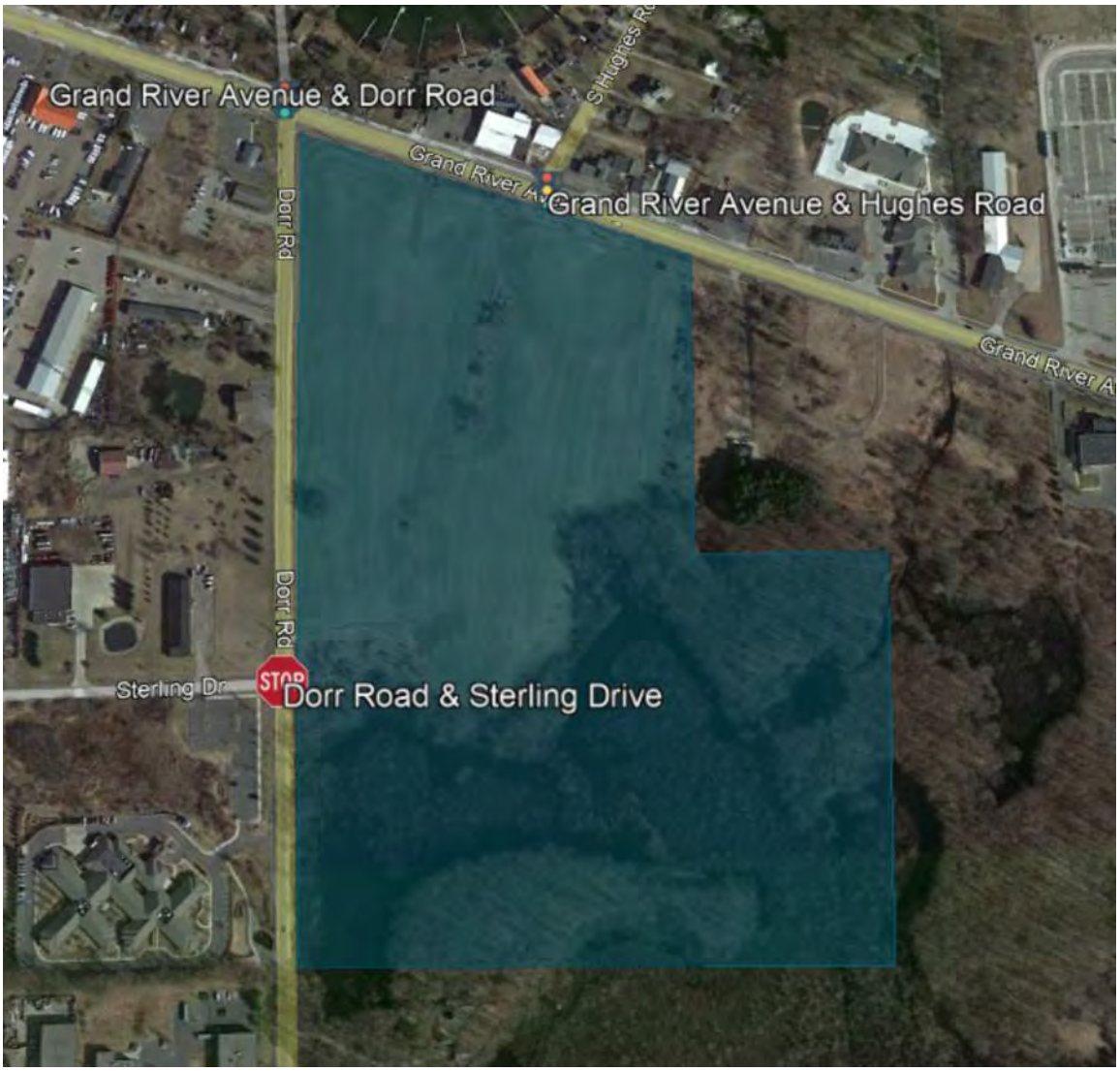
1.1 Project Overview

On behalf of Grand River Dorr LLC, Fishbeck has conducted a traffic impact study (TIS) related to the development of Legacy Apartment Homes located in the southeast (SE) quadrant of Grand River Avenue and Dorr Road in Genoa Township (Township), Livingston County, Michigan. The vacant lot is proposed to be developed into multifamily residential with 204 dwelling units (DU)'s proposed. The development will be open and fully operational in 2025.

The proposed site plan includes a driveway on Grand River Avenue that will be the south approach of the signalized intersection of Grand River Avenue and Hughes Road and a driveway on Dorr Road that will be the east approach of the unsignalized intersection of Dorr Road and Sterling Drive.

The project location and study intersections are indicated in Figure 1 – Project Location and Study Network.

Figure 1 – Project Location and Study Network



1.2 Study Methodology

The objectives of this TIS were to determine what impacts, if any, the proposed project will have on adjacent roadway traffic operations, and to develop recommendations for any improvements necessary to mitigate the project impacts on the studied intersections. Study analyses were completed relative to typical weekday a.m. and p.m. peak traffic periods.

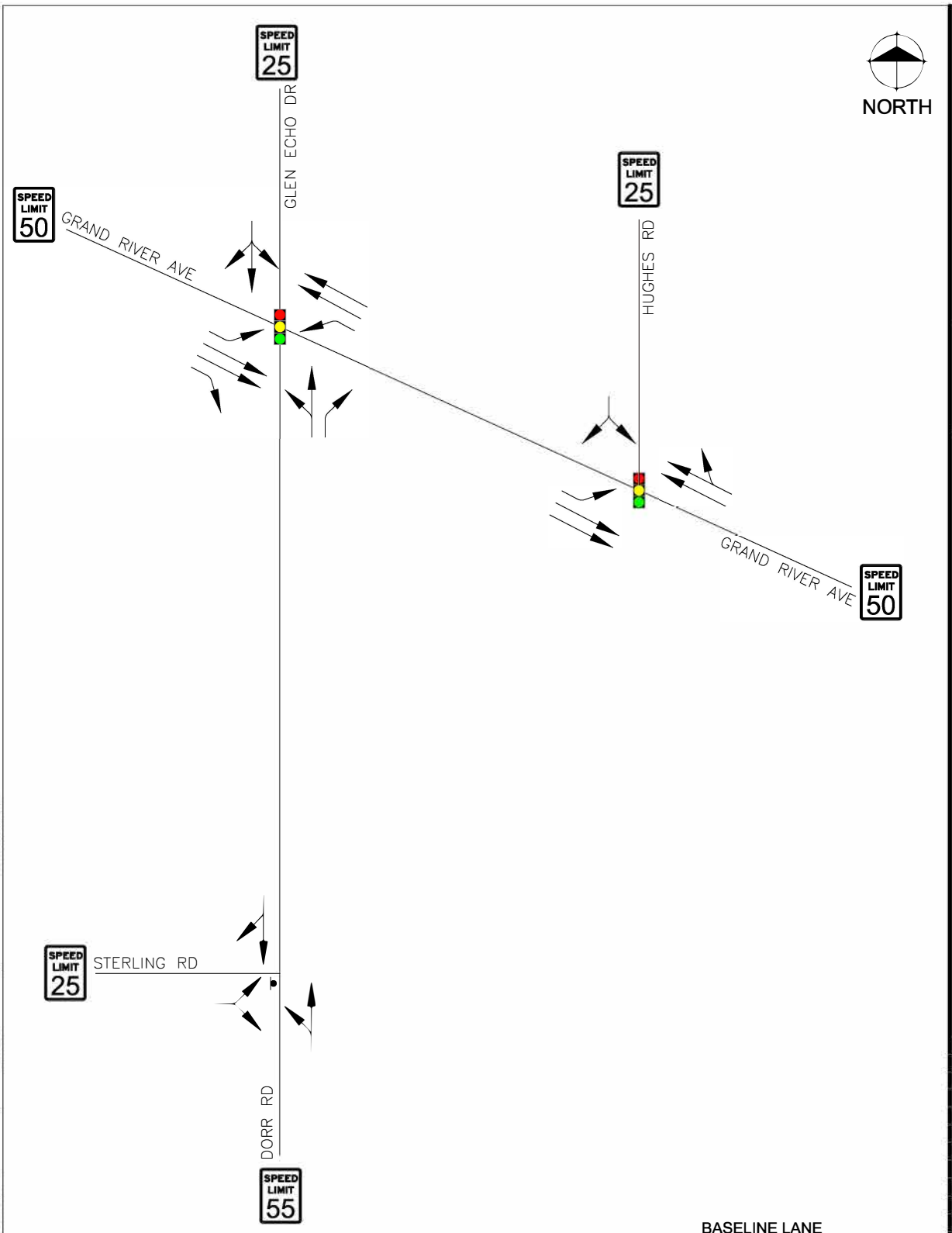
This study was conducted according to the methodologies and guidance published by Institute of Transportation Engineers (ITE), American Association of State Highway and Transportation Officials (AASHTO), Livingston County Road Commission (LCRC) and the Township.

1.3 Intersection Characteristics

Based on the type and size of the proposed development, input from LCRC, and the likely area of influence for the site trips, traffic operations were analyzed for the following intersections:

1. Grand River Avenue and Dorr Road/Glen Echo Drive (signalized).
2. Grand River Avenue and Hughes Road/Driveway 1 (signalized).
3. Dorr Road and Sterling Drive/Driveway 2 (unsignalized).

The existing intersection lane configurations, traffic controls, and posted speed limits are indicated in Figure 2 – Existing Lane Configurations.



BASELINE LANE
CONFIGURATION

NO SCALE

LEGEND

- LANE ASSIGNMENT
- SIGNALIZED INTERSECTION
- STOP CONTROL

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Multifamily Residential Development
Genoa Township, MI 48843

Traffic Impact Study

PROJECT NO.
221380

FIGURE NO.
2

PLOT INFO: M:\CUSTOM\AUTODESK PRODUCTS\ACAD\SYMBOLS\B-85X11.DWG LAYOUT: MODEL DATE: — TIME: — USER: DMEADE

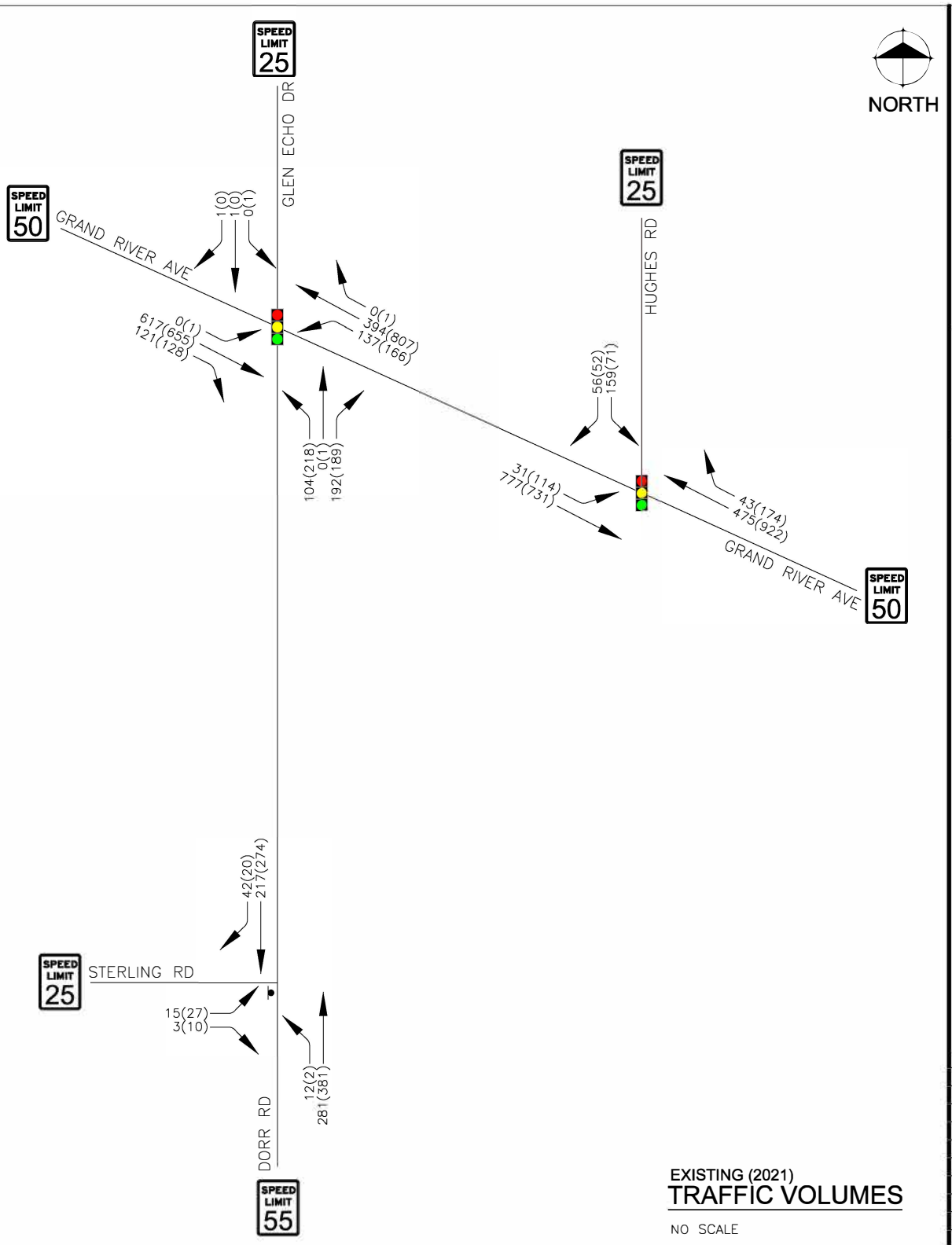
1.4 Existing Traffic Volumes

Vehicular Turning Movement Counts (TMC) were collected at the following study intersections during the weekday a.m. (7 to 9 a.m.) and p.m. (4 to 6 p.m.) peak traffic periods of the road network on December 14, 2021:

- Grand River Avenue and Dorr Road/Glen Echo Drive.
- Grand River Avenue and Hughes Road.
- Dorr Road and Sterling Drive.

Due to the impact of COVID-19, current traffic volume data may not be representative of typical operations. Historical traffic data from the SE Michigan Council of Governments (SEMCOG) website was reviewed. Based on this review, an adjustment factor of 1.16 and 1.11 was determined for the a.m. and p.m. peak hours, respectively to adjust the completed TMCs to "Pre-COVID-19 levels".

Traffic volume information can be found in Appendix 1 – Traffic Volume Data, which include heavy vehicle data. The adjusted existing traffic volumes used in this study are indicated in Figure 3– Existing Traffic Volumes.



EXISTING (2021)
TRAFFIC VOLUMES

NO SCALE

LEGEND

- LANE ASSIGNMENT
- SIGNALIZED INTERSECTION
- STOP CONTROL
- XX(XX) AM/PM PEAK HOUR VOLUMES

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FIGURE NO.
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2.0 Existing Conditions Analysis

2.1 Traffic Operations Analysis Methodology

Synchro was used to perform Highway Capacity Manual (HCM)operational analyses during the a.m. and p.m. peak hours for all the intersections within this study. According to the most recent edition of the HCM, Level of Service (LOS) is a qualitative measure describing operational conditions of a traffic stream or intersection. LOS ranges from A to F, with LOS A representing desirable traffic operations characterized by low delay and LOS F representing extremely poor traffic operations characterized by excessive delays and long vehicle queues. LOS D is considered acceptable for most areas. Table 1 – LOS Criteria presents the HCM criteria for various LOS for unsignalized and signalized intersections. The color coding in the table is used in the LOS analysis summary tables later in this report.

Table 1– LOS Criteria

LOS	Average Stopped Vehicle Delay (seconds)	
	Unsignalized	Signalized
A	≤ 10	≤ 10
B	> 10 and ≤ 15	> 10 and ≤ 20
C	> 15 and ≤ 25	> 20 and ≤ 35
D	> 25 and ≤ 35	> 35 and ≤ 55
E	> 35 and ≤ 50	> 55 and ≤ 80
F	> 50	> 80

2.2 Existing Conditions Traffic Analysis

Synchro models for the existing network were created based on the existing roadway configurations and traffic controls. Where applicable, data concerning the existing intersection and roadway lane configurations, geometry, and traffic control that were observed in the field were entered in the models. The traffic signal timing permits for the signalized intersections were provided by LCRC for use in the models.

The resulting LOS and delay for the existing conditions are indicated in Table 2 – LOS Analysis for Existing Conditions.

Table 2 – LOS Analysis for Existing Conditions

Approach	LOS/Delay(s)			
	a.m. Peak Hour		p.m. Peak Hour	
Grand River Avenue and Dorr Road/Glen Echo Drive (Signalized)				
EB Grand River Avenue	B	18.6	B	19.7
WB Grand River Avenue	A	3.3	A	3.3
NB Dorr Road	C	29.1	D	38.6
SB Glen Echo Drive	D	52.3	E	61.4
Overall	B	16.0	B	15.9
Grand River Avenue and Hughes Road (Signalized)				
EB Grand River Avenue	B	12.7	B	15.8
WB Grand River Avenue	A	6.8	A	5.8
SB Hughes Road	D	46.3	D	43.1
Overall	B	16.1	B	11.8
Dorr Road and Sterling Drive (Stop-Controlled)				
EB Sterling Drive	B	14.1	B	14.5
NB Dorr Road	A	0.3	A	0.0
SB Dorr Road	A	0.0	A	0.0
Overall	A	0.7	A	1.1

Eastbound (EB)
Northbound (NB)
Southbound (SB)
Westbound (WB)

Further analysis of the LOS results for existing conditions revealed that most movements, approaches, and intersections are expected to operate at an acceptable LOS D or better during both the a.m. and p.m. peak hours, with the following exceptions:

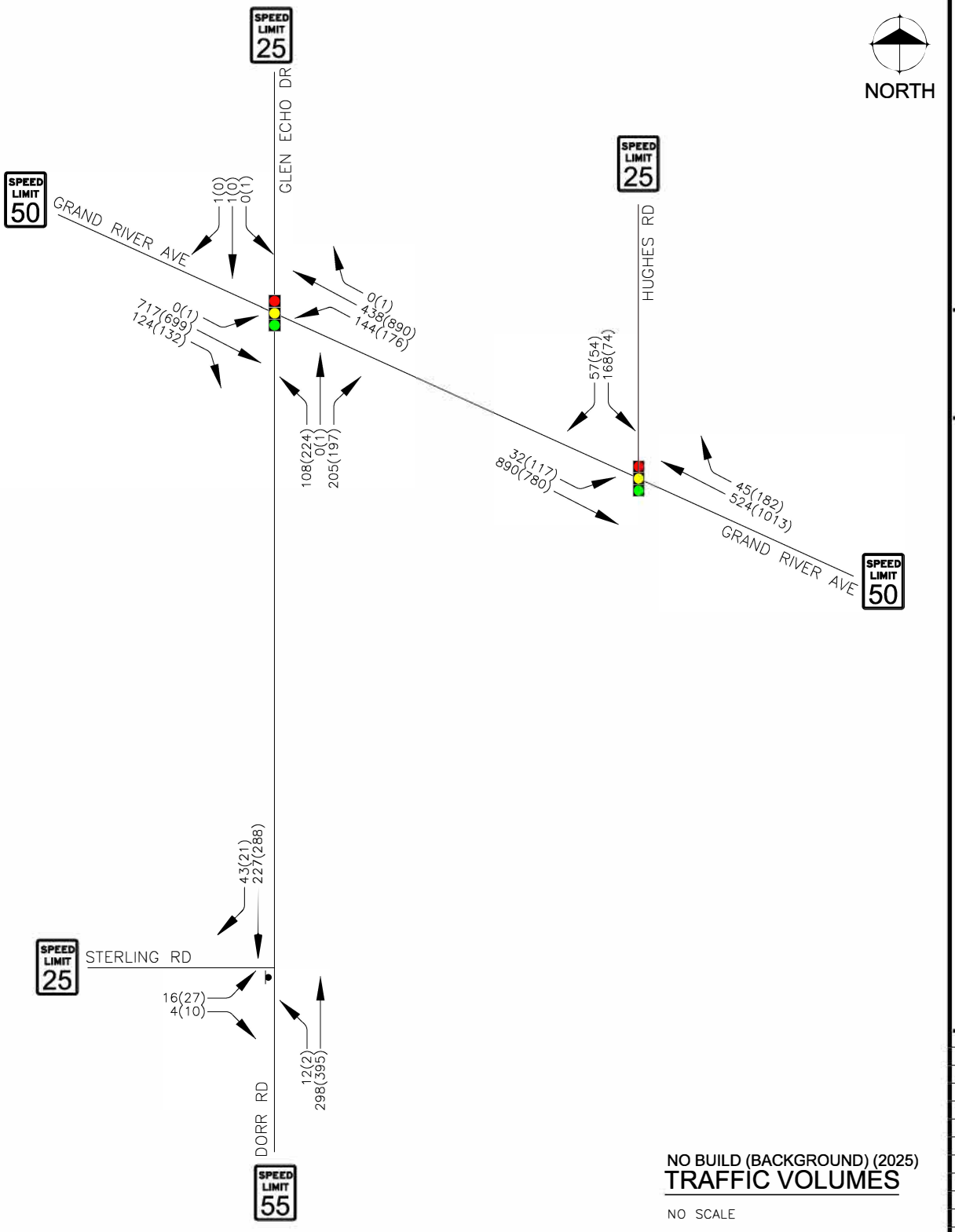
- Grand River Avenue and Dorr Road/Glen Echo Drive
  - The SB approach operates at LOS E in the p.m. peak hour.

SimTraffic simulations were also reviewed to observe network operations and vehicle queues. For existing conditions, study network operations are acceptable, without significant vehicle queues or spill-back from available storage lanes. No 95th percentile queue lengths for the turning movements exceeded the provided storage length. See Appendix 2 – Existing LOS Output Reports for the existing conditions LOS reports and queueing analysis reports.

3.0 Background Conditions Analysis

Historical traffic data on the SEMCOG Transportation Data Management System (TDMS) website was referenced to determine the applicable growth rate for the existing traffic volumes to the project build-out year in 2025. Based on this review, a background growth rate of 0.75% was utilized. In addition, one background development was identified and included in the background traffic conditions. Fishbeck was provided the TIS completed for the proposed St. Joseph Mercy Brighton Health Center Expansion, this development has a buildout year of 2024. The intersections of Grand River Avenue/Dorr Road and Grand River Avenue/Hughes Road were included in the prepared TIS.

Refer to Appendix 3 – Background Development Trip Generation for additional details related to the trip generation forecast at these intersections. The total background traffic volumes are indicated in Figure 4 – Background Traffic Volumes.



NO BUILD (BACKGROUND) (2025)

TRAFFIC VOLUMES

NO SCALE

LEGEND

- LANE ASSIGNMENT
- SIGNALIZED INTERSECTION
- STOP CONTROL
- XX(XX) AM/PM PEAK HOUR VOLUMES

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4

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3.1 Background Conditions Traffic Analysis

The resulting LOS and delay for the background conditions are presented in Table 3 – LOS Analysis for Background Conditions.

Table 3 – LOS Analysis for Background Conditions

Approach	LOS/Delay (s)			
	a.m. Peak Hour		p.m. Peak Hour	
Grand River Avenue and Dorr Road/Glen Echo Drive (Signalized)				
EB Grand River Avenue	C	20.6	C	20.8
WB Grand River Avenue	A	3.6	A	8.5
NB Dorr Road	C	28.7	D	39.0
SB Glen Echo Drive	D	52.3	E	61.4
Overall	B	16.9	B	18.5
Grand River Avenue and Hughes Road (Signalized)				
EB Grand River Avenue	B	13.9	B	16.8
WB Grand River Avenue	A	7.3	A	6.5
SB Hughes Road	D	47.3	D	42.8
Overall	B	16.7	B	12.4
Dorr Road and Sterling Drive (Stop-Controlled)				
EB Sterling Drive	B	14.4	C	15.0
NB Dorr Road	A	0.3	A	0.0
SB Dorr Road	A	0.0	A	0.0
Overall	A	0.7	A	1.1

Further analysis of the LOS results for background conditions revealed that most movements, approaches, and intersections are expected to continue to operate at an acceptable LOS D or better during both the a.m. and p.m. peak hours, with the following exceptions:

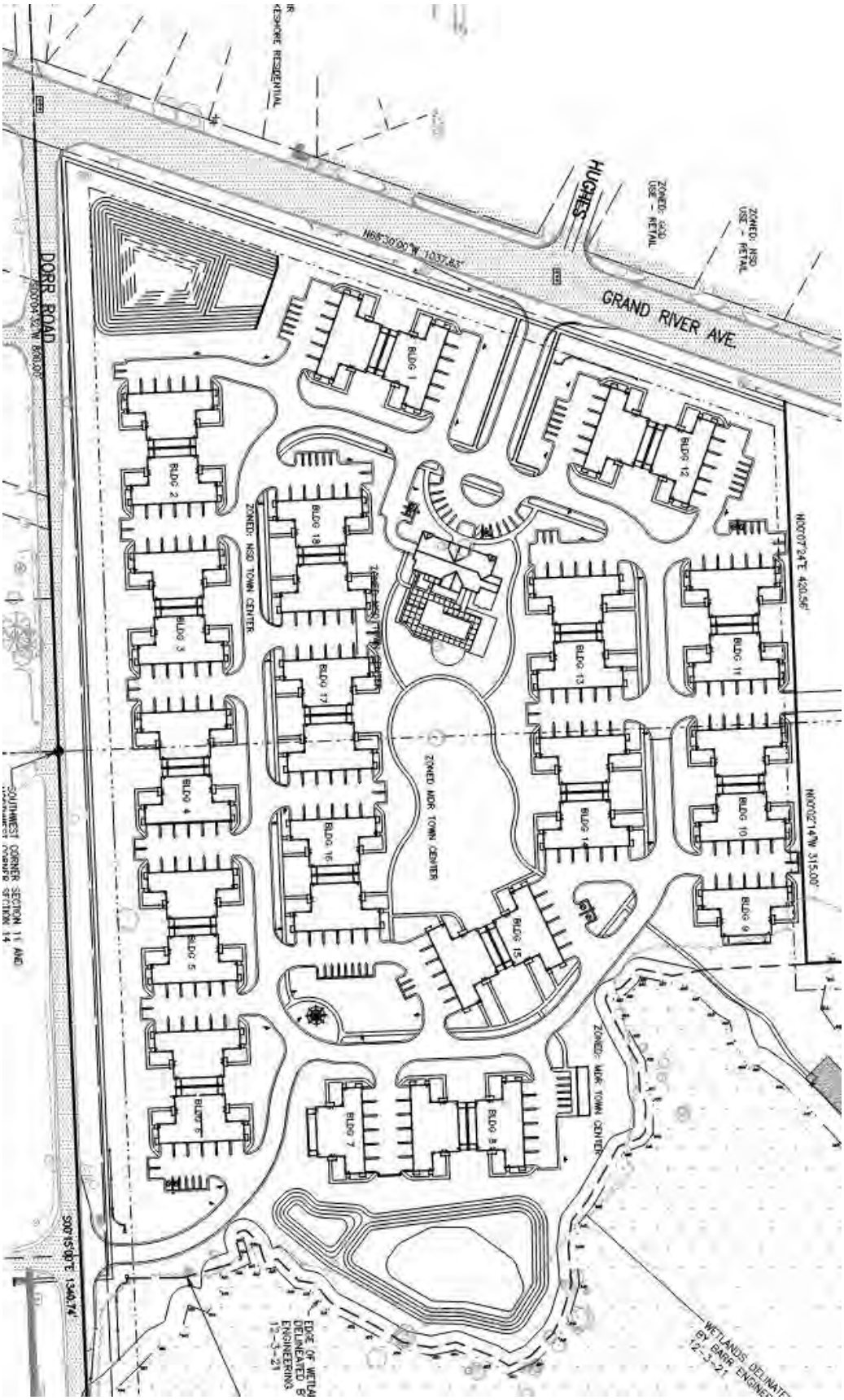
- Grand River Avenue and Dorr Road/Glen Echo Drive:
  - The SB approach continues to operate at LOS E in the p.m. peak hour.

SimTraffic simulations were also reviewed to observe network operations and vehicle queues. For background conditions, study network operations are acceptable, without significant vehicle queues or spill-back from available storage lanes. No 95th percentile queue lengths for the turning movements exceed the provided storage length, see Appendix 4 – Background LOS Output Reports.

4.0 Site Traffic Characteristics

A representation of the current conceptual site plan is provided in Figure 5 – Conceptual Site Plan, see below.

Figure 5 – Conceptual Site Plan



4.1 Trip Generation

Using the information and methodologies specified in the latest version of Trip Generation, Fishbeck forecast the weekday a.m. and p.m. peak hour trips associated with the proposed development.

Table 4 – Trip Generation for Proposed Development presents the resulting trip generation for the development. Refer to Appendix 5 – Trip Generation Calculations.

Table 4 – Trip Generation for Proposed Development

ITE LUC	LUC	Units	a.m. Peak Hour			p.m. Peak Hour			Weekday
			In	Out	Total	In	Out	Total	
220	Multifamily Housing (Low-Rise)	204 DU	21	65	86	68	40	108	1,383
Total New Trips			21	65	86	68	40	108	1,383

Land Use Code (LUC)

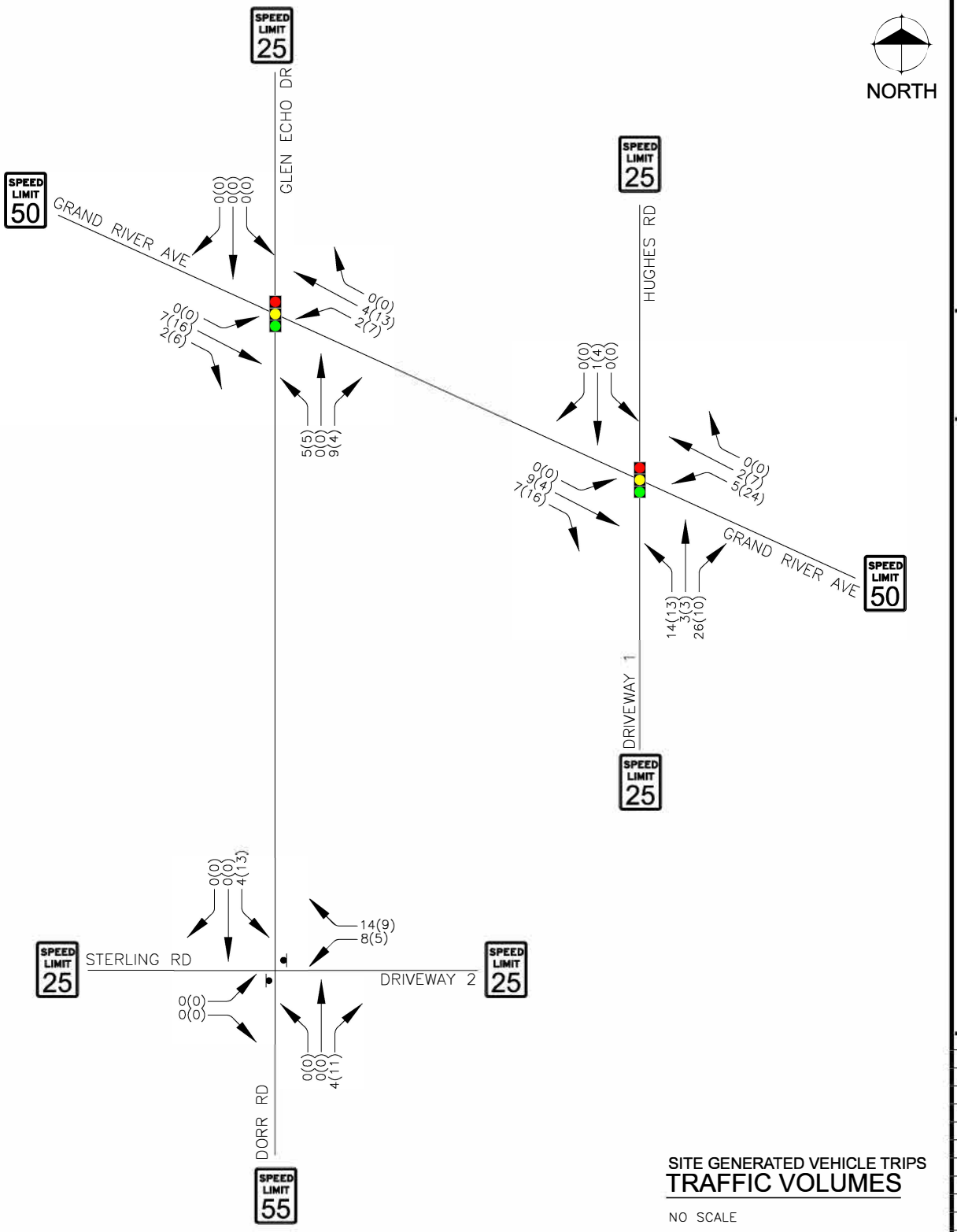
4.2 Trip Distribution

The directions that site traffic will travel to and from were based upon existing traffic patterns during the a.m. and p.m. peak hours. The existing traffic patterns reflect the gravity between origins and destinations in the study area, and therefore an accurate indication of where the proposed trips would be coming from and going to. Table 5 – Trip Distribution provides the probable distribution based on the existing traffic patterns.

Table 5 – Trip Distribution

Direction	Via	New Trips			
		a.m. Peak Hour		p.m. Peak Hour	
		To	From	To	From
North	Hughes Road	4%	7%	7%	5%
South	Dorr Road	13%	18%	13%	16%
East	Grand River Avenue	54%	31%	35%	46%
West	Grand River Avenue	29%	44%	45%	33%

The trip distribution for the site is indicated in Figure 6 – Trip Generation Volumes, see below. These trips were added to the background volumes (Figure 4) to result in the future conditions volumes in Figure 7– Future Conditions Volumes.



SITE GENERATED VEHICLE TRIPS

TRAFFIC VOLUMES

NO SCALE

LEGEND

- LANE ASSIGNMENT
- SIGNALIZED INTERSECTION
- STOP CONTROL
- XX(XX) AM/PM PEAK HOUR VOLUMES

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Engineers | Architects | Scientists | Constructors

Hard copy is intended to be 8.5"x11" when plotted. Scale(s) indicated and graphic quality may not be accurate for any other size.

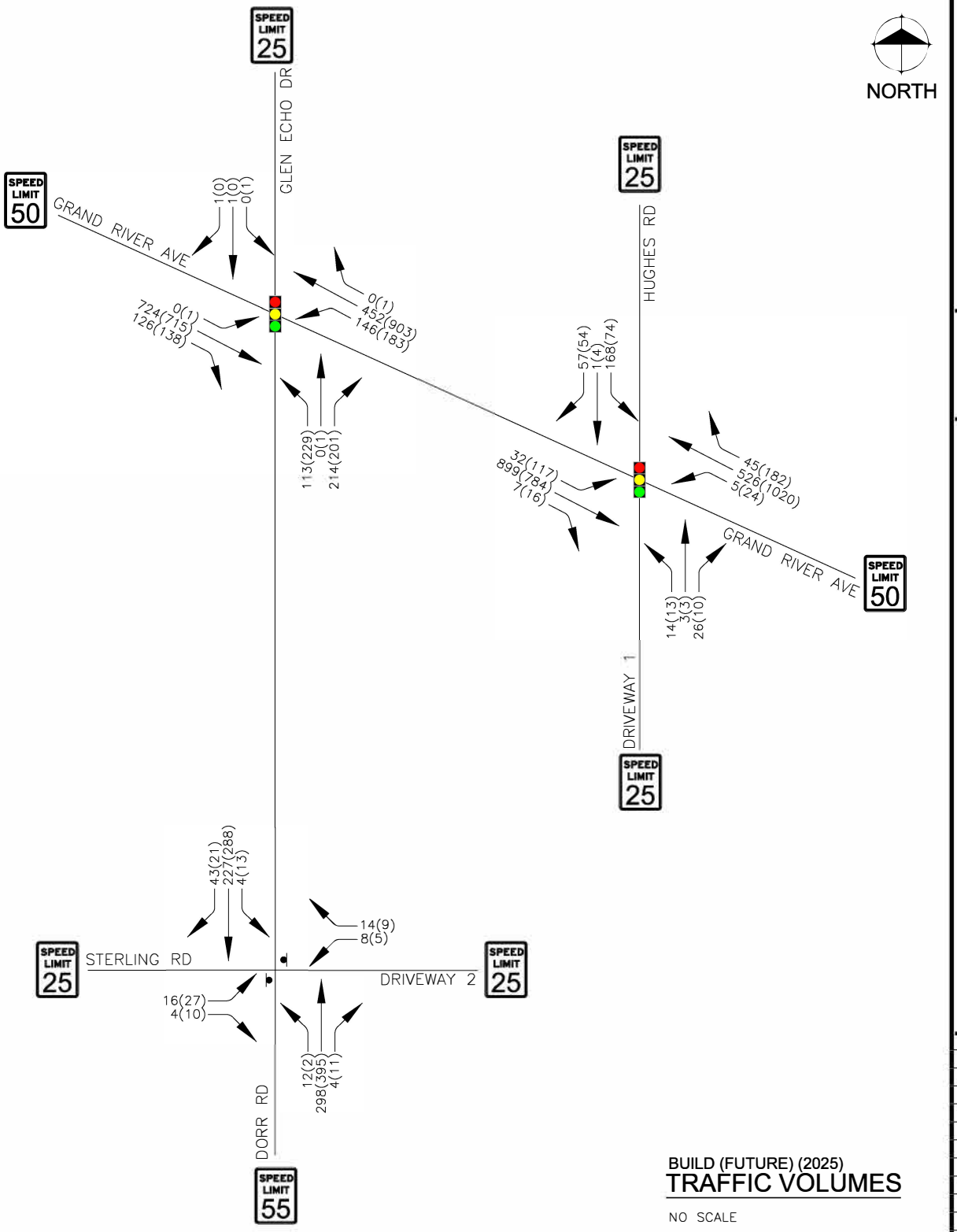
Multifamily Residential Development
Genoa Township, MI 48843

Traffic Impact Study

PROJECT NO.
221380

FIGURE NO.
6

PLOT INFO: M:\CUSTOM\AUTODESK PRODUCTS\ACAD\SYMBOLS\B-85X11.DWG LAYOUT: MODEL DATE: — TIME: — USER: DMEADE



BUILD (FUTURE) (2025)

TRAFFIC VOLUMES

NO SCALE

LEGEND

- LANE ASSIGNMENT
- SIGNALIZED INTERSECTION
- STOP CONTROL
- XX(XX) AM/PM PEAK HOUR VOLUMES

fishbeck
Engineers | Architects | Scientists | Constructors

Hard copy is intended to be 8.5"x11" when plotted. Scale(s) indicated and graphic quality may not be accurate for any other size.

Multifamily Residential Development
Genoa Township, MI 48843

Traffic Impact Study

PROJECT NO.
221380

FIGURE NO.
7

PLOT INFO: M:\CUSTOM\AUTODESK PRODUCTS\ACAD\SYMBOLS\B-85X11.DWG LAYOUT: MODEL DATE: — TIME: — USER: DMEADE

5.0 Future Conditions Analysis

5.1 Turn Lane Warrants

An evaluation was performed in accordance with LCRC requirements to determine if left turn passing lanes or right turn deceleration lanes are required at the site driveways. The results of the analysis indicated that a left turn passing lane is warranted at Driveway 1. WB Grand River Avenue already has a center left turn lane present. All turn lane warrant charts are in Appendix 6 – Turn Lane Warrants. The results of the analysis are presented in Table 6 – Turn Lane Warrants.

Table 6 – Turn Lane Warrants

Intersection	Movement	Result
Grand River Avenue and Hughes Road/Driveway 1	WB Left Turn	Warranted[1]
	EB Right Turn	Not Warranted
Dorr Road and Sterling Drive/Driveway 2	SB Left Turn	Not Warranted
	NB Right Turn	Not Warranted

[1]Two-way left turn lane (TWLTL) exists

5.2 Future Conditions Traffic Analysis

Due to the construction of Driveway 1 as the NB approach of the intersection of Grand River Avenue and Hughes Road, LCRC requested that the SB approach be widened to accommodate a left turn lane and shared right/through lane. Driveway 1 is also to be constructed with a left turn lane and right/through lane. The resulting LOS and delay for the future conditions are indicated in Table 7 – LOS Analysis for Future Conditions.

Table 7 – LOS Analysis for Future Conditions

Approach	LOS/Delay (s)			
	a.m. Peak Hour		p.m. Peak Hour	
Grand River Avenue and Dorr Road/Glen Echo Drive (Signalized)				
EB Grand River Avenue	C	21.3	C	21.5
WB Grand River Avenue	A	3.7	A	8.9
NB Dorr Road	C	28.6	D	39.3
SB Glen Echo Drive	D	52.3	E	61.4
Overall	B	17.2	B	19.0
Grand River Avenue and Hughes Road/Driveway 1 (Signalized)				
EB Grand River Avenue	B	14.5	B	16.3
WB Grand River Avenue	A	7.5	A	5.9
NB Driveway 1	C	26.5	D	35.1
SB Hughes Road	D	32.4	D	36.8
Overall	B	15.1	B	11.8
Dorr Road and Sterling Drive/Driveway 2 (Stop-Controlled)				
EB Sterling Drive	C	16.4	C	17.8
WB Driveway 2	B	13.3	B	13.8
NB Dorr Road	A	0.3	A	0.0
SB Dorr Road	A	0.1	A	0.3
Overall	A	1.2	A	1.6

Further analysis of the LOS results for future conditions revealed that most movements, approaches, and intersections are expected to continue to operate at an acceptable LOS D or better during both the a.m. and p.m. peak hours, with the following exceptions:

- Grand River Avenue and Dorr Road/Glen Echo Drive:
  - SB approach continues to operate at LOS E in the p.m. peak hour.

SimTraffic simulations were also reviewed to observe network operations and vehicle queues. For future conditions, study network operations are acceptable, without significant vehicle queues or spill-back from available storage lanes. No 95th percentile queue lengths for the turning movements exceed the provided storage length. See Appendix 7 – Future LOS Output Reports for the future conditions LOS reports and queueing analysis reports.

5.3 Future Conditions with Split Phasing Traffic Analysis

LCRC suggested split phasing of the traffic signal operation for the NB and SB movements as an alternative to the SB approach being widened. Driveway 1 is to be constructed with a left turn lane and right/through lane. The resulting LOS and delay for the future conditions are indicated in Table 8 – LOS Analysis for Future Conditions with Split Phasing.

Table 8 – LOS Analysis for Future Conditions with Split Phasing

Approach	LOS/Delay (s)			
	a.m. Peak Hour		p.m. Peak Hour	
Grand River Avenue and Dorr Road/Glen Echo Drive (Signalized)				
EB Grand River Avenue	C	21.3	C	21.5
WB Grand River Avenue	A	3.6	A	8.7
NB Dorr Road	C	28.6	D	39.3
SB Glen Echo Drive	D	52.3	E	61.4
Overall	B	17.2	B	18.9
Grand River Avenue and Hughes Road/Driveway 1 (Signalized)				
EB Grand River Avenue	C	22.0	C	23.9
WB Grand River Avenue	B	13.6	B	13.4
NB Driveway 1	D	38.0	D	38.6
SB Hughes Road	D	45.6	D	41.8
Overall	C	23.0	B	19.1
Dorr Road and Sterling Drive/Driveway 2 (Stop-Controlled)				
EB Sterling Drive	C	16.4	C	17.8
WB Driveway 2	B	13.3	B	13.8
NB Dorr Road	A	0.3	A	0.0
SB Dorr Road	A	0.1	A	0.3
Overall	A	1.2	A	1.6

Further analysis of the LOS results for future conditions revealed that most movements, approaches, and intersections are expected to continue to operate at an acceptable LOS D or better during both the a.m. and p.m. peak hours, with the following exceptions:

- Grand River Avenue and Dorr Road/Glen Echo Drive:
  - SB approach continues to operate at LOS E in the p.m. peak hour.

SimTraffic simulations were also reviewed to observe network operations and vehicle queues. For future conditions, study network operations are acceptable, without significant vehicle queues or spill-back from available storage lanes. No 95th percentile queue lengths for the turning movements exceed the provided storage length. See Appendix 8 – Future with Split Phase LOS Output Reports for the future conditions with split phasing LOS reports and queueing analysis reports.

6.0 Findings and Recommendations

The analyses conducted for this TIS indicate the proposed development will not result in any significant impact to the adjacent road network. The proposed site access configuration is appropriate and will acceptably facilitate site ingress and egress. The proposed alternative that provides split phasing of the traffic signal operation for the NB and SB approaches of the Grand River Avenue and Hughes Road intersection and will not require widening of Hughes Road is the preferred alternative. In this alternative, Driveway 1 is to be constructed with a left turn lane and right/through lane. This conclusion is supported by the following key findings:

1. Existing and proposed storage lengths are adequate for all movements in existing and future conditions.
2. Lane configurations and physical capacity are appropriate within the study area.

Appendix 1

Traffic Volume Data

Intersection	Time period	Year	Movement	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR	NBRR	SBRR	EBRR	WBRR
#1 - Grand River Ave & Dorr Rd/ Glen Echo Dr	AM Peak 12/14/21		PHF	0.69			0.60			0.92			0.87						
			% Heavy	3%			0%			3%			4%						
		2021	Existing	**90**		**165**		**1**	**1**		**531**	**104**	**118**	**339**		**110**	**1**	**17**	**0**
		2021	Existing Adj.	104	0	192	0	1	1	0	617	121	137	394	0				
		2025	Background	108	0	197	0	1	1	0	635	124	141	406	0				
			Bckgrd. Dev. A			8					82		3	32					
			Bckgrd. Dev. B																
			Bckgrd. Dev. C																
			Total Background	**108**	**0**	**205**	**0**	**1**	**1**	**0**	**717**	**124**	**144**	**438**	**0**				
			Site Generated	5		9					7	2	2	14					
			Pass By																
			Total Site Gen	5	0	9	0	0	0	0	7	2	2	14	0				
			Total Future	**113**	**0**	**214**	**0**	**1**	**1**	**0**	**724**	**126**	**146**	**452**	**0**				

Intersection	Time period	Year	Movement	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR	NBRR	SBRR	EBRR	WBRR
#2 - Grand River Ave & Hughes Rd/ Site Driveway	AM Peak 12/14/21		PHF				0.72			0.85			0.83						
			% Heavy				2%			3%			4%						
		2021	Existing				**137**		**48**	**27**	**669**			**409**	**37**		**25**		**5**
		2021	Existing Adj.	0	0	0	159	0	56	31	777	0	0	475	43				
		2025	Background	0	0	0	164	0	57	32	800	0	0	489	44				
			Bckgrd. Dev. A				4				90			35	1				
			Bckgrd. Dev. B																
			Bckgrd. Dev. C																
			Total Background	**0**	**0**	**0**	**168**	**0**	**57**	**32**	**890**	**0**	**0**	**524**	**45**				
			Site Generated	14	3	26		1			9	7	5	2					
			Pass By																
			Total Site Gen	14	3	26	0	1	0	0	9	7	5	2	0				
			Total Future	**14**	**3**	**26**	**168**	**1**	**57**	**32**	**899**	**7**	**5**	**526**	**45**				

Intersection	Time period	Year	Movement	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR	NBRR	SBRR	EBRR	WBRR
#3 - Dorr Rd & Sterling Dr/Driveway 2	AM Peak 12/14/21		PHF	0.69			0.90			0.67									
			% Heavy	2%			4%			6%									
		2021	Existing	**10**	**242**			**187**	**36**	**13**		**3**							
		2021	Existing Adj.	12	281	0	0	217	42	15	0	3	0	0	0				
		2025	Background	12	290	0	0	224	43	16	0	4	0	0	0				
			Bckgrd. Dev. A		8			3											
			Bckgrd. Dev. B																
			Bckgrd. Dev. C																
			Total Background	**12**	**298**	**0**	**0**	**227**	**43**	**16**	**0**	**4**	**0**	**0**	**0**				
			Site Generated			4	4						8		14				
			Pass By																
			Total Site Gen	0	0	4	4	0	0	0	0	0	8	0	14				
			Total Future	**12**	**298**	**4**	**4**	**227**	**43**	**16**	**0**	**4**	**8**	**0**	**14**				

Count Date:	12/14/2021
Count Year:	2021
Existing Adj. Year:	2021
Existing Adjustment Rate:	1.16
Growth Rate:	0.75%
Buildout Year:	2025
Scenario:	AM Peak

Bckgrd. Dev. A: St. Joseph Mercy Brighton Health Center Expansion
Bckgrd. Dev. B:
Bckgrd. Dev. C:

Intersection	Time period	Year	Movement	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR	NBRR	SBRR	EBRR	WBRR
#1 - Grand River Ave & Dorr Rd/ Glen Echo Dr	PM Peak 12/14/21		PHF	0.76			0.60			0.90			0.79						
			% Heavy	2%			0%			1%			1%						
		2021	Existing	**197**	**1**	**171**	**1**	**0**	**0**	**1**	**592**	**116**	**150**	**730**	**1**	**94**	**0**	**44**	
		2021	Existing Adj.	218	1	189	1	0	0	1	655	128	166	807	1				
		2025	Background	224	1	195	1	0	0	1	674	132	171	832	1				
			Bckgrd. Dev. A			2					25		5	58					
			Bckgrd. Dev. B																
			Bckgrd. Dev. C																
			Total Background	**224**	**1**	**197**	**1**	**0**	**0**	**1**	**699**	**132**	**176**	**890**	**1**				
			Site Generated	5		4					16	6	7	13					
			Pass By																
			Total Site Gen	5	0	4	0	0	0	0	16	6	7	13	0				
			Total Future	**229**	**1**	**201**	**1**	**0**	**0**	**1**	**715**	**138**	**183**	**903**	**1**				

Intersection	Time period	Year	Movement	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR	NBRR	SBRR	EBRR	WBRR
#2 - Grand River Ave & Hughes Rd/ Site Driveway	PM Peak 12/14/21		PHF				0.90			0.92			0.81						
			% Heavy				2%			1%			1%						
		2021	Existing				**64**		**47**	**103**	**661**			**834**	**157**		**25**		**11**
		2021	Existing Adj.	0	0	0	71	0	52	114	731	0	0	922	174				
		2025	Background	0	0	0	73	0	54	117	753	0	0	950	179				
			Bckgrd. Dev. A				1				27			63	3				
			Bckgrd. Dev. B																
			Bckgrd. Dev. C																
			Total Background	**0**	**0**	**0**	**74**	**0**	**54**	**117**	**780**	**0**	**0**	**1013**	**182**				
			Site Generated	13	3	10		4			4	16	24	7					
			Pass By																
			Total Site Gen	13	3	10	0	4	0	0	4	16	24	7	0				
			Total Future	**13**	**3**	**10**	**74**	**4**	**54**	**117**	**784**	**16**	**24**	**1020**	**182**				

Intersection	Time period	Year	Movement	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR	NBRR	SBRR	EBRR	WBRR
#3 - Dorr Rd & Sterling Dr/Driveway 2	PM Peak 12/14/21		PHF		0.86			0.94			0.60								
			% Heavy		3%			2%			0%								
		2021	Existing	**2**	**345**			**248**	**18**	**24**		**9**							
		2021	Existing Adj.	2	381	0	0	274	20	27	0	10	0	0	0				
		2025	Background	2	393	0	0	283	21	27	0	10	0	0	0				
			Bckgrd. Dev. A		2			5											
			Bckgrd. Dev. B																
			Bckgrd. Dev. C																
			Total Background	**2**	**395**	**0**	**0**	**288**	**21**	**27**	**0**	**10**	**0**	**0**	**0**				
			Site Generated			11	13						5		9				
			Pass By																
			Total Site Gen	0	0	11	13	0	0	0	0	0	5	0	9				
			Total Future	**2**	**395**	**11**	**13**	**288**	**21**	**27**	**0**	**10**	**5**	**0**	**9**				

Count Date: 12/14/2021
Count Year: 2021
Existing Adj. Year: 2021

Existing Adjustment Rate: 1.11
Growth Rate: 0.75%
Buildout Year: 2025
Scenario: PM Peak

Bckgrd. Dev. A: St. Joseph Mercy Brighton Health Center Expansion
Bckgrd. Dev. B:
Bckgrd. Dev. C:

Grand River and Dorr - RTOR x 4 - TMC

Tue Dec 14, 2021
Full Length (7 AM-9 AM, 4 PM-6 PM)
All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)
All Movements
ID: 908959, Location: 42.57436, -83.834417

Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US

Leg	Dorr Rd						Glen Echo Dr					
Direction	Northbound						Southbound					
Time	BL	T	HR	U	HRR	**App**	BL	T	HR	U	HRR	**App**
2021-12-14 7:00AM	5	0	4	0	5	**14**	0	0	0	0	0	**0**
7:15AM	11	0	7	0	18	**36**	0	1	1	0	0	**2**
7:30AM	14	0	5	0	14	**33**	1	0	0	0	0	**1**
7:45AM	22	0	8	0	25	**55**	0	0	0	0	0	**0**
Hourly Total	52	0	24	0	62	**138**	1	1	1	0	0	**3**
8:00AM	19	0	10	0	21	**50**	0	0	0	0	0	**0**
8:15AM	13	0	15	0	32	**60**	0	0	0	0	0	**0**
8:30AM	16	0	7	0	30	**53**	0	0	0	0	0	**0**
8:45AM	42	0	23	0	27	**92**	0	1	0	0	1	**2**
Hourly Total	90	0	55	0	110	**255**	0	1	0	0	1	**2**
4:00PM	53	3	15	0	19	**90**	0	1	0	0	1	**2**
4:15PM	52	0	13	0	26	**91**	0	0	0	0	0	**0**
4:30PM	38	0	15	0	21	**74**	0	0	0	0	0	**0**
4:45PM	47	1	18	0	17	**83**	1	0	0	0	0	**1**
Hourly Total	190	4	61	0	83	**338**	1	1	0	0	1	**3**
5:00PM	60	0	31	0	30	**121**	0	0	0	0	0	**0**
5:15PM	36	0	10	0	24	**70**	0	0	0	0	0	**0**
5:30PM	29	0	19	0	24	**72**	0	0	0	0	0	**0**
5:45PM	30	0	9	0	11	**50**	0	1	0	0	0	**1**
Hourly Total	155	0	69	0	89	**313**	0	1	0	0	0	**1**
Total	487	4	209	0	344	**1044**	2	4	1	0	2	**9**
% Approach	46.6%	0.4%	20.0%	0%	33.0%	**-**	22.2%	44.4%	11.1%	0%	22.2%	**-**
% Total	8.1%	0.1%	3.5%	0%	5.7%	**17.4%**	0%	0.1%	0%	0%	0%	**0.2%**
Lights	479	4	202	0	339	**1024**	2	4	1	0	2	**9**
% Lights	98.4%	100%	96.7%	0%	98.5%	**98.1%**	100%	100%	100%	0%	100%	**100%**
Articulated Trucks	1	0	2	0	0	**3**	0	0	0	0	0	**0**
% Articulated Trucks	0.2%	0%	1.0%	0%	0%	**0.3%**	0%	0%	0%	0%	0%	**0%**
Buses and Single-Unit Trucks	7	0	5	0	5	**17**	0	0	0	0	0	**0**
% Buses and Single-Unit Trucks	1.4%	0%	2.4%	0%	1.5%	**1.6%**	0%	0%	0%	0%	0%	**0%**

*BL: Bear left, BR: Bear right, BRR: Bear right on red, HL: Hard left, HR: Hard right, HRR: Hard right on red, T: Thru, U: U-Turn

Grand River and Dorr - RTOR x 4 - TMC

Tue Dec 14, 2021
Full Length (7 AM-9 AM, 4 PM-6 PM)
All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)
All Movements
ID: 908959, Location: 42.57436, -83.834417

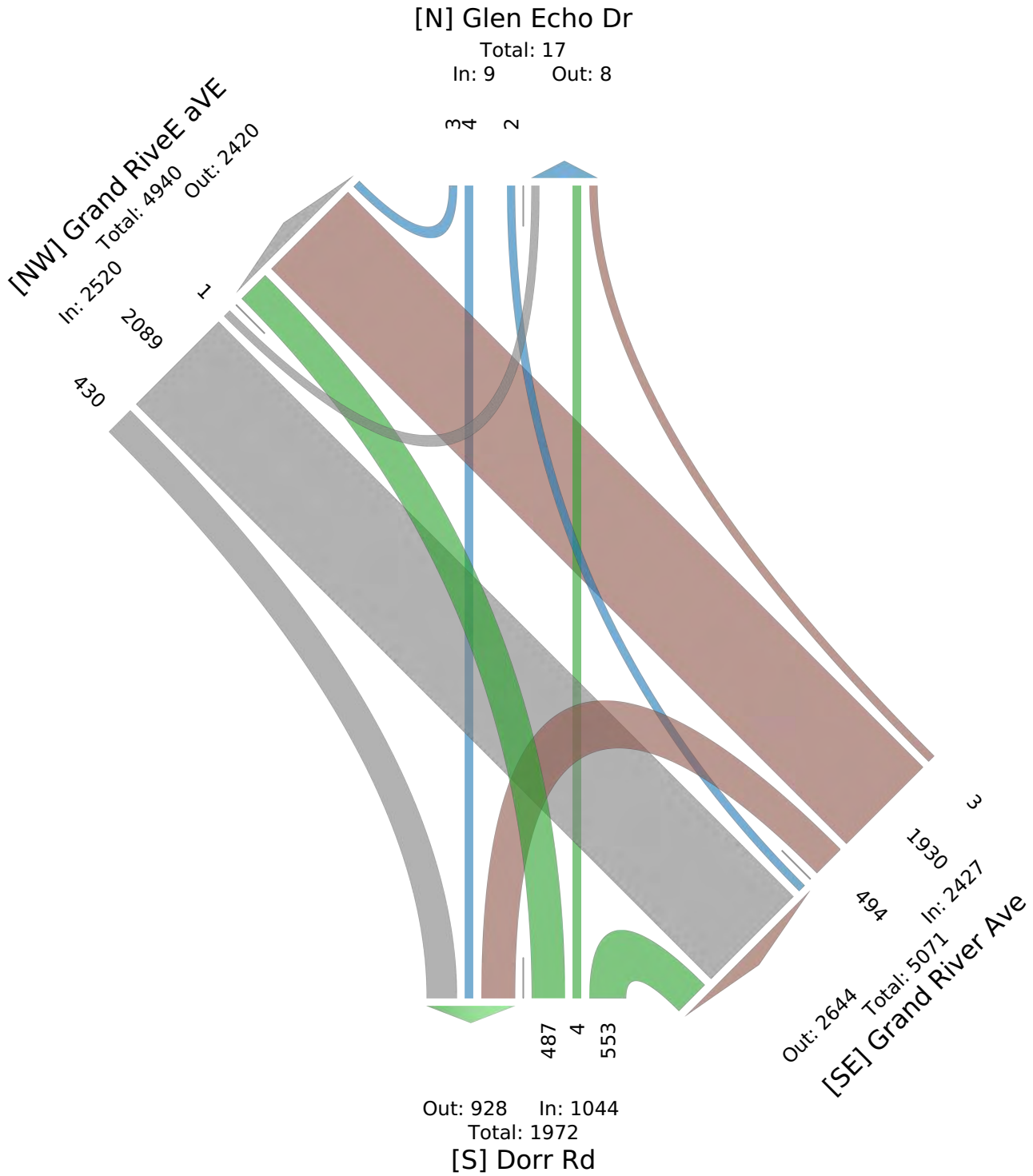
Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US

Leg	Grand RiveE aVE						Grand River Ave						
Direction	Southeastbound						Northwestbound						
Time	HL	T	BR	U	BRR	**App**	HL	T	BR	U	BRR	**App**	**Int**
2021-12-14 7:00AM	0	71	13	0	3	**87**	25	52	0	0	0	**77**	**178**
7:15AM	0	77	22	0	1	**100**	17	52	0	0	0	**69**	**207**
7:30AM	0	114	18	0	1	**133**	13	56	0	0	0	**69**	**236**
7:45AM	0	129	27	0	7	**163**	41	61	0	0	0	**102**	**320**
Hourly Total	0	391	80	0	12	**483**	96	221	0	0	0	**317**	**941**
8:00AM	0	118	26	0	2	**146**	29	65	0	0	0	**94**	**290**
8:15AM	0	154	16	0	3	**173**	35	70	0	0	0	**105**	**338**
8:30AM	0	116	26	0	7	**149**	27	104	0	0	0	**131**	**333**
8:45AM	0	143	19	0	5	**167**	27	100	0	0	0	**127**	**388**
Hourly Total	0	531	87	0	17	**635**	118	339	0	0	0	**457**	**1349**
4:00PM	0	144	18	0	13	**175**	37	189	1	0	0	**227**	**494**
4:15PM	0	130	20	0	11	**161**	39	179	0	0	0	**218**	**470**
4:30PM	0	151	19	0	13	**183**	38	155	1	0	0	**194**	**451**
4:45PM	0	162	20	0	14	**196**	28	162	0	0	0	**190**	**470**
Hourly Total	0	587	77	0	51	**715**	142	685	2	0	0	**829**	**1885**
5:00PM	1	149	13	0	6	**169**	45	234	0	0	0	**279**	**569**
5:15PM	0	147	26	0	10	**183**	32	179	0	0	1	**212**	**465**
5:30PM	0	140	21	0	4	**165**	35	134	0	0	0	**169**	**406**
5:45PM	0	144	20	0	6	**170**	26	138	0	0	0	**164**	**385**
Hourly Total	1	580	80	0	26	**687**	138	685	0	0	1	**824**	**1825**
Total	1	2089	324	0	106	**2520**	494	1930	2	0	1	**2427**	**6000**
% Approach	0%	82.9%	12.9%	0%	4.2%	**-**	20.4%	79.5%	0.1%	0%	0%	**-**	-
% Total	0%	34.8%	5.4%	0%	1.8%	**42.0%**	8.2%	32.2%	0%	0%	0%	**40.5%**	-
Lights	1	2057	312	0	106	**2476**	482	1902	2	0	1	**2387**	5896
% Lights	100%	98.5%	96.3%	0%	100%	**98.3%**	97.6%	98.5%	100%	0%	100%	**98.4%**	98.3%
Articulated Trucks	0	1	2	0	0	**3**	1	2	0	0	0	**3**	9
% Articulated Trucks	0%	0%	0.6%	0%	0%	**0.1%**	0.2%	0.1%	0%	0%	0%	**0.1%**	0.2%
Buses and Single-Unit Trucks	0	31	10	0	0	**41**	11	26	0	0	0	**37**	95
% Buses and Single-Unit Trucks	0%	1.5%	3.1%	0%	0%	**1.6%**	2.2%	1.3%	0%	0%	0%	**1.5%**	1.6%

*BL: Bear left, BR: Bear right, BRR: Bear right on red, HL: Hard left, HR: Hard right, HRR: Hard right on red, T: Thru, U: U-Turn

Grand River and Dorr - RTOR x 4 - TMC
Tue Dec 14, 2021
Full Length (7 AM-9 AM, 4 PM-6 PM)
All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)
All Movements
ID: 908959, Location: 42.57436, -83.834417

Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US



Grand River and Dorr - RTOR x 4 - TMC

Tue Dec 14, 2021
AM Peak (8 AM - 9 AM)
All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)
All Movements
ID: 908959, Location: 42.57436, -83.834417

Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US

Leg	Dorr Rd						Glen Echo Dr					
Direction	Northbound						Southbound					
Time	BL	T	HR	U	HRR	**App**	BL	T	HR	U	HRR	**App**
2021-12-14 8:00AM	19	0	10	0	21	**50**	0	0	0	0	0	**0**
8:15AM	13	0	15	0	32	**60**	0	0	0	0	0	**0**
8:30AM	16	0	7	0	30	**53**	0	0	0	0	0	**0**
8:45AM	42	0	23	0	27	**92**	0	1	0	0	1	**2**
Total	90	0	55	0	110	**255**	0	1	0	0	1	**2**
% Approach	35.3%	0%	21.6%	0%	43.1%	**-**	0%	50.0%	0%	0%	50.0%	**-**
% Total	6.7%	0%	4.1%	0%	8.2%	**18.9%**	0%	0.1%	0%	0%	0.1%	**0.1%**
PHF	0.536	-	0.598	-	0.859	**0.693**	-	0.250	-	-	0.250	**0.250**
Lights	87	0	54	0	107	**248**	0	1	0	0	1	**2**
% Lights	96.7%	0%	98.2%	0%	97.3%	**97.3%**	0%	100%	0%	0%	100%	**100%**
Articulated Trucks	1	0	0	0	0	**1**	0	0	0	0	0	**0**
% Articulated Trucks	1.1%	0%	0%	0%	0%	**0.4%**	0%	0%	0%	0%	0%	**0%**
Buses and Single-Unit Trucks	2	0	1	0	3	**6**	0	0	0	0	0	**0**
% Buses and Single-Unit Trucks	2.2%	0%	1.8%	0%	2.7%	**2.4%**	0%	0%	0%	0%	0%	**0%**

*BL: Bear left, BR: Bear right, BRR: Bear right on red, HL: Hard left, HR: Hard right, HRR: Hard right on red, T: Thru, U: U-Turn

Grand River and Dorr - RTOR x 4 - TMC

Tue Dec 14, 2021
AM Peak (8 AM - 9 AM)
All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)
All Movements
ID: 908959, Location: 42.57436, -83.834417

Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US

Leg	Grand RiveE aVE						Grand River Ave						
Direction	Southeastbound						Northwestbound						
Time	HL	T	BR	U	BRR	**App**	HL	T	BR	U	BRR	**App**	**Int**
2021-12-14 8:00AM	0	118	26	0	2	**146**	29	65	0	0	0	**94**	**290**
8:15AM	0	154	16	0	3	**173**	35	70	0	0	0	**105**	**338**
8:30AM	0	116	26	0	7	**149**	27	104	0	0	0	**131**	**333**
8:45AM	0	143	19	0	5	**167**	27	100	0	0	0	**127**	**388**
Total	0	531	87	0	17	**635**	118	339	0	0	0	**457**	**1349**
% Approach	0%	83.6%	13.7%	0%	2.7%	**-**	25.8%	74.2%	0%	0%	0%	**-**	-
% Total	0%	39.4%	6.4%	0%	1.3%	**47.1%**	8.7%	25.1%	0%	0%	0%	**33.9%**	-
PHF	-	0.862	0.837	-	0.607	**0.918**	0.843	0.815	-	-	-	**0.872**	0.869
Lights	0	517	83	0	17	**617**	113	325	0	0	0	**438**	1305
% Lights	0%	97.4%	95.4%	0%	100%	**97.2%**	95.8%	95.9%	0%	0%	0%	**95.8%**	96.7%
Articulated Trucks	0	0	0	0	0	**0**	1	2	0	0	0	**3**	4
% Articulated Trucks	0%	0%	0%	0%	0%	**0%**	0.8%	0.6%	0%	0%	0%	**0.7%**	0.3%
Buses and Single-Unit Trucks	0	14	4	0	0	**18**	4	12	0	0	0	**16**	40
% Buses and Single-Unit Trucks	0%	2.6%	4.6%	0%	0%	**2.8%**	3.4%	3.5%	0%	0%	0%	**3.5%**	3.0%

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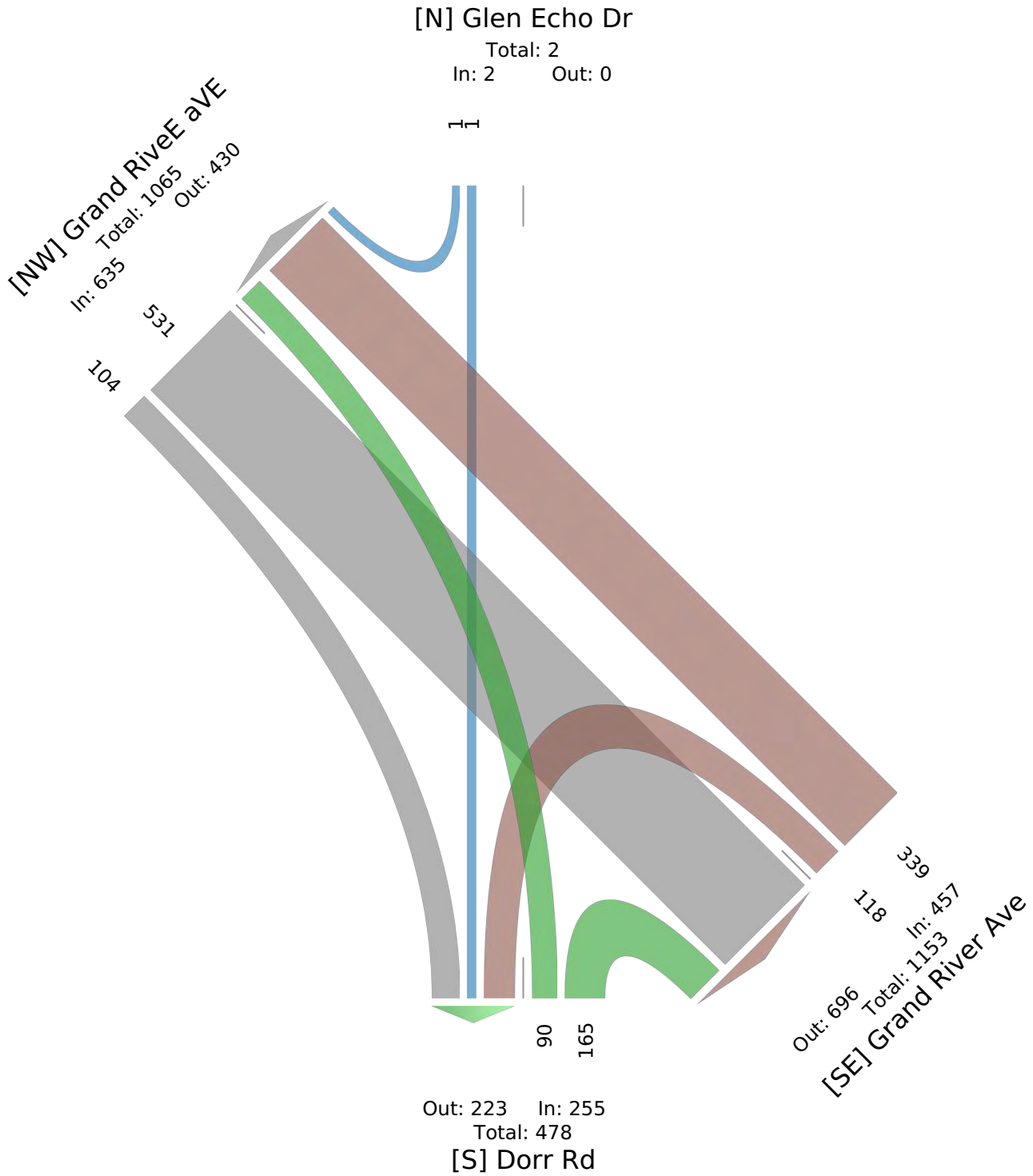
Grand River and Dorr - RTOR x 4 - TMC
Tue Dec 14, 2021
AM Peak (8 AM - 9 AM)
All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)
All Movements
ID: 908959, Location: 42.57436, -83.834417

Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US



Grand River and Dorr - RTOR x 4 - TMC

Tue Dec 14, 2021
PM Peak (4:15 PM - 5:15 PM) - Overall Peak Hour
All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)
All Movements
ID: 908959, Location: 42.57436, -83.834417

Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US

Leg	Dorr Rd						Glen Echo Dr					
Direction	Northbound						Southbound					
Time	BL	T	HR	U	HRR	**App**	BL	T	HR	U	HRR	**App**
2021-12-14 4:15PM	52	0	13	0	26	**91**	0	0	0	0	0	**0**
4:30PM	38	0	15	0	21	**74**	0	0	0	0	0	**0**
4:45PM	47	1	18	0	17	**83**	1	0	0	0	0	**1**
5:00PM	60	0	31	0	30	**121**	0	0	0	0	0	**0**
Total	197	1	77	0	94	**369**	1	0	0	0	0	**1**
% Approach	53.4%	0.3%	20.9%	0%	25.5%	**-**	100%	0%	0%	0%	0%	**-**
% Total	10.1%	0.1%	3.9%	0%	4.8%	**18.8%**	0.1%	0%	0%	0%	0%	**0.1%**
PHF	0.821	0.250	0.621	-	0.783	**0.762**	0.250	-	-	-	-	**0.250**
Lights	194	1	73	0	92	**360**	1	0	0	0	0	**1**
% Lights	98.5%	100%	94.8%	0%	97.9%	**97.6%**	100%	0%	0%	0%	0%	**100%**
Articulated Trucks	0	0	2	0	0	**2**	0	0	0	0	0	**0**
% Articulated Trucks	0%	0%	2.6%	0%	0%	**0.5%**	0%	0%	0%	0%	0%	**0%**
Buses and Single-Unit Trucks	3	0	2	0	2	**7**	0	0	0	0	0	**0**
% Buses and Single-Unit Trucks	1.5%	0%	2.6%	0%	2.1%	**1.9%**	0%	0%	0%	0%	0%	**0%**

*BL: Bear left, BR: Bear right, BRR: Bear right on red, HL: Hard left, HR: Hard right, HRR: Hard right on red, T: Thru, U: U-Turn

Grand River and Dorr - RTOR x 4 - TMC

Tue Dec 14, 2021
PM Peak (4:15 PM - 5:15 PM) - Overall Peak Hour
All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)
All Movements
ID: 908959, Location: 42.57436, -83.834417

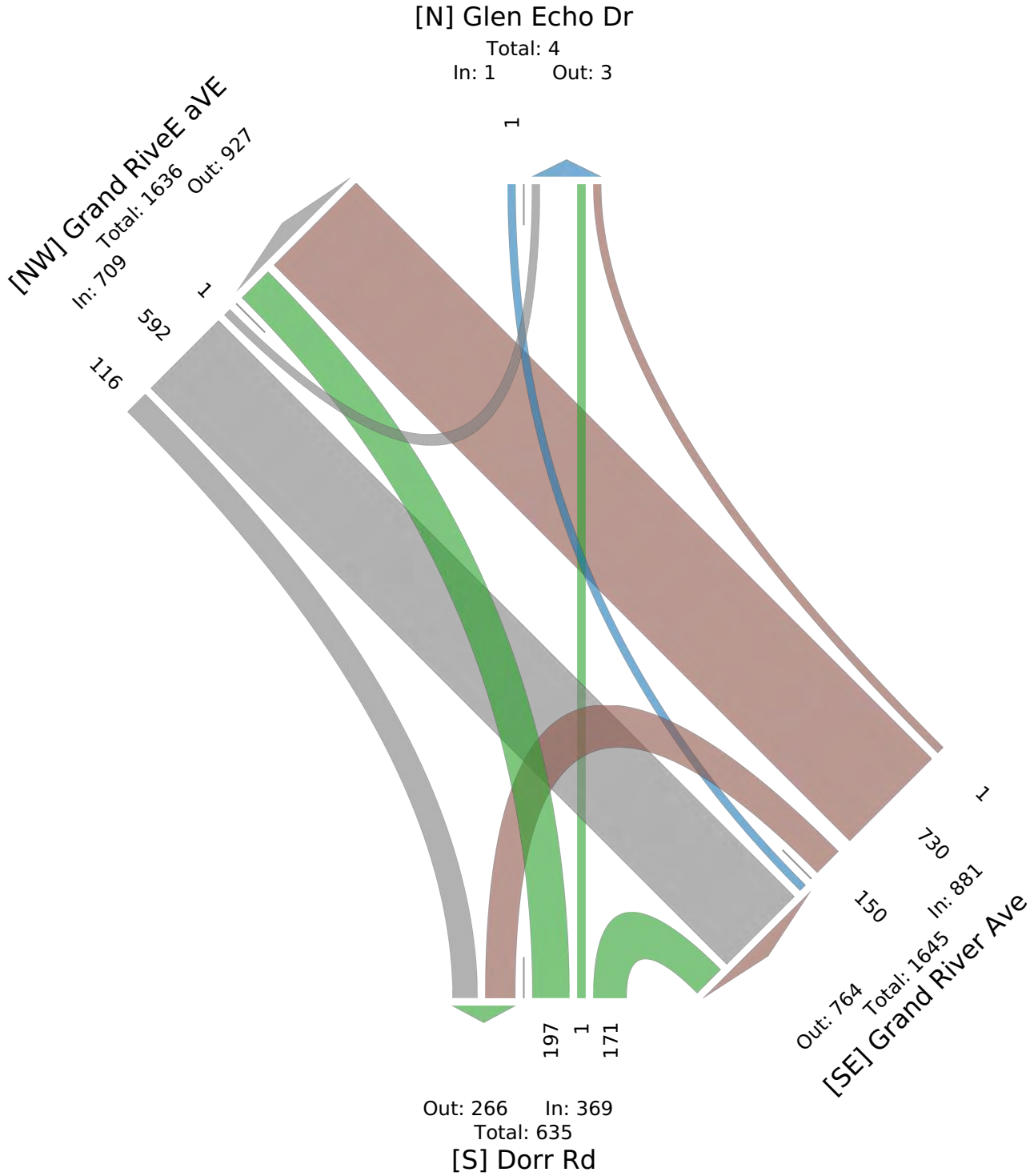
Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US

Leg	Grand RiveE aVE						Grand River Ave						
Direction	Southeastbound						Northwestbound						
Time	HL	T	BR	U	BRR	**App**	HL	T	BR	U	BRR	**App**	**Int**
2021-12-14 4:15PM	0	130	20	0	11	**161**	39	179	0	0	0	**218**	**470**
4:30PM	0	151	19	0	13	**183**	38	155	1	0	0	**194**	**451**
4:45PM	0	162	20	0	14	**196**	28	162	0	0	0	**190**	**470**
5:00PM	1	149	13	0	6	**169**	45	234	0	0	0	**279**	**569**
Total	1	592	72	0	44	**709**	150	730	1	0	0	**881**	**1960**
% Approach	0.1%	83.5%	10.2%	0%	6.2%	**-**	17.0%	82.9%	0.1%	0%	0%	**-**	-
% Total	0.1%	30.2%	3.7%	0%	2.2%	**36.2%**	7.7%	37.2%	0.1%	0%	0%	**44.9%**	-
PHF	0.250	0.914	0.900	-	0.786	**0.904**	0.833	0.780	0.250	-	-	**0.789**	0.861
Lights	1	590	70	0	44	**705**	148	724	1	0	0	**873**	1939
% Lights	100%	99.7%	97.2%	0%	100%	**99.4%**	98.7%	99.2%	100%	0%	0%	**99.1%**	98.9%
Articulated Trucks	0	0	1	0	0	**1**	0	0	0	0	0	**0**	3
% Articulated Trucks	0%	0%	1.4%	0%	0%	**0.1%**	0%	0%	0%	0%	0%	**0%**	0.2%
Buses and Single-Unit Trucks	0	2	1	0	0	**3**	2	6	0	0	0	**8**	18
% Buses and Single-Unit Trucks	0%	0.3%	1.4%	0%	0%	**0.4%**	1.3%	0.8%	0%	0%	0%	**0.9%**	0.9%

*BL: Bear left, BR: Bear right, BRR: Bear right on red, HL: Hard left, HR: Hard right, HRR: Hard right on red, T: Thru, U: U-Turn

Grand River and Dorr - RTOR x 4 - TMC
Tue Dec 14, 2021
PM Peak (4:15 PM - 5:15 PM) - Overall Peak Hour
All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)
All Movements
ID: 908959, Location: 42.57436, -83.834417

GEWALT HAMILTON ASSOCIATES, INC.
Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US



Grand River and Hughes - RTOR x 3 - TMC

Tue Dec 14, 2021
Full Length (7 AM-9 AM, 4 PM-6 PM)
All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)
All Movements
ID: 908958, Location: 42.573747, -83.831951

Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US

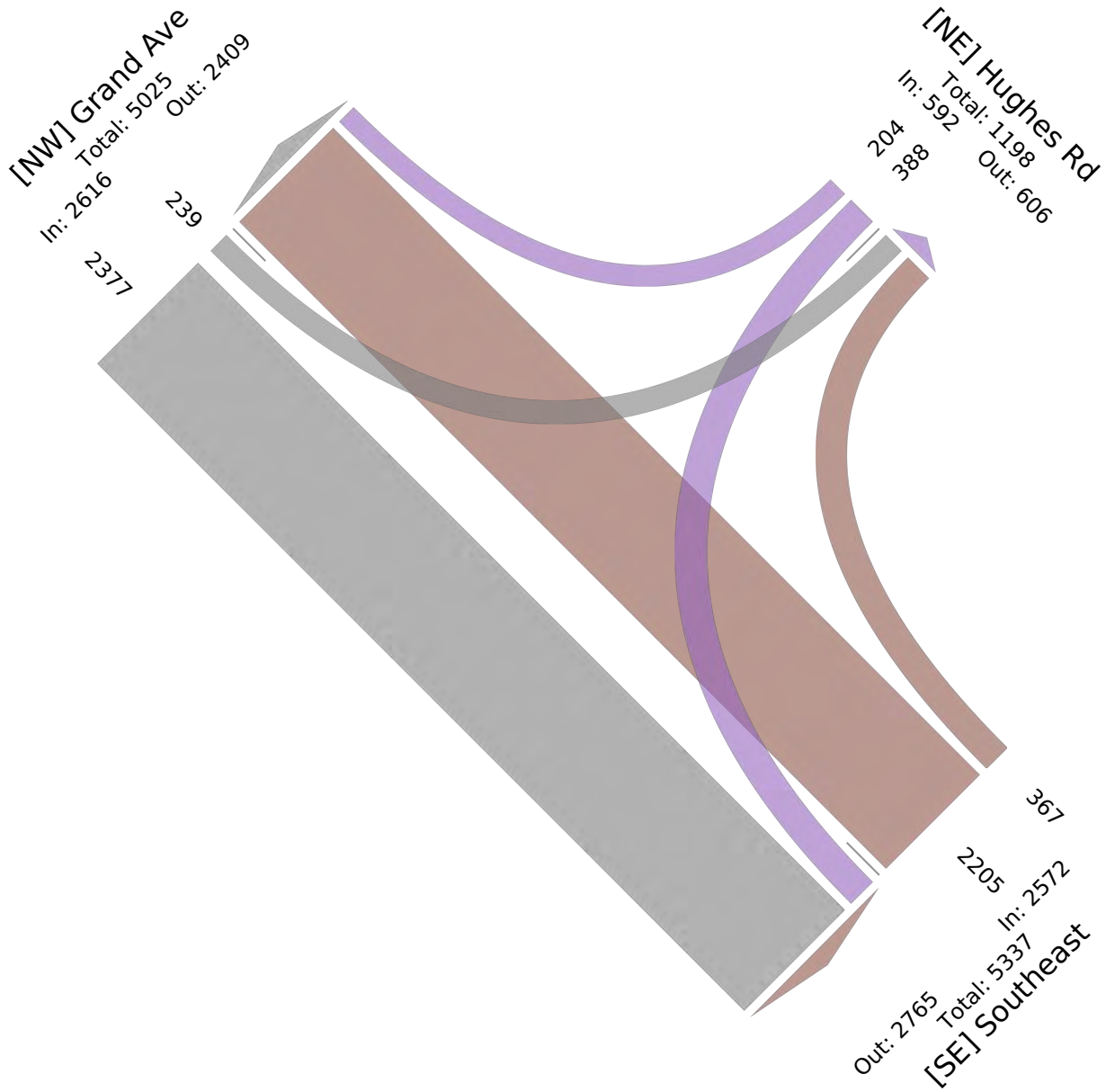
Leg	Grand Ave				Southeast					Hughes Rd					
Direction	Southeastbound				Northwestbound					Southwestbound					
Time	L	T	U	**App**	T	R	U	RR	**App**	L	R	U	RR	**App**	**Int**
2021-12-14 7:00AM	2	69	0	**71**	65	5	0	1	**71**	23	6	0	6	**35**	**177**
7:15AM	2	106	0	**108**	51	5	0	0	**56**	28	4	0	11	**43**	**207**
7:30AM	7	120	0	**127**	61	6	0	0	**67**	36	5	0	4	**45**	**239**
7:45AM	5	157	0	**162**	84	5	0	1	**90**	36	7	0	10	**53**	**305**
Hourly Total	16	452	0	**468**	261	21	0	2	**284**	123	22	0	31	**176**	**928**
8:00AM	5	135	0	**140**	82	2	0	2	**86**	36	6	0	8	**50**	**276**
8:15AM	8	193	0	**201**	84	6	0	1	**91**	46	6	0	12	**64**	**356**
8:30AM	6	144	0	**150**	118	13	0	0	**131**	29	6	0	4	**39**	**320**
8:45AM	8	184	0	**192**	119	11	0	2	**132**	26	5	0	1	**32**	**356**
Hourly Total	27	656	0	**683**	403	32	0	5	**440**	137	23	0	25	**185**	**1308**
4:00PM	19	155	0	**174**	220	36	0	0	**256**	12	4	0	9	**25**	**455**
4:15PM	24	149	0	**173**	204	40	0	5	**249**	18	7	0	6	**31**	**453**
4:30PM	28	158	0	**186**	179	31	0	2	**212**	9	4	0	6	**19**	**417**
4:45PM	15	182	0	**197**	184	30	0	3	**217**	18	4	0	8	**30**	**444**
Hourly Total	86	644	0	**730**	787	137	0	10	**934**	57	19	0	29	**105**	**1769**
5:00PM	36	171	0	**207**	258	45	0	1	**304**	19	7	0	5	**31**	**542**
5:15PM	29	158	0	**187**	189	36	0	5	**230**	16	8	0	10	**34**	**451**
5:30PM	24	157	0	**181**	152	34	0	4	**190**	22	4	0	10	**36**	**407**
5:45PM	21	139	0	**160**	155	32	0	3	**190**	14	8	0	3	**25**	**375**
Hourly Total	110	625	0	**735**	754	147	0	13	**914**	71	27	0	28	**126**	**1775**
Total	239	2377	0	**2616**	2205	337	0	30	**2572**	388	91	0	113	**592**	**5780**
% Approach	9.1%	90.9%	0%	**-**	85.7%	13.1%	0%	1.2%	**-**	65.5%	15.4%	0%	19.1%	**-**	-
% Total	4.1%	41.1%	0%	**45.3%**	38.1%	5.8%	0%	0.5%	**44.5%**	6.7%	1.6%	0%	2.0%	**10.2%**	-
Lights	231	2339	0	**2570**	2163	335	0	29	**2527**	384	91	0	111	**586**	5683
% Lights	96.7%	98.4%	0%	**98.2%**	98.1%	99.4%	0%	96.7%	**98.3%**	99.0%	100%	0%	98.2%	**99.0%**	98.3%
Articulated Trucks	2	2	0	**4**	6	0	0	0	**6**	0	0	0	0	**0**	10
% Articulated Trucks	0.8%	0.1%	0%	**0.2%**	0.3%	0%	0%	0%	**0.2%**	0%	0%	0%	0%	**0%**	0.2%
Buses and Single-Unit Trucks	6	36	0	**42**	36	2	0	1	**39**	4	0	0	2	**6**	87
% Buses and Single-Unit Trucks	2.5%	1.5%	0%	**1.6%**	1.6%	0.6%	0%	3.3%	**1.5%**	1.0%	0%	0%	1.8%	**1.0%**	1.5%

*L: Left, R: Right, RR: Right on red, T: Thru, U: U-Turn

Grand River and Hughes - RTOR x 3 - TMC

Tue Dec 14, 2021
Full Length (7 AM-9 AM, 4 PM-6 PM)
All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)
All Movements
ID: 908958, Location: 42.573747, -83.831951

Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US



Grand River and Hughes - RTOR x 3 - TMC

Tue Dec 14, 2021
AM Peak (8 AM - 9 AM)
All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)
All Movements
ID: 908958, Location: 42.573747, -83.831951

Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US

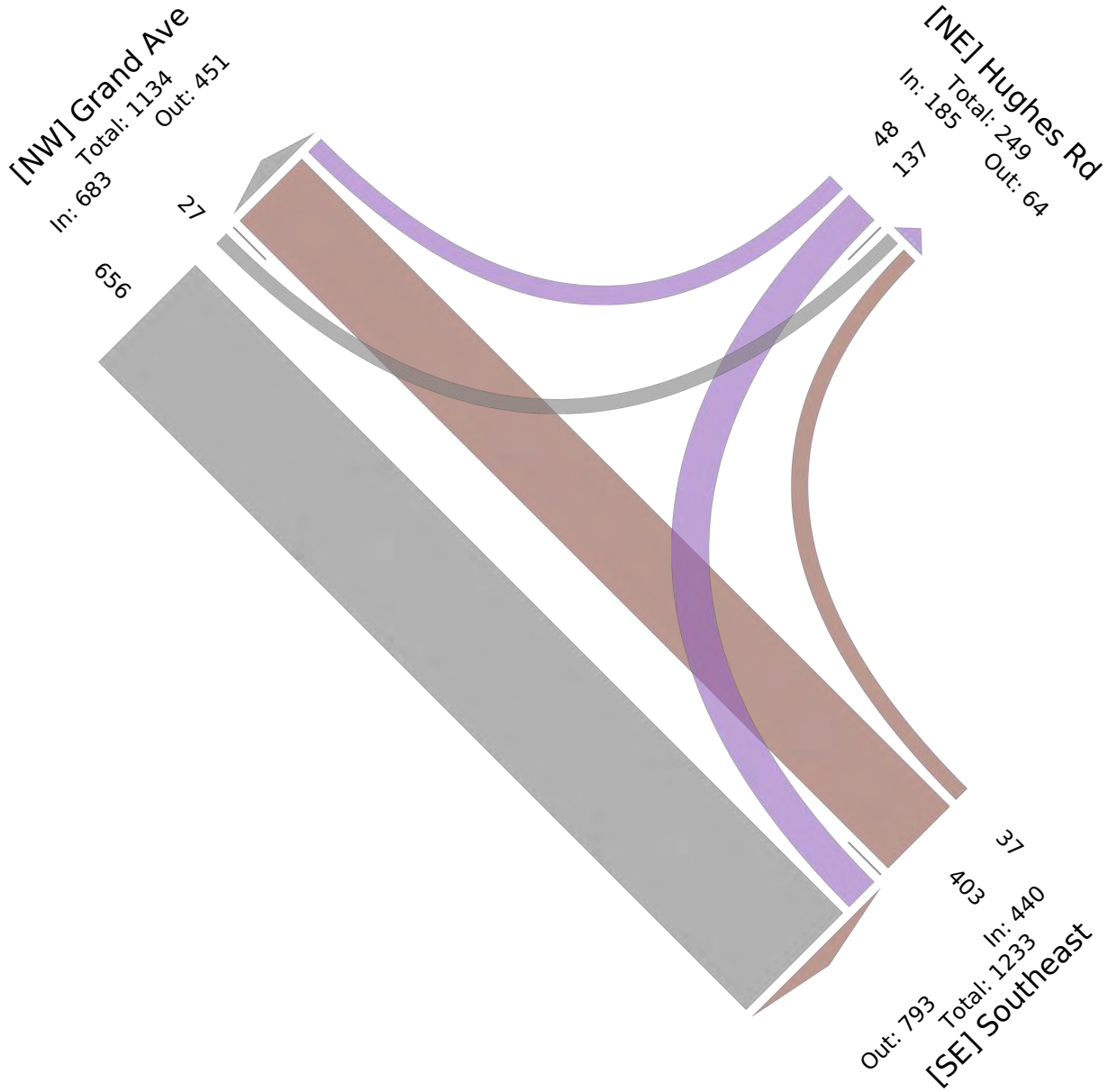
Leg	Grand Ave				Southeast					Hughes Rd					
Direction	Southeastbound				Northwestbound					Southwestbound					
Time	L	T	U	**App**	T	R	U	RR	**App**	L	R	U	RR	**App**	**Int**
2021-12-14 8:00AM	5	135	0	**140**	82	2	0	2	**86**	36	6	0	8	**50**	**276**
8:15AM	8	193	0	**201**	84	6	0	1	**91**	46	6	0	12	**64**	**356**
8:30AM	6	144	0	**150**	118	13	0	0	**131**	29	6	0	4	**39**	**320**
8:45AM	8	184	0	**192**	119	11	0	2	**132**	26	5	0	1	**32**	**356**
Total	27	656	0	**683**	403	32	0	5	**440**	137	23	0	25	**185**	**1308**
% Approach	4.0%	96.0%	0%	**-**	91.6%	7.3%	0%	1.1%	**-**	74.1%	12.4%	0%	13.5%	**-**	-
% Total	2.1%	50.2%	0%	**52.2%**	30.8%	2.4%	0%	0.4%	**33.6%**	10.5%	1.8%	0%	1.9%	**14.1%**	-
PHF	0.844	0.850	-	**0.850**	0.847	0.615	-	0.625	**0.833**	0.745	0.958	-	0.521	**0.723**	0.919
Lights	22	642	0	**664**	384	32	0	5	**421**	135	23	0	24	**182**	1267
% Lights	81.5%	97.9%	0%	**97.2%**	95.3%	100%	0%	100%	**95.7%**	98.5%	100%	0%	96.0%	**98.4%**	96.9%
Articulated Trucks	1	0	0	**1**	4	0	0	0	**4**	0	0	0	0	**0**	5
% Articulated Trucks	3.7%	0%	0%	**0.1%**	1.0%	0%	0%	0%	**0.9%**	0%	0%	0%	0%	**0%**	0.4%
Buses and Single-Unit Trucks	4	14	0	**18**	15	0	0	0	**15**	2	0	0	1	**3**	36
% Buses and Single-Unit Trucks	14.8%	2.1%	0%	**2.6%**	3.7%	0%	0%	0%	**3.4%**	1.5%	0%	0%	4.0%	**1.6%**	2.8%

*L: Left, R: Right, RR: Right on red, T: Thru, U: U-Turn

Grand River and Hughes - RTOR x 3 - TMC

Tue Dec 14, 2021
AM Peak (8 AM - 9 AM)
All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)
All Movements
ID: 908958, Location: 42.573747, -83.831951

Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US



Grand River and Hughes - RTOR x 3 - TMC

Tue Dec 14, 2021
PM Peak (4:15 PM - 5:15 PM) - Overall Peak Hour
All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)
All Movements
ID: 908958, Location: 42.573747, -83.831951

Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US

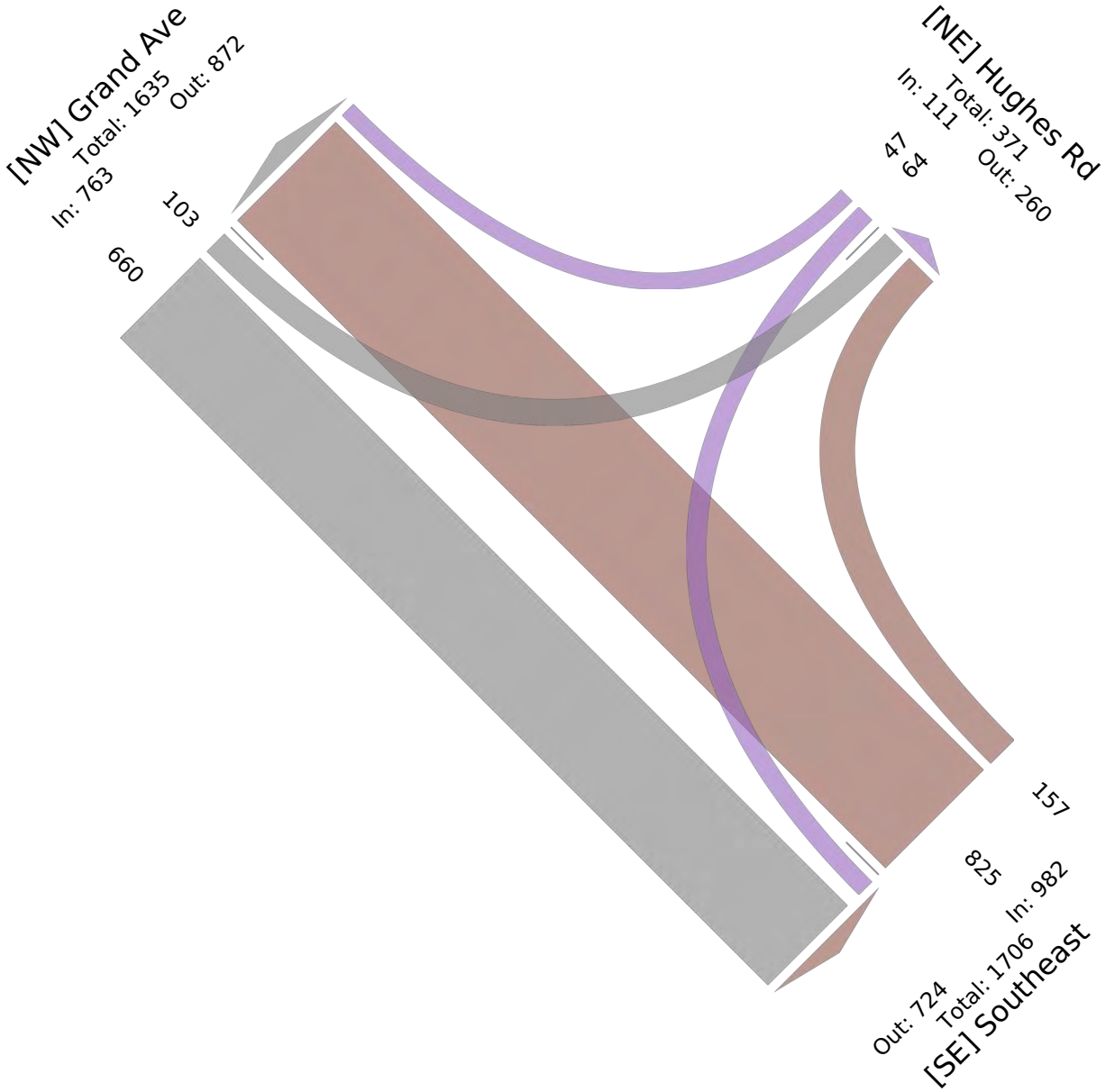
Leg	Grand Ave				Southeast					Hughes Rd					
Direction	Southeastbound				Northwestbound					Southwestbound					
Time	L	T	U	**App**	T	R	U	RR	**App**	L	R	U	RR	**App**	**Int**
2021-12-14 4:15PM	24	149	0	**173**	204	40	0	5	**249**	18	7	0	6	**31**	**453**
4:30PM	28	158	0	**186**	179	31	0	2	**212**	9	4	0	6	**19**	**417**
4:45PM	15	182	0	**197**	184	30	0	3	**217**	18	4	0	8	**30**	**444**
5:00PM	36	171	0	**207**	258	45	0	1	**304**	19	7	0	5	**31**	**542**
Total	103	660	0	**763**	825	146	0	11	**982**	64	22	0	25	**111**	**1856**
% Approach	13.5%	86.5%	0%	**-**	84.0%	14.9%	0%	1.1%	**-**	57.7%	19.8%	0%	22.5%	**-**	-
% Total	5.5%	35.6%	0%	**41.1%**	44.5%	7.9%	0%	0.6%	**52.9%**	3.4%	1.2%	0%	1.3%	**6.0%**	-
PHF	0.715	0.907	-	**0.921**	0.799	0.811	-	0.550	**0.808**	0.842	0.786	-	0.781	**0.895**	0.856
Lights	102	653	0	**755**	818	146	0	11	**975**	63	22	0	24	**109**	1839
% Lights	99.0%	98.9%	0%	**99.0%**	99.2%	100%	0%	100%	**99.3%**	98.4%	100%	0%	96.0%	**98.2%**	99.1%
Articulated Trucks	0	2	0	**2**	1	0	0	0	**1**	0	0	0	0	**0**	3
% Articulated Trucks	0%	0.3%	0%	**0.3%**	0.1%	0%	0%	0%	**0.1%**	0%	0%	0%	0%	**0%**	0.2%
Buses and Single-Unit Trucks	1	5	0	**6**	6	0	0	0	**6**	1	0	0	1	**2**	14
% Buses and Single-Unit Trucks	1.0%	0.8%	0%	**0.8%**	0.7%	0%	0%	0%	**0.6%**	1.6%	0%	0%	4.0%	**1.8%**	0.8%

*L: Left, R: Right, RR: Right on red, T: Thru, U: U-Turn

Grand River and Hughes - RTOR x 3 - TMC

Tue Dec 14, 2021
PM Peak (4:15 PM - 5:15 PM) - Overall Peak Hour
All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)
All Movements
ID: 908958, Location: 42.573747, -83.831951

GEWALT HAMILTON ASSOCIATES, INC.
Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US



Dorr and Sterling - TMC

Tue Dec 14, 2021
Full Length (7 AM-9 AM, 4 PM-6 PM)
All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)
All Movements
ID: 908960, Location: 42.570246, -83.834325

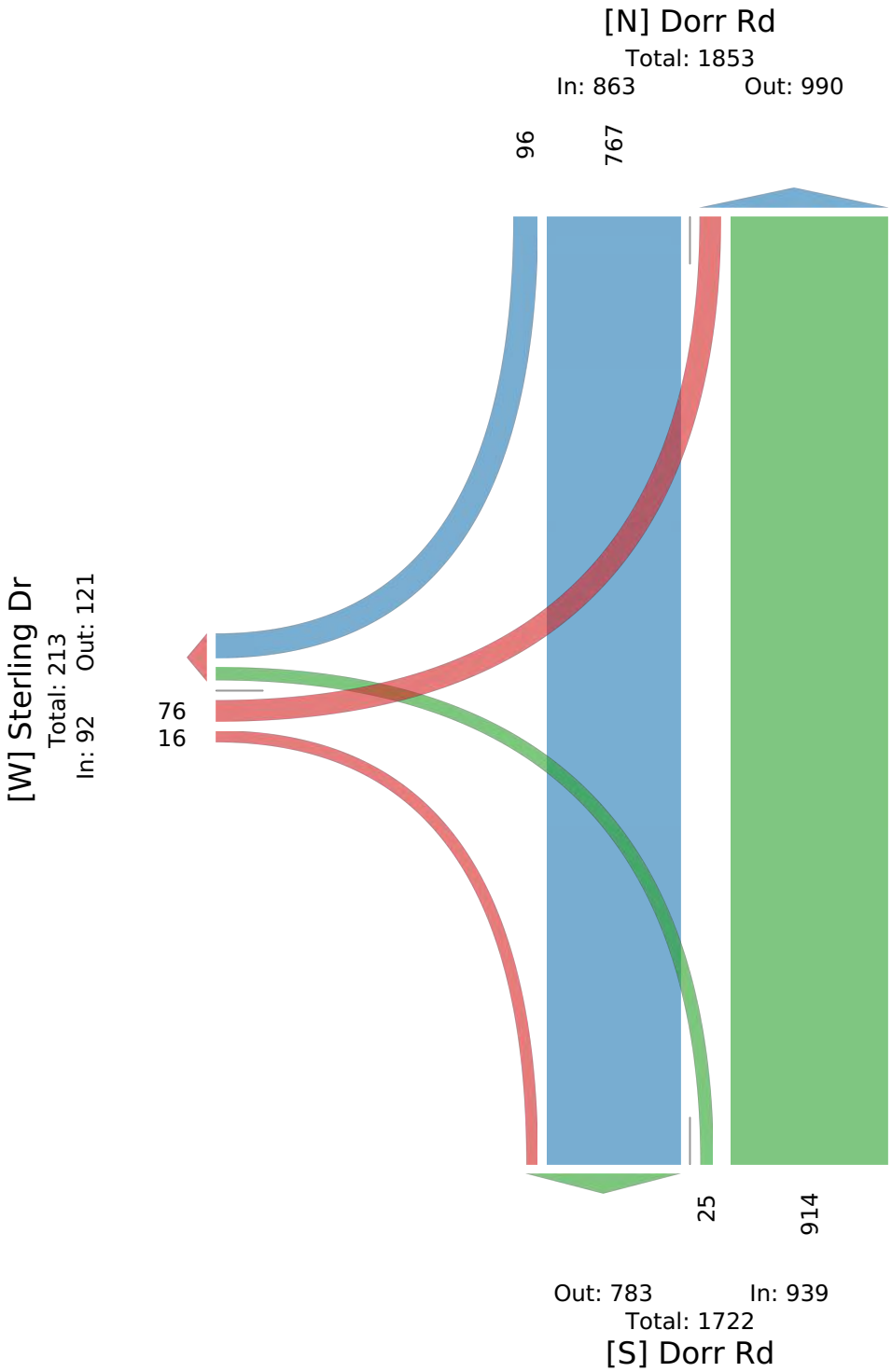
Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US

Leg	Sterling Dr				Dorr Rd				Dorr Rd				
Direction	Eastbound				Northbound				Southbound				
Time	L	R	U	**App**	L	T	U	**App**	T	R	U	**App**	**Int**
2021-12-14 7:00AM	0	0	0	**0**	1	17	0	**18**	34	5	0	**39**	**57**
7:15AM	1	0	0	**1**	1	32	0	**33**	35	4	0	**39**	**73**
7:30AM	4	0	0	**4**	0	34	0	**34**	18	6	0	**24**	**62**
7:45AM	4	0	0	**4**	5	54	0	**59**	38	14	0	**52**	**115**
Hourly Total	9	0	0	**9**	7	137	0	**144**	125	29	0	**154**	**307**
8:00AM	3	0	0	**3**	2	40	0	**42**	40	6	0	**46**	**91**
8:15AM	5	1	0	**6**	3	54	0	**57**	39	13	0	**52**	**115**
8:30AM	1	0	0	**1**	1	51	0	**52**	50	7	0	**57**	**110**
8:45AM	4	2	0	**6**	4	82	0	**86**	41	10	0	**51**	**143**
Hourly Total	13	3	0	**16**	10	227	0	**237**	170	36	0	**206**	**459**
4:00PM	6	2	0	**8**	2	83	0	**85**	63	6	0	**69**	**162**
4:15PM	3	1	0	**4**	0	92	0	**92**	65	5	0	**70**	**166**
4:30PM	1	1	0	**2**	2	65	0	**67**	62	5	0	**67**	**136**
4:45PM	7	1	0	**8**	0	69	0	**69**	58	2	0	**60**	**137**
Hourly Total	17	5	0	**22**	4	309	0	**313**	248	18	0	**266**	**601**
5:00PM	13	6	0	**19**	0	89	0	**89**	65	6	0	**71**	**179**
5:15PM	15	1	0	**16**	2	45	0	**47**	63	4	0	**67**	**130**
5:30PM	4	1	0	**5**	1	64	0	**65**	51	3	0	**54**	**124**
5:45PM	5	0	0	**5**	1	43	0	**44**	45	0	0	**45**	**94**
Hourly Total	37	8	0	**45**	4	241	0	**245**	224	13	0	**237**	**527**
Total	76	16	0	**92**	25	914	0	**939**	767	96	0	**863**	**1894**
% Approach	82.6%	17.4%	0%	**-**	2.7%	97.3%	0%	**-**	88.9%	11.1%	0%	**-**	-
% Total	4.0%	0.8%	0%	**4.9%**	1.3%	48.3%	0%	**49.6%**	40.5%	5.1%	0%	**45.6%**	-
Lights	75	15	0	**90**	25	894	0	**919**	747	88	0	**835**	1844
% Lights	98.7%	93.8%	0%	**97.8%**	100%	97.8%	0%	**97.9%**	97.4%	91.7%	0%	**96.8%**	97.4%
Articulated Trucks	0	0	0	**0**	0	3	0	**3**	3	0	0	**3**	6
% Articulated Trucks	0%	0%	0%	**0%**	0%	0.3%	0%	**0.3%**	0.4%	0%	0%	**0.3%**	0.3%
Buses and Single-Unit Trucks	1	1	0	**2**	0	17	0	**17**	17	8	0	**25**	44
% Buses and Single-Unit Trucks	1.3%	6.3%	0%	**2.2%**	0%	1.9%	0%	**1.8%**	2.2%	8.3%	0%	**2.9%**	2.3%

*L: Left, R: Right, T: Thru, U: U-Turn

Dorr and Sterling - TMC
Tue Dec 14, 2021
Full Length (7 AM-9 AM, 4 PM-6 PM)
All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)
All Movements
ID: 908960, Location: 42.570246, -83.834325

Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US



Dorr and Sterling - TMC

Tue Dec 14, 2021
AM Peak (8 AM - 9 AM)
All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)
All Movements
ID: 908960, Location: 42.570246, -83.834325

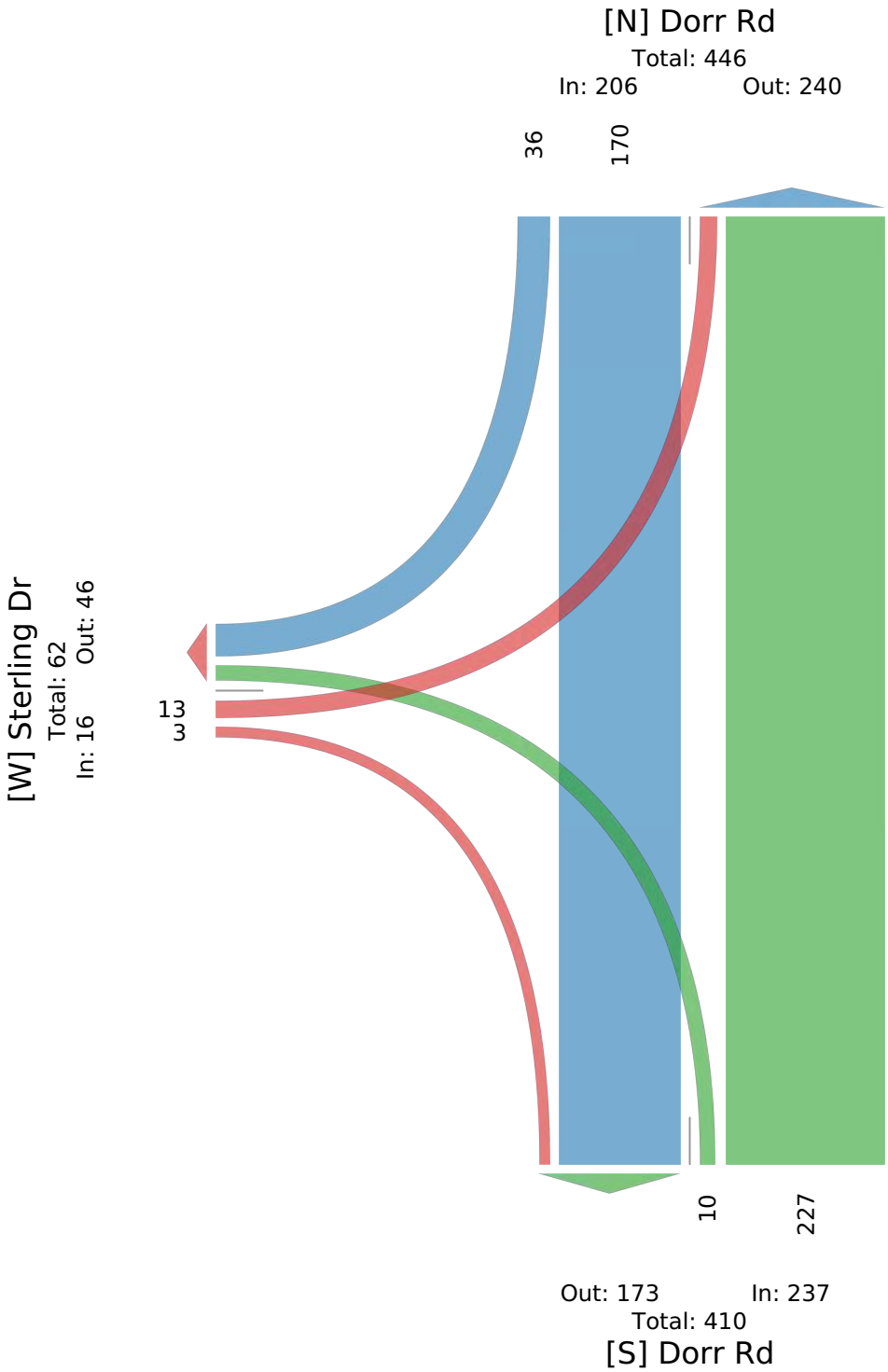
Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US

Leg	Sterling Dr				Dorr Rd				Dorr Rd				
Direction	Eastbound				Northbound				Southbound				
Time	L	R	U	**App**	L	T	U	**App**	T	R	U	**App**	**Int**
2021-12-14 8:00AM	3	0	0	**3**	2	40	0	**42**	40	6	0	**46**	**91**
8:15AM	5	1	0	**6**	3	54	0	**57**	39	13	0	**52**	**115**
8:30AM	1	0	0	**1**	1	51	0	**52**	50	7	0	**57**	**110**
8:45AM	4	2	0	**6**	4	82	0	**86**	41	10	0	**51**	**143**
Total	13	3	0	**16**	10	227	0	**237**	170	36	0	**206**	**459**
% Approach	81.3%	18.8%	0%	**-**	4.2%	95.8%	0%	**-**	82.5%	17.5%	0%	**-**	-
% Total	2.8%	0.7%	0%	**3.5%**	2.2%	49.5%	0%	**51.6%**	37.0%	7.8%	0%	**44.9%**	-
PHF	0.650	0.375	-	**0.667**	0.625	0.692	-	**0.689**	0.850	0.692	-	**0.904**	0.802
Lights	12	3	0	**15**	10	222	0	**232**	164	34	0	**198**	445
% Lights	92.3%	100%	0%	**93.8%**	100%	97.8%	0%	**97.9%**	96.5%	94.4%	0%	**96.1%**	96.9%
Articulated Trucks	0	0	0	**0**	0	0	0	**0**	1	0	0	**1**	1
% Articulated Trucks	0%	0%	0%	**0%**	0%	0%	0%	**0%**	0.6%	0%	0%	**0.5%**	0.2%
Buses and Single-Unit Trucks	1	0	0	**1**	0	5	0	**5**	5	2	0	**7**	13
% Buses and Single-Unit Trucks	7.7%	0%	0%	**6.3%**	0%	2.2%	0%	**2.1%**	2.9%	5.6%	0%	**3.4%**	2.8%

*L: Left, R: Right, T: Thru, U: U-Turn

Dorr and Sterling - TMC
Tue Dec 14, 2021
AM Peak (8 AM - 9 AM)
All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)
All Movements
ID: 908960, Location: 42.570246, -83.834325

Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US



Dorr and Sterling - TMC

Tue Dec 14, 2021
PM Peak (4:15 PM - 5:15 PM) - Overall Peak Hour
All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)
All Movements
ID: 908960, Location: 42.570246, -83.834325

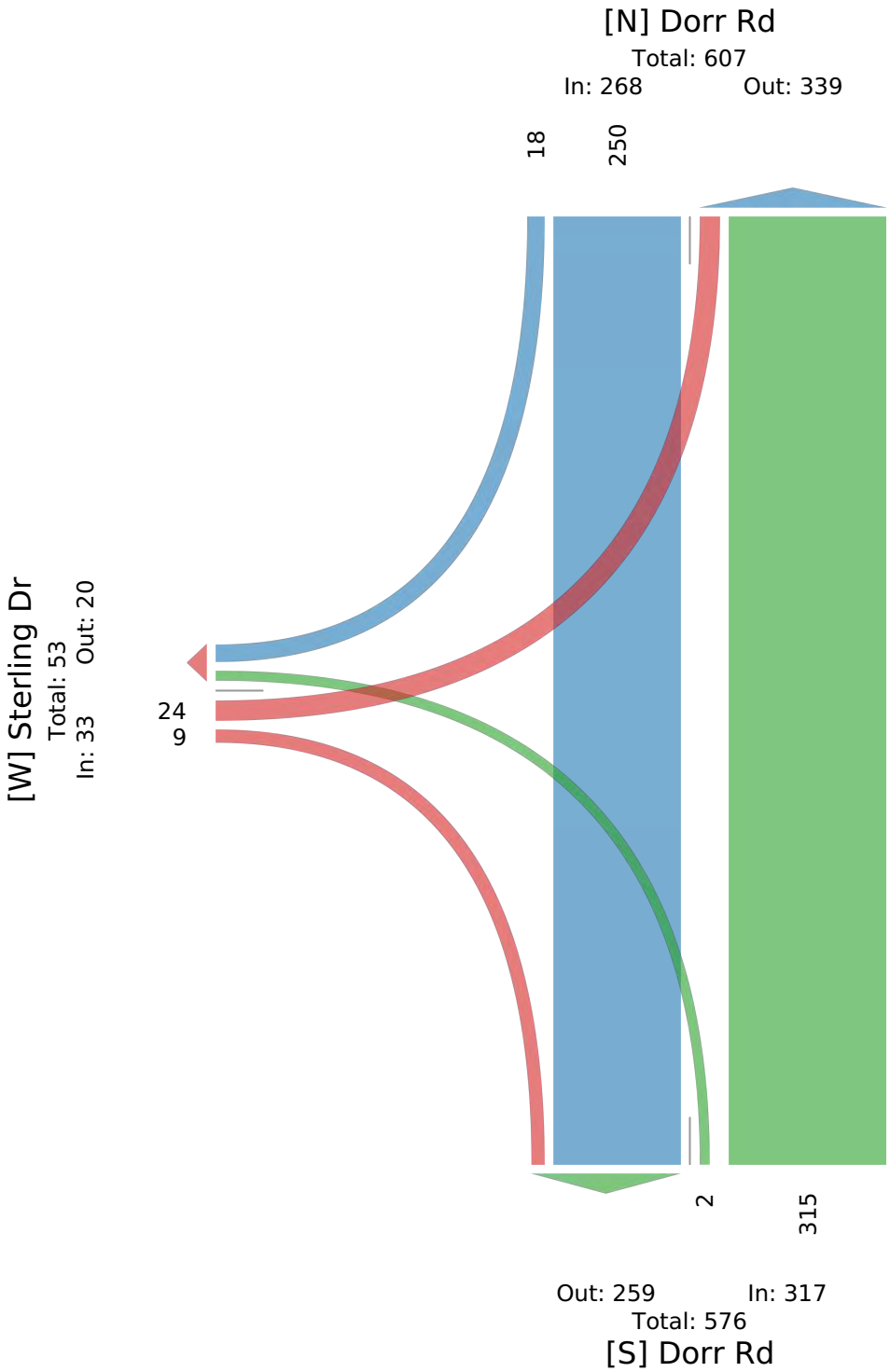
Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US

Leg	Sterling Dr				Dorr Rd				Dorr Rd				
Direction	Eastbound				Northbound				Southbound				
Time	L	R	U	**App**	L	T	U	**App**	T	R	U	**App**	**Int**
2021-12-14 4:15PM	3	1	0	**4**	0	92	0	**92**	65	5	0	**70**	**166**
4:30PM	1	1	0	**2**	2	65	0	**67**	62	5	0	**67**	**136**
4:45PM	7	1	0	**8**	0	69	0	**69**	58	2	0	**60**	**137**
5:00PM	13	6	0	**19**	0	89	0	**89**	65	6	0	**71**	**179**
Total	24	9	0	**33**	2	315	0	**317**	250	18	0	**268**	**618**
% Approach	72.7%	27.3%	0%	**-**	0.6%	99.4%	0%	**-**	93.3%	6.7%	0%	**-**	-
% Total	3.9%	1.5%	0%	**5.3%**	0.3%	51.0%	0%	**51.3%**	40.5%	2.9%	0%	**43.4%**	-
PHF	0.462	0.375	-	**0.434**	0.250	0.856	-	**0.861**	0.962	0.750	-	**0.944**	0.863
Lights	24	9	0	**33**	2	307	0	**309**	247	16	0	**263**	605
% Lights	100%	100%	0%	**100%**	100%	97.5%	0%	**97.5%**	98.8%	88.9%	0%	**98.1%**	97.9%
Articulated Trucks	0	0	0	**0**	0	2	0	**2**	0	0	0	**0**	2
% Articulated Trucks	0%	0%	0%	**0%**	0%	0.6%	0%	**0.6%**	0%	0%	0%	**0%**	0.3%
Buses and Single-Unit Trucks	0	0	0	**0**	0	6	0	**6**	3	2	0	**5**	11
% Buses and Single-Unit Trucks	0%	0%	0%	**0%**	0%	1.9%	0%	**1.9%**	1.2%	11.1%	0%	**1.9%**	1.8%

*L: Left, R: Right, T: Thru, U: U-Turn

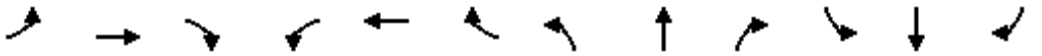
Dorr and Sterling - TMC
Tue Dec 14, 2021
PM Peak (4:15 PM - 5:15 PM) - Overall Peak Hour
All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)
All Movements
ID: 908960, Location: 42.570246, -83.834325

Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US



Appendix 2

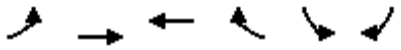
Existing LOS Output Reports



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	617	121	137	394	0	104	0	192	0	1	1
Future Volume (veh/h)	0	617	121	137	394	0	104	0	192	0	1	1
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1856	1856	1856	1841	1841	0	1856	1856	1856	1900	1900	1900
Adj Flow Rate, veh/h	0	671	132	157	453	0	151	0	278	0	2	2
Peak Hour Factor	0.92	0.92	0.92	0.87	0.87	0.87	0.69	0.69	0.69	0.60	0.60	0.60
Percent Heavy Veh, %	3	3	3	4	4	0	3	3	3	0	0	0
Cap, veh/h	90	1408	628	392	1948	0	339	0	418	0	6	6
Arrive On Green	0.00	0.40	0.40	0.15	1.00	0.00	0.19	0.00	0.19	0.00	0.01	0.01
Sat Flow, veh/h	930	3526	1572	1753	3589	0	1767	0	1572	0	872	872
Grp Volume(v), veh/h	0	671	132	157	453	0	151	0	278	0	0	4
Grp Sat Flow(s),veh/h/ln	930	1763	1572	1753	1749	0	1767	0	1572	0	0	1743
Q Serve(g_s), s	0.0	11.3	4.4	4.0	0.0	0.0	6.0	0.0	12.6	0.0	0.0	0.2
Cycle Q Clear(g_c), s	0.0	11.3	4.4	4.0	0.0	0.0	6.0	0.0	12.6	0.0	0.0	0.2
Prop In Lane	1.00		1.00	1.00		0.00	1.00		1.00	0.00		0.50
Lane Grp Cap(c), veh/h	90	1408	628	392	1948	0	339	0	418	0	0	13
V/C Ratio(X)	0.00	0.48	0.21	0.40	0.23	0.00	0.45	0.00	0.67	0.00	0.00	0.31
Avail Cap(c_a), veh/h	90	1408	628	444	1948	0	424	0	494	0	0	174
HCM Platoon Ratio	1.00	1.00	1.00	2.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	1.00	0.97	0.97	0.00	1.00	0.00	1.00	0.00	0.00	1.00
Uniform Delay (d), s/veh	0.0	17.8	15.8	11.5	0.0	0.0	28.6	0.0	26.2	0.0	0.0	39.5
Incr Delay (d2), s/veh	0.0	1.2	0.8	0.6	0.3	0.0	0.9	0.0	2.6	0.0	0.0	12.8
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	4.2	1.5	1.2	0.1	0.0	2.4	0.0	4.5	0.0	0.0	0.1
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	0.0	19.0	16.5	12.1	0.3	0.0	29.5	0.0	28.8	0.0	0.0	52.3
LnGrp LOS	A	B	B	B	A	A	C	A	C	A	A	D
Approach Vol, veh/h		803			610			429			4	
Approach Delay, s/veh		18.6			3.3			29.1			52.3	
Approach LOS		B			A			C			D	

Timer - Assigned Phs	1	2		4		6		8				
Phs Duration (G+Y+Rc), s	12.6	38.6		6.6		51.3		22.1				
Change Period (Y+Rc), s	6.7	6.7		6.0		6.7		6.8				
Max Green Setting (Gmax), s	8.3	18.3		8.0		33.3		19.2				
Max Q Clear Time (g_c+I1), s	6.0	13.3		2.2		2.0		14.6				
Green Ext Time (p_c), s	0.1	2.0		0.0		2.8		0.7				

Intersection Summary			
HCM 6th Ctrl Delay		16.0	
HCM 6th LOS		B	



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	31	778	475	43	159	56
Future Volume (veh/h)	31	778	475	43	159	56
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No	No		No	
Adj Sat Flow, veh/h/ln	1856	1856	1841	1841	1870	1870
Adj Flow Rate, veh/h	36	915	572	52	221	78
Peak Hour Factor	0.85	0.85	0.83	0.83	0.72	0.72
Percent Heavy Veh, %	3	3	4	4	2	2
Cap, veh/h	540	2266	2084	189	252	89
Arrive On Green	0.43	0.43	0.64	0.64	0.20	0.20
Sat Flow, veh/h	794	3618	3334	294	1271	449
Grp Volume(v), veh/h	36	915	308	316	300	0
Grp Sat Flow(s),veh/h/ln	794	1763	1749	1788	1726	0
Q Serve(g_s), s	2.3	14.3	6.1	6.1	13.5	0.0
Cycle Q Clear(g_c), s	8.5	14.3	6.1	6.1	13.5	0.0
Prop In Lane	1.00			0.16	0.74	0.26
Lane Grp Cap(c), veh/h	540	2266	1124	1149	343	0
V/C Ratio(X)	0.07	0.40	0.27	0.28	0.88	0.00
Avail Cap(c_a), veh/h	540	2266	1124	1149	432	0
HCM Platoon Ratio	0.67	0.67	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.92	0.92	1.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	12.5	12.2	6.2	6.2	31.1	0.0
Incr Delay (d2), s/veh	0.2	0.5	0.6	0.6	15.2	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.4	5.3	1.7	1.8	6.9	0.0
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	12.7	12.7	6.8	6.8	46.3	0.0
LnGrp LOS	B	B	A	A	D	A
Approach Vol, veh/h		951	624		300	
Approach Delay, s/veh		12.7	6.8		46.3	
Approach LOS		B	A		D	

Timer - Assigned Phs	2	4	6
Phs Duration (G+Y+Rc), s	58.1	21.9	58.1
Change Period (Y+Rc), s	6.7	6.0	6.7
Max Green Setting (Gmax), s	47.3	20.0	47.3
Max Q Clear Time (g_c+I1), s	16.3	15.5	8.1
Green Ext Time (p_c), s	6.7	0.4	3.6

Intersection Summary	
HCM 6th Ctrl Delay	16.1
HCM 6th LOS	B

Notes

User approved volume balancing among the lanes for turning movement.

Intersection	
Int Delay, s/veh	0.7

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	15	3	12	281	217	42
Future Vol, veh/h	15	3	12	281	217	42
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	67	67	69	69	90	90
Heavy Vehicles, %	6	6	2	2	4	4
Mvmt Flow	22	4	17	407	241	47

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	706	265	288	0	-	0
Stage 1	265	-	-	-	-	-
Stage 2	441	-	-	-	-	-
Critical Hdwy	6.46	6.26	4.12	-	-	-
Critical Hdwy Stg 1	5.46	-	-	-	-	-
Critical Hdwy Stg 2	5.46	-	-	-	-	-
Follow-up Hdwy	3.554	3.354	2.218	-	-	-
Pot Cap-1 Maneuver	396	764	1274	-	-	-
Stage 1	770	-	-	-	-	-
Stage 2	640	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	389	764	1274	-	-	-
Mov Cap-2 Maneuver	389	-	-	-	-	-
Stage 1	757	-	-	-	-	-
Stage 2	640	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	14.1	0.3	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1274	-	424	-	-
HCM Lane V/C Ratio	0.014	-	0.063	-	-
HCM Control Delay (s)	7.9	0	14.1	-	-
HCM Lane LOS	A	A	B	-	-
HCM 95th %tile Q(veh)	0	-	0.2	-	-

Intersection: 1: Dorrs Rd/Glen Echo Dr & Grand River Rd

Movement	EB	EB	EB	WB	WB	WB	NB	NB	SB
Directions Served	T	T	R	L	T	T	LT	R	LTR
Maximum Queue (ft)	137	163	44	133	116	79	145	128	36
Average Queue (ft)	53	57	8	39	12	18	63	49	2
95th Queue (ft)	109	124	31	89	57	55	119	97	17
Link Distance (ft)	4462	4462			641	641	1423		263
Upstream Blk Time (%)									
Queuing Penalty (veh)									
Storage Bay Dist (ft)			230	200				410	
Storage Blk Time (%)				0					
Queuing Penalty (veh)				0					

Intersection: 2: Grand River Rd & Hughes Rd

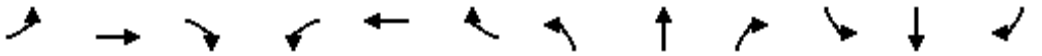
Movement	EB	EB	EB	WB	WB	SB
Directions Served	L	T	T	T	TR	LR
Maximum Queue (ft)	44	151	151	110	109	241
Average Queue (ft)	14	51	62	43	33	116
95th Queue (ft)	40	120	124	85	80	204
Link Distance (ft)		641	641	3184	3184	1202
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)	200					
Storage Blk Time (%)		0				
Queuing Penalty (veh)		0				

Intersection: 3: Dorrs Rd & Sterling Dr

Movement	EB	NB
Directions Served	LR	LT
Maximum Queue (ft)	56	41
Average Queue (ft)	15	4
95th Queue (ft)	45	21
Link Distance (ft)	1066	1651
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Zone Summary

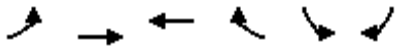
Zone wide Queuing Penalty: 0



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	1	655	128	166	807	1	218	1	189	1	0	0
Future Volume (veh/h)	1	655	128	166	807	1	218	1	189	1	0	0
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1885	1885	1885	1885	1885	1885	1870	1870	1870	1900	1900	1900
Adj Flow Rate, veh/h	1	728	142	210	1022	1	287	1	249	2	0	0
Peak Hour Factor	0.90	0.90	0.90	0.79	0.79	0.79	0.76	0.76	0.76	0.60	0.60	0.60
Percent Heavy Veh, %	1	1	1	1	1	1	2	2	2	0	0	0
Cap, veh/h	306	1390	620	407	2076	2	332	1	445	7	0	0
Arrive On Green	0.39	0.39	0.39	0.19	1.00	1.00	0.19	0.19	0.19	0.00	0.00	0.00
Sat Flow, veh/h	556	3582	1598	1795	3672	4	1775	6	1585	1809	0	0
Grp Volume(v), veh/h	1	728	142	210	498	525	288	0	249	2	0	0
Grp Sat Flow(s),veh/h/ln	556	1791	1598	1795	1791	1885	1782	0	1585	1810	0	0
Q Serve(g_s), s	0.1	12.5	4.8	5.4	0.0	0.0	12.5	0.0	10.7	0.1	0.0	0.0
Cycle Q Clear(g_c), s	0.1	12.5	4.8	5.4	0.0	0.0	12.5	0.0	10.7	0.1	0.0	0.0
Prop In Lane	1.00		1.00	1.00		0.00	1.00		1.00	1.00		0.00
Lane Grp Cap(c), veh/h	306	1390	620	407	1012	1065	333	0	445	7	0	0
V/C Ratio(X)	0.00	0.52	0.23	0.52	0.49	0.49	0.86	0.00	0.56	0.29	0.00	0.00
Avail Cap(c_a), veh/h	306	1390	620	470	1012	1065	361	0	469	181	0	0
HCM Platoon Ratio	1.00	1.00	1.00	2.00	2.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	0.82	0.82	0.82	1.00	0.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	15.0	18.8	16.4	11.6	0.0	0.0	31.5	0.0	24.6	39.7	0.0	0.0
Incr Delay (d2), s/veh	0.0	1.4	0.9	0.8	1.4	1.3	18.1	0.0	1.3	21.7	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	4.8	1.7	1.6	0.4	0.4	6.5	0.0	3.7	0.1	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	15.0	20.2	17.3	12.4	1.4	1.3	49.6	0.0	25.9	61.4	0.0	0.0
LnGrp LOS	B	C	B	B	A	A	D	A	C	E	A	A
Approach Vol, veh/h		871			1233			537			2	
Approach Delay, s/veh		19.7			3.3			38.6			61.4	
Approach LOS		B			A			D			E	

Timer - Assigned Phs	1	2		4		6		8				
Phs Duration (G+Y+Rc), s	14.2	37.7		6.3		51.9		21.8				
Change Period (Y+Rc), s	6.7	6.7		6.0		6.7		6.8				
Max Green Setting (Gmax), s	10.3	19.3		8.0		36.3		16.2				
Max Q Clear Time (g_c+I1), s	7.4	14.5		2.1		2.0		14.5				
Green Ext Time (p_c), s	0.2	2.1		0.0		6.6		0.4				

Intersection Summary												
HCM 6th Ctrl Delay			15.9									
HCM 6th LOS			B									



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	114	731	922	174	71	52
Future Volume (veh/h)	114	731	922	174	71	52
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No	No		No	
Adj Sat Flow, veh/h/ln	1885	1885	1885	1885	1870	1870
Adj Flow Rate, veh/h	124	795	1138	215	79	58
Peak Hour Factor	0.92	0.92	0.81	0.81	0.90	0.90
Percent Heavy Veh, %	1	1	1	1	2	2
Cap, veh/h	325	2646	2223	418	99	73
Arrive On Green	0.24	0.24	0.74	0.74	0.10	0.10
Sat Flow, veh/h	406	3676	3103	566	970	712
Grp Volume(v), veh/h	124	795	675	678	138	0
Grp Sat Flow(s),veh/h/ln	406	1791	1791	1783	1694	0
Q Serve(g_s), s	22.0	14.5	12.6	12.8	6.4	0.0
Cycle Q Clear(g_c), s	34.8	14.5	12.6	12.8	6.4	0.0
Prop In Lane	1.00			0.32	0.57	0.42
Lane Grp Cap(c), veh/h	325	2646	1323	1318	173	0
V/C Ratio(X)	0.38	0.30	0.51	0.51	0.80	0.00
Avail Cap(c_a), veh/h	325	2646	1323	1318	360	0
HCM Platoon Ratio	0.33	0.33	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.88	0.88	1.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	26.8	13.4	4.4	4.4	35.1	0.0
Incr Delay (d2), s/veh	3.0	0.3	1.4	1.4	8.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.6	6.6	2.7	2.7	3.0	0.0
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	29.8	13.6	5.8	5.8	43.1	0.0
LnGrp LOS	C	B	A	A	D	A
Approach Vol, veh/h		919	1353		138	
Approach Delay, s/veh		15.8	5.8		43.1	
Approach LOS		B	A		D	

Timer - Assigned Phs	2		4		6
Phs Duration (G+Y+Rc), s	65.8		14.2		65.8
Change Period (Y+Rc), s	6.7		6.0		6.7
Max Green Setting (Gmax), s	50.3		17.0		50.3
Max Q Clear Time (g_c+I1), s	36.8		8.4		14.8
Green Ext Time (p_c), s	5.6		0.2		10.5

Intersection Summary	
HCM 6th Ctrl Delay	11.8
HCM 6th LOS	B

Notes

User approved volume balancing among the lanes for turning movement.

Intersection	
Int Delay, s/veh	1.1

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	27	10	2	381	274	20
Future Vol, veh/h	27	10	2	381	274	20
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	60	60	86	86	94	94
Heavy Vehicles, %	0	0	3	3	2	2
Mvmt Flow	45	17	2	443	291	21

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	749	302	312	0	-	0
Stage 1	302	-	-	-	-	-
Stage 2	447	-	-	-	-	-
Critical Hdwy	6.4	6.2	4.13	-	-	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	2.227	-	-	-
Pot Cap-1 Maneuver	382	742	1243	-	-	-
Stage 1	755	-	-	-	-	-
Stage 2	649	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	381	742	1243	-	-	-
Mov Cap-2 Maneuver	381	-	-	-	-	-
Stage 1	753	-	-	-	-	-
Stage 2	649	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	14.5	0	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1243	-	439	-	-
HCM Lane V/C Ratio	0.002	-	0.14	-	-
HCM Control Delay (s)	7.9	0	14.5	-	-
HCM Lane LOS	A	A	B	-	-
HCM 95th %tile Q(veh)	0	-	0.5	-	-

Intersection: 1: Dorr Rd/Glen Echo Dr & Grand River Rd

Movement	EB	EB	EB	EB	WB	WB	WB	NB	NB	SB
Directions Served	L	T	T	R	L	T	TR	LT	R	LTR
Maximum Queue (ft)	6	155	168	36	122	190	210	202	134	22
Average Queue (ft)	0	74	76	8	48	60	74	106	46	1
95th Queue (ft)	3	134	145	26	101	139	155	173	92	10
Link Distance (ft)		4462	4462			641	641	1423		263
Upstream Blk Time (%)										
Queuing Penalty (veh)										
Storage Bay Dist (ft)	200			230	200				410	
Storage Blk Time (%)						0				
Queuing Penalty (veh)						0				

Intersection: 2: Grand River Rd & Hughes Rd

Movement	EB	EB	EB	WB	WB	SB
Directions Served	L	T	T	T	TR	LR
Maximum Queue (ft)	136	97	106	154	143	123
Average Queue (ft)	54	17	30	51	57	69
95th Queue (ft)	104	62	83	111	119	113
Link Distance (ft)		641	641	3184	3184	1202
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)	200					
Storage Blk Time (%)						
Queuing Penalty (veh)						

Intersection: 3: Dorr Rd & Sterling Dr

Movement	EB	NB
Directions Served	LR	LT
Maximum Queue (ft)	45	5
Average Queue (ft)	20	0
95th Queue (ft)	46	4
Link Distance (ft)	1066	1651
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Network Summary

Network wide Queuing Penalty: 0

Appendix 3

Background Development Trip Generation

Table 7: No-Build Traffic Conditions with Improvements (continued)

Intersection	Control	Approach	Movement	AM Peak				PM Peak			
				No-Build		No-Build IMP		No-Build		No-Build IMP	
				Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
Grand River Avenue (I-96 BL) & Latson Road	Signal	EB	Left	43.5	D	43.5	D	45.2	D	45.2	D
			Thru	33.3	C	34.2	C	46.5	D	42.1	D
			Right	23.2	C	24.3	C	27.6	C	24.4	C
		WB	Left	88.8	F	47.7	D	60.2	E	60.2	E
			Thru	29.0	C	27.8	C	48.3	D	42.9	D
			Right	13.8	B	13.8	B	87.7	F	58.8	E
		NB	Left	43.9	D	47.3	D	138.3	F	69.2	E
			Thru	37.3	D	37.3	D	43.9	D	68.6	E
			Right	82.5	F	62.4	E	33.2	C	40.1	D
		SB	Left	42.3	D	49.5	D	130.6	F	65.9	E
			Thru	31.3	C	31.7	C	38.3	D	47.3	D
			Right	25.2	C	25.5	C	25.0	C	27.8	C
		Overall		**41.4**	**D**	**38.5**	**D**	**61.3**	**E**	**51.0**	**D**
Grand River Avenue & Hilton Road	Signal	WB	Left	42.2	D	38.9	D	40.8	D	42.9	D
			Right	29.5	C	28.8	C	33.1	C	33.6	C
		NB	Thru	23.0	C	14.4	B	14.9	B	11.3	B
			Right	3.4	A	4.0	A	4.2	A	6.6	A
		SB	Left	48.5	D	48.5	D	53.0	D	54.1	D
			Thru	9.8	A	10.4	B	7.7	A	7.4	A
		Overall		**21.5**	**C**	**18.2**	**B**	**16.1**	**B**	**15.0**	**B**
Grand River Avenue & WB I-96 Ramps	Signal	WB	Left	30.1	C	22.1	C	25.9	C	20.0	C
			Right	10.2	B	15.2	B	14.7	B	19.9	B
		NB	Thru	52.5	D	46.9	D	50.4	D	53.0	D
		SB	Left								
			Thru	12.5	B	16.0	B	23.1	C	22.3	C
		Overall		**23.4**	**C**	**23.3**	**C**	**29.3**	**C**	**29.7**	**C**
Grand River Avenue & EB I-96 Ramps	STOP (Minor)	EB	Left/Right	Free		10.8	B	Free		14.3	B
			Right	33.7	C	26.8	C	24.3	C	20.2	C
		NB	Thru/Right	48.6	D	25.6	C	76.6	E	23.1	C
		SB	Thru	17.3	B	15.6	B	23.3	C	18.3	B
		Overall		**27.8**	**C**	**19.9**	**B**	**44.5**	**D**	**20.4**	**C**

Although these improvements are needed to help mitigate no-build operations; these improvements are not included in the planned roadway improvements. Therefore, the build conditions analysis for this study evaluates traffic operations with only the planned roadway improvements by MDOT and LCRC.

6.0 Build Conditions Analysis

6.1 SITE TRIP GENERATION

The number of AM and PM peak hour vehicle trips that will be generated by the proposed development will be forecast based on the rates and equations published by ITE in *Trip Generation, 11th Edition*. The ITE land use category that most closely matches the operation of the proposed expansion space is *Land Use #610, Hospital*. For Land Use #610, trip generation data is published by Gross Square Feet (GSF), number of beds, and number of employees. Review of the statistical data published by ITE for each independent variable as summarized in **Table 8** indicates

that the number of employees provides the strongest correlation to trip-making potential. Therefore, as the number of employees for the Hospital is known, it was selected as the independent variable for trip generation calculations. The resulting trip generation forecast for the development expansion is summarized in **Table 9**.

Table 8: Land Use #610 Statistical Summary

Land Use	Time Period	Independent Variable	# of Studies	Standard Deviation	R^2
#610 Hospital	AM	Beds	8	1.28	NA
		GSF	19	0.55	0.72
		Employees	16	0.11	0.82
	PM	Beds	6	1.2	NA
		GSF	19	0.65	0.69
		Employees	13	0.15	0.76

Table 9: Site Trip Generation

Land Use	ITE Code	Amount	Units	Average Daily Traffic	AM Peak Hour			PM Peak Hour		
					In	Out	Total	In	Out	Total
Hospital	610	559	Employees	3,654	192	74	266	59	137	196

6.2 TRAFFIC ASSIGNMENTS

The vehicle trips that would be generated by the proposed development were assigned to the study road network based on peak hour traffic patterns at the existing site driveway and Genoa Business Park Drive, population densities within a 30-minute travel time to the site, professional engineering judgment, and ITE methodologies. These methods indicate that new trips will return to their direction of origin.

As the proposed Hospital use is a very similar land use as compared to the existing medical land use on site, the existing traffic distribution at the St. Joseph Mercy Health and Genoa Business Park Driveways are assumed to accurately reflect the relationship between residential areas and employment centers in this region. These patterns indicate approximately 60% of traffic travels to/from the east on Grand River Avenue while 40% of traffic travels to/from the west.

These proportions of traffic in each direction along Grand River Avenue were then assigned to off-site study intersections based on existing turning movement patterns, population densities within a 30-minute travel time to the site, and professional engineering judgment. It should be noted that all traffic to the south on Latson Road was assumed to utilize Dorr Road as Crooked Lake Road is planned to be paved by LCRC between Dorr Road and Latson Road in 2022 and provides a shorter travel time as compared to traveling along Grand River Avenue to Latson Road. Furthermore, a small 10% of traffic to the west on I-96 (2% of overall traffic) was assumed to utilize the Grand River Avenue interchange as opposed to the Latson Road interchange. The resulting directional distributions for site-generated traffic are summarized in **Table 10** and shown on **Figure 5**.

Utilization of the existing site driveway and Genoa Business Park Drive by future site-generated traffic was determined based on the direction of origin and destination relative to the site, proposed site layout including location of the proposed Hospital and future parking supply, and existing use of the cross-access connection between the two sites. A field review of the cross-access connection indicates minimal traffic from the St. Joseph site passing through into the Genoa Business Park.

As the proposed expansion and additional parking will be located on the east side of the site, this cross-access connection will be even less desired by new site-generated traffic as compared to existing traffic. Therefore, traffic approaching from the west was assumed to predominantly (95%) use the signalized St. Joseph Mercy Health site drive while traffic volumes approaching from the east on Grand River Avenue were assumed to exclusively (100%)

utilize the signalized St. Joseph Mercy Health Drive. New trips were assumed to exit via the same drive that was entered.

Table 10: Site Trip Distribution

To/From	Via	AM/PM
North	Latson Road	9%
	Hacker Road (via Bendix)	13%
	Hughes Road	2%
South	Dorr Road	4%
	Latson Road	0%
East	Grand River Avenue	9%
	I-96	23%
	Hilton Road	4%
West	Grand River Avenue	20%
	I-96	16%
TOTAL		**100%**

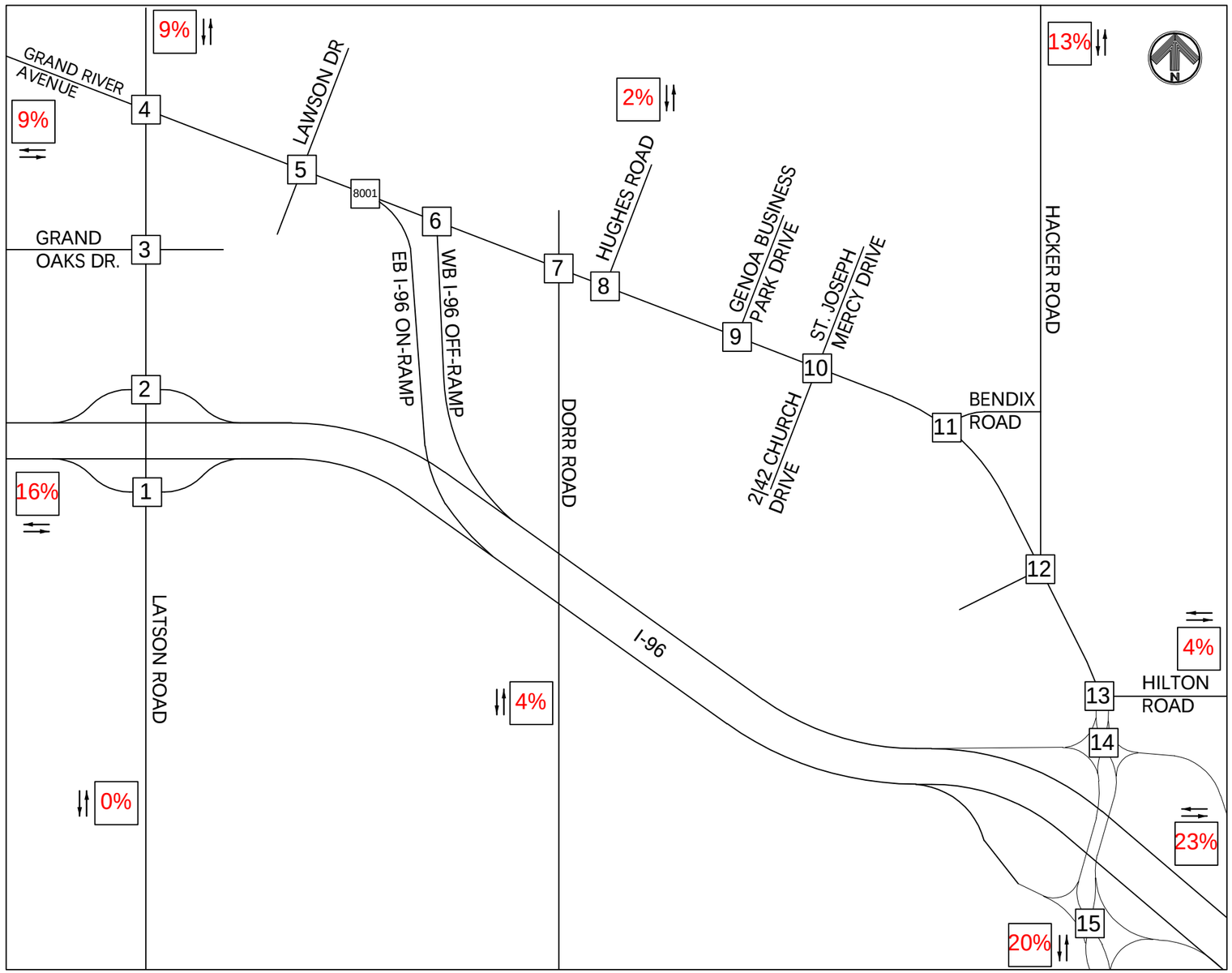
The site-generated vehicle trips were assigned to the study network as shown on **Figure 6**. These trips were added to the no-build traffic volumes shown on **Figure 4** to calculate the future build traffic volumes shown on **Figure 7**.

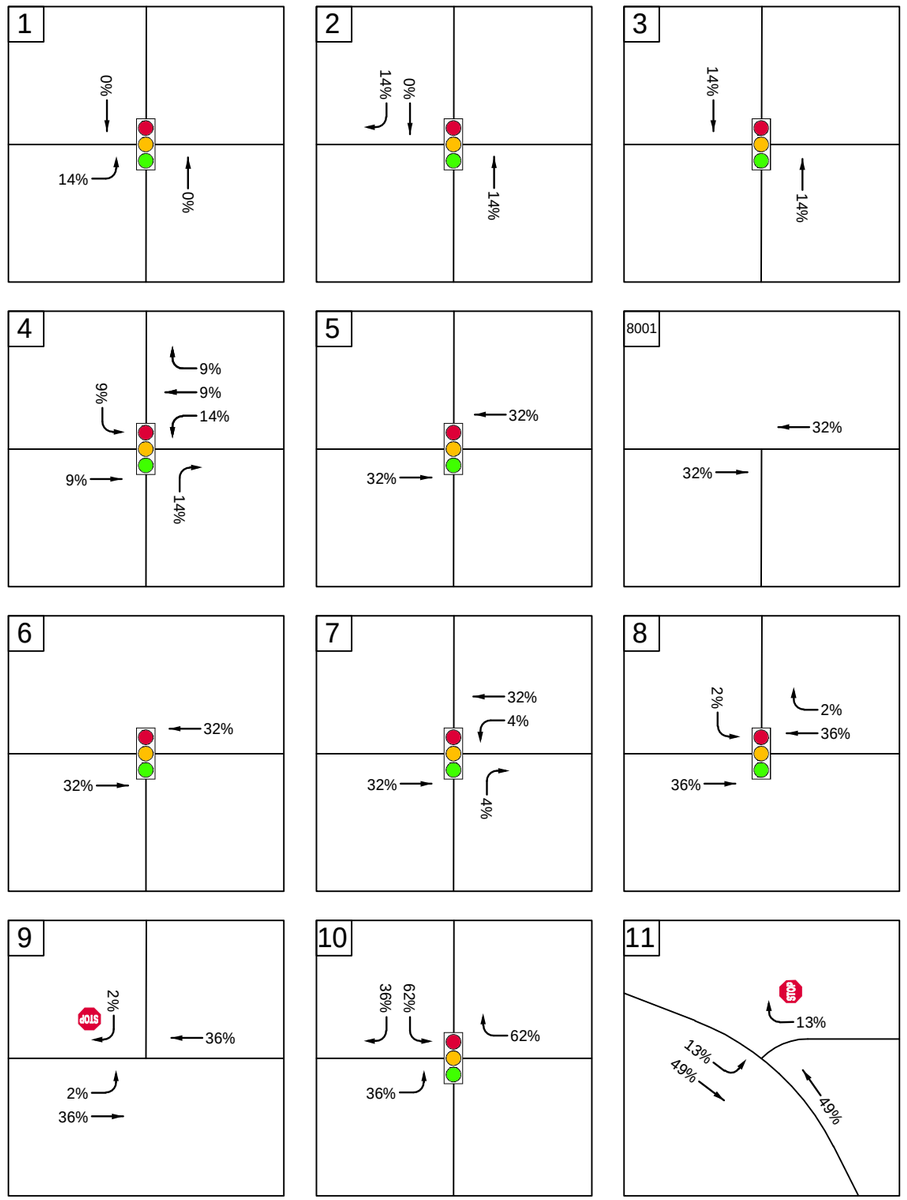
6.3 AUXILIARY LANES

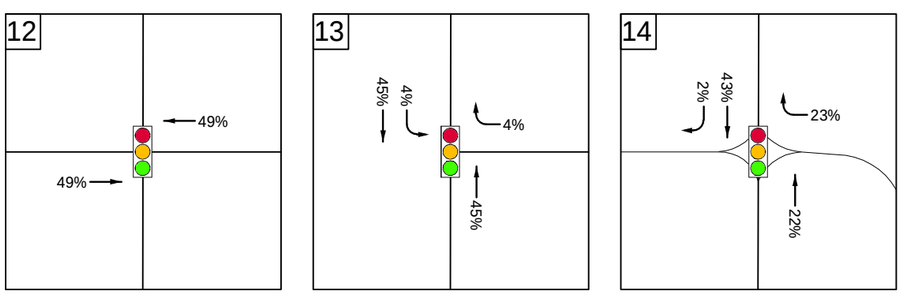
Right and left-turn lanes currently exist along Grand River Avenue at the existing St. Joseph Mercy Health Drive to facilitate site-generated traffic.

6.4 BUILD TRAFFIC CONDITIONS

Future build peak hour vehicle delays and LOS ***with the proposed development*** were calculated based on existing lane configurations and traffic control plus the planned roadway improvements shown on **Figure 2**, build traffic volumes shown on **Figure 7**, and HCM methodologies. SimTraffic simulations were also utilized to evaluate traffic flow and vehicle queues throughout the study network. The build conditions results are included in **Appendix D** and summarized in **Table 11.**





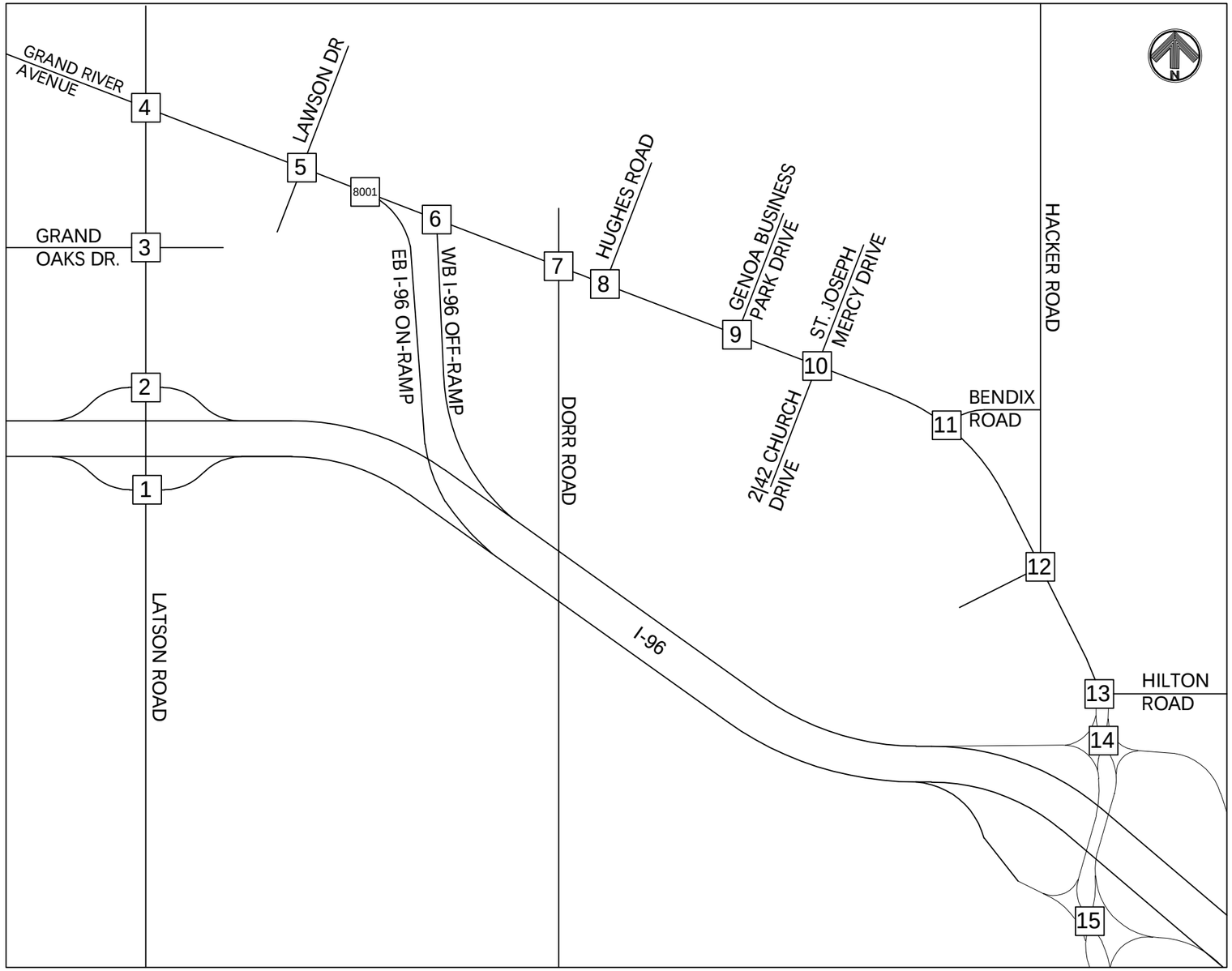


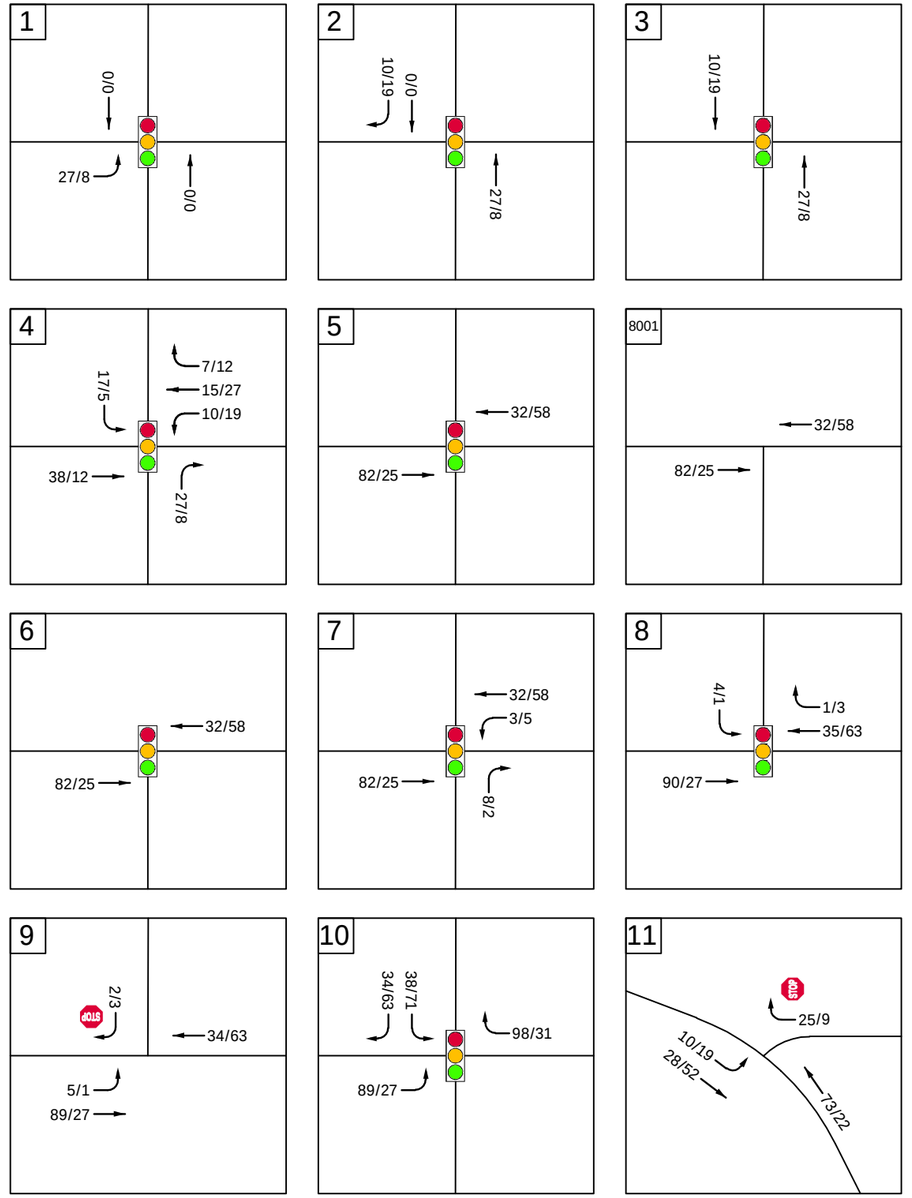
St. Joseph Mercy Brighton Health Center Expansion TIS
Genoa Township, MI

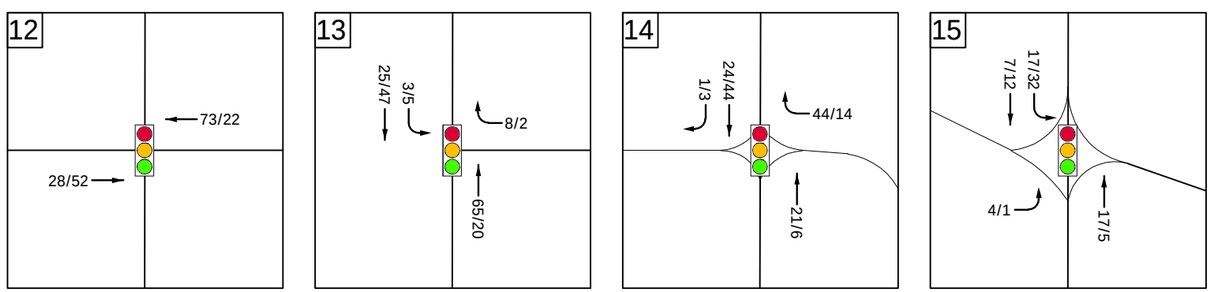
Figure 5
Trip Distribution

PAGE NO.	SCALE	DATE
24	No Scale	Mar '22

BERGMANN ASSOCIATES ENGINEERS PLANNERS







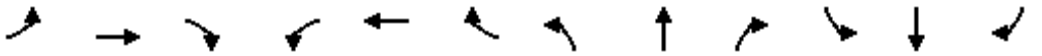
St. Joseph Mercy Brighton Health Center Expansion TIS
Genoa Township, MI

Figure 6
Site-Generated Traffic Volumes

PAGE NO.	SCALE	DATE	
25	No Scale	Mar '22	BERGMANN ARCHITECTS ENGINEERS PLANNERS

Appendix 4

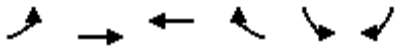
Background LOS Output Reports



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	717	124	144	438	0	108	0	205	0	1	1
Future Volume (veh/h)	0	717	124	144	438	0	108	0	205	0	1	1
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1856	1856	1856	1841	1841	0	1856	1856	1856	1900	1900	1900
Adj Flow Rate, veh/h	0	779	135	166	503	0	157	0	297	0	2	2
Peak Hour Factor	0.92	0.92	0.92	0.87	0.87	0.87	0.69	0.69	0.69	0.60	0.60	0.60
Percent Heavy Veh, %	3	3	3	4	4	0	3	3	3	0	0	0
Cap, veh/h	90	1359	606	355	1915	0	355	0	440	0	6	6
Arrive On Green	0.00	0.39	0.39	0.16	1.00	0.00	0.20	0.00	0.20	0.00	0.01	0.01
Sat Flow, veh/h	889	3526	1572	1753	3589	0	1767	0	1572	0	872	872
Grp Volume(v), veh/h	0	779	135	166	503	0	157	0	297	0	0	4
Grp Sat Flow(s),veh/h/ln	889	1763	1572	1753	1749	0	1767	0	1572	0	0	1743
Q Serve(g_s), s	0.0	13.9	4.6	4.4	0.0	0.0	6.2	0.0	13.4	0.0	0.0	0.2
Cycle Q Clear(g_c), s	0.0	13.9	4.6	4.4	0.0	0.0	6.2	0.0	13.4	0.0	0.0	0.2
Prop In Lane	1.00		1.00	1.00		0.00	1.00		1.00	0.00		0.50
Lane Grp Cap(c), veh/h	90	1359	606	355	1915	0	355	0	440	0	0	13
V/C Ratio(X)	0.00	0.57	0.22	0.47	0.26	0.00	0.44	0.00	0.68	0.00	0.00	0.31
Avail Cap(c_a), veh/h	90	1359	606	399	1915	0	424	0	501	0	0	174
HCM Platoon Ratio	1.00	1.00	1.00	2.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	1.00	0.96	0.96	0.00	1.00	0.00	1.00	0.00	0.00	1.00
Uniform Delay (d), s/veh	0.0	19.4	16.5	12.5	0.0	0.0	28.0	0.0	25.6	0.0	0.0	39.5
Incr Delay (d2), s/veh	0.0	1.8	0.8	0.9	0.3	0.0	0.9	0.0	3.0	0.0	0.0	12.8
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	5.3	1.6	1.3	0.1	0.0	2.5	0.0	4.8	0.0	0.0	0.1
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	0.0	21.2	17.4	13.4	0.3	0.0	28.9	0.0	28.6	0.0	0.0	52.3
LnGrp LOS	A	C	B	B	A	A	C	A	C	A	A	D
Approach Vol, veh/h		914			669			454			4	
Approach Delay, s/veh		20.6			3.6			28.7			52.3	
Approach LOS		C			A			C			D	

Timer - Assigned Phs	1	2		4		6		8				
Phs Duration (G+Y+Rc), s	13.0	37.5		6.6		50.5		22.9				
Change Period (Y+Rc), s	6.7	6.7		6.0		6.7		6.8				
Max Green Setting (Gmax), s	8.3	18.3		8.0		33.3		19.2				
Max Q Clear Time (g_c+I1), s	6.4	15.9		2.2		2.0		15.4				
Green Ext Time (p_c), s	0.1	1.2		0.0		3.1		0.7				

Intersection Summary												
HCM 6th Ctrl Delay			16.9									
HCM 6th LOS			B									



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	32	890	524	45	168	57
Future Volume (veh/h)	32	890	524	45	168	57
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No	No		No	
Adj Sat Flow, veh/h/ln	1856	1856	1841	1841	1870	1870
Adj Flow Rate, veh/h	38	1047	631	54	233	79
Peak Hour Factor	0.85	0.85	0.83	0.83	0.72	0.72
Percent Heavy Veh, %	3	3	4	4	2	2
Cap, veh/h	502	2241	2073	177	264	90
Arrive On Green	0.43	0.43	0.64	0.64	0.21	0.21
Sat Flow, veh/h	751	3618	3353	279	1286	436
Grp Volume(v), veh/h	38	1047	338	347	313	0
Grp Sat Flow(s),veh/h/ln	751	1763	1749	1791	1728	0
Q Serve(g_s), s	2.7	17.0	7.0	7.0	14.1	0.0
Cycle Q Clear(g_c), s	9.7	17.0	7.0	7.0	14.1	0.0
Prop In Lane	1.00			0.16	0.74	0.25
Lane Grp Cap(c), veh/h	502	2241	1112	1138	355	0
V/C Ratio(X)	0.08	0.47	0.30	0.30	0.88	0.00
Avail Cap(c_a), veh/h	502	2241	1112	1138	432	0
HCM Platoon Ratio	0.67	0.67	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.88	0.88	1.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	13.4	13.2	6.6	6.6	30.8	0.0
Incr Delay (d2), s/veh	0.3	0.6	0.7	0.7	16.4	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.4	6.9	2.0	2.1	7.3	0.0
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	13.7	13.9	7.3	7.3	47.3	0.0
LnGrp LOS	B	B	A	A	D	A
Approach Vol, veh/h		1085	685		313	
Approach Delay, s/veh		13.9	7.3		47.3	
Approach LOS		B	A		D	

Timer - Assigned Phs	2	4	6
Phs Duration (G+Y+Rc), s	57.6	22.4	57.6
Change Period (Y+Rc), s	6.7	6.0	6.7
Max Green Setting (Gmax), s	47.3	20.0	47.3
Max Q Clear Time (g_c+I1), s	19.0	16.1	9.0
Green Ext Time (p_c), s	7.9	0.4	4.0

Intersection Summary	
HCM 6th Ctrl Delay	16.7
HCM 6th LOS	B

Notes

User approved volume balancing among the lanes for turning movement.

Intersection	
Int Delay, s/veh	0.7

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	16	4	12	298	227	43
Future Vol, veh/h	16	4	12	298	227	43
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	67	67	69	69	90	90
Heavy Vehicles, %	6	6	2	2	4	4
Mvmt Flow	24	6	17	432	252	48

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	742	276	300	0	-	0
Stage 1	276	-	-	-	-	-
Stage 2	466	-	-	-	-	-
Critical Hdwy	6.46	6.26	4.12	-	-	-
Critical Hdwy Stg 1	5.46	-	-	-	-	-
Critical Hdwy Stg 2	5.46	-	-	-	-	-
Follow-up Hdwy	3.554	3.354	2.218	-	-	-
Pot Cap-1 Maneuver	377	753	1261	-	-	-
Stage 1	761	-	-	-	-	-
Stage 2	623	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	370	753	1261	-	-	-
Mov Cap-2 Maneuver	370	-	-	-	-	-
Stage 1	747	-	-	-	-	-
Stage 2	623	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	14.4	0.3	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1261	-	412	-	-
HCM Lane V/C Ratio	0.014	-	0.072	-	-
HCM Control Delay (s)	7.9	0	14.4	-	-
HCM Lane LOS	A	A	B	-	-
HCM 95th %tile Q(veh)	0	-	0.2	-	-

Intersection: 1: Dorr Rd/Glen Echo Dr & Grand River Rd

Movement	EB	EB	EB	WB	WB	WB	NB	NB	SB
Directions Served	T	T	R	L	T	T	LT	R	LTR
Maximum Queue (ft)	162	171	52	111	78	99	154	132	28
Average Queue (ft)	67	68	7	41	12	24	66	57	3
95th Queue (ft)	133	140	27	89	45	70	124	103	16
Link Distance (ft)	4462	4462			641	641	1423		263
Upstream Blk Time (%)									
Queuing Penalty (veh)									
Storage Bay Dist (ft)			230	200				410	
Storage Blk Time (%)	0								
Queuing Penalty (veh)	0								

Intersection: 2: Grand River Rd & Hughes Rd

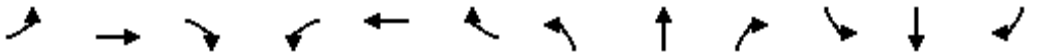
Movement	EB	EB	EB	WB	WB	SB
Directions Served	L	T	T	T	TR	LR
Maximum Queue (ft)	53	153	162	114	109	238
Average Queue (ft)	15	55	70	50	38	127
95th Queue (ft)	43	128	145	97	87	206
Link Distance (ft)		641	641	3184	3184	1202
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)	200					
Storage Blk Time (%)						
Queuing Penalty (veh)						

Intersection: 3: Dorr Rd & Sterling Dr

Movement	EB	NB
Directions Served	LR	LT
Maximum Queue (ft)	58	48
Average Queue (ft)	15	4
95th Queue (ft)	45	23
Link Distance (ft)	1066	1651
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Network Summary

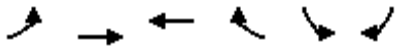
Network wide Queuing Penalty: 0



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	1	699	132	176	890	1	224	1	197	1	0	0
Future Volume (veh/h)	1	699	132	176	890	1	224	1	197	1	0	0
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1885	1885	1885	1885	1885	1885	1870	1870	1870	1900	1900	1900
Adj Flow Rate, veh/h	1	777	147	223	1127	1	295	1	259	2	0	0
Peak Hour Factor	0.90	0.90	0.90	0.79	0.79	0.79	0.76	0.76	0.76	0.60	0.60	0.60
Percent Heavy Veh, %	1	1	1	1	1	1	2	2	2	0	0	0
Cap, veh/h	281	1363	608	392	2063	2	339	1	457	7	0	0
Arrive On Green	0.38	0.38	0.38	0.13	0.75	0.75	0.19	0.19	0.19	0.00	0.00	0.00
Sat Flow, veh/h	503	3582	1598	1795	3672	3	1776	6	1585	1809	0	0
Grp Volume(v), veh/h	1	777	147	223	550	578	296	0	259	2	0	0
Grp Sat Flow(s),veh/h/ln	503	1791	1598	1795	1791	1885	1782	0	1585	1810	0	0
Q Serve(g_s), s	0.1	13.7	5.0	5.7	10.5	10.5	12.9	0.0	11.1	0.1	0.0	0.0
Cycle Q Clear(g_c), s	0.1	13.7	5.0	5.7	10.5	10.5	12.9	0.0	11.1	0.1	0.0	0.0
Prop In Lane	1.00		1.00	1.00		0.00	1.00		1.00	1.00		0.00
Lane Grp Cap(c), veh/h	281	1363	608	392	1006	1059	340	0	457	7	0	0
V/C Ratio(X)	0.00	0.57	0.24	0.57	0.55	0.55	0.87	0.00	0.57	0.29	0.00	0.00
Avail Cap(c_a), veh/h	281	1363	608	449	1006	1059	361	0	476	181	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.33	1.33	1.33	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	0.78	0.78	0.78	1.00	0.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	15.4	19.6	16.9	13.2	5.8	5.8	31.4	0.0	24.2	39.7	0.0	0.0
Incr Delay (d2), s/veh	0.0	1.7	0.9	1.0	1.7	1.6	19.3	0.0	1.5	21.7	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	5.3	1.8	1.9	2.8	2.9	6.8	0.0	3.8	0.1	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	15.4	21.3	17.9	14.2	7.4	7.3	50.7	0.0	25.7	61.4	0.0	0.0
LnGrp LOS	B	C	B	B	A	A	D	A	C	E	A	A
Approach Vol, veh/h		925			1351			555			2	
Approach Delay, s/veh		20.8			8.5			39.0			61.4	
Approach LOS		C			A			D			E	

Timer - Assigned Phs	1	2		4		6		8				
Phs Duration (G+Y+Rc), s	14.5	37.1		6.3		51.6		22.1				
Change Period (Y+Rc), s	6.7	6.7		6.0		6.7		6.8				
Max Green Setting (Gmax), s	10.3	19.3		8.0		36.3		16.2				
Max Q Clear Time (g_c+I1), s	7.7	15.7		2.1		12.5		14.9				
Green Ext Time (p_c), s	0.2	1.7		0.0		7.0		0.4				

Intersection Summary												
HCM 6th Ctrl Delay			18.5									
HCM 6th LOS			B									



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	117	780	1013	182	74	54
Future Volume (veh/h)	117	780	1013	182	74	54
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No	No		No	
Adj Sat Flow, veh/h/ln	1885	1885	1885	1885	1870	1870
Adj Flow Rate, veh/h	127	848	1251	225	82	60
Peak Hour Factor	0.92	0.92	0.81	0.81	0.90	0.90
Percent Heavy Veh, %	1	1	1	1	2	2
Cap, veh/h	288	2634	2234	398	103	75
Arrive On Green	0.24	0.24	0.74	0.74	0.11	0.11
Sat Flow, veh/h	361	3676	3131	542	971	711
Grp Volume(v), veh/h	127	848	734	742	143	0
Grp Sat Flow(s),veh/h/ln	361	1791	1791	1788	1694	0
Q Serve(g_s), s	26.1	15.6	14.7	15.0	6.6	0.0
Cycle Q Clear(g_c), s	41.1	15.6	14.7	15.0	6.6	0.0
Prop In Lane	1.00			0.30	0.57	0.42
Lane Grp Cap(c), veh/h	288	2634	1317	1315	179	0
V/C Ratio(X)	0.44	0.32	0.56	0.56	0.80	0.00
Avail Cap(c_a), veh/h	288	2634	1317	1315	360	0
HCM Platoon Ratio	0.33	0.33	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.84	0.84	1.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	30.5	13.9	4.7	4.8	34.9	0.0
Incr Delay (d2), s/veh	4.1	0.3	1.7	1.8	7.9	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.8	7.3	3.2	3.3	3.1	0.0
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	34.6	14.2	6.4	6.5	42.8	0.0
LnGrp LOS	C	B	A	A	D	A
Approach Vol, veh/h		975	1476		143	
Approach Delay, s/veh		16.8	6.5		42.8	
Approach LOS		B	A		D	

Timer - Assigned Phs	2	4	6
Phs Duration (G+Y+Rc), s	65.5	14.5	65.5
Change Period (Y+Rc), s	6.7	6.0	6.7
Max Green Setting (Gmax), s	50.3	17.0	50.3
Max Q Clear Time (g_c+I1), s	43.1	8.6	17.0
Green Ext Time (p_c), s	3.9	0.2	11.9

Intersection Summary	
HCM 6th Ctrl Delay	12.4
HCM 6th LOS	B

Notes

User approved volume balancing among the lanes for turning movement.

Intersection	
Int Delay, s/veh	1.1

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	27	10	2	395	288	21
Future Vol, veh/h	27	10	2	395	288	21
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	60	60	86	86	94	94
Heavy Vehicles, %	0	0	3	3	2	2
Mvmt Flow	45	17	2	459	306	22

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	780	317	328	0	-	0
Stage 1	317	-	-	-	-	-
Stage 2	463	-	-	-	-	-
Critical Hdwy	6.4	6.2	4.13	-	-	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	2.227	-	-	-
Pot Cap-1 Maneuver	367	728	1226	-	-	-
Stage 1	743	-	-	-	-	-
Stage 2	638	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	366	728	1226	-	-	-
Mov Cap-2 Maneuver	366	-	-	-	-	-
Stage 1	742	-	-	-	-	-
Stage 2	638	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	15	0	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1226	-	423	-	-
HCM Lane V/C Ratio	0.002	-	0.146	-	-
HCM Control Delay (s)	7.9	0	15	-	-
HCM Lane LOS	A	A	C	-	-
HCM 95th %tile Q(veh)	0	-	0.5	-	-

Intersection: 1: Dorr Rd/Glen Echo Dr & Grand River Rd

Movement	EB	EB	EB	EB	WB	WB	WB	NB	NB	SB
Directions Served	L	T	T	R	L	T	TR	LT	R	LTR
Maximum Queue (ft)	10	187	202	44	159	199	202	212	120	11
Average Queue (ft)	0	81	80	9	53	73	87	110	48	2
95th Queue (ft)	4	149	155	31	109	159	166	182	91	13
Link Distance (ft)		4462	4462			641	641	1423		263
Upstream Blk Time (%)										
Queuing Penalty (veh)										
Storage Bay Dist (ft)	200			230	200				410	
Storage Blk Time (%)		0	0			0				
Queuing Penalty (veh)		0	0			0				

Intersection: 2: Grand River Rd & Hughes Rd

Movement	EB	EB	EB	WB	WB	SB
Directions Served	L	T	T	T	TR	LR
Maximum Queue (ft)	139	130	96	145	163	155
Average Queue (ft)	56	17	30	58	63	73
95th Queue (ft)	123	72	79	120	133	128
Link Distance (ft)		641	641	3184	3184	1202
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)	200					
Storage Blk Time (%)	1					
Queuing Penalty (veh)	2					

Intersection: 3: Dorr Rd & Sterling Dr

Movement	EB	NB
Directions Served	LR	LT
Maximum Queue (ft)	61	5
Average Queue (ft)	22	0
95th Queue (ft)	50	3
Link Distance (ft)	1066	1651
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Network Summary

Network wide Queuing Penalty: 3

Appendix 5

Trip Generation Calculations

Trip Generation - Weekday Summary

ITE Code	ITE Rate Description	Unit	Amount	AM Ingress	AM Egress	AM Total	PM Ingress	PM Egress	PM Total
ITE 220	Multifamily Housing (Low-Rise)	DU	204	21	65	86	68	40	108
			Total Trips	**21**	**65**	**86**	**68**	**40**	**108**

ITE Trip Generation Rates - Weekday

ITE Code	*ITE Rate Description*	*Unit*	*Amount*	*R2*	*Rate*	*Pass-by*
ITE 220	**Multifamily Housing (Low-Rise)**	**DU**	**204**			
AM	T = 0.31X + 22.85		86	0.79	0.4	0%
PM	T = 0.43X + 20.55		108	0.84	0.51	0%

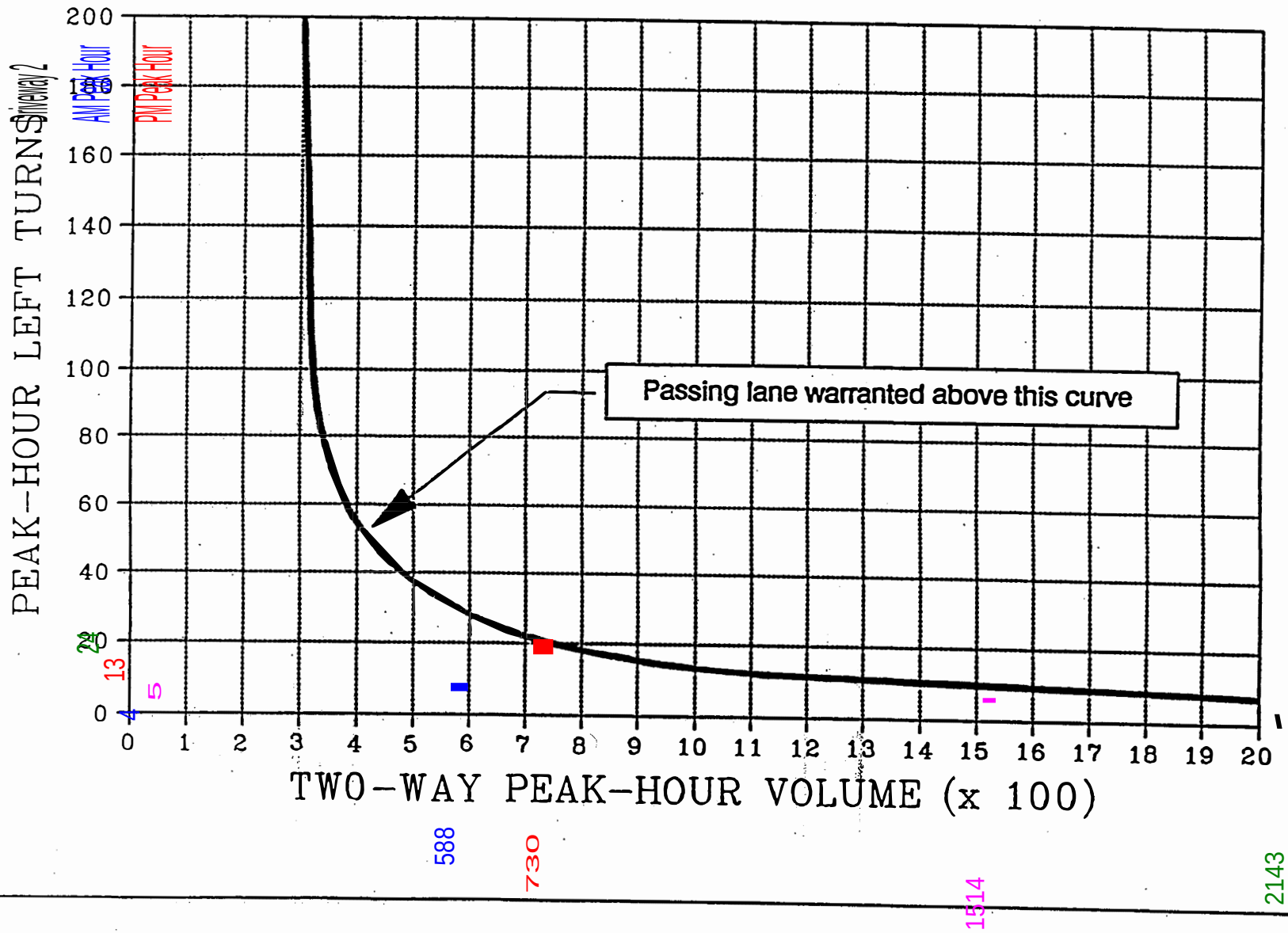
	AM Ingress	AM Egress	AM Total	PM Ingress	PM Egress	PM Total
Directional Distribution	24%	76%	100%	63%	37%	100%
Volume Distribution	**21**	**65**	**86**	**68**	**40**	**108**

Appendix 6

Turn Lane Warrants

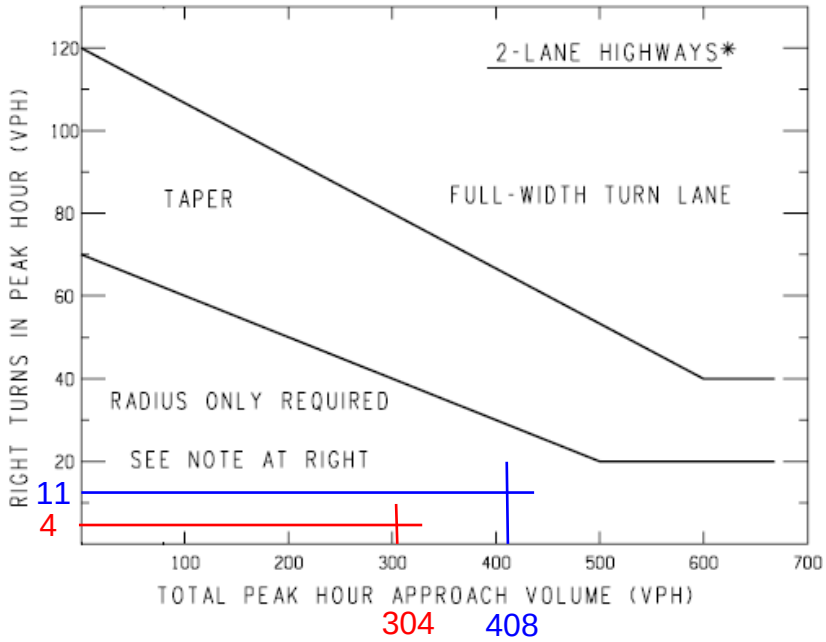
LEFT TURN PASSING LANE WARRANT

(Based on Total Development)



A.15

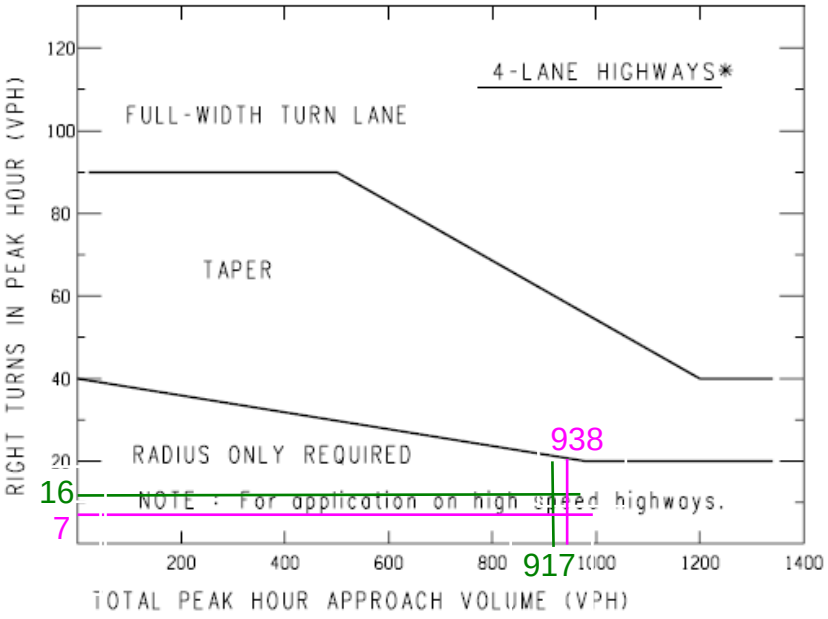
Driveway 2:
AM Peak Hour
PM Peak Hour



NOTE: For posted speeds at or under 45 mph, peak hour right turns greater than 40 vph, and total peak hour approach less than 300 vph, adjust right turn volumes.

Adjust peak hour
Right turns = Peak hour
Right turns – 20

Driveway 1:
AM Peak Hour
PM Peak Hour



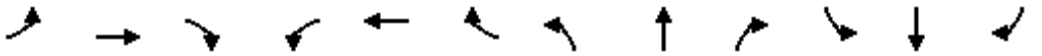
*If a center left-turn lane exists (ie 3 or 5 lane roadway), subtract the number of left turns in approach volume form the total approach volume to get an adjusted total approach volume.

Sample Problem: The Design Speed is 55 mph. The Peak Hour Approach Volume is 300 vph. The Number of Right Turns in the Peak Hous is 100 vph. Determine if a right turn lane is recommended.

Solution: Figure indicates that the intersection of 300 vph and 100 vph is located above the upper trend line; thus, a right-turn lane may be recommended.

Appendix 7

Future LOS Output Reports



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	724	126	146	452	0	113	0	214	0	1	1
Future Volume (veh/h)	0	724	126	146	452	0	113	0	214	0	1	1
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1856	1856	1856	1841	1841	0	1856	1856	1856	1900	1900	1900
Adj Flow Rate, veh/h	0	787	137	168	520	0	164	0	310	0	2	2
Peak Hour Factor	0.92	0.92	0.92	0.87	0.87	0.87	0.69	0.69	0.69	0.60	0.60	0.60
Percent Heavy Veh, %	3	3	3	4	4	0	3	3	3	0	0	0
Cap, veh/h	90	1331	593	348	1893	0	367	0	452	0	6	6
Arrive On Green	0.00	0.38	0.38	0.16	1.00	0.00	0.21	0.00	0.21	0.00	0.01	0.01
Sat Flow, veh/h	875	3526	1572	1753	3589	0	1767	0	1572	0	872	872
Grp Volume(v), veh/h	0	787	137	168	520	0	164	0	310	0	0	4
Grp Sat Flow(s),veh/h/ln	875	1763	1572	1753	1749	0	1767	0	1572	0	0	1743
Q Serve(g_s), s	0.0	14.3	4.8	4.5	0.0	0.0	6.5	0.0	14.0	0.0	0.0	0.2
Cycle Q Clear(g_c), s	0.0	14.3	4.8	4.5	0.0	0.0	6.5	0.0	14.0	0.0	0.0	0.2
Prop In Lane	1.00		1.00	1.00		0.00	1.00		1.00	0.00		0.50
Lane Grp Cap(c), veh/h	90	1331	593	348	1893	0	367	0	452	0	0	13
V/C Ratio(X)	0.00	0.59	0.23	0.48	0.27	0.00	0.45	0.00	0.69	0.00	0.00	0.31
Avail Cap(c_a), veh/h	90	1331	593	390	1893	0	424	0	503	0	0	174
HCM Platoon Ratio	1.00	1.00	1.00	2.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	1.00	0.96	0.96	0.00	1.00	0.00	1.00	0.00	0.00	1.00
Uniform Delay (d), s/veh	0.0	20.0	17.0	12.9	0.0	0.0	27.7	0.0	25.3	0.0	0.0	39.5
Incr Delay (d2), s/veh	0.0	1.9	0.9	1.0	0.3	0.0	0.9	0.0	3.4	0.0	0.0	12.8
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	5.5	1.7	1.4	0.1	0.0	2.5	0.0	5.0	0.0	0.0	0.1
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	0.0	21.9	17.9	13.9	0.3	0.0	28.5	0.0	28.7	0.0	0.0	52.3
LnGrp LOS	A	C	B	B	A	A	C	A	C	A	A	D
Approach Vol, veh/h		924			688			474			4	
Approach Delay, s/veh		21.3			3.7			28.6			52.3	
Approach LOS		C			A			C			D	

Timer - Assigned Phs	1	2		4		6		8				
Phs Duration (G+Y+Rc), s	13.1	36.9		6.6		50.0		23.4				
Change Period (Y+Rc), s	6.7	6.7		6.0		6.7		6.8				
Max Green Setting (Gmax), s	8.3	18.3		8.0		33.3		19.2				
Max Q Clear Time (g_c+I1), s	6.5	16.3		2.2		2.0		16.0				
Green Ext Time (p_c), s	0.1	1.0		0.0		3.2		0.6				

Intersection Summary												
HCM 6th Ctrl Delay			17.2									
HCM 6th LOS			B									

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	32	899	7	5	526	45	14	3	26	168	1	57
Future Volume (veh/h)	32	899	7	5	526	45	14	3	26	168	1	57
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1856	1856	1856	1841	1841	1841	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	38	1058	8	6	634	54	15	3	28	233	1	79
Peak Hour Factor	0.85	0.85	0.85	0.83	0.83	0.83	0.92	0.92	0.92	0.72	0.72	0.72
Percent Heavy Veh, %	3	3	3	4	4	4	2	2	2	2	2	2
Cap, veh/h	497	2268	17	309	2063	175	310	33	304	357	4	328
Arrive On Green	0.42	0.42	0.42	0.63	0.63	0.63	0.21	0.21	0.21	0.21	0.21	0.21
Sat Flow, veh/h	749	3586	27	521	3262	277	1319	156	1453	1378	20	1568
Grp Volume(v), veh/h	38	520	546	6	340	348	15	0	31	233	0	80
Grp Sat Flow(s),veh/h/ln	749	1763	1851	521	1749	1791	1319	0	1609	1378	0	1588
Q Serve(g_s), s	2.7	17.0	17.0	0.5	7.1	7.1	0.8	0.0	1.2	13.1	0.0	3.4
Cycle Q Clear(g_c), s	9.8	17.0	17.0	17.5	7.1	7.1	4.1	0.0	1.2	14.4	0.0	3.4
Prop In Lane	1.00		0.01	1.00		0.15	1.00		0.90	1.00		0.99
Lane Grp Cap(c), veh/h	497	1115	1170	309	1106	1132	310	0	336	357	0	332
V/C Ratio(X)	0.08	0.47	0.47	0.02	0.31	0.31	0.05	0.00	0.09	0.65	0.00	0.24
Avail Cap(c_a), veh/h	497	1115	1170	309	1106	1132	364	0	402	413	0	397
HCM Platoon Ratio	0.67	0.67	0.67	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.88	0.88	0.88	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	13.6	13.4	13.4	13.6	6.7	6.7	28.1	0.0	25.5	31.3	0.0	26.4
Incr Delay (d2), s/veh	0.3	1.2	1.2	0.1	0.7	0.7	0.1	0.0	0.1	3.0	0.0	0.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.4	7.1	7.4	0.1	2.1	2.1	0.2	0.0	0.5	4.6	0.0	1.3
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	13.9	14.6	14.5	13.7	7.4	7.4	28.1	0.0	25.6	34.3	0.0	26.7
LnGrp LOS	B	B	B	B	A	A	C	A	C	C	A	C
Approach Vol, veh/h		1104			694			46			313	
Approach Delay, s/veh		14.5			7.5			26.5			32.4	
Approach LOS		B			A			C			C	

Timer - Assigned Phs	2	4	6	8
Phs Duration (G+Y+Rc), s	57.3	22.7	57.3	22.7
Change Period (Y+Rc), s	6.7	6.0	6.7	6.0
Max Green Setting (Gmax), s	47.3	20.0	47.3	20.0
Max Q Clear Time (g_c+I1), s	19.0	16.4	19.5	6.1
Green Ext Time (p_c), s	7.1	0.4	3.9	0.1

Intersection Summary	
HCM 6th Ctrl Delay	15.1
HCM 6th LOS	B

Intersection	
Int Delay, s/veh	1.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		⇕			⇕			⇕			⇕	
Traffic Vol, veh/h	16	0	4	8	0	14	12	298	4	4	227	43
Future Vol, veh/h	16	0	4	8	0	14	12	298	4	4	227	43
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	67	67	67	92	92	92	69	69	69	90	90	90
Heavy Vehicles, %	6	6	6	2	2	2	2	2	2	4	4	4
Mvmt Flow	24	0	6	9	0	15	17	432	6	4	252	48

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	761	756	276	756	777	435	300	0	0	438	0	0
Stage 1	284	284	-	469	469	-	-	-	-	-	-	-
Stage 2	477	472	-	287	308	-	-	-	-	-	-	-
Critical Hdwy	7.16	6.56	6.26	7.12	6.52	6.22	4.12	-	-	4.14	-	-
Critical Hdwy Stg 1	6.16	5.56	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.16	5.56	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.554	4.054	3.354	3.518	4.018	3.318	2.218	-	-	2.236	-	-
Pot Cap-1 Maneuver	317	333	753	325	328	621	1261	-	-	1111	-	-
Stage 1	714	669	-	575	561	-	-	-	-	-	-	-
Stage 2	562	552	-	720	660	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	304	326	753	317	321	621	1261	-	-	1111	-	-
Mov Cap-2 Maneuver	304	326	-	317	321	-	-	-	-	-	-	-
Stage 1	701	666	-	565	551	-	-	-	-	-	-	-
Stage 2	538	542	-	711	657	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	16.4	13.3	0.3	0.1
HCM LOS	C	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1261	-	-	345	460	1111	-	-
HCM Lane V/C Ratio	0.014	-	-	0.087	0.052	0.004	-	-
HCM Control Delay (s)	7.9	0	-	16.4	13.3	8.3	0	-
HCM Lane LOS	A	A	-	C	B	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0.3	0.2	0	-	-

Intersection: 1: Dorr Rd/Glen Echo Dr & Grand River Rd

Movement	EB	EB	EB	WB	WB	WB	NB	NB	SB
Directions Served	T	T	R	L	T	T	LT	R	LTR
Maximum Queue (ft)	174	181	48	141	96	93	147	132	28
Average Queue (ft)	68	69	7	45	15	23	68	55	2
95th Queue (ft)	143	149	27	97	55	68	124	103	14
Link Distance (ft)	4462	4462			629	629	1428		263
Upstream Blk Time (%)									
Queuing Penalty (veh)									
Storage Bay Dist (ft)			230	200				410	
Storage Blk Time (%)	0	0							
Queuing Penalty (veh)	0	0							

Intersection: 2: Driveway 1/Hughes Rd & Grand River Rd

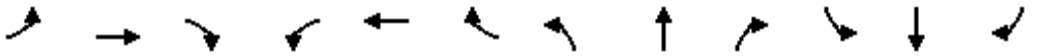
Movement	EB	EB	EB	WB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	TR	L	T	TR	L	TR	L	TR
Maximum Queue (ft)	51	133	138	24	115	103	42	64	124	240
Average Queue (ft)	14	43	55	2	42	34	11	22	92	46
95th Queue (ft)	40	104	114	14	87	80	34	53	136	150
Link Distance (ft)		629	629		3179	3179		320		1201
Upstream Blk Time (%)										
Queuing Penalty (veh)										
Storage Bay Dist (ft)	200			200			100		100	
Storage Blk Time (%)								0	12	
Queuing Penalty (veh)								0	8	

Intersection: 3: Dorr Rd & Sterling Dr/Driveway 2

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (ft)	54	44	36	22
Average Queue (ft)	16	17	3	1
95th Queue (ft)	45	43	19	8
Link Distance (ft)	1066	327	1645	1428
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Network Summary

Network wide Queuing Penalty: 8



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	1	715	138	183	903	1	229	1	201	1	0	0
Future Volume (veh/h)	1	715	138	183	903	1	229	1	201	1	0	0
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1885	1885	1885	1885	1885	1885	1870	1870	1870	1900	1900	1900
Adj Flow Rate, veh/h	1	794	153	232	1143	1	301	1	264	2	0	0
Peak Hour Factor	0.90	0.90	0.90	0.79	0.79	0.79	0.76	0.76	0.76	0.60	0.60	0.60
Percent Heavy Veh, %	1	1	1	1	1	1	2	2	2	0	0	0
Cap, veh/h	275	1340	598	389	2053	2	343	1	467	7	0	0
Arrive On Green	0.37	0.37	0.37	0.13	0.74	0.74	0.19	0.19	0.19	0.00	0.00	0.00
Sat Flow, veh/h	496	3582	1598	1795	3672	3	1776	6	1585	1809	0	0
Grp Volume(v), veh/h	1	794	153	232	557	587	302	0	264	2	0	0
Grp Sat Flow(s),veh/h/ln	496	1791	1598	1795	1791	1885	1782	0	1585	1810	0	0
Q Serve(g_s), s	0.1	14.3	5.3	6.0	10.9	10.9	13.2	0.0	11.3	0.1	0.0	0.0
Cycle Q Clear(g_c), s	0.1	14.3	5.3	6.0	10.9	10.9	13.2	0.0	11.3	0.1	0.0	0.0
Prop In Lane	1.00		1.00	1.00		0.00	1.00		1.00	1.00		0.00
Lane Grp Cap(c), veh/h	275	1340	598	389	1001	1054	344	0	467	7	0	0
V/C Ratio(X)	0.00	0.59	0.26	0.60	0.56	0.56	0.88	0.00	0.57	0.29	0.00	0.00
Avail Cap(c_a), veh/h	275	1340	598	438	1001	1054	361	0	481	181	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.33	1.33	1.33	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	0.82	0.82	0.82	1.00	0.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	15.7	20.1	17.3	13.6	5.9	5.9	31.3	0.0	23.9	39.7	0.0	0.0
Incr Delay (d2), s/veh	0.0	1.9	1.0	1.5	1.8	1.7	20.3	0.0	1.5	21.7	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	5.5	1.9	2.0	2.9	3.0	7.0	0.0	3.9	0.1	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	15.7	22.1	18.4	15.1	7.8	7.7	51.6	0.0	25.3	61.4	0.0	0.0
LnGrp LOS	B	C	B	B	A	A	D	A	C	E	A	A
Approach Vol, veh/h		948			1376			566			2	
Approach Delay, s/veh		21.5			8.9			39.3			61.4	
Approach LOS		C			A			D			E	

Timer - Assigned Phs	1	2		4		6		8				
Phs Duration (G+Y+Rc), s	14.8	36.6		6.3		51.4		22.3				
Change Period (Y+Rc), s	6.7	6.7		6.0		6.7		6.8				
Max Green Setting (Gmax), s	10.3	19.3		8.0		36.3		16.2				
Max Q Clear Time (g_c+I1), s	8.0	16.3		2.1		12.9		15.2				
Green Ext Time (p_c), s	0.1	1.5		0.0		7.1		0.3				

Intersection Summary			
HCM 6th Ctrl Delay		19.0	
HCM 6th LOS		B	

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	117	784	16	24	1020	182	13	3	10	74	4	54
Future Volume (veh/h)	117	784	16	24	1020	182	13	3	10	74	4	54
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1885	1885	1885	1885	1885	1885	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	127	852	17	30	1259	225	14	3	11	82	4	60
Peak Hour Factor	0.92	0.92	0.92	0.81	0.81	0.81	0.92	0.92	0.92	0.90	0.90	0.90
Percent Heavy Veh, %	1	1	1	1	1	1	2	2	2	2	2	2
Cap, veh/h	295	2696	54	448	2282	404	161	32	117	206	9	136
Arrive On Green	0.25	0.25	0.25	0.75	0.75	0.75	0.09	0.09	0.09	0.09	0.09	0.09
Sat Flow, veh/h	358	3592	72	642	3040	539	1338	351	1287	1400	100	1500
Grp Volume(v), veh/h	127	425	444	30	737	747	14	0	14	82	0	64
Grp Sat Flow(s),veh/h/ln	358	1791	1872	642	1791	1788	1338	0	1639	1400	0	1600
Q Serve(g_s), s	26.1	15.5	15.5	1.7	14.0	14.3	0.8	0.0	0.6	4.6	0.0	3.0
Cycle Q Clear(g_c), s	40.4	15.5	15.5	17.2	14.0	14.3	3.8	0.0	0.6	5.2	0.0	3.0
Prop In Lane	1.00		0.04	1.00		0.30	1.00		0.79	1.00		0.94
Lane Grp Cap(c), veh/h	295	1344	1405	448	1344	1342	161	0	149	206	0	145
V/C Ratio(X)	0.43	0.32	0.32	0.07	0.55	0.56	0.09	0.00	0.09	0.40	0.00	0.44
Avail Cap(c_a), veh/h	295	1344	1405	448	1344	1342	324	0	348	376	0	340
HCM Platoon Ratio	0.33	0.33	0.33	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.83	0.83	0.83	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	29.3	13.3	13.3	8.2	4.2	4.3	36.3	0.0	33.4	35.7	0.0	34.5
Incr Delay (d2), s/veh	3.8	0.5	0.5	0.3	1.6	1.7	0.2	0.0	0.3	1.2	0.0	2.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.7	7.3	7.7	0.2	2.8	2.9	0.3	0.0	0.3	1.6	0.0	1.3
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	33.0	13.8	13.8	8.5	5.8	5.9	36.5	0.0	33.6	37.0	0.0	36.5
LnGrp LOS	C	B	B	A	A	A	D	A	C	D	A	D
Approach Vol, veh/h		996			1514			28			146	
Approach Delay, s/veh		16.3			5.9			35.1			36.8	
Approach LOS		B			A			D			D	

Timer - Assigned Phs	2	4	6	8
Phs Duration (G+Y+Rc), s	66.7	13.3	66.7	13.3
Change Period (Y+Rc), s	6.7	6.0	6.7	6.0
Max Green Setting (Gmax), s	50.3	17.0	50.3	17.0
Max Q Clear Time (g_c+I1), s	42.4	7.2	19.2	5.8
Green Ext Time (p_c), s	4.1	0.4	12.1	0.0

Intersection Summary	
HCM 6th Ctrl Delay	11.8
HCM 6th LOS	B

Intersection	
Int Delay, s/veh	1.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	27	0	10	5	0	9	2	395	11	13	288	21
Future Vol, veh/h	27	0	10	5	0	9	2	395	11	13	288	21
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	60	60	60	92	92	92	86	86	86	94	94	94
Heavy Vehicles, %	0	0	0	2	2	2	3	3	3	2	2	2
Mvmt Flow	45	0	17	5	0	10	2	459	13	14	306	22

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	820	821	317	824	826	466	328	0	0	472	0	0
Stage 1	345	345	-	470	470	-	-	-	-	-	-	-
Stage 2	475	476	-	354	356	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.12	6.52	6.22	4.13	-	-	4.12	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.518	4.018	3.318	2.227	-	-	2.218	-	-
Pot Cap-1 Maneuver	296	312	728	292	307	597	1226	-	-	1090	-	-
Stage 1	675	640	-	574	560	-	-	-	-	-	-	-
Stage 2	574	560	-	663	629	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	287	306	728	281	301	597	1226	-	-	1090	-	-
Mov Cap-2 Maneuver	287	306	-	281	301	-	-	-	-	-	-	-
Stage 1	674	630	-	573	559	-	-	-	-	-	-	-
Stage 2	563	559	-	637	619	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	17.8	13.8	0	0.3
HCM LOS	C	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1226	-	-	343	426	1090	-	-
HCM Lane V/C Ratio	0.002	-	-	0.18	0.036	0.013	-	-
HCM Control Delay (s)	7.9	0	-	17.8	13.8	8.3	0	-
HCM Lane LOS	A	A	-	C	B	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0.6	0.1	0	-	-

Intersection: 1: Dorr Rd/Glen Echo Dr & Grand River Rd

Movement	EB	EB	EB	WB	WB	WB	NB	NB	SB
Directions Served	T	T	R	L	T	TR	LT	R	LTR
Maximum Queue (ft)	199	209	40	136	197	215	210	122	26
Average Queue (ft)	87	88	9	55	70	84	106	51	2
95th Queue (ft)	163	172	29	114	153	171	172	94	14
Link Distance (ft)	4462	4462			629	629	1428		263
Upstream Blk Time (%)									
Queuing Penalty (veh)									
Storage Bay Dist (ft)			230	200				410	
Storage Blk Time (%)	0	0			0				
Queuing Penalty (veh)	0	0			0				

Intersection: 2: Grand River Rd & Hughes Rd

Movement	EB	EB	EB	WB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	TR	L	T	TR	L	TR	L	TR
Maximum Queue (ft)	157	82	103	38	135	155	53	42	116	105
Average Queue (ft)	62	14	29	10	55	58	13	13	51	30
95th Queue (ft)	124	56	75	31	115	119	38	38	95	67
Link Distance (ft)		629	629		3174	3174		389		1201
Upstream Blk Time (%)										
Queuing Penalty (veh)										
Storage Bay Dist (ft)	200			200			100		100	
Storage Blk Time (%)	0								2	0
Queuing Penalty (veh)	1								1	0

Intersection: 3: Dorr Rd & Sterling Dr

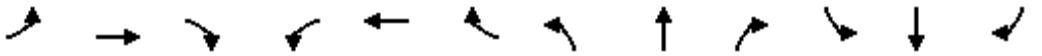
Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (ft)	57	31	21	32
Average Queue (ft)	22	11	1	4
95th Queue (ft)	49	35	11	19
Link Distance (ft)	1066	401	1645	1428
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Network Summary

Network wide Queuing Penalty: 3

Appendix 8

Future with Split Phase LOS Output Reports



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	724	126	146	452	0	113	0	214	0	1	1
Future Volume (veh/h)	0	724	126	146	452	0	113	0	214	0	1	1
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1856	1856	1856	1841	1841	0	1856	1856	1856	1900	1900	1900
Adj Flow Rate, veh/h	0	787	137	168	520	0	164	0	310	0	2	2
Peak Hour Factor	0.92	0.92	0.92	0.87	0.87	0.87	0.69	0.69	0.69	0.60	0.60	0.60
Percent Heavy Veh, %	3	3	3	4	4	0	3	3	3	0	0	0
Cap, veh/h	90	1331	593	348	1893	0	367	0	452	0	6	6
Arrive On Green	0.00	0.38	0.38	0.16	1.00	0.00	0.21	0.00	0.21	0.00	0.01	0.01
Sat Flow, veh/h	875	3526	1572	1753	3589	0	1767	0	1572	0	872	872
Grp Volume(v), veh/h	0	787	137	168	520	0	164	0	310	0	0	4
Grp Sat Flow(s),veh/h/ln	875	1763	1572	1753	1749	0	1767	0	1572	0	0	1743
Q Serve(g_s), s	0.0	14.3	4.8	4.5	0.0	0.0	6.5	0.0	14.0	0.0	0.0	0.2
Cycle Q Clear(g_c), s	0.0	14.3	4.8	4.5	0.0	0.0	6.5	0.0	14.0	0.0	0.0	0.2
Prop In Lane	1.00		1.00	1.00		0.00	1.00		1.00	0.00		0.50
Lane Grp Cap(c), veh/h	90	1331	593	348	1893	0	367	0	452	0	0	13
V/C Ratio(X)	0.00	0.59	0.23	0.48	0.27	0.00	0.45	0.00	0.69	0.00	0.00	0.31
Avail Cap(c_a), veh/h	90	1331	593	390	1893	0	424	0	503	0	0	174
HCM Platoon Ratio	1.00	1.00	1.00	2.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	1.00	0.93	0.93	0.00	1.00	0.00	1.00	0.00	0.00	1.00
Uniform Delay (d), s/veh	0.0	20.0	17.0	12.9	0.0	0.0	27.7	0.0	25.3	0.0	0.0	39.5
Incr Delay (d2), s/veh	0.0	1.9	0.9	1.0	0.3	0.0	0.9	0.0	3.4	0.0	0.0	12.8
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	5.5	1.7	1.4	0.1	0.0	2.5	0.0	5.0	0.0	0.0	0.1
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	0.0	21.9	17.9	13.9	0.3	0.0	28.5	0.0	28.7	0.0	0.0	52.3
LnGrp LOS	A	C	B	B	A	A	C	A	C	A	A	D
Approach Vol, veh/h		924			688			474			4	
Approach Delay, s/veh		21.3			3.6			28.6			52.3	
Approach LOS		C			A			C			D	

Timer - Assigned Phs	1	2		4		6		8				
Phs Duration (G+Y+Rc), s	13.1	36.9		6.6		50.0		23.4				
Change Period (Y+Rc), s	6.7	6.7		6.0		6.7		6.8				
Max Green Setting (Gmax), s	8.3	18.3		8.0		33.3		19.2				
Max Q Clear Time (g_c+I1), s	6.5	16.3		2.2		2.0		16.0				
Green Ext Time (p_c), s	0.1	1.0		0.0		3.2		0.6				

Intersection Summary												
HCM 6th Ctrl Delay			17.2									
HCM 6th LOS			B									

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	32	899	7	5	526	45	14	3	26	168	1	57
Future Volume (veh/h)	32	899	7	5	526	45	14	3	26	168	1	57
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1856	1856	1856	1841	1841	1841	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	38	1058	8	6	634	54	15	3	28	233	1	79
Peak Hour Factor	0.85	0.85	0.85	0.83	0.83	0.83	0.92	0.92	0.92	0.72	0.72	0.72
Percent Heavy Veh, %	3	3	3	4	4	4	2	2	2	2	2	2
Cap, veh/h	378	1808	14	226	1644	140	100	9	81	265	1	90
Arrive On Green	0.34	0.34	0.34	0.50	0.50	0.50	0.06	0.06	0.06	0.21	0.21	0.21
Sat Flow, veh/h	749	3586	27	521	3262	277	1781	156	1453	1286	6	436
Grp Volume(v), veh/h	38	520	546	6	340	348	15	0	31	313	0	0
Grp Sat Flow(s),veh/h/ln	749	1763	1851	521	1749	1791	1781	0	1609	1728	0	0
Q Serve(g_s), s	3.1	19.5	19.5	0.7	9.6	9.6	0.6	0.0	1.5	14.1	0.0	0.0
Cycle Q Clear(g_c), s	12.7	19.5	19.5	20.2	9.6	9.6	0.6	0.0	1.5	14.1	0.0	0.0
Prop In Lane	1.00		0.01	1.00		0.15	1.00		0.90	0.74		0.25
Lane Grp Cap(c), veh/h	378	888	933	226	881	903	100	0	90	356	0	0
V/C Ratio(X)	0.10	0.59	0.59	0.03	0.39	0.39	0.15	0.00	0.34	0.88	0.00	0.00
Avail Cap(c_a), veh/h	378	888	933	226	881	903	156	0	141	453	0	0
HCM Platoon Ratio	0.67	0.67	0.67	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.88	0.88	0.88	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	21.0	19.6	19.6	22.1	12.2	12.2	35.9	0.0	36.3	30.8	0.0	0.0
Incr Delay (d2), s/veh	0.5	2.5	2.4	0.2	1.3	1.2	0.7	0.0	2.2	14.8	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.6	8.5	8.9	0.1	3.4	3.4	0.3	0.0	0.6	7.2	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	21.5	22.1	22.0	22.3	13.5	13.5	36.6	0.0	38.6	45.6	0.0	0.0
LnGrp LOS	C	C	C	C	B	B	D	A	D	D	A	A
Approach Vol, veh/h		1104			694			46			313	
Approach Delay, s/veh		22.0			13.6			38.0			45.6	
Approach LOS		C			B			D			D	

Timer - Assigned Phs	2	4	6	8
Phs Duration (G+Y+Rc), s	47.0	22.5	47.0	10.5
Change Period (Y+Rc), s	6.7	6.0	6.7	6.0
Max Green Setting (Gmax), s	33.3	21.0	33.3	7.0
Max Q Clear Time (g_c+I1), s	21.5	16.1	22.2	3.5
Green Ext Time (p_c), s	4.9	0.5	2.9	0.0

Intersection Summary	
HCM 6th Ctrl Delay	23.0
HCM 6th LOS	C

Intersection	
Int Delay, s/veh	1.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		⇕			⇕			⇕			⇕	
Traffic Vol, veh/h	16	0	4	8	0	14	12	298	4	4	227	43
Future Vol, veh/h	16	0	4	8	0	14	12	298	4	4	227	43
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	67	67	67	92	92	92	69	69	69	90	90	90
Heavy Vehicles, %	6	6	6	2	2	2	2	2	2	4	4	4
Mvmt Flow	24	0	6	9	0	15	17	432	6	4	252	48

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	761	756	276	756	777	435	300	0	0	438	0	0
Stage 1	284	284	-	469	469	-	-	-	-	-	-	-
Stage 2	477	472	-	287	308	-	-	-	-	-	-	-
Critical Hdwy	7.16	6.56	6.26	7.12	6.52	6.22	4.12	-	-	4.14	-	-
Critical Hdwy Stg 1	6.16	5.56	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.16	5.56	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.554	4.054	3.354	3.518	4.018	3.318	2.218	-	-	2.236	-	-
Pot Cap-1 Maneuver	317	333	753	325	328	621	1261	-	-	1111	-	-
Stage 1	714	669	-	575	561	-	-	-	-	-	-	-
Stage 2	562	552	-	720	660	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	304	326	753	317	321	621	1261	-	-	1111	-	-
Mov Cap-2 Maneuver	304	326	-	317	321	-	-	-	-	-	-	-
Stage 1	701	666	-	565	551	-	-	-	-	-	-	-
Stage 2	538	542	-	711	657	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	16.4	13.3	0.3	0.1
HCM LOS	C	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1261	-	-	345	460	1111	-	-
HCM Lane V/C Ratio	0.014	-	-	0.087	0.052	0.004	-	-
HCM Control Delay (s)	7.9	0	-	16.4	13.3	8.3	0	-
HCM Lane LOS	A	A	-	C	B	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0.3	0.2	0	-	-

Intersection: 1: Dorr Rd/Glen Echo Dr & Grand River Rd

Movement	EB	EB	EB	WB	WB	WB	NB	NB	SB
Directions Served	T	T	R	L	T	T	LT	R	LTR
Maximum Queue (ft)	159	170	48	133	107	119	150	126	27
Average Queue (ft)	63	70	6	45	19	25	67	58	3
95th Queue (ft)	131	143	26	97	63	73	121	110	16
Link Distance (ft)	4462	4462			629	629	1428		263
Upstream Blk Time (%)									
Queuing Penalty (veh)									
Storage Bay Dist (ft)			230	200				410	
Storage Blk Time (%)									
Queuing Penalty (veh)									

Intersection: 2: Driveway 1/Hughes Rd & Grand River Rd

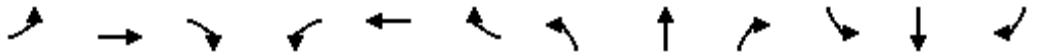
Movement	EB	EB	EB	WB	WB	WB	NB	NB	SB
Directions Served	L	T	TR	L	T	TR	L	TR	LTR
Maximum Queue (ft)	51	160	185	31	144	143	51	62	247
Average Queue (ft)	14	44	62	3	58	48	12	20	121
95th Queue (ft)	42	114	133	18	115	109	38	49	203
Link Distance (ft)		629	629		3179	3179		320	1201
Upstream Blk Time (%)									
Queuing Penalty (veh)									
Storage Bay Dist (ft)	200			200			100		
Storage Blk Time (%)		0			0				
Queuing Penalty (veh)		0			0				

Intersection: 3: Dorr Rd & Sterling Dr/Driveway 2

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (ft)	52	45	71	15
Average Queue (ft)	14	17	6	1
95th Queue (ft)	42	43	34	6
Link Distance (ft)	1066	327	1645	1428
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Network Summary

Network wide Queuing Penalty: 0



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	1	715	138	183	903	1	229	1	201	1	0	0
Future Volume (veh/h)	1	715	138	183	903	1	229	1	201	1	0	0
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1885	1885	1885	1885	1885	1885	1870	1870	1870	1900	1900	1900
Adj Flow Rate, veh/h	1	794	153	232	1143	1	301	1	264	2	0	0
Peak Hour Factor	0.90	0.90	0.90	0.79	0.79	0.79	0.76	0.76	0.76	0.60	0.60	0.60
Percent Heavy Veh, %	1	1	1	1	1	1	2	2	2	0	0	0
Cap, veh/h	275	1340	598	389	2053	2	343	1	467	7	0	0
Arrive On Green	0.37	0.37	0.37	0.13	0.74	0.74	0.19	0.19	0.19	0.00	0.00	0.00
Sat Flow, veh/h	496	3582	1598	1795	3672	3	1776	6	1585	1809	0	0
Grp Volume(v), veh/h	1	794	153	232	557	587	302	0	264	2	0	0
Grp Sat Flow(s),veh/h/ln	496	1791	1598	1795	1791	1885	1782	0	1585	1810	0	0
Q Serve(g_s), s	0.1	14.3	5.3	6.0	10.9	10.9	13.2	0.0	11.3	0.1	0.0	0.0
Cycle Q Clear(g_c), s	0.1	14.3	5.3	6.0	10.9	10.9	13.2	0.0	11.3	0.1	0.0	0.0
Prop In Lane	1.00		1.00	1.00		0.00	1.00		1.00	1.00		0.00
Lane Grp Cap(c), veh/h	275	1340	598	389	1001	1054	344	0	467	7	0	0
V/C Ratio(X)	0.00	0.59	0.26	0.60	0.56	0.56	0.88	0.00	0.57	0.29	0.00	0.00
Avail Cap(c_a), veh/h	275	1340	598	438	1001	1054	361	0	481	181	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.33	1.33	1.33	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	0.71	0.71	0.71	1.00	0.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	15.7	20.1	17.3	13.6	5.9	5.9	31.3	0.0	23.9	39.7	0.0	0.0
Incr Delay (d2), s/veh	0.0	1.9	1.0	1.3	1.6	1.5	20.3	0.0	1.5	21.7	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	5.5	1.9	2.0	2.8	2.9	7.0	0.0	3.9	0.1	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	15.7	22.1	18.4	14.9	7.5	7.4	51.6	0.0	25.3	61.4	0.0	0.0
LnGrp LOS	B	C	B	B	A	A	D	A	C	E	A	A
Approach Vol, veh/h		948			1376			566			2	
Approach Delay, s/veh		21.5			8.7			39.3			61.4	
Approach LOS		C			A			D			E	

Timer - Assigned Phs	1	2		4		6		8				
Phs Duration (G+Y+Rc), s	14.8	36.6		6.3		51.4		22.3				
Change Period (Y+Rc), s	6.7	6.7		6.0		6.7		6.8				
Max Green Setting (Gmax), s	10.3	19.3		8.0		36.3		16.2				
Max Q Clear Time (g_c+I1), s	8.0	16.3		2.1		12.9		15.2				
Green Ext Time (p_c), s	0.1	1.5		0.0		7.1		0.3				

Intersection Summary			
HCM 6th Ctrl Delay		18.9	
HCM 6th LOS		B	

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	117	784	16	24	1020	182	13	3	10	74	4	54
Future Volume (veh/h)	117	784	16	24	1020	182	13	3	10	74	4	54
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1885	1885	1885	1885	1885	1885	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	127	852	17	30	1259	225	14	3	11	82	4	60
Peak Hour Factor	0.92	0.92	0.92	0.81	0.81	0.81	0.92	0.92	0.92	0.90	0.90	0.90
Percent Heavy Veh, %	1	1	1	1	1	1	2	2	2	2	2	2
Cap, veh/h	212	2213	44	354	1873	332	72	14	52	104	5	76
Arrive On Green	0.20	0.20	0.20	0.62	0.62	0.62	0.04	0.04	0.04	0.11	0.11	0.11
Sat Flow, veh/h	358	3592	72	642	3040	539	1781	351	1287	953	46	697
Grp Volume(v), veh/h	127	425	444	30	737	747	14	0	14	146	0	0
Grp Sat Flow(s),veh/h/ln	358	1791	1872	642	1791	1788	1781	0	1639	1697	0	0
Q Serve(g_s), s	27.3	16.4	16.4	2.3	21.5	22.0	0.6	0.0	0.7	6.7	0.0	0.0
Cycle Q Clear(g_c), s	49.3	16.4	16.4	18.7	21.5	22.0	0.6	0.0	0.7	6.7	0.0	0.0
Prop In Lane	1.00		0.04	1.00		0.30	1.00		0.79	0.56		0.41
Lane Grp Cap(c), veh/h	212	1104	1154	354	1104	1102	72	0	66	186	0	0
V/C Ratio(X)	0.60	0.38	0.38	0.08	0.67	0.68	0.19	0.00	0.21	0.79	0.00	0.00
Avail Cap(c_a), veh/h	212	1104	1154	354	1104	1102	200	0	184	339	0	0
HCM Platoon Ratio	0.33	0.33	0.33	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.83	0.83	0.83	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	43.4	18.8	18.8	14.5	10.0	10.1	37.1	0.0	37.1	34.7	0.0	0.0
Incr Delay (d2), s/veh	10.0	0.8	0.8	0.5	3.2	3.4	1.3	0.0	1.6	7.1	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	3.3	7.9	8.2	0.3	6.9	7.1	0.3	0.0	0.3	3.1	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	53.4	19.6	19.6	15.0	13.2	13.5	38.4	0.0	38.7	41.8	0.0	0.0
LnGrp LOS	D	B	B	B	B	B	D	A	D	D	A	A
Approach Vol, veh/h		996			1514			28			146	
Approach Delay, s/veh		23.9			13.4			38.6			41.8	
Approach LOS		C			B			D			D	

Timer - Assigned Phs	2	4	6	8
Phs Duration (G+Y+Rc), s	56.0	14.8	56.0	9.2
Change Period (Y+Rc), s	6.7	6.0	6.7	6.0
Max Green Setting (Gmax), s	36.3	16.0	36.3	9.0
Max Q Clear Time (g_c+I1), s	51.3	8.7	24.0	2.7
Green Ext Time (p_c), s	0.0	0.4	7.3	0.0

Intersection Summary	
HCM 6th Ctrl Delay	19.1
HCM 6th LOS	B

Intersection	
Int Delay, s/veh	1.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		⇕			⇕			⇕			⇕	
Traffic Vol, veh/h	27	0	10	5	0	9	2	395	11	13	288	21
Future Vol, veh/h	27	0	10	5	0	9	2	395	11	13	288	21
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	60	60	60	92	92	92	86	86	86	94	94	94
Heavy Vehicles, %	0	0	0	2	2	2	3	3	3	2	2	2
Mvmt Flow	45	0	17	5	0	10	2	459	13	14	306	22

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	820	821	317	824	826	466	328	0	0	472	0	0
Stage 1	345	345	-	470	470	-	-	-	-	-	-	-
Stage 2	475	476	-	354	356	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.12	6.52	6.22	4.13	-	-	4.12	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.518	4.018	3.318	2.227	-	-	2.218	-	-
Pot Cap-1 Maneuver	296	312	728	292	307	597	1226	-	-	1090	-	-
Stage 1	675	640	-	574	560	-	-	-	-	-	-	-
Stage 2	574	560	-	663	629	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	287	306	728	281	301	597	1226	-	-	1090	-	-
Mov Cap-2 Maneuver	287	306	-	281	301	-	-	-	-	-	-	-
Stage 1	674	630	-	573	559	-	-	-	-	-	-	-
Stage 2	563	559	-	637	619	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	17.8	13.8	0	0.3
HCM LOS	C	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1226	-	-	343	426	1090	-	-
HCM Lane V/C Ratio	0.002	-	-	0.18	0.036	0.013	-	-
HCM Control Delay (s)	7.9	0	-	17.8	13.8	8.3	0	-
HCM Lane LOS	A	A	-	C	B	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0.6	0.1	0	-	-

Intersection: 1: Dorr Rd/Glen Echo Dr & Grand River Rd

Movement	EB	EB	EB	EB	WB	WB	WB	NB	NB	SB
Directions Served	L	T	T	R	L	T	TR	LT	R	LTR
Maximum Queue (ft)	6	184	188	44	164	200	214	231	116	25
Average Queue (ft)	0	89	92	10	57	71	84	118	49	2
95th Queue (ft)	3	163	170	30	119	159	172	198	89	12
Link Distance (ft)		4462	4462			629	629	1428		263
Upstream Blk Time (%)										
Queuing Penalty (veh)										
Storage Bay Dist (ft)	200			230	200				410	
Storage Blk Time (%)		0			0	0				
Queuing Penalty (veh)		0			0	0				

Intersection: 2: Grand River Rd & Hughes Rd

Movement	EB	EB	EB	WB	WB	WB	NB	NB	SB
Directions Served	L	T	TR	L	T	TR	L	TR	LTR
Maximum Queue (ft)	167	155	136	46	199	212	52	46	160
Average Queue (ft)	70	22	37	14	82	92	12	13	76
95th Queue (ft)	144	85	98	38	171	189	38	40	128
Link Distance (ft)		629	629		3174	3174		389	1201
Upstream Blk Time (%)									
Queuing Penalty (veh)									
Storage Bay Dist (ft)	200			200			100		
Storage Blk Time (%)	1				0				
Queuing Penalty (veh)	5				0				

Intersection: 3: Dorr Rd & Sterling Dr

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (ft)	68	35	19	37
Average Queue (ft)	23	10	1	4
95th Queue (ft)	54	34	14	20
Link Distance (ft)	1066	401	1645	1428
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Network Summary

Network wide Queuing Penalty: 5

EXHIBIT D

SOILS INVESTIGATION REPORT

SOILS INVESTIGATION
PROPOSED RESIDENTIAL DEVELOPMENT
GRAND RIVER AVENUE AND DORR ROAD
GENOA TOWNSHIP, MICHIGAN

GRAND RIVER DORR LLC
31550 NORTHWESTERN HIGHWAY
SUITE 220
FARMINGTON HILLS, MICHIGAN 48334

OCTOBER 26, 2022
BY
McDOWELL & ASSOCIATES

McDowell & Associates
Geotechnical, Environmental & Hydrogeological Services • Materials Testing & Inspection
21355 Hatcher Avenue • Ferndale, MI 48220
Phone: (248) 399-2066 • Fax: (248) 399-2157
www.mcdowasc.com

October 26, 2022

Grand River Dorr LLC
31550 Northwestern Highway
Suite 220
Farmington Hills, Michigan 48334

Job No. 22-173

Attention: Mr. Don Cucco

Subject: Soils Investigation
Proposed Residential Development
Grand River Avenue and Dorr Road
Genoa Township, Michigan

Dear Mr. Cucco:

In accordance with your request, we have made a Soils Investigation at the subject project. We had previously made a Soils Investigation at this site in 2004, and due to the changes of the site plan and building locations you requested further investigation. The results of the previous investigation can be found in a report dated September 28, 2004 (M&A Job No. 04-407).

Field Work and Laboratory Testing

Nine Soil Test Borings, designated as A through G, I and J, were performed at the subject property at the approximate locations shown on the Soil Boring Location Plan which accompanies this report. The boring locations were selected by you and field located by others. The borings were advanced to depths ranging from about fifteen feet (15') to twenty feet (20') below the existing ground surface at the boring locations.

Soil descriptions, groundwater observations and the results of field and laboratory tests are to be found on the accompanying Logs of Soil Test Borings and summary sheet of Sieve Analysis results.

The borings encountered about six inches (6") to one foot six inches (1'6") of surficial topsoil/fill and possible fill, which consisted of topsoil, sand, silt and vegetation. Borings B through D, F, I and J were underlain by natural soil and stiff to extremely stiff brown silty clay to depths ranging from nine feet (9') to fourteen feet (14'), underlain by compact to extremely compact fine to medium sand to the termination of the deepest boring at twenty feet six inches (20'6"). Boring D has an interbedded medium compact sand pocket. At Borings A and E, the topsoil was underlain by a very compact sand layer to depths ranging from one foot one inch (1'1") to three feet six inches (3'6") below the ground surface, underlain by soft to extremely stiff silty sandy clay, underlain by compact to very compact fine to medium sand to the termination depth of the borings at fifteen feet six inches (15'6").

Soil descriptions and depths shown on the boring logs are approximate indications of change from one soil type to another and are not intended to represent an area of exact geologic change or stratification.

Groundwater was encountered in the borings at initial depths ranging from four feet four inches (4'4") to nineteen feet six inches (19'6") below the existing ground surface. No water was found in Borings E and I. The groundwater levels were measured upon completion of drilling in Boring A at a depth of fifteen feet (15') below the existing ground surface. The rest of the borings were dry. It should be noted that short-term groundwater observations may not provide a reliable indication of the depth of the water table. In clay or clayey soils, this is due to the slow rate of infiltration of water into the borehole as well as the potential for water to become trapped in overlying layers of granular soils during periods of heavy rainfall. Water levels in granular soils fluctuate with seasonal and climatic changes as well as the amount of rainfall in the area immediately prior to the measurements. It should be expected that groundwater fluctuations could occur on a seasonal basis and that seams of water-bearing sands or silts could be found within the various clay strata at the site.

Standard Penetration Tests (SPTs) made during the sampling operation indicate that the soils have poor to very good strengths and densities. At the tests in the native soils, penetration indices ranged from 4 to 36 blows per foot. All SPTs were performed with a rope and cathead safety hammer.

Project Description

It is understood that you are proposing to construct a residential development with one- to two-story, slab-on-grade multi-family structures at the subject property. It is anticipated that the structures will transmit relatively light loads to the supporting soils.

Foundation Recommendations

Based on the project information provided and the results of field and laboratory tests, the indications are that the structure could be supported by conventional spread or strip footings. All exterior footings should be constructed at, or below, a minimum frost penetration depth of three feet six inches (3'6") below finished grade. All interior and exterior load-bearing footings should extend through non-engineered fill soils (if any), soils containing significant amounts of organic substances or excessively weak soils. All strip footings should be continuously reinforced in order to minimize any noticeable effects of differential settlement.

Footings constructed at the following boring locations could be proportioned for the design soil pressures shown below, provided this results in the footings bearing on native, non-organic soils:

Boring	Depth			Soil Pressure (psf)
A	1'6"	to	3'6"	4,000
	3'6"	to	8'0"	2,000
B	1'6"	to	5'0"	4,000
	5'0"	to	8'0"	3,500
C	1'6"	to	3'6"	4,000
	3'6"	to	8'0"	1,500

Boring	Depth			Soil Pressure (psf)
D	1'6"	to	3'0"	4,000
	3'0"	to	8'0"	2,000*
E	1'6"	to	3'0"	4,000
	3'0"	to	8'0"	1,500
F	1'6"	to	4'0"	3,500
	4'0"	to	8'0"	2,500
G	1'6"	to	6'0"	4,000
	6'0"	to	8'0"	3,000
I	1'6"	to	3'6"	4,000
	3'6"	to	8'0"	3,000
J	1'6"	to	8'0"	4,000

*Where sand type soils are overlying clay soils, it is suggested that footing inverts be at least one foot (1') above the top of clay. If this is not possible, it is suggested that the footings extend down to the underlying clay.

Based on the above chart, it appears that lower strength soils may be encountered in Borings C, D and E between the depth of three feet six inches (3'6") and eight feet (8'), which may necessitate slightly larger than normal footing sizes. Higher design soil pressures are available at various depths in the borings and could be detailed, if desired.

Groundwater Considerations

Groundwater was encountered in the borings at initial depths ranging from four feet four inches (4'4") to nineteen feet six inches (19'6") below the existing ground surface. No water was found in Borings E and I. The groundwater levels were measured upon completion of drilling in Boring A at a depth of fifteen feet (15') below the existing ground surface. The rest of the borings were dry. Seepage from wet sand seams (if encountered) should be manageable with construction pumping and sumps. However, this is not known for certain. If large volumes of water or saturated granular soils are encountered, special dewatering techniques may be required. Care must be taken to minimize the removal of soil fines during any pumping operations. If standing water remains on the clay-type footing invert soils for an extended period of time, it may result in a couple inches of "slop" material at the footing invert. This material should be removed prior to the placement of concrete.

Floor Slabs

With the exception of some surficial topsoil, the soil subgrade appears reasonably suitable for floor slab support. Any surficial topsoil or other obviously objectionable material should be removed and the subgrade thoroughly proof-compacted. If, during the proof-compaction operation, areas are found where the soils yield excessively, the yielding materials should be scarified, dried and recompacted or removed and replaced with engineered fill. Where fill or backfill is required to raise

the subgrade for concrete floors or backfill utility trenches, it is suggested that clean, well-graded granular soils be used. If clay material is utilized, it should be placed within 3% of its optimum moisture content. The fill should be deposited in horizontal lifts not to exceed nine inches (9") in thickness with each lift being compacted uniformly to a minimum density of 95% of its maximum value as determined by the Modified Proctor Test (ASTM D-1557).

Fill soils were encountered in borings up to a depth of one foot six inches (1'6"). If the possibility of more than normal differential settlement can be tolerated, slab-on-grade floors or floor-supporting backfill could be placed at, or near, the present grade in the vicinity of these borings. Any topsoil or other obviously objectionable material should be removed and the subgrade thoroughly proof-compacted. If, during the proof-compaction operation, areas are found where the soils yield excessively, the yielding materials should be scarified, dried and recompacted or removed and replaced with engineered fill.

If the possibility of more than normal differential movement cannot be tolerated, then all existing fill soils should be removed and replaced with engineered fill meeting the requirements outlined above, or the floor slab should be structurally supported.

If any existing structures are found, they should be entirely removed from the proposed building area. Buried utilities should be removed or grouted in place. Resulting excavations should be backfilled with engineered fill meeting the requirements outlined above.

To minimize capillary action under floor slabs, we suggest placing at least four inches (4") of clean material on the subgrade followed by a suitable plastic vapor barrier between the clean material and the concrete slab. The clean material could consist of pea stone, MDOT Class I sand, 2NS sand or 6AA crushed stone.

Closing

Experience indicates that actual subsurface conditions at the site could vary from those found at the nine test borings made at specific locations. It is, therefore, essential that McDowell & Associates be notified of any variation of soil conditions to determine their effects on the recommendations presented in this report. The evaluations and recommendations presented in this report have been formulated on the basis of reported or assumed data relating to the proposed project. Any significant change in the final design plans should be brought to our attention for review and evaluation with respect to the prevailing subsoil conditions.

It is recommended that the services of McDowell & Associates be engaged to observe the soils in the footing excavations prior to concreting in order to test the soils for the required bearing capacities. Testing should also be performed to check that suitable materials are being used for controlled fills and that they are properly placed and compacted.

If we can be of any further service, please feel free to call.

Very truly yours,

McDOWELL & ASSOCIATES

Tony (Antoine) Merheb, M.S., P.E.
Senior Geotechnical Engineer

Robert McDowell, M.S., P.E.
CEO McDowell & Associates

TM/

McDOWELL & ASSOCIATES
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LOG OF SOIL BORING NO. A

PROJECT Soils Investigation – Proposed Residential Development

JOB NO. 22-173

LOCATION Grand River Avenue and Dorr Road

SURFACE ELEV. 979.1 DATE 10-12-22

Genoa Township, Michigan

Sample & Type	Depth	Legend	SOIL DESCRIPTION	Penetration Blows for 6"	Moisture %	Natural Wt. P.C.F.	Dry Den Wt. P.C.F.	Unc. Comp. Strength PSF.	Str. %
			0'6" Moist dark brown sandy TOPSOIL with vegetation						
	1								
A	2		Very compact moist brown fine to medium SAND	11					
UL			with traces of clay and pebbles	11	5.7	118			
	3			11					
			3'6"						
	4								
B				9					
UL	5		Extremely stiff moist brown silty CLAY with sand	13	10.8				
			and pebbles	15			*	(9000+)	
	6								
			6'6"						
C	7			4					
UL				4	15.5	131			
	8			3			*	(3000-5500)	
	9								
D				3					
UL	10		Stiff moist brown silty sandy CLAY with trace of	5	16.0	131			
			pebbles	7			*	(2500)	
	11								
	12								
	13								
	14								
			14'0"						
E				6					
UL	15			5					
				5					
	16		Stiff moist brown sandy CLAY with wet brown silty						
			fine sand seams						
	17								
	18								
			18'0"						
	19		Compact wet brown fine to medium SAND with						
F			trace of silt	4					
UL	20			4					
				5					
			20'6"						
	21								
	22								
	23								
	24								
	25								

TYPE OF SAMPLE
D. - DISTURBED
U.L. - UNDIST. LINER
S.T. - SHELBY TUBE
S.S. - SPLIT SPOON
R.C. - ROCK CORE
( ) - PENETROMETER

REMARKS: *Calibrated penetrometer

Standard Penetration Test - Driving 2" OD Sampler 1' With 140# Hammer Falling 30": Count Made at 6" Intervals

GROUND WATER OBSERVATIONS

G.W. ENCOUNTERED AT	7	FT.	8	INS.
G.W. ENCOUNTERED AT	9	FT.	0	INS.
G.W. AFTER COMPLETION	15	FT.	0	INS.
G.W. AFTER HRS.		FT.		INS.
G.W. VOLUMES	Medium			

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LOG OF SOIL BORING NO. B

PROJECT Soils Investigation – Proposed Residential Development

JOB NO. 22-173

LOCATION Grand River Avenue and Dorr Road

SURFACE ELEV. 989.5 DATE 10-12-22

Genoa Township, Michigan

Sample & Type	Depth	Legend	SOIL DESCRIPTION	Penetration Blows for 6"	Moisture %	Natural Wt. P.C.F.	Dry Den Wt. P.C.F.	Unc. Comp. Strength PSF.	Str. %
			0'6" Moist dark brown clayey TOPSOIL with vegetation						
	1		Very stiff moist brown silty CLAY with sand and pebbles						
A	2			6					
UL				9	14.6				
	3		2'6"	14			*	(9000+)	
	4								
B			Extremely stiff moist brown silty CLAY with sand and pebbles	11					
UL	5			12	10.5	134			
				16			*	(9000+)	
	6		6'0"						
C	7			5					
UL				6	11.6	135			
	8			8			*	(9000+)	
	9								
D				8					
UL	10		Stiff moist brown silty CLAY with sand	6	11.7	133			
				5			*	(2000)	
	11								
	12								
	13								
	14		14'0"						
E				11					
UL	15			13					
				16					
	16		Extremely compact moist brown fine to medium SAND with gravel						
	17								
	18		18'0"						
	19								
F			Very compact moist brown fine SAND	11					
UL	20			11					
				11					
	21		20'6"						
	22								
	23								
	24								
	25								

TYPE OF SAMPLE
D. - DISTURBED
U.L. - UNDIST. LINER
S.T. - SHELBY TUBE
S.S. - SPLIT SPOON
R.C. - ROCK CORE
( ) - PENETROMETER

REMARKS: *Calibrated penetrometer

Standard Penetration Test - Driving 2" OD Sampler 1' With 140# Hammer Falling 30": Count Made at 6" Intervals

GROUND WATER OBSERVATIONS

G.W. ENCOUNTERED AT	6	FT.	6	INS.
G.W. ENCOUNTERED AT	9	FT.	0	INS.
G.W. AFTER COMPLETION	Dry	FT.		INS.
G.W. AFTER HRS.		FT.		INS.
G.W. VOLUMES	Light			

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LOG OF SOIL BORING NO. C

PROJECT Soils Investigation – Proposed Residential Development

JOB NO. 22-173

LOCATION Grand River Avenue and Dorr Road

SURFACE ELEV. 979.3 DATE 10-12-22

Genoa Township, Michigan

Sample & Type	Depth	Legend	SOIL DESCRIPTION	Penetration Blows for 6"	Moisture %	Natural Wt. P.C.F.	Dry Den Wt. P.C.F.	Unc. Comp. Strength PSF.	Str. %
	1		Moist discolored brown silty CLAY with sand and pebbles, occasional stones and topsoil streaks, fill						
			1'6"						
A	2			6					
UL				12	14.9				
	3			17			*	(9000+)	
	4		Extremely stiff moist brown silty CLAY with sand and pebbles						
B				10					
UL	5			15	10.8	134			
				17			*	(9000+)	
	6								
			6'6"						
C	7			3					
UL				3	11.2				
	8		Firm moist brown silty sandy CLAY with occasional pebbles	2			*	(2500)	
	9								
			9'0"						
D				6					
UL	10			7	17.6	120			
				9					
	11								
			Compact moist brown sandy SILT						
	12								
	13								
	14								
E				6					
UL	15		14'6"	7					
				7					
	16								
	17		Compact moist brown fine to medium SAND						
	18								
	19								
F			19'6"	7					
UL	20		Compact wet brown fine to medium SAND	7					
				9					
			20'6"						
	21								
	22								
	23								
	24								
	25								

TYPE OF SAMPLE
D. - DISTURBED
U.L. - UNDIST. LINER
S.T. - SHELBY TUBE
S.S. - SPLIT SPOON
R.C. - ROCK CORE
( ) - PENETROMETER

REMARKS: *Calibrated penetrometer

Standard Penetration Test - Driving 2" OD Sampler 1' With 140# Hammer Falling 30": Count Made at 6" Intervals

GROUND WATER OBSERVATIONS

G.W. ENCOUNTERED AT 19 FT. 6 INS.
G.W. ENCOUNTERED AT FT. INS.
G.W. AFTER COMPLETION Dry FT. INS.
G.W. AFTER HRS. FT. INS.
G.W. VOLUMES Light

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LOG OF SOIL BORING NO. D

PROJECT Soils Investigation – Proposed Residential Development

JOB NO. 22-173

LOCATION Grand River Avenue and Dorr Road

SURFACE ELEV. 987.0 DATE 10-13-22

Genoa Township, Michigan

Sample & Type	Depth	Legend	SOIL DESCRIPTION	Penetration Blows for 6"	Moisture %	Natural Wt. P.C.F.	Dry Den Wt. P.C.F.	Unc. Comp. Strength PSF.	Str. %
	1		Moist dark brown sandy clayey TOPSOIL						
			1'0"						
A	2			7					
UL			Oxidized brown silty CLAY with sand and pebbles	11	14.4	127			
	3			16			*	(9000+)	
	4								
			4'0"						
B				10					
UL	5			11	10.9	137			
			Extremely stiff moist brown silty sandy CLAY with occasional pebbles	15			*	(9000+)	
	6								
			6'6"						
C	7			3					
UL			Medium compact moist brown silty fine to medium SAND with gravel and little silt	3	6.2				
	8			4					
	9								
			9'0"						
D				7					
UL	10			9	10.8	130			
				11			*	(3200)	
	11								
	12		Very stiff moist brown silty sandy CLAY with trace of pebbles						
	13								
	14								
			14'0"						
E				22					
UL	15		Extremely compact moist brown silty fine SAND	20					
				14					
			15'6"						
	16								
	17								
	18								
	19								
	20								
	21								
	22								
	23								
	24								
	25								

TYPE OF SAMPLE
D. - DISTURBED
U.L. - UNDIST. LINER
S.T. - SHELBY TUBE
S.S. - SPLIT SPOON
R.C. - ROCK CORE
( ) - PENETROMETER

REMARKS: *Calibrated penetrometer

Standard Penetration Test - Driving 2" OD Sampler 1' With 140# Hammer Falling 30": Count Made at 6" Intervals

GROUND WATER OBSERVATIONS

G.W. ENCOUNTERED AT	6	FT.	6	INS.
G.W. ENCOUNTERED AT	9	FT.	0	INS.
G.W. AFTER COMPLETION	Dry	FT.		INS.
G.W. AFTER HRS.		FT.		INS.
G.W. VOLUMES	Light			

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LOG OF SOIL BORING NO. E

PROJECT Soils Investigation – Proposed Residential Development

JOB NO. 22-173

LOCATION Grand River Avenue and Dorr Road

SURFACE ELEV. 981.0 DATE 10-12-22

Genoa Township, Michigan

Sample & Type	Depth	Legend	SOIL DESCRIPTION	Penetration Blows for 6"	Moisture %	Natural Wt. P.C.F.	Dry Den Wt. P.C.F.	Unc. Comp. Strength PSF.	Str. %
			Moist dark brown sandy TOPSOIL with vegetation						
	1		0'9" Moist brown silty fine SAND						
			1'6"						
A	2			6					
UL				8	13.0	129			
	3		Very stiff moist brown silty sandy CLAY with occasional pebbles	10			*	(9000+)	
	4								
			4'0"						
B				6					
UL	5		Very stiff moist brown silty CLAY with sand and pebbles and occasional stones	9	12.4				
				11			*	(9000+)	
	6								
			6'6"						
C	7			2					
UL				2	11.9				
	8		Soft moist brown silty sandy CLAY with sand and pebbles to clayey fine to medium brown sand	2			*	(3000)	
	9								
			9'0"						
D				9					
UL	10			13	7.4	118			
				12					
	11								
	12								
			Very compact moist brown silty fine to medium SAND with trace of gravel						
	13								
	14								
E				9					
UL	15			10					
			15'6"	11					
	16								
	17								
	18								
	19								
	20								
	21								
	22								
	23								
	24								
	25								

TYPE OF SAMPLE
D. - DISTURBED
U.L. - UNDIST. LINER
S.T. - SHELBY TUBE
S.S. - SPLIT SPOON
R.C. - ROCK CORE
( ) - PENETROMETER

REMARKS: *Calibrated penetrometer

Standard Penetration Test - Driving 2" OD Sampler 1' With 140# Hammer Falling 30": Count Made at 6" Intervals

GROUND WATER OBSERVATIONS

G.W. ENCOUNTERED AT FT. INS.
G.W. ENCOUNTERED AT FT. INS.
G.W. AFTER COMPLETION FT. INS.
G.W. AFTER HRS. FT. INS.
G.W. VOLUMES None

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LOG OF SOIL BORING NO. F

PROJECT Soils Investigation – Proposed Residential Development

JOB NO. 22-173

LOCATION Grand River Avenue and Dorr Road

SURFACE ELEV. 981.3 DATE 10-12-22

Genoa Township, Michigan

Sample & Type	Depth	Legend	SOIL DESCRIPTION	Penetration Blows for 6"	Moisture %	Natural Wt. P.C.F.	Dry Den Wt. P.C.F.	Unc. Comp. Strength PSF.	Str. %
			0'3" Moist dark brown sandy TOPSOIL with traces of clay and vegetation						
	1								
			1'6" Moist dark brown clayey TOPSOIL with sand and pebbles						
A	2			7					
UL				9	13.7				
	3		Very stiff moist brown silty CLAY with sand and pebbles and occasional stones	13			*	(9000+)	
	4		3'6"						
B				3					
UL	5			5	13.3	129			
				7			*	(5000-9000+)	
	6								
C	7			4					
UL				4	12.3	132			
	8			5			*	(2000)	
			Stiff moist brown silty sandy CLAY with trace of pebbles						
	9								
D				5					
UL	10			6	12.2	134			
				6			*	(2500)	
	11								
	12								
	13								
			13'0"						
	14		Compact very moist brown clayey SAND with trace of gravel and moist to wet brown fine sand seams						
E				3					
UL	15			5					
				9					
			15'6"						
	16								
	17								
	18								
	19								
	20								
	21								
	22								
	23								
	24								
	25								

TYPE OF SAMPLE
D. - DISTURBED
U.L. - UNDIST. LINER
S.T. - SHELBY TUBE
S.S. - SPLIT SPOON
R.C. - ROCK CORE
( ) - PENETROMETER

REMARKS: *Calibrated penetrometer

Standard Penetration Test - Driving 2" OD Sampler 1' With 140# Hammer Falling 30": Count Made at 6" Intervals

GROUND WATER OBSERVATIONS

G.W. ENCOUNTERED AT	4	FT.	0	INS.
G.W. ENCOUNTERED AT	6	FT.	6	INS.
G.W. AFTER COMPLETION	Dry	FT.		INS.
G.W. AFTER	HRS.	FT.		INS.
G.W. VOLUMES	Medium – Light			

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LOG OF SOIL BORING NO. G

PROJECT Soils Investigation – Proposed Residential Development

JOB NO. 22-173

LOCATION Grand River Avenue and Dorr Road

SURFACE ELEV. 986.9 DATE 10-12-22

Genoa Township, Michigan

Sample & Type	Depth	Legend	SOIL DESCRIPTION	Penetration Blows for 6"	Moisture %	Natural Wt. P.C.F.	Dry Den Wt. P.C.F.	Unc. Comp. Strength PSF.	Str. %
			0'6" Moist dark brown sandy TOPSOIL with vegetation						
	1		and trace of clay						
			1'1"						
			Moist brown silty fine SAND						
A	2			5					
UL				9	13.3	133			
	3			12			*	(9000+)	
	4		Extremely stiff moist brown silty sandy CLAY with						
B			trace of pebbles	9					
UL	5			14	10.7	136			
				18			*	(9000+)	
	6								
			6'6"						
C	7			6					
UL			Stiff moist brown silty CLAY with sand and pebbles	6	14.6	128			
	8		and moist brown sand seams	9			*	(7500)	
			8'6"						
	9								
D				3					
UL	10			5	15.1	135			
				6			*	(2700)	
	11		Stiff moist brown silty sandy CLAY						
	12								
			12'6"						
	13								
	14		Very compact moist brown silty fine SAND						
E				8					
UL	15			9					
				12					
			15'6"						
	16								
	17								
	18								
	19								
	20								
	21								
	22								
	23								
	24								
	25								

TYPE OF SAMPLE
D. - DISTURBED
U.L. - UNDIST. LINER
S.T. - SHELBY TUBE
S.S. - SPLIT SPOON
R.C. - ROCK CORE
( ) - PENETROMETER

REMARKS: *Calibrated penetrometer

Standard Penetration Test - Driving 2" OD Sampler 1' With 140# Hammer Falling 30": Count Made at 6" Intervals

GROUND WATER OBSERVATIONS

G.W. ENCOUNTERED AT	9	FT.	0	INS.
G.W. ENCOUNTERED AT		FT.		INS.
G.W. AFTER COMPLETION	Dry	FT.		INS.
G.W. AFTER HRS.		FT.		INS.
G.W. VOLUMES	Light			

McDOWELL & ASSOCIATES
Geotechnical, Environmental, & Hydrogeologic Services
21355 Hatcher Avenue • Ferndale, MI 48220
Phone: (248) 399-2066 • Fax: (248) 399-2157

LOG OF SOIL BORING NO. 1

PROJECT Soils Investigation – Proposed Residential Development

JOB NO. 22-173

LOCATION Grand River Avenue and Dorr Road

SURFACE ELEV. 983.4 DATE 10-13-22

Genoa Township, Michigan

Sample & Type	Depth	Legend	SOIL DESCRIPTION	Penetration Blows for 6"	Moisture %	Natural Wt. P.C.F.	Dry Den Wt. P.C.F.	Unc. Comp. Strength PSF.	Str. %
			0'6" Moist dark brown clayey TOPSOIL with sand,						
	1		pebbles, vegetation and stones						
A	2		Extremely stiff moist brown silty sandy CLAY with	8					
UL			trace of pebbles	13	13.1				
	3			15			*	(9000+)	
			3'6"						
	4								
B				9					
UL	5		Stiff moist brown silty sandy CLAY with lenses of	9	7.6	117			
			sand and trace of pebbles	8			*	(9000+)	
	6								
			6'6"						
C	7			6					
UL				6	9.9	135			
	8		Stiff moist brown silty sandy CLAY with streaks of	7			*	(3500)	
			sand						
	9		9'0"						
D				11					
UL	10			12	6.8	117			
				12					
	11								
			Very compact moist brown fine to medium SAND						
	12		with little silt and trace of gravel						
	13								
	14		14'0"						
E				12					
UL	15			11					
				16					
	16								
	17		Extremely compact moist brown fine to medium						
			SAND						
	18								
	19								
F				10					
UL	20			12					
				14					
	21		20'6"						
	22								
	23								
	24								
	25								

TYPE OF SAMPLE
D. - DISTURBED
U.L. - UNDIST. LINER
S.T. - SHELBY TUBE
S.S. - SPLIT SPOON
R.C. - ROCK CORE
( ) - PENETROMETER

REMARKS: *Calibrated penetrometer

Standard Penetration Test - Driving 2" OD Sampler 1' With 140# Hammer Falling 30": Count Made at 6" Intervals

GROUND WATER OBSERVATIONS

G.W. ENCOUNTERED AT FT. INS.
G.W. ENCOUNTERED AT FT. INS.
G.W. AFTER COMPLETION FT. INS.
G.W. AFTER HRS. FT. INS.
G.W. VOLUMES None

McDOWELL & ASSOCIATES
Geotechnical, Environmental, & Hydrogeologic Services
21355 Hatcher Avenue • Ferndale, MI 48220
Phone: (248) 399-2066 • Fax: (248) 399-2157

LOG OF SOIL BORING NO. J

PROJECT Soils Investigation – Proposed Residential Development

JOB NO. 22-173

LOCATION Grand River Avenue and Dorr Road

SURFACE ELEV. 988.5 DATE 10-12-22

Genoa Township, Michigan

Sample & Type	Depth	Legend	SOIL DESCRIPTION	Penetration Blows for 6"	Moisture %	Natural Wt. P.C.F.	Dry Den Wt. P.C.F.	Unc. Comp. Strength PSF.	Str. %
			0'6" Moist dark brown clayey TOPSOIL with sand, pebbles and vegetation, fill						
	1								
			1'6" Moist brown and dark brown sandy CLAY with topsoil, possible fill						
A	2			7					
UL				9	11.8				
	3			12			*	(9000+)	
	4		Very stiff moist brown silty CLAY with sand and pebbles						
B				6					
UL	5			9	10.6	133			
				11			*	(9000+)	
	6		6'0"						
C	7			8					
UL			Very stiff moist brown silty sandy CLAY	10	11.1	137			
	8			9			*	(2500)	
			8'6"						
	9								
D				9					
UL	10			8	11.0	140			
				12			*	(3500)	
	11		Very stiff moist brown silty sandy CLAY with occasional pebbles						
	12								
	13								
			13'0" Extremely compact moist brown fine to medium SAND with gravel						
	14		14'0"						
E				15					
UL	15			17					
				19					
	16								
	17								
			Extremely compact moist brown fine SAND						
	18								
	19								
F				12					
UL	20			14					
				14					
	21		20'6"						
	22								
	23								
	24								
	25								

TYPE OF SAMPLE
D. - DISTURBED
U.L. - UNDIST. LINER
S.T. - SHELBY TUBE
S.S. - SPLIT SPOON
R.C. - ROCK CORE
( ) - PENETROMETER

REMARKS: *Calibrated penetrometer

Standard Penetration Test - Driving 2" OD Sampler 1' With 140# Hammer Falling 30": Count Made at 6" Intervals

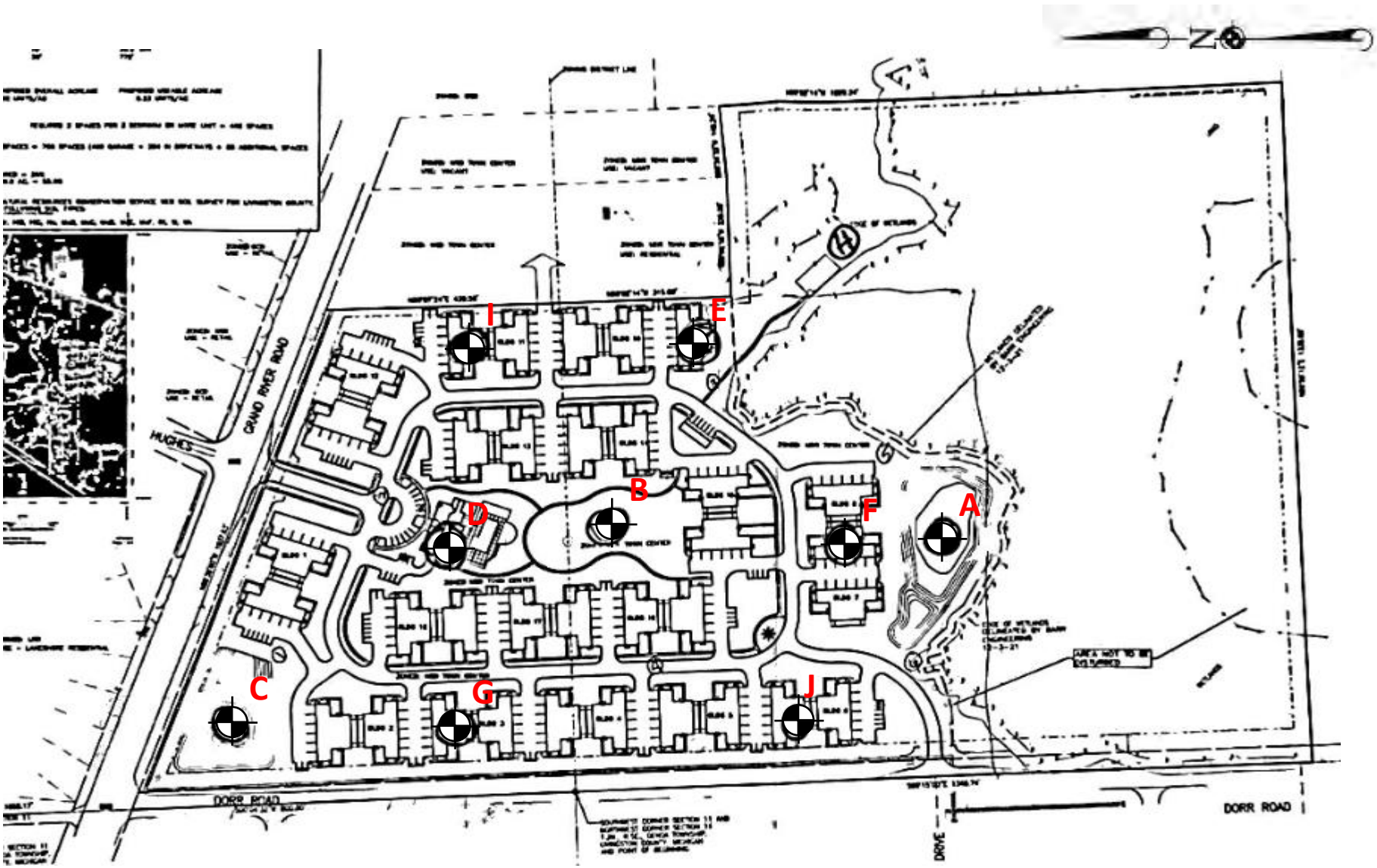
GROUND WATER OBSERVATIONS

G.W. ENCOUNTERED AT 9 FT. 0 INS.
G.W. ENCOUNTERED AT FT. INS.
G.W. AFTER COMPLETION Dry FT. INS.
G.W. AFTER HRS. FT. INS.
G.W. VOLUMES Light

Job No. 22-173

SIEVE ANALYSIS SUMMARY

Boring	Sample	% Passing #4 Sieve	% Passing #10 Sieve	% Passing #40 Sieve	% Passing #100 Sieve	% Passing #200 Sieve
C	D	100.0	99.7	98.1	85.2	60.7
D	C	79.5	69.3	51.8	23.0	15.8
E	D	98.0	95.4	83.2	43.2	27.8
I	D	89.0	77.4	52.2	24.6	17.9



Note: Base drawing prepared by others.

LEGEND

Soil Boring Locations, A through G, I and J:
Drilled by McDowell & Associates

McDowell & Associates
21355 Hatcher Avenue
Ferndale, Michigan 48220
Phone: (248) 399-2066
Fax: (248) 399-2157

Soil Boring & Test Pit Location Plan

Job No. 22-173 [186]

EXHIBIT E

INFILTRATION TESTING REPORT

PEA GROUP

844.813.2949
PEAGROUP.COM

September 22, 2022
PEA Project No: 2021-0578

via email: dcucco@mshapirorealestate.com

Mr. Don Cucco
M. Shapiro Real Estate Group
31550 Northwestern Highway
Farmington Hills, Michigan 48334

RE: Infiltration Testing
The Legacy Park Apartment Homes
SE Corner of Grand River Ave. & Dorr Road
Genoa Township, Livingston County, MI

PEA Group is pleased to submit this summary of our field infiltration testing at the above referenced project site. Eight test pits designated A-1 through D-2 were excavated during the site visit on September 8, 2022. Test pits were excavated to depths approved by Livingston County and ranged from 4 to 14.5 below the ground surface (bgs.). Guidelines require 3 feet of clearance between the test depth and the groundwater surface or clay layer. Upon inspection of the excavated test pits, and completion of infiltration testing, the test pits were backfilled with the excavated soil.

It is our understanding that M. Shapiro Real Estate Group proposes to construct 18 apartment homes, a clubhouse and pool, and detention basins on the property located at the southeast corner of Grand River Avenue and Dorr Road. Test locations A-1, A-2, D-1, and D-2 were performed in proposed detention basins, and locations C-1, B-2, C-1, and C-2 were performed in proposed greenspace areas in the central and southern portions of the site. Please refer to the test location diagram attached to this report for test locations and existing site features.

At the test locations we generally encountered 4 to 10 inches of silty topsoil overlying clays with varying amounts of silt, sand, and gravel. Granular sand soils were encountered at test location A-1 from 11.5 feet to termination depth of 14.5 feet bgs; at location B-1 beneath the topsoil to a termination depth of 7 feet bgs; and at location B-2 beneath the topsoil to a depth of 3 feet bgs. Infiltration testing was performed at locations A-1 and B-1 within the sand at depths of 11.5 feet and 3.5 feet, respectively. At location B-2 infiltration testing was not performed due to clay encountered at 3 feet bgs. to termination depth of 6 feet bgs.

Infiltration testing was performed using a double ring infiltrometer and the procedure outlined in the Livingston County Drain Commissioner Procedures and Design Criteria for Stormwater Management Systems at test locations A-1 and B-1 at the depths outlined above. At the test locations we embedded the double ring infiltrometer apparatus into the native granular soil. We made sure the apparatus was embedded with a good seal. We then filled both rings of the apparatus with clean water and presoaked each location in accordance with Livingston County Drain Commissioner Guidelines. After the presoak, the apparatus was filled water again and the water level was measured with a tape to the nearest 1/16” in 2 to 4 minute intervals for the infiltration test. We performed three trials at each location. The results of each trial were tabulated on data sheets. The infiltration rate over the last trial was used to calculate the

unfactored infiltration rate. We applied appropriate safety factors to the unfactored results to obtain our recommended infiltration rate at each location. For the purposes of site suitability, Livingston County Drain Commission allows areas with tested soil infiltration rates as low as 0.1 inches per hour to be used for infiltration BMPs. However, in the design of these BMPs and the sizing of the BMP, the designer should incorporate a safety factor. The Livingston Drain Commission Procedures and Design Criteria for Stormwater Management Systems indicates a safety factor of two (2) must be used in the design of stormwater infiltration systems.

At location A-1, after applying the appropriate safety factor, we recommend an infiltration rate of 1 in./hr. within the sand at a depth of 11.5 feet bgs. At location B-1, after applying the appropriate safety factor, we recommend an infiltration rate of 2 in./hr. within the sand at a depth of 3.5 feet bgs.

If you have any questions regarding this report, or if we may be of further assistance to you in any respect, please feel free to contact us. We appreciate the opportunity to have been of service to you.

Sincerely,

PEA Group

Kevin Bennett
Geotechnical Staff Engineer

D. Jack Sattelmeier, PE
Director of Geotechnical Engineering

Attachments: Log of Test Pit
Location Plan

PEA GROUP

LOG OF TEST PIT

PEA GROUP JOB NO: 2021-0578

PEA GROUP PROJECT NAME: Lautrec Genoa Township

TEST PIT #	ELEV. (Feet)	DEPTH (Feet)	DESCRIPTION	REMARKS
A1	979.5	0” – 5” 5” – 11’ 11.5’ – 14.5’	TOPSOIL: Dark Brown Silty Sand Brown SANDY CLAY, Some Silt, Trace Gravel Brown SILTY SAND, Trace to Little Clay	Infiltration test performed At 11.5’
A2	977.5	0” – 4” 4” – 10’	TOPSOIL: Dark Brown Silty Sand Brown SANDY CLAY, Some Silt, Trace to Little Gravel	No infiltration test Performed due to clay
B1	989.5	0” – 10” 10” – 7’	TOPSOIL: Dark Brown Silty Sand Brown SILTY SAND	Infiltration test performed At 3.5’
B2	989.5	0” – 4” 4” – 3’ 3’ – 6’	TOPSOIL: Dark Brown Silty Sand Brown SILTY SAND Brown SANDY CLAY, Some Silt	No infiltration test Performed due to clay
C1	987.5	0” – 5” 5” – 5’ 5’ – 7’	TOPSOIL: Dark Brown Silty Sand Brown SANDY CLAY, Little Silt Gray SILTY CLAY, Little Sand	No infiltration test Performed due to clay
C2	984.0	0” – 5” 5” – 5’	TOPSOIL: Dark Brown Silty Sand Brown SANDY CLAY, Some Silt, Trace Gravel	No infiltration test Performed due to clay
D1	978.5	0” – 4” 4” – 3.5’ 3.5’ – 4’	TOPSOIL: Dark Brown Silty Sand FILL: Brown Sandy Clay FILL: Crushed Limestone	No infiltration test Performed. Stopped Digging at 4’ due to possible unmarked underground utility trench`
D2	977.5	0” – 6” 6” – 6’	TOPSOIL: Dark Brown Silty Sand Brown SANDY CLAY, Some Silt, Trace Gravel	No infiltration test Performed. Due to clay

NOTES:

BY:KB	DATE: 9/20/2022	FIGURE:1

Infiltration Test Pit Number	Existing Ground Elevation (EG)	Proposed Ground Elevation (PG)	Infiltration Test Elevation (ITE)	Cut From EG to ITE	Minimum Test Pit Excavation Elevation (See Note)
A1	979.5	971.0	968.0	11.5	966.0
A2	977.5	971.0	968.0	9.5	966.0
B1	989.5	989.0	986.0	3.5	984.0
B2	989.5	987.5	984.5	5.0	982.5
C1	987.5	985.0	982.0	5.5	980.0
C2	984.0	985.0	982.0	2.0	980.0
D1	978.5	975.0	972.0	6.5	970.0
D2	977.5	975.0	972.0	5.5	970.0

Adjacent Relevant Elevations
Edge of Wetland: 974 +/-

SOIL INVESTIGATION LEGEND:

PROPOSED TEST PIT LOCATION — TP–X

SOIL INVESTIGATION

PER THE US DEPARTMENT OF AGRICULTURE SOIL CONSERVATION SERVICE SOILS MAP FOR LIVINGSTON COUNTY, SITE SOILS CONSIST OF:

MoC – WAWASEE LOAM, 2–6% SLOPES
MoB – WAWASEE LOAM, 6–12% SLOPES

LEGEND:

- CONCRETE PAVEMENT (STD DUTY / HEAVY DUTY / R.O.W. ONLY)
- ASPHALT PAVEMENT (STD DUTY / HEAVY DUTY / DEEP STRENGTH)
- GRAVEL
- WETLAND
- CONCRETE CURB AND GUTTER
- REVERSE GUTTER PAN
- SETBACK LINE
- SIGN
- LIGHTPOLE
- FENCE
- GUARD RAIL

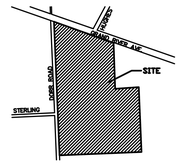
PEA GROUP
t: 844.813.2949
www.peagroup.com

NORTH

0 50 100 200
SCALE: 1" = 100'

811 Know what's below. Call before you dig.

CAUTION!!
THE LOCATIONS AND ELEVATIONS OF EXISTING UNDERGROUND UTILITIES AS SHOWN ON THIS DRAWING ARE ONLY APPROXIMATE. NO GUARANTEE IS EITHER EXPRESSED OR IMPLIED AS TO THE COMPLETENESS OR ACCURACY THEREOF. THE CONTRACTOR SHALL BE EXCLUSIVELY RESPONSIBLE FOR VERIFYING THE LOCATIONS, ELEVATIONS AND ELEVATIONS PRIOR TO THE START OF CONSTRUCTION.



CLIENT

GRAND RIVER DORR LLC.
315550 NORTHWESTERN HIGHWAY
FARMINGTON HILLS, MI 48334

PROJECT TITLE

THE LEGACY APARTMENT HOMES
6080 W GRAND RIVER
GENOA TOWNSHIP, LIVINGSTON COUNTY, MICHIGAN

REVISIONS
REVISED PER TWP COMMENTS 6.23.22

ORIGINAL ISSUE DATE:
MAY 24, 2022

DRAWING TITLE

INFILTRATION TESTING

PEA JOB NO.	2021-0578
P.M.	JEC
DN.	JMR
DES.	JMR

DRAWING NUMBER:

IT-1

NOT FOR CONSTRUCTION

S:\PROJECTS\2021\2021-0578\LAU\REC - GENOA TOWNSHIP\DWG\CONCEPTUAL\Infiltration Test.dwg

EXHIBIT F

WETLAND REPORT

resourceful. naturally.
engineering and environmental consultants

BARR

January 25, 2022

Mr. Mark Kassab
M. Shapiro Real Estate Group
31550 Northwestern Highway, Suite 220
Farmington Hills, MI 48334

Re: Wetland Delineation Report – Grand River and Dorr, Genoa Township

Dear Mr. Kassab:

At your request, Barr Engineering Co. (Barr) conducted a wetland delineation at the above-referenced site. The purpose of this wetland delineation report is to summarize the results of the wetland delineation conducted on December 3, 2021.

1.0 Area of Investigation Description

The Area of Investigation (AOI) includes parcel numbers 4711-11-300-014 and 4711-17-100-002, located in Genoa Township of Livingston County. Surrounding land uses and cover types include residential, forest, and agriculture. The dominant land uses and cover types within the AOI consist of crops, forested areas, and scrub-shrub and open water wetlands.

1.1 Desktop Review

Barr conducted a desktop review of the site to evaluate aerial imagery, topography, soil types, and mapped wetlands within the AOI prior to the wetland delineation. As part of the desktop review, Barr staff reviewed resources such as the Natural Resources Conservation Service (NRCS) Web Soil Survey (WSS; Figure 1), National Wetland Inventory (NWI; Figure 2), and aerial photography.

1.2 Methodology

The wetland delineation was conducted in a manner consistent with the *Corps of Engineers Wetlands Delineation Manual* (USACE 1987) and the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Northcentral and Northeast Region (Version 2.0,* USACE 2012*)*. The wetland delineation procedures outlined in these manuals require the evaluation of on-site vegetation, soils, and hydrologic characteristics. Site observations are described in the sections below.

The wetland boundaries were flagged in the field with alpha-numerical labeled pink flagging tape. Flagging was located using traditional survey methods by PEA.

1.3 Results

The AOI includes emergent (PEM) and scrub-shrub (PSS) wetland habitats. Figure 3 depicts the approximate location of the wetland areas encountered on site and the attached U.S. Army Corps of Engineers (USACE) wetland data forms provide additional detail relative to the wetlands and the boundaries we have flagged.

Vegetation, Soil, and Hydrology

Wetland A and Wetland B

Both Wetland A and Wetland B consist of PEM/PSS habitat types and have similar plant species compositions. Wetland A is located along the southern end of the AOI and is identified by flags A1-A92. Wetland B is located on the eastern side of the property and is identified by flags B1-B19. The vegetation identified within these wetlands includes species such as silver maple (*A. saccharinum*), eastern cottonwood (*Populus deltoides*), Button Bush (Cephalanthus occientalis), silky dogwood (*Cornus racemose*), multiflora rose (*Rosa multiflora*), sensitive fern (*Onoclea sensibilis*), and reed canary grass (*Phalaris arundinacea*). Both primary and secondary wetland hydrology indicators were identified within the wetlands. The soils are described in the Web Soil Survey as Rifle muck, 0 percent slopes (very poorly drained) and Carlisle muck, 0 to 2 percent slopes (very poorly drained). The soils evaluated within the wetland were consistent with these descriptions, as they appeared to be very poorly drained, displaying hydric characteristics.

In contrast, the adjacent upland areas included species such as black cherry (*Prunus serotina*), bur oak (*Quercus marcrocarpa*), red oak (*Quercus rubra*), common prickly ash (*Zanthoxylum Americanum*), multiflora rosa (Rosa muliflora), and riverbank grape (Vitis Riparia) with no observed evidence of wetland hydrology or soils.

1.4 Conclusions

Based on observations of topography, vegetation, soil, and indicators of hydrology, Barr has determined that wetland habitat is present within the AOI. These wetland areas were identified as PEM, and PSS habitat types. According to Part 303, Wetlands Protection, of the Michigan Natural Resources and Environmental Protection Act, 1994 PA 451, as amended, wetlands regulated by the State of Michigan include wetlands that are:

1. Located within 500 feet of, or having a direct surface water connection to, an inland lake, pond, river, or stream; or
2. Greater than 5 acres in size; or
3. Located within 1,000 feet of, or having a direct surface water connection to, the Great Lakes or Lake St. Clair; or
4. A water of the United States as that term is used in section 502(7) of the Federal Water Pollution Control Act, 33 USC 1362; or
5. Known to have a documented presence of an endangered or threatened species under Part 365 of State of Michigan 1994 PA 451, as amended or the Federal Endangered Species Act of 1973, Public Law 93-205; or
6. Rare or imperiled.

Wetland A appears to be regulated under Part 303, as it is greater than 5 acres in size. Wetland B appears to be regulated under Part 303 as it appears to be located within 500 feet of a stream which occurs off-site, to the east. Therefore, a Part 303 permit would be required from the Michigan Department of Environment, Great Lakes, and Energy ("EGLE") in most instances to place fill, remove soil, drain surface water from, or make use of these wetlands.

Please be advised that EGLE has regulatory authority regarding the wetland boundary location(s) and jurisdictional status of wetlands in the State of Michigan. Barr's wetland determination was performed in general accordance with accepted procedures for conducting wetland determinations in Michigan. Barr provides no warranty, guarantee, or other agreement in respect to the period of time for which this wetland determination will remain valid. Barr's conclusions reflect our professional opinion based on the site conditions within the AOI observed during the site visits. Discrepancies may arise between current and future wetland determinations and delineations due to changes in vegetation and/or hydrology as the result of land use practices or other environmental factors, whether on-site or on adjacent or nearby properties. In addition, wetland delineations performed outside the growing season, from late-October until late-April, may differ from those performed at the same site during the growing season due to the presence of snow cover or frozen ground conditions. We recommend our wetland boundary determination and jurisdictional opinion be reviewed by EGLE prior to undertaking any activity within any identified wetlands.

Thank you for the opportunity to provide this wetland delineation. If you have any questions, please contact either Jeff King at 248.207.6996 (email jking@barr.com) or me at your convenience at 810.247.1229 (email fthompson@barr.com).

Sincerely,

BARR ENGINEERING CO.

Frances Thompson

Ecologist

References

U.S. Army Corps of Engineers (USACE). 1987. *Corps of Engineers Wetlands Delineation Manual.* Washington, DC.

USACE. 2012. *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Northcentral and Northeast Region (Version 2.0).* Washington, DC.

Figures:
Figure 1 – WSS
Figure 2 – NWI
Figure 3 – Mapped Wetlands

Attachments:
Attachments – USACE Wetland Determination Data Forms

Map Unit Legend

Map Unit Symbol	Map Unit Name
Cc	Carlisle muck, 0 to 2 percent slopes
FrB	Fox-Boyer complex, 2 to 6 percent slopes
MoB	Wawasee loam, 2 to 6 percent slopes
MoC	Wawasee loam, 6 to 12 percent slopes
MoD	Miami loam, 12 to 18 percent slopes
MoE	Miami loam, 18 to 25 percent slopes
Rf	Rifle muck
Wh	Washtenaw silt loam

0 400' 800'

SCALE IN FEET

BARR

Corporate Headquarters:
Minneapolis, Minnesota
Ph: 1-800-632-2277

Project Office:
BARR ENGINEERING CO.
3005 BOARDWALK STREET
SUITE 100
ANN ARBOR, MI 48108
Ph: 1-800-270-5017
Fax: (732) 922-4401
www.barr.com

Scale	1"=400'
Date	12/03/2021
Drawn	FMT
Checked	JK
Designed	FMT
Approved	JK

Grand River Road and Dorr Road
Genoa Township, Livingston County

Web Soil Survey

BARR PROJECT No. 22471022.00

CLIENT PROJECT No.

SHEET No. 1

REV. No.

Part 303 Final Wetlands Inventory

- Wetlands as identified on NWI and MIRIS maps
- Soil areas which include wetland soils
- Wetlands as identified on NWI and MIRIS maps and soil areas which include wetland soils

0 400' 800'

SCALE IN FEET

BARR Corporate Headquarters: Minneapolis, Minnesota Ph: 1-800-632-2277	Project Office: BARR ENGINEERING CO. 3005 BOARDWALK STREET SUITE 100 ANN ARBOR, MI 48108 Ph: 1-800-270-5017 Fax: (732) 922-4401 www.barr.com	Scale	1"=400'	Grand River Road and Dorr Road Genoa Township, Livingston County	BARR PROJECT No. 22471022.00
		Date	12/03/2021		CLIENT PROJECT No.
		Drawn	FMT		
		Checked	JK	National Wetland Inventory	SHEET No. 2 / REV. No.
		Designed	FMT		
		Approved	JK		

0 400' 800'

SCALE IN FEET

BARR

Corporate Headquarters:
Minneapolis, Minnesota
Ph: 1-800-632-2277

Project Office:
BARR ENGINEERING CO.
3005 BOARDWALK STREET
SUITE 100
ANN ARBOR, MI 48108
Ph: 1-800-270-5017
Fax: (732) 922-4401
www.barr.com

Scale	1"=400'
Date	12/03/2021
Drawn	FMT
Checked	JK
Designed	FMT
Approved	JK

Grand River Road and Dorr Road
Genoa Township, Livingston County

Wetland Boundary Map

BARR PROJECT No.
22471022.00

CLIENT PROJECT No.

SHEET No.
3

REV. No.

WETLAND DETERMINATION DATA FORM – Midwest Region

Project/Site: Dorr and Grand River | City/County: Genoa Chater Twp/Livingston Co. | Sampling Date: 12/3/2021

Applicant/Owner: Mark Kassab; M. Shapiro Real Estate Group | State: MI | Sampling Point: A26 UPL

Investigator(s): Frances Thompson | Section, Township, Range: S14, T2N, R5E

Landform (hillside, terrace, etc.): hillside | Local relief (concave, convex, none): convex

Slope (%): 0-2 | Lat: 42.5704167 | Long: -83.833289 | Datum: WGS

Soil Map Unit Name: Wawasee loam | NWI classification: NONE

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ____ No X (If no, explain in Remarks.)

Are Vegetation No , Soil No , or Hydrology No significantly disturbed? Are "Normal Circumstances" present? Yes ____ No X

Are Vegetation No , Soil No , or Hydrology No naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____	No X	**Is the Sampled Area within a Wetland?** **Yes** ____ **No** X
Hydric Soil Present?	Yes ____	No X	
Wetland Hydrology Present?	Yes ____	No X	

Remarks:
Delineation was conduted outside of the growing season.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 30 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Prunus serotina*	55	Yes	FACU
2. *Quercus macrocarpa*	30	Yes	FAC
3. *Quercus rubra*	30	Yes	FACU
4.			
5.			
	115	=Total Cover	
Sapling/Shrub Stratum (Plot size: 15 ft)			
1. *Zanthoxylum americanum*	40	Yes	FACU
2. *Rosa multiflora*	20	Yes	FACU
3.			
4.			
5.			
	60	=Total Cover	
Herb Stratum (Plot size: 5 ft)			
1. *Prunus serotina*	5	Yes	FACU
2. *Rosa multiflora*	5	Yes	FACU
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	10	=Total Cover	
Woody Vine Stratum (Plot size: NA)			
1. *Vitis riparia*	10	Yes	FACW
2.			
	10	=Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 8 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 25.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	10	x 2 =	20
FAC species	30	x 3 =	90
FACU species	155	x 4 =	620
UPL species	0	x 5 =	0
Column Totals:	195 (A)		730 (B)

Prevalence Index = B/A = 3.74

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes** ____ **No** X

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: A26 UPL

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-8	10YR 4/4	100					Loamy/Clayey	
8-12	10YR 5/8	100					Sandy	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ Coast Prairie Redox (A16)
- ___ Iron-Manganese Masses (F12)
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (F22)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** ____ **No** X

Remarks:

This data form is revised from Midwest Regional Supplement Version 2.0 to include the NRCS Field Indicators of Hydric Soils, Version 7.0, 2015 Errata. (http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_051293.docx)

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Gauge or Well Data (D9)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- X Geomorphic Position (D2)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ____ No X Depth (inches): ____

Water Table Present? Yes ____ No X Depth (inches): ____

Saturation Present? Yes ____ No X Depth (inches): ____

(includes capillary fringe)

Wetland Hydrology Present? **Yes** ____ **No** X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Midwest Region

Project/Site: Dorr and Grand River | City/County: Genoa Chater Twp/Livingston Co. | Sampling Date: 12/3/2021

Applicant/Owner: Mark Kassab; M. Shapiro Real Estate Group | State: MI | Sampling Point: A26 WET

Investigator(s): Frances Thompson | Section, Township, Range: S14, T2N, R5E

Landform (hillside, terrace, etc.): depression | Local relief (concave, convex, none): concave

Slope (%): 0-2 | Lat: 42.569839 | Long: -83.832825 | Datum: WGS

Soil Map Unit Name: Rifle muck | NWI classification: PSS

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ____ No X (If no, explain in Remarks.)

Are Vegetation No , Soil No , or Hydrology No significantly disturbed? Are "Normal Circumstances" present? Yes ____ No X

Are Vegetation No , Soil No , or Hydrology No naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ____	**Is the Sampled Area within a Wetland?** **Yes** X **No** ____
Hydric Soil Present?	Yes X	No ____	
Wetland Hydrology Present?	Yes X	No ____	

Remarks:
Delineation was conduted outside of the growing season.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 30 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Acer saccharinum*	45	Yes	FACW
2. *Populus deltoides*	25	Yes	FAC
3.			
4.			
5.			
	70	=Total Cover	
Sapling/Shrub Stratum (Plot size: 15 ft)			
1. *Cephalanthus occidentalis*	55	Yes	OBL
2. *Cornus racemosa*	10	No	FAC
3.			
4.			
5.			
	65	=Total Cover	
Herb Stratum (Plot size: 5 ft)			
1. *Rosa mulitflora*	20	Yes	
2. *Onoclea sensibilis*	10	Yes	FACW
3. *Phalaris arundinacea*	10	Yes	FACW
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	40	=Total Cover	
Woody Vine Stratum (Plot size: NA)			
1.			
2.			
		=Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 5 (A)

Total Number of Dominant Species Across All Strata: 6 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 83.3% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	55	x 1 =	55
FACW species	65	x 2 =	130
FAC species	35	x 3 =	105
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column Totals:	155 (A)		290 (B)

Prevalence Index = B/A = 1.87

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

X 2 - Dominance Test is >50%

X 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes** X **No** ____

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: A26 WET

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-3	10YR 2/1	100					Muck	
3-8	10YR 5/1	95	7.5YR 6/6	5	C	M		Prominent redox concentrations
8-16	10YR 5/1	80	7.5YR 6/6	20	C	M		Prominent redox concentrations

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- X 2 cm Muck (A10)
- ? Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ Coast Prairie Redox (A16)
- ___ Iron-Manganese Masses (F12)
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (F22)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** X **No** ___

Remarks:

This data form is revised from Midwest Regional Supplement Version 2.0 to include the NRCS Field Indicators of Hydric Soils, Version 7.0, 2015 Errata. (http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_051293.docx)

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- X High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Gauge or Well Data (D9)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- X Geomorphic Position (D2)
- X FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ___ No X Depth (inches): ___

Water Table Present? Yes X No ___ Depth (inches): 0.5

Saturation Present? Yes X No ___ Depth (inches): 0

(includes capillary fringe)

Wetland Hydrology Present? **Yes** X **No** ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Midwest Region

Project/Site: Dorr and Grand River | City/County: Genoa Chater Twp/Livingston Co. | Sampling Date: 12/3/2021

Applicant/Owner: Mark Kassab; M. Shapiro Real Estate Group | State: MI | Sampling Point: B8 UPL

Investigator(s): Frances Thompson | Section, Township, Range: S14, T2N, R5E

Landform (hillside, terrace, etc.): hillside | Local relief (concave, convex, none): convex

Slope (%): 0-2 | Lat: 42.570981 | Long: -83.830394 | Datum: WGS

Soil Map Unit Name: Wawasee loam | NWI classification: NONE

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ____ No X (If no, explain in Remarks.)

Are Vegetation No , Soil No , or Hydrology No significantly disturbed? Are "Normal Circumstances" present? Yes ____ No X

Are Vegetation No , Soil No , or Hydrology No naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____	No X	**Is the Sampled Area within a Wetland?** **Yes** ____ **No** X
Hydric Soil Present?	Yes ____	No X	
Wetland Hydrology Present?	Yes ____	No X	

Remarks:
Delineation was conduted outside of the growing season.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 30 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Quercus rubra*	30	Yes	FACU
2. *Prunus serotina*	30	Yes	FACU
3. *Quercus macrocarpa*	20	Yes	FAC
4. *Acer rubrum*	5	No	FAC
5.			
	85	=Total Cover	
Sapling/Shrub Stratum (Plot size: 15 ft)			
1. *Lonicera morrowii*	50	Yes	FACU
2. *Rhamnus cathartica*	10	No	FAC
3.			
4.			
5.			
	60	=Total Cover	
Herb Stratum (Plot size: 5 ft)			
1. *Rosa multiflora*	15	Yes	FACU
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	15	=Total Cover	
Woody Vine Stratum (Plot size: NA)			
1. *Vitis riparia*			
2.			
		=Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 5 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 20.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	0	x 2 =	0
FAC species	35	x 3 =	105
FACU species	125	x 4 =	500
UPL species	0	x 5 =	0
Column Totals:	160 (A)		605 (B)

Prevalence Index = B/A = 3.78

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes** ____ **No** X

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: B8 UPL

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-6	10YR 4/4	100					Loamy/Clayey	
6-13	10YR 5/6	100					Loamy/Clayey	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ Coast Prairie Redox (A16)
- ___ Iron-Manganese Masses (F12)
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (F22)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** ____ **No** X

Remarks:

This data form is revised from Midwest Regional Supplement Version 2.0 to include the NRCS Field Indicators of Hydric Soils, Version 7.0, 2015 Errata. (http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_051293.docx)

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Gauge or Well Data (D9)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- X Geomorphic Position (D2)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ____ No X Depth (inches): ____

Water Table Present? Yes ____ No X Depth (inches): ____

Saturation Present? (includes capillary fringe) Yes ____ No X Depth (inches): ____

Wetland Hydrology Present? **Yes** ____ **No** X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Midwest Region

Project/Site: Dorr and Grand River | City/County: Genoa Chater Twp/Livingston Co. | Sampling Date: 12/3/2021

Applicant/Owner: Mark Kassab; M. Shapiro Real Estate Group | State: MI | Sampling Point: B8 WET

Investigator(s): Frances Thompson | Section, Township, Range: S14, T2N, R5E

Landform (hillside, terrace, etc.): depression | Local relief (concave, convex, none): concave

Slope (%): 0-2 | Lat: 42.571011 | Long: -83.830039 | Datum: WGS

Soil Map Unit Name: Wawasee loam | NWI classification: PSS

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ____ No X (If no, explain in Remarks.)

Are Vegetation No , Soil No , or Hydrology No significantly disturbed? Are "Normal Circumstances" present? Yes ____ No X

Are Vegetation No , Soil No , or Hydrology No naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No 0	**Is the Sampled Area within a Wetland?** **Yes** X **No** ____
Hydric Soil Present?	Yes X	No X	
Wetland Hydrology Present?	Yes X	No X	

Remarks:
Delineation was conduted outside of the growing season.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 30 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1.	55	Yes	
2.	30	Yes	
3.	30	Yes	
4.			
5.			
	115	=Total Cover	
Sapling/Shrub Stratum (Plot size: 15 ft)			
1. *Cephalanthus occidentalis*	60	Yes	OBL
2. *Cornus amomum*	20	Yes	FACW
3.			
4.			
5.			
	80	=Total Cover	
Herb Stratum (Plot size: 5 ft)			
1. *Carex lacustris*	20	Yes	OBL
2. *Glyceria striata*	5	Yes	OBL
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	25	=Total Cover	
Woody Vine Stratum (Plot size: NA)			
1. *Vitis riparia*			
2.			
		=Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 4 (A)

Total Number of Dominant Species Across All Strata: 7 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 57.1% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	85	x 1 =	85
FACW species	20	x 2 =	40
FAC species	0	x 3 =	0
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column Totals:	105 (A)		125 (B)

Prevalence Index = B/A = 1.19

Hydrophytic Vegetation Indicators:

____ 1 - Rapid Test for Hydrophytic Vegetation

X 2 - Dominance Test is >50%

X 3 - Prevalence Index is ≤3.0[1]

____ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes** X **No** ____

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: B8 WET

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-3	10YR 2/1	100					Muck	
3-8	10YR 5/2	90	7.5YR 6/8	10	C	M	Loamy/Clayey	Prominent redox concentrations

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- X 2 cm Muck (A10)
- ? Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- X Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ Coast Prairie Redox (A16)
- ___ Iron-Manganese Masses (F12)
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (F22)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** X **No** X

Remarks:

This data form is revised from Midwest Regional Supplement Version 2.0 to include the NRCS Field Indicators of Hydric Soils, Version 7.0, 2015 Errata. (http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_051293.docx)

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- X High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Gauge or Well Data (D9)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- X Geomorphic Position (D2)
- X FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ___ No X Depth (inches): ___

Water Table Present? Yes X No ___ Depth (inches): 1

Saturation Present? Yes X No X Depth (inches): 0

(includes capillary fringe)

Wetland Hydrology Present? **Yes** X **No** X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

PLANNED UNIT DEVELOPMENT AGREEMENT

Commented [JS1]: Should be "Planned Unit Development" throughout the documents, inconsistently called a PD agreement

THE LEGACY APARTMENT HOMES

Entered into between:

Grand River Dorr, LLC

a Michigan limited liability company

and

Genoa Charter Township, County of Livingston

Dated: May 1, 2023

PLANNED UNIT DEVELOPMENT AGREEMENT

This Planned Unit Development Agreement **("Agreement")** is entered into as of _____ 202~~2~~3, by Grand River Dorr LLC, a Michigan liability company, whose address is 31550 Northwestern Hwy., Ste 220, Farmington Hills, MI 48334 **("Owner")** and Genoa Charter Township, a Michigan Charter Township, whose address is 2911 Dorr Road, Brighton, Michigan 48116 **("Township").**

RECITALS

A. Owners, own certain real property consisting of **52+/-** acres located in the Genoa Charter Township, Michigan which is more particularly described on **Exhibit A** attached hereto (the "**Property**"). The Property has been established as two (2) separate tax parcels consisting of 11-11-300-014 and 11-14-100-002.

B. Owner desires to develop the Property as a Planned Development, which will consist of a development of **204** attached apartment units.

C. At a meeting held by the Township Planning Commission on _____, 2022, the Township Planning Commission recommended approval of Owner's Preliminary Planned Development Site Plan for the Project prepared by PEA Engineering – Job Number **2021-0578**, last revised **5/24/2022 ("Preliminary Site Plan")**, subject to certain conditions as more fully set forth in Section 2.3 below.

D. At a meeting held by the Township Board on _____ __ 2022, the Township Board approved the Preliminary Site Plan, subject to certain conditions as more fully set forth in Section 2.3 below.

E. At a meeting held by the Township Planning Commission on _____ _____ 2022, the Township Planning Commission approved Owner's Final Plan for the Project subject to certain conditions as more fully set forth in Section 2.3 below. The Final Development Site Plan is attached as **Exhibit B** as is referred to herein as the **"PUD Plan**."

F. At a meeting held by the Township Board on _____ _____ 2022, the Township Board approved Owner's Planned Development Agreement on the Project, subject to the conditions set forth in this Agreement, including without limitation Section 2.3 below.

G. The Township determined that the Property qualifies for development as a Residential Planned Unit Development (RPUD) under the Genoa Charter Township's Zoning Ordinance **("Zoning Ordinance")** because the Project will: (i) provide for the preservation of open space: (ii) provide recreational area for the use and benefit of the residents of the Project; and (iii) will facilitate the construction and maintenance of streets, utilities, and public services in an efficient manner.

H. By entering in this Agreement, Owner, and the Township desire to set forth the parties' obligations with respect to the Property and the Project and the terms and requirements under which the Property and the Project shall be developed.

NOW, THEREFORE, in consideration of the premises and the mutual covenants of the parties described in this Agreement, the parties agree as follows:

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Commented [JS2]: Does not track qualifying conditions in 10.02.04

ARTICLE I

DESCRIPTION OF THE PROJECT; ~~PD~~PUD AND ~~PD~~PUD PLANS

1.1 **Description of Project.** The overall project (**"Project"**) covers an area comprising **52 +/-** acres located along Grand River Road and Dorr in the Township. The project will contain **204** attached apartment units (each, a **"Project"**). The Project generally meets the requirement of the Zoning Ordinance and is consistent with the conditions imposed in the recommendation for approval by the Planning Commission. The Project shall include open space and other elements as set forth in this Agreement and the ~~PD~~PUD Plan. The Project will also contain approximately **29** acres of total open space.

1.2 **Final ~~PD~~PUD Plan Approval; Exhibits.** The ~~PD~~PUD Plan was approved by the Township Planning Commission on ____ __ 2022. The ~~PD~~PUD Plan approval grants the Owner the right to improve as set forth in the ~~PD~~PUD Plan, as the same may be modified and amended in accordance with the Township Zoning Ordinance are incorporated herein and made a part thereof by reference.

1.3 **Variances and/or Modifications to Standard Zoning Requirements.** Except as otherwise provided in this Agreement and the ~~PD~~PUD Plan attached hereto, Owner shall generally adhere to all Township Ordinances. Variances from the Township Zoning Ordinance which the Township shall be deemed to have granted, and hereby grants, as well as modifications to standard zoning requirements which will be requested, if any, are as set forth on the ~~PD~~PUD Plan. Deviations requested are as follows:

ZONING Deviations

3.05.02 (e)	Modification of the horizontal minimum curve radius from 150' to 100'
15.05.03	R~~r~~oad to garage and parking driveways less than 30' radius.
10.03.01(c)	The open space along the exterior public roads shall generally have a depth of at least 100' either landscaped or preserved in a natural wooded condition.
12.01.03	Request for reduction in the percentage or brick required on building walls exposed to public and an increase in percentage of vinyl siding on the areas over the garages. Front facing elevations along Grand River and Dorr Road will contain a higher end material in addition to the enhanced frontage landscaping along both roads
13.02.04(d)	Request for grading up to 10' from regulated wetland.
14.02.06	Request to exceed parking space requirement more than 20%.
14.06.09	Parking lots and related maneuvering aisles shall meet minimum setbacks from adjacent street R.O.W. as shown in the schedule of regulations and have parking lot landscaping
14.06.10	Parking lots shall have minimum rear and side yard setbacks including berming and landscaping.

Commented [JS3]: Should this be PUD, I think PD is a term from White Lake

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Commented [JS4]: Deviations?

Commented [AR5]: Add all deviations in this section. Including signage, fences and retaining walls if they do not meet the zoning ordinance.

Commented [AR6]: Explain more specifically what is meant by "generally"

Commented [AR7]: Give percentages proposed

Commented [AR8]: What will the exceedance be?

Commented [AR9]: How is this a deviation?

Commented [AR10]: How is this a deviation?

1.4 **Minor Modifications.** The Zoning Administrator may approve the proposed revision upon finding the change would not alter the basic design nor any conditions imposed upon the original plan approval by the Planning Commission. The Zoning Administrator shall inform the Planning Commission of such approval in writing. The Zoning Administrator shall consider the following when determining a change to be a minor.

a) For residential buildings, the size of structures may be reduced; or increased by five percent (5%) or 10,000 square feet, whichever is smaller.

b) Gross floor area of non-residential buildings may be decreased; or increased by up to five percent (5%) or 10,000 square feet, whichever is smaller.

c) Floor plans may be changed if consistent with the character of the use.

d) Horizontal and/or vertical elevations may be altered by up to five percent (5%).

e) Relocation of a building by up to five (5) feet, if consistent with required setbacks and other standards.

f) Designated "Areas not to be disturbed" may be increased.

g) Plantings approved in the Final PUD Landscape Plan may be replaced by similar types of landscaping on a one-to-one or greater basis. Any trees to be preserved which are lost during construction may be replaced by at least two trees of the same or similar species.

h) Improvements or slight relocations of site access or circulation, such as inclusion of deceleration lanes, boulevards, curbing, pedestrian/bicycle paths, etc.

i) Changes of building materials to another of higher quality, as determined by the Zoning Administrator.

j) Slight modification of sign placement or reduction of size.

k) Internal rearrangement of parking lot which does not affect the number of parking spaces or alter access locations or design.

l) Changes required or requested by the Township, County, or state for safety reasons.

1.5 **Owner.** The obligations contained in this Agreement which apply to the Owner shall remain the responsibility of the Owner until such time as the Owner has assigned its obligations under this Agreement to a successor Owner who has assumed Owner's obligations under this Agreement in writing or to an association of owners that assume such obligations. Wherever the term "Owner" is used in this Agreement, it shall be deemed to include (i) the Owner named in this Agreement and the entity identified as the Owner (ii) the Owners of the Property.

1.6 **Name and Address of Owner.** The Owner of the Property described on Exhibit A is Grand River Dorr, LLC, whose address is c/o Mark Kassab, 31550 Northwestern Highway, Suite 220, Farmington Hills, MI 48334.

Commented [AR11]: See 6-22-22 version with 7-6-22 comments from the Township.

1.7 **Statement of Planning Objectives to Be Achieved by the Owner.** The primary planning objectives of this development is to provide Apartments for rent consisting of stacked ranch units.

1.8 **Statement of Applicant's Intention Regarding Leasing.** It is the intent of the Owner to develop the Project and to market for leasing of apartment homes.

ARTICLE II

REQUIREMENTS FOR DEVELOPMENTS

2.1 **Development Standards.** The Property shall be developed and improved compliance with the following:

(a) The Charter Township of Genoa Zoning Ordinance, as amended, except were modified by this Agreement and the Exhibits attached hereto;

(b) This Agreement;

(c) The ~~PD~~PUD Plan;

(d) The conditions set forth in Section 2.3 below; and

(e) All Applicable federal, state and country laws, rules and regulations.

2.1 **Effect of ~~PD~~PUD Approval.** To the extent that developing the Property in accordance with this Agreement and the ~~PD~~PUD Plan will deviate from the Zoning Ordinance or any other Township ordinance or regulation, this Agreement and the ~~PD~~PUD Plan shall control. To the extent this Agreement and ~~PD~~PUD Plan attached hereto are silent on development issues, the Project shall comply with the Zoning Ordinance and other Township ordinances and regulations. All improvements constructed in accordance with this Agreement and the ~~PD~~PUD Plan shall be deemed to be conforming under the Zoning Ordinance and in compliance with all ordinances of the Township. The Project shall not be subject to any additional requirements contained in any amendments or additions to Township Zoning Ordinance adopted subsequent to the date of this Agreement which conflict with the provisions of this Agreement, including the ~~PD~~PUD Plan and/or any plans which are approved pursuant to this Agreement.

2.2 **Conditions to Approval.** Owner shall obtain all state, county, Township and federal permits for the development of the Project**.** Owner shall not install any site improvements within the Property, including without limitation, installation of roads and utilities, until the completion of such pre-construction meeting (the "Site Improvement (Pre-Con Meeting"). Notwithstanding the foregoing, Owner shall be entitled to obtain a grading permit from the Township and thereafter commence grading and clearing activities. The execution of this Agreement by the parties hereto; (ii) Owner obtaining a soil erosion permit from Livingston County the scheduling and completion of a re-grading meeting between Owner and the Township staff and consultants (the **"Grading Pre-Con Meeting").**

Commented [AR12]: Please see 6-22-22 with comments from Township staff.

ARTICLE III

USES WITHIN THE PROJECT

3.1 **Approved Uses for the Project.** The Project will consist of a residential project containing **204** attached apartment units, with approximately **29 acres** of total open space, per the ~~PD~~PUD Plan.

3.2 **Permitted Density.** The Project will have a density of between **6.23** residential units per acre based on the net acreage of the property.

Commented [JS13]: Between what?

ARTICLE IV

OWNER'S RIGHTS AND OBLIGATIONS

4.1 **Right to Develop; Phasing.** Owner shall develop the Property in accordance with the ~~PD~~PUD Plan and this Agreement in a single phase. ~~1 phase~~.

4.2 **Development Schedule.** Owner shall commence development of Phase I on or about April 2023.

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4.3 **Internal Roads in the Project.** The internal roads within the Project will be private and asphalt or concrete. As such, internal circulation drives shall be built in conformance with the applicable requirements and standards of the Township for private roads.

4.4 **Landscape Plan**. The Landscape Plan which is part of the ~~PD~~PUD Plan attached hereto as Exhibit B identifies the landscaping to be installed within the Project.

4.5 **Utilities.**

(a) **Sanitary Sewer System.** Sanitary sewers are available to the site and the Owner must connect to the Township's sanitary sewer system. Connection to the sanitary sewer system shall require payment of all applicable fees, charges, and assessments, in accordance with the Township's Ordinance. The ~~PD~~PUD Plan identifies the sewer lines and related sanitary sewer easements to be dedicated to the Township.

(b) **Water System.** Water service sewers is available to the site and the Owner must connect to the Township' s water system. Connection to the water system shall require payment of all applicable fees, charges, and assessments, in accordance with the Township's Ordinance. The ~~PD~~PUD Plan identifies the water lines and related water easements to be dedicated to the Township.

4.6 **Storm Water Detention.** Storm water shall be conveyed by a storm sewer system to a

storm water detention basin located within the Project. All such storm water drainage facilities, including the detention basin and all related improvements shall be designed in accordance with all applicable ordinances in addition to the Livingston County Drain Commission engineering regulations and standards.

4.7 **Signs and Entryway Features.** The ~~PD~~PUD Plan attached hereto includes an entry wall monument, signage, stone, piers and decorative fencing, which is approved. Owner shall otherwise comply with all the sign regulations in the Township's sign ordinance, as amended.

Commented [AR14]: Add "Demarcation signs to be installed along the natural features 25-foot setback to ensure that encroachment does not take place."

4.8 **Architectural and Site Design Guidelines.** The Project shall be developed in conformance with the following architectural and site minimum standards:

(a) **Minimum Setbacks.** Setback's requirements shall be as specified in the ~~PD~~PUD Plan.

(b) **Exterior Materials.** The materials used on the exterior of the attached units shall consist of any of the following materials: brick, vinyl, or similar siding, or stone. Elevations of buildings that directly front along Grand River and Dorr Road will contain a material other than horizontal vinyl siding. Alternatives to horizontal siding may be LP siding, decorative shakes (vinyl or wood). This will only be applicable to the frontage on the building elevation along Grand River and Dorr Road.

(c) **Driveway and Sidewalks**. Curbs, gutters, driveways and sidewalks shall be constructed of concrete or asphalt.

Commented [AR15]: Sidewalks, curbs and gutters are required to be concrete only.

(d) **Garages.** All dwellings shall have an attached garage.

ARTICLE V

PERFORMANCE GUARANTEE REQUIREMENTS

5.1 **Performance Guaranties.** Performance guarantees covering the estimated cost of improvements for the applicable phase being developed shall be provided to the extent required by and in accordance with the Township's Ordinances. The Owner shall place a bond, cash, or other form of financial instrument for any such performance guarantees required by the Township.

5.2 **Escrow for Offsite Sanitary Upgrade:** The Developer has agreed to assist the Township with an upgrade to an off-site pump station (Pump Station 10). The Developer shall place in escrow an amount equivalent to the cost of its proportionate share of its impact to the pump station. As a condition of approvals, the Owner and Township shall enter into a Utility Pump Station Escrow Agreement as shown in exhibit _____.

Commented [AR16]:

ARTICLE VI

MAINTENANCE OF OPEN SPACE AND COMMON AREAS

6.1 **Common Elements and Common Facilities.** The Owner shall be responsible for the maintenance and repair of all roads, utilities that are not dedicated to the Township, storm drainage facilities, walkways, parks, signs, lighting, landscaping, ~~and~~ open space and other site features. The use and access of the wetlands will be established as a conservation easement over the regulated wetlands in a form to be agreed upon with the Township.

Commented [JS17]: Missing a program and financing for maintaining common areas, walkways, signs, lighting and landscaping - see 10.05.04(c)

Commented [AR18]: If use and access of wetlands includes any other natural features 25 foot setback encroachment, Township approval will be required in addition to EGLE approval. The conservation easement shall be added as an exhibit to this agreement.

ARTICLE VII

TOWNSHIP'S RIGHTS AND OBLIGATIONS

7.1 **Permits and Authorizations.** The Township shall grant to Owner and its contractors and subcontractors all Township permits and authorizations necessary to bring and/or construct all utilities necessary to service the Property and to otherwise develop and improve the Property in accordance with the ~~PD~~PUD Plan, provided the Owner has first made all requisite filings and submissions for permits, complied with the requirements for said permits or authorizations, submissions and paid all required fees in accordance with the Township's Ordinances and design standards in addition to the agencies having authority over such. The Owner will be responsible for obtaining all required approvals and necessary permits or authorizations from the appropriate agencies.

Commented [AR19]: As shown in the 6-22-22 version with staff comments, the utility authority has their own process and permits for water and sewer and this agreement does not include them.

7.2 **Township Action for Failure to Maintain Property.** In the event the Owner defaults in its obligation to maintain the Property in a reasonable condition, using reasonable standards, and consistent with and as required under the ~~PD~~PUD Plan and this Agreement, the Township ~~may serve written notice upon Owner setting forth the manner in which Owner has failed to maintain the Property, and such notice shall include a demand that deficiencies be cured within a stated reasonable time period no less than thirty (30) days, and shall set forth the date, time and place of a hearing before the Township Board for the purpose of allowing Owner to be heard as to why the Township should not proceed to perform the maintenance which has not been undertaken.~~ The cost and expense of such curative action, including the cost of notices by the Township and reasonable legal, planning and engineering fees and cost incurred by the Township shall be paid by the Owner. Such amount shall constitute a lien on the property and the Township may require such costs and expenses to be paid prior to the commencement of work.

Commented [AR21]: Please add "seek remedy as provide by section 21.04 of the Zoning Ordinance."

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Commented [AR20]: This language was in the 6-22-22 version.

ARTICLE VIII

MISCELLANEOUS PROVISIONS

8.1 **Governing Law.** This Agreement shall be governed by and construed in accordance with the laws of the State of Michigan.

8.2 **Counterparts.** This Agreement may be executed in multiple counterparts, each of which shall be deemed an original and all of which shall constitute one agreement. The signature of any party

to any counterpart shall be deemed to be a signature to, and may be appended to, any other counterpart.

8.3 **Successors and Assigns.** The terms, provisions and conditions of this Agreement are and shall be deemed to be of benefit to the Property and shall run with and bind the Property, and shall bind and inure to the benefit of the successors and assigns of the parties to this Agreement.

8.4 **Amendment.** This Agreement may only be modified by written agreement of the Township and Owner or any successor in title who assumes Owner's rights and obligations hereunder. Notwithstanding, any amendments to this Agreement shall also require the written consent of Owners if Owners continue to hold title to any portion of the Property.

8.5 **Authority.** This Agreement has been duly authorized by all necessary action of Owner and the Township, through the approval of the Township Board at a meeting in accordance with the laws of the State of Michigan, and the ordinances of the Township. By the execution of this Agreement, the parties each warrant that they have the authority to execute this Agreement and bind the Property in its respective entities to its terms and conditions.

8.6 **Partial Invalidity.** Invalidation of any of the provisions contained in this Agreement or of the application thereof to any person by judgment or court order shall in no way affect any of the other provisions hereof or the application thereof to any other person and the same shall remain in full force and effect.

8.7 **No Partnership.** None of the terms or provisions of this Agreement shall be deemed to create a partnership or joint venture between Owner and the Township.

8.8 **Incorporation of Documents.** The recitals contained in this Agreement, the introductory paragraph, and all exhibits attached to this Agreement and referred to herein shallfor all purposes be deemed to be incorporated in this Agreement by this reference and made apart of this Agreement.

8.9 **Integration Clause.** This Agreement is intended as the complete integration of all understandings between the parties related to the subject matter herein. No prior contemporaneous addition, deletion or other amendment shall have any force or effect whatsoever, unless referenced in this Agreement.

8.10 **Incorporation of Owner's Representations, Warranties and Information.** All representations, warranties and information previously provided by Owner in any submission by the Owner to the Township are hereby incorporated in this Agreement by reference.

8.11 **Recording.** This Agreement, or a notice of its existence, shall be executed by the Owner and Owners and recorded by the Owner in the office of the Livingston County Register of Deeds, and may be recorded by any of the undersigned parties following the execution of this Agreement prior to land use permit issuance. ~~Alternatively, the Township shall be authorized to prepare and record a Notice of Development Agreement.~~

8.12 **Waiver.** Failure of either party to insist upon strict performance of any of the terms, conditions or covenants hereof shall not be deemed to be a waiver of any rights or

remedies that such party may have hereunder, at law or in equity, and shall not be deemed a waiver of any subsequent breach or default under this Agreement. No waiver by either party of any default under this Agreement shall be effective or binding unless made in writing and no such waiver shall be implied from any omission by the party to take an action with respect to the default. No express written waiver of any default shall affect any other default or cover any other period of time, and one or more written waivers of any default shall not be deemed to be a waiver of any subsequent default in performance of the same or any other term or provision contained in this Agreement.

8.13 **Violations.** Violations of the provisions of this Agreement shall be deemed to be violations of the Township Zoning Ordinance and shall entitle the Township to all the rights and remedies provided by the Zoning Ordinance or any other applicable law for such violation.

[Signatures and notarization are contained on the following pages]

[Signature page to Planned Development Agreement]

The parties hereto have executed this Agreement as of the year and date set forth above.

"OWNER"

Grand River Dorr, LLC,
A Michigan Limited Liability Company

By: _____

Mark Kassab

Its: Authorized Agent

[Signatures and notarization are continued on the following page)

[Signature page to Planned Development Agreement)

"TOWNSHIP"

Genoa Charter Township, Livingston County
A Michigan Charter Township~~Limited Liability Company~~

By: _____
Its:
_____

By: _____
Its:
_____

STATE OF MICHIGAN)
) ss.
COUNTY OF LIVINGSTON)

The foregoing PUD Agreement was acknowledged before me on this day of _____ ___, 2023~~2~~, by _____, _Township Supervisor, _____, _____, Township Clerk~~_____~~ of Genoa Charter Township, a Michigan Charter Township, on behalf of the Township~~company~~.

EXHIBIT A

LEGAL DESCRIPTION OF THE PROPERTY

PROPERTY DESCRIPTION:

BEING A PART OF THE SOUTHWEST QUARTER (SW 1/4) OF SECTION 11, AND A PART OF THE NORTHWEST QUARTER (NW 1/4) OF THE NORTHWEST QUARTER (NW 1/4) OF SECTION 14, TOWN 2 NORTH, RANGE 5 EAST, GENOA TOWNSHIP, LIVINGSTON COUNTY, MICHIGAN, DESCRIBED AS:

BEGINNING AT THE SOUTHWEST CORNER OF THE SOUTHWEST QUARTER OF THE SOUTHWEST QUARTER OF SAID SECTION 11 SAME BEING THE NORTHWEST CORNER OF THE NORTHWEST QUARTER OF THE NORTHWEST QUARTER OF SAID SECTION 14; THENCE, ALONG THE WEST LINE OF SAID NORTHWEST QUARTER OF THE NORTHWEST QUARTER OF SECTION 14, SAME BEING THE CENTERLINE OF DORR ROAD (66 FOOT RIGHT OF WAY), SOUTH 00 DEGREES 15 MINUTES 00 SECONDS EAST, A DISTANCE OF 1340.74 FEET TO THE SOUTHWEST CORNER OF SAID NORTHWEST QUARTER OF THE NORTHWEST QUARTER OF SECTION 14; THENCE ALONG THE SOUTH LINE OF SAID NORTHWEST QUARTER OF THE NORTHWEST QUARTER OF SECTION 14, NORTH 89 DEGREES 50 MINUTES 12 SECONDS EAST, A DISTANCE OF 1335.60 FEET TO THE SOUTHEAST CORNER OF SAID NORTHWEST QUARTER OF THE NORTHWEST QUARTER OF SECTION 14; THENCE ALONG THE EAST LINE OF SAID NORTHWEST QUARTER OF THE NORTHWEST QUARTER OF SECTION 14, NORTH 00 DEGREES 02 MINUTES 14 SECONDS WEST, A DISTANCE OF 1029.24 FEET TO THE SOUTHEAST CORNER OF A PARCEL DESCRIBED IN WARRANTY DEED RECORDED IN LIBER 777, PAGE 269, LIVINGSTON COUNTY RECORDS; THENCE ALONG THE SOUTHERLY LINE OF SAID PARCEL, SOUTH 86 DEGREES 34 MINUTES 33 SECONDS WEST, A DISTANCE OF 140.24 FEET TO THE SOUTHWEST CORNER OF SAID PARCEL; THENCE ALONG THE SOUTHERLY LINE OF S PARCEL DESCRIBED IN WARRANTY DEED RECORDED IN LIBER 2443, PAGE 454, LIVINGSTON COUNTY RECORDS, NORTH 89 DEGREES 56 MINUTES 58 SECONDS WEST, A DISTANCE OF 235.00 FEET TO A POINT BEING 375.00 FEET WEST OF THE EAST LINE OF SAID NORTHWEST QUARTER OF THE NORTHWEST QUARTER OF SECTION 14; THENCE ALONG A LINE BEING 375.00 FEET WEST OF AND PARALLEL TO THE EAST LINE OF SAID NORTHWEST QUARTER OF THE NORTHWEST QUARTER OF SECTION 14, NORTH 00 DEGREES 02 MINUTES 14 SECONDS WEST, A DISTANCE OF 315.00 FEET TO A POINTON THE NORTH LINE OF SAID NORTHWEST QUARTER OF THE NORTHWEST QUARTER OF SECTION 14 SAME BEING THE SOUTH LINE OF SAID SOUTHWEST QUARTER OF THE SOUTHWEST QUARTER OF SECTION 11; THENCE ALONG A LINE BEING 375.00 WEST AND PARALLEL TO THE EAST LINE OF SAID SOUTHWEST QUARTER OF THE SOUTHWEST QUARTER OF SECTION 11, NORTH 00 DEGREES 07 MINUTES 24 SECONDS EAST, A DISTANCE OF 420.56 FEET TO THE SOUTHERLY LINE OF GRAND RIVER AVENUE (100 FOOT RIGHT OF WAY); THENCE ALONG SAID SOUTHERLY LINE, NORTH 68 DEGREES 30 MINUTES 00 SECONDS WEST, A DISTANCE OF 1037.63 FEET TO A POINT ON THE WEST LINE OF SAID SOUTHWEST QUARTER OF THE SOUTHWEST QUARTER OF SECTION 11 SAME BEING THE CENTERLINE OF SAID DORR ROAD; THENCE ALONG SAID WEST LINE OF THE SOUTHWEST QUARTER OF THE SOUTHWEST QUARTER OF SECTION 11, SOUTH 00 DEGREES 04 MINUTES 32 SECONDS WEST A DISTANCE OF 800.00 FEET TO THE POINT OF BEGINNING. CONTAINING 2,262,563 +– SQUARE FEET OR 51.941 +– ACRES OF LAND.

PUD FINAL SITE PLAN

THE LEGACY APARTMENT HOMES

6080 W. GRAND RIVER

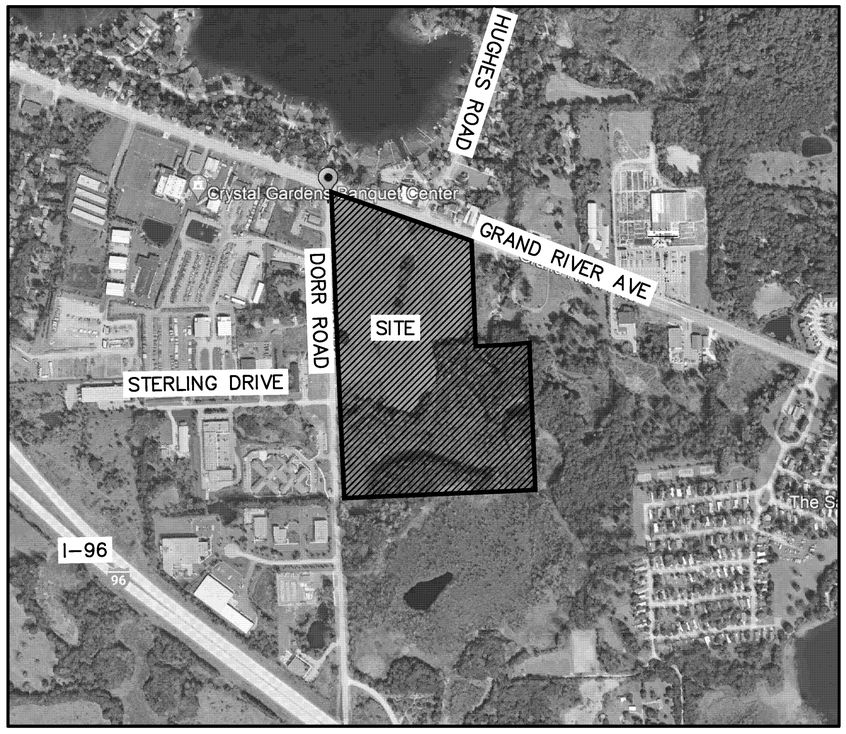
GENOA TOWNSHIP, LIVINGSTON COUNTY, MICHIGAN

PERMIT / APPROVAL SUMMARY		
DATE SUBMITTED	DATE APPROVED	PERMIT / APPROVAL

PROPERTY DESCRIPTION:

BEING A PART OF THE SOUTHWEST QUARTER (SW 1/4) OF SECTION 11, AND A PART OF THE NORTHWEST QUARTER (NW 1/4) OF THE NORTHWEST QUARTER (NW 1/4) OF SECTION 14, TOWN 2 NORTH, RANGE 5 EAST, GENOA TOWNSHIP, LIVINGSTON COUNTY, MICHIGAN, DESCRIBED AS:

BEGINNING AT THE SOUTHWEST CORNER OF THE SOUTHWEST QUARTER OF THE SOUTHWEST QUARTER OF SAID SECTION 11 SAME BEING THE NORTHWEST CORNER OF THE NORTHWEST QUARTER OF THE NORTHWEST QUARTER OF SAID SECTION 14; THENCE, ALONG THE WEST LINE OF SAID NORTHWEST QUARTER OF THE NORTHWEST QUARTER OF SECTION 14, SAME BEING THE CENTERLINE OF DORR ROAD (66 FOOT RIGHT OF WAY), SOUTH 00 DEGREES 15 MINUTES 00 SECONDS EAST, A DISTANCE OF 1340.74 FEET TO THE SOUTHWEST CORNER OF SAID NORTHWEST QUARTER OF THE NORTHWEST QUARTER OF SECTION 14; THENCE ALONG THE SOUTH LINE OF SAID NORTHWEST QUARTER OF THE NORTHWEST QUARTER OF SECTION 14, NORTH 89 DEGREES 50 MINUTES 12 SECONDS EAST, A DISTANCE OF 1335.60 FEET TO THE SOUTHEAST CORNER OF SAID NORTHWEST QUARTER OF THE NORTHWEST QUARTER OF SECTION 14; THENCE ALONG THE EAST LINE OF SAID NORTHWEST QUARTER OF THE NORTHWEST QUARTER OF SECTION 14, NORTH 00 DEGREES 02 MINUTES 14 SECONDS WEST, A DISTANCE OF 1029.24 FEET TO THE SOUTHEAST CORNER OF A PARCEL DESCRIBED IN WARRANTY DEED RECORDED IN LIBER 777, PAGE 269, LIVINGSTON COUNTY RECORDS; THENCE ALONG THE SOUTHERLY LINE OF SAID PARCEL, SOUTH 86 DEGREES 34 MINUTES 33 SECONDS WEST, A DISTANCE OF 140.24 FEET TO THE SOUTHWEST CORNER OF SAID PARCEL; THENCE ALONG THE SOUTHERLY LINE OF S PARCEL DESCRIBED IN WARRANTY DEED RECORDED IN LIBER 2443, PAGE 454, LIVINGSTON COUNTY RECORDS, NORTH 89 DEGREES 56 MINUTES 58 SECONDS WEST, A DISTANCE OF 235.00 FEET TO A POINT BEING 375.00 FEET WEST OF THE EAST LINE OF SAID NORTHWEST QUARTER OF THE NORTHWEST QUARTER OF SECTION 14; THENCE ALONG A LINE BEING 375.00 FEET WEST OF AND PARALLEL TO THE EAST LINE OF SAID NORTHWEST QUARTER OF THE NORTHWEST QUARTER OF SECTION 14, NORTH 00 DEGREES 02 MINUTES 14 SECONDS WEST, A DISTANCE OF 315.00 FEET TO A POINTON THE NORTH LINE OF SAID NORTHWEST QUARTER OF THE NORTHWEST QUARTER OF SECTION 14 SAME BEING THE SOUTH LINE OF SAID SOUTHWEST QUARTER OF THE SOUTHWEST QUARTER OF SECTION 11; THENCE ALONG A LINE BEING 375.00 WEST AND PARALLEL TO THE EAST LINE OF SAID SOUTHWEST QUARTER OF THE SOUTHWEST QUARTER OF SECTION 11, NORTH 00 DEGREES 07 MINUTES 24 SECONDS EAST, A DISTANCE OF 420.56 FEET TO THE SOUTHERLY LINE OF GRAND RIVER AVENUE (100 FOOT RIGHT OF WAY); THENCE ALONG SAID SOUTHERLY LINE, NORTH 68 DEGREES 30 MINUTES 00 SECONDS WEST, A DISTANCE OF 1037.63 FEET TO A POINT ON THE WEST LINE OF SAID SOUTHWEST QUARTER OF THE SOUTHWEST QUARTER OF SECTION 11 SAME BEING THE CENTERLINE OF SAID DORR ROAD; THENCE ALONG SAID WEST LINE OF THE SOUTHWEST QUARTER OF THE SOUTHWEST QUARTER OF SECTION 11, SOUTH 00 DEGREES 04 MINUTES 32 SECONDS WEST A DISTANCE OF 800.00 FEET TO THE POINT OF BEGINNING. CONTAINING 2,262,563 +– SQUARE FEET OR 51.941 +– ACRES OF LAND.



LOCATION MAP
1"=500'

SHEET INDEX	
SHEET NO.	TITLE
	COVER
C-1.1	TOPOGRAPHIC SURVEY OVERALL
C-1.2	TOPOGRAPHIC SURVEY NORTH
C-1.3	TOPOGRAPHIC SURVEY SOUTH
C-1.4	TREE LIST
C-2.1	OVERALL SITE PLAN
C-2.2	SITE PLAN NORTH
C-2.3	SITE PLAN SOUTH
C-3.1	GRADING PLAN NORTH
C-3.2	GRADING PLAN SOUTH
C-4.1	UTILITY PLAN NORTH
C-4.2	UTILITY PLAN SOUTH
C-5.1	STORM SEWER PROFILES
C-5.2	STORM SEWER PROFILES
C-5.3	STORM SEWER PROFILES
C-5.4	STORM SEWER PROFILES
C-5.5	STORM SEWER PROFILES
C-6.1	OVERALL STORMWATER MANAGEMENT PLAN
C-6.2	POND DESIGN DETAILS
C-6.3	NORTH POND DESIGN CALCULATIONS
C-6.4	SOUTH POND DESIGN CALCULATIONS
C-6.5	NORTH STORM SEWER DRAINAGE AREAS
C-6.6	SOUTH STROM SEWER DRAINAGE AREAS
C-6.7	STORM DESIGN CALCULATIONS
C-6.8	WATER QUALITY UNIT
C-7.1	SESC PLAN NORTH
C-7.2	SESC PLAN SOUTH
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C-9.1	CONSTRUCTION NOTES
C-9.2	NOTES & DETAILS I
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MHOG - 1.0	MHOG STANDARD DETAILS
MHOG - 2.0	MHOG STANDARD DETAILS
MHOG - 3.0	MHOG STANDARD DETAILS
LS-1	OVERALL LANDSCAPE PLAN VIEW
LS-2	GENERAL PLANTING DETAIL PLAN
LS-3	GENERAL PLANTING DETAIL PLAN
LS-4	MATERIAL LIST, PLANT DETAILS & LANDSCAPE NOTE
LS-5	ENTRANCE PLANTING DETAIL PLAN
LS-6	CLUBHOUSE & BUILDING FOUNDATION PLANTING DETAIL PLAN
LS-7	DETENTION PLANTING DETAIL PLAN
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---	ARCHITECTURAL COVER SHEET
1	FOUNDATION PLAN
2	FIRST FLOOR PLAN
3-A	SECOND FLOOR
4-A	ELEVATIONS
4-B	ELEVATIONS
	PHOTOMETRIC PLAN

DESIGN TEAM

OWNER/APPLICANT/DEVELOPER

GRAND RIVER DORR, LLC
315550 NORTHWESTERN HIGHWAY
FARMINGTON HILLS, MI 48334
CONTACT: MARK KASSAB
PHONE:248.865.0066
EMAIL: MKASSAB@MSHAPIROREALESTATE.COM

CIVIL ENGINEER

PEA GROUP
7927 NEMCO WAY, STE. 115
BRIGHTON, MI 48116
CONTACT: JONATHAN E. CURRY, PE
PHONE: 844.813.2949
EMAIL: JCURRY@PEAGROUP.COM

ARCHITECT

BURMANN ASSOCIATES INC.
119 W. ST. CLAIR
ROMEO, MICHIGAN 58065-4655
PHONE: 586.752.5010 , MOBILE: 586.201.1602
EMAIL: GREATARCHITECTS@CHARTER.NET

SURVEYOR

HUBBELL ROTH AND CLARK
555 HULET DRIVE
BLOOMFIELD HILLS, MICHIGAN 48303
CONTACT: MELISSA COATTE, P.E.
PHONE:248-454-6300
EMAIL: mcoatta@hrcengr.com

LANDSCAPE ARCHITECT/PLANNER

FELINO A. PASCUAL AND ASSOCIATES
24333 ORCHARD LAKE ROAD SUITE G
CONTACT: FELINO A. PASCUAL, RLA, CLARB
PHONE: 248.557.5588

PEA GROUP

REVISIONS	
DESCRIPTION	DATE
PUD FINAL SITE PLAN SUBMITTAL	4/10/2023
REV PER TWP	5/30/2023

STATE OF MICHIGAN · JILL M. ANCHARA · License No. 6201048141 · PROFESSIONAL ENGINEER

NOT FOR CONSTRUCTION

OVERALL PROPERTY DESCRIPTION:

BEING A PART OF THE SOUTHWEST QUARTER (SW 1/4) OF SECTION 11, AND A PART OF THE NORTHWEST QUARTER (NW 1/4) OF THE NORTHWEST QUARTER (NW 1/4) OF SECTION 14, TOWN 2 NORTH, RANGE 5 EAST, GENOA TOWNSHIP, LIVINGSTON COUNTY, MICHIGAN, DESCRIBED AS:

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47-11-14-100-002 PROPERTY DESCRIPTION (FROM TWP RECORDS):

SEC. 14 T2N R5E NW ¼ OF NW ¼ EXC BEG NE CORN, TH. S 306.5 FT, TH S 86D W 136 FT, TH S 89D W 235 FT, TH N TO SEC LIN, TH J 373 TO POB.

47-11-11-200-014 PROPERTY DESCRIPTION (FROM TWP RECORDS):

SEC. 11 T2N R5E ALL OF SW ¼ OF SW ¼ LYING S OF GRAND RIVER ROAD EXC E 375 FT THEREOF.

TOPOGRAPHIC AND BOUNDARY SURVEY DISCLAIMER:

TOPOGRAPHIC AND BOUNDARY SURVEY, INCLUDING PROPERTY LINES, LEGAL DESCRIPTION, EXISTING UTILITIES, EXISTING ELEVATIONS, EXISTING PHYSICAL FEATURES AND STRUCTURES WAS PROVIDED BY HRC, INC. THE NORTH WETLAND LINES WERE IDENTIFIED BY BARR ENGINEERING AND FIELD LOCATED BY PEA GROUP

INDIVIDUAL TREES IDENTIFIED AND FIELD LOCATED BY PEA GROUP..

PEA GROUP WILL NOT BE HELD RESPONSIBLE FOR THE ACCURACY OF THE SURVEY OR FOR DESIGN ERRORS/OMISSIONS RESULTING FROM SURVEY INACCURACIES.

BM NO. 300
ARROW ON HYDRANT EAST SIDE OF DORR ROAD OPPOSITE ENTRANCE TO 2200 DORR ROAD.
ELEV = 980.69

BM 301
ARROW ON HYDRANT EAST SIDE DORR ROAD 100'+/– NORTH OF STERLING DRIVE.
ELEV = 990.00

BM NO. 302
MAG NAIL NORTHWEST FACE UTILITY POLE 350'+/– EAST OF DORR ROAD 250'+/– NORTH OF STERLING DRIVE.
ELEV = 987.92

BM 303
ARROW ON HYDRANT EAST SIDE DORR ROAD 100'+/– SOUTH OF 1920 DORR ROAD.
ELEV = 998.44

BM NO. 304
ARROW ON HYDRANT EAST SIDE DORR ROAD, 385'+/– SOUTH OF CENTERLINE OF GRAND RIVER ROAD.
ELEV = 986.61

BM NO. 305
ARROW ON HYDRNAT SOUTH SIDE GRAND RIVER 100'+/– EAST OF CENTERLINE OF DORR ROAD.
ELEV = 978.96

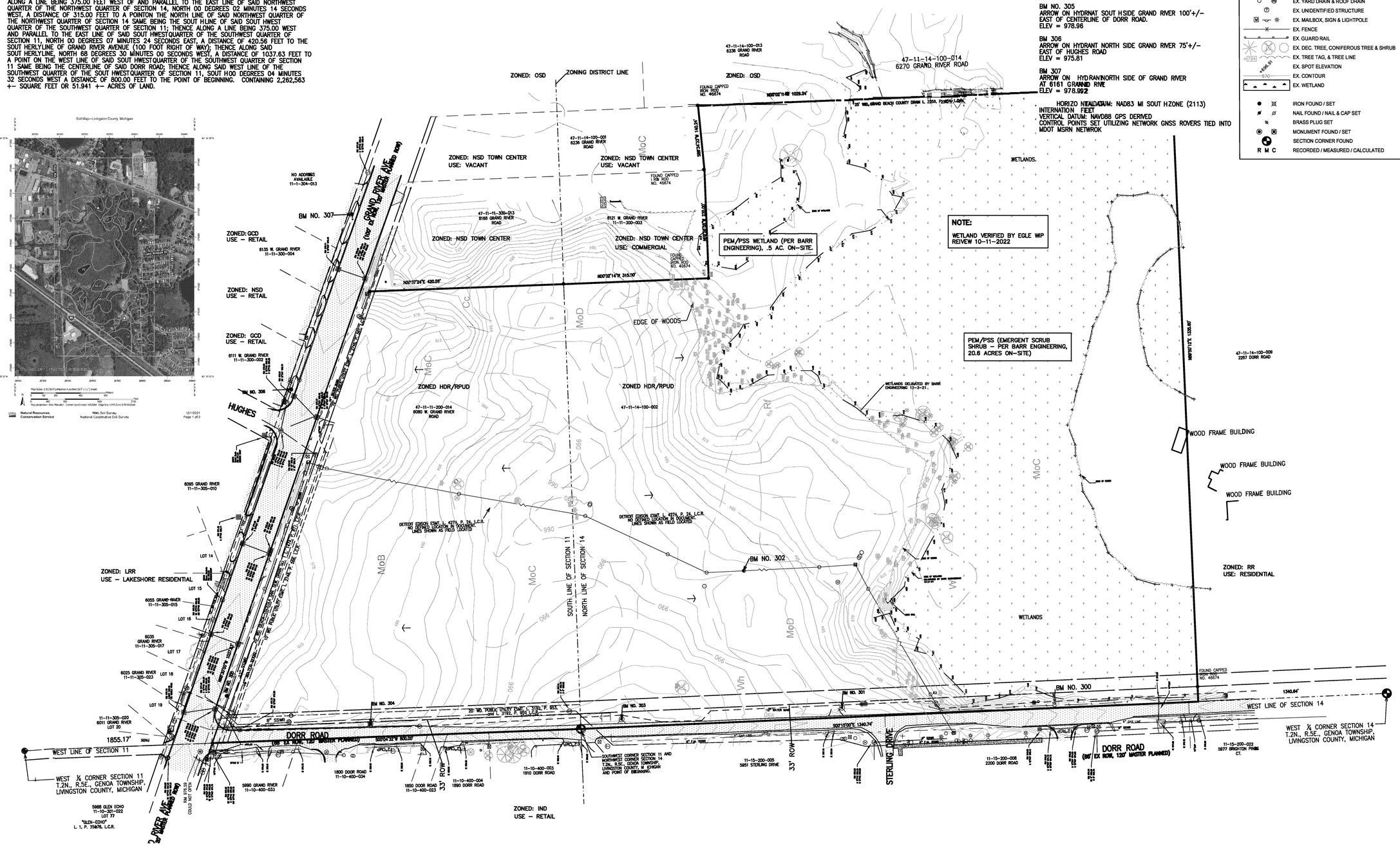
BM 306
ARROW ON HYDRANT NORTH SIDE GRAND RIVER 75'+/– EAST OF HUGHES ROAD
ELEV = 975.81

BM NO. 307
ARROW ON HYDRANT NORTH SIDE OF GRAND RIVER AT 6151 GRAND RIVER
ELEV = 978.892

HORIZONTAL DATUM: NAD83 MI SOUTH ZONE (2113) INTERNATIONAL FEET
VERTICAL DATUM: NAVD88 GPS DERIVED
CONTROL POINTS SET UTILIZING NETWORK GNSS ROVERS TIED INTO MDOT MSRN NETWORK

LEGEND:

-OH-ELEC-W-O-	EX. OH. ELEC, POLE & GUY WIRE
-UG-CATV-T-	EX. U.G. CABLE TV & PEDESTAL
-UG-COMM-O-	EX. U.G. COMMUNICATION LINE, PEDESTAL & MANHOLE
-UG-ELEC-E-E-E-	EX. U.G. ELEC,MANHOLE, METER & HANDHOLE
	EX. GAS LINE
G GAS	EX. GAS VALVE & GAS LINE MARKER
T T	EX. TRANSFORMER & IRRIGATION VALVE
	EX. WATER MAIN
W	EX. HYDRANT, GATE VALVE & POST INDICATOR VALVE
W	EX. WATER VALVE BOX & SHUTOFF
	EX. SANITARY SEWER
S	EX. SANITARY CLEANOUT & MANHOLE
C	EX. COMBINED SEWER MANHOLE
	EX. STORM SEWER
D	EX. CLEANOUT & MANHOLE
D	EX. SQUARE, ROUND & BEEHIVE CATCH BASIN
	EX. YARD DRAIN & ROOF DRAIN
	EX. UNIDENTIFIED STRUCTURE
M	EX. MAILBOX, SIGN & LIGHTPOLE
	EX. FENCE
	EX. GUARD RAIL
	EX. DEC. TREE, CONIFEROUS TREE & SHRUB
1724	EX. TREE TAG, & TREE LINE
988.91	EX. SPOT ELEVATION
970	EX. CONTOUR
	EX. WETLAND
	IRON FOUND / SET
	NAIL FOUND / NAIL & CAP SET
	BRASS PLUG SET
	MONUMENT FOUND / SET
	SECTION CORNER FOUND
R M C	RECORDED / MEASURED / CALCULATED



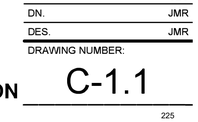
PEA GROUP
t: 844.813.2949
www.peagroup.com

NORTH

0 50 100 200
SCALE: 1" = 100'

811 Know what's below. Call before you dig.

CAUTION!!
THE LOCATIONS AND ELEVATIONS OF EXISTING UNDERGROUND UTILITIES AS SHOWN ON THIS DRAWING ARE ONLY APPROXIMATE. NO GUARANTEE IS EITHER EXPRESSED OR IMPLIED AS TO THE COMPLETENESS OR ACCURACY THEREOF. THE CONTRACTOR SHALL BE EXCLUSIVELY RESPONSIBLE FOR DETERMINING THE EXACT LOCATIONS AND ELEVATIONS PRIOR TO THE START OF CONSTRUCTION.



CLIENT

GRAND RIVER DORR LLC.
315550 NORTHWESTERN HIGHWAY
FARMINGTON HILLS, MI 48334

PROJECT TITLE

THE LEGACY APARTMENT HOMES
6080 W GRAND RIVER
GENOA TOWNSHIP, LIVINGSTON COUNTY, MICHIGAN

REVISIONS	
REV PER TWP	5-30-23

ORIGINAL ISSUE DATE:
APRIL 10, 2023

DRAWING TITLE

TOPOGRAPHIC SURVEY OVERALL

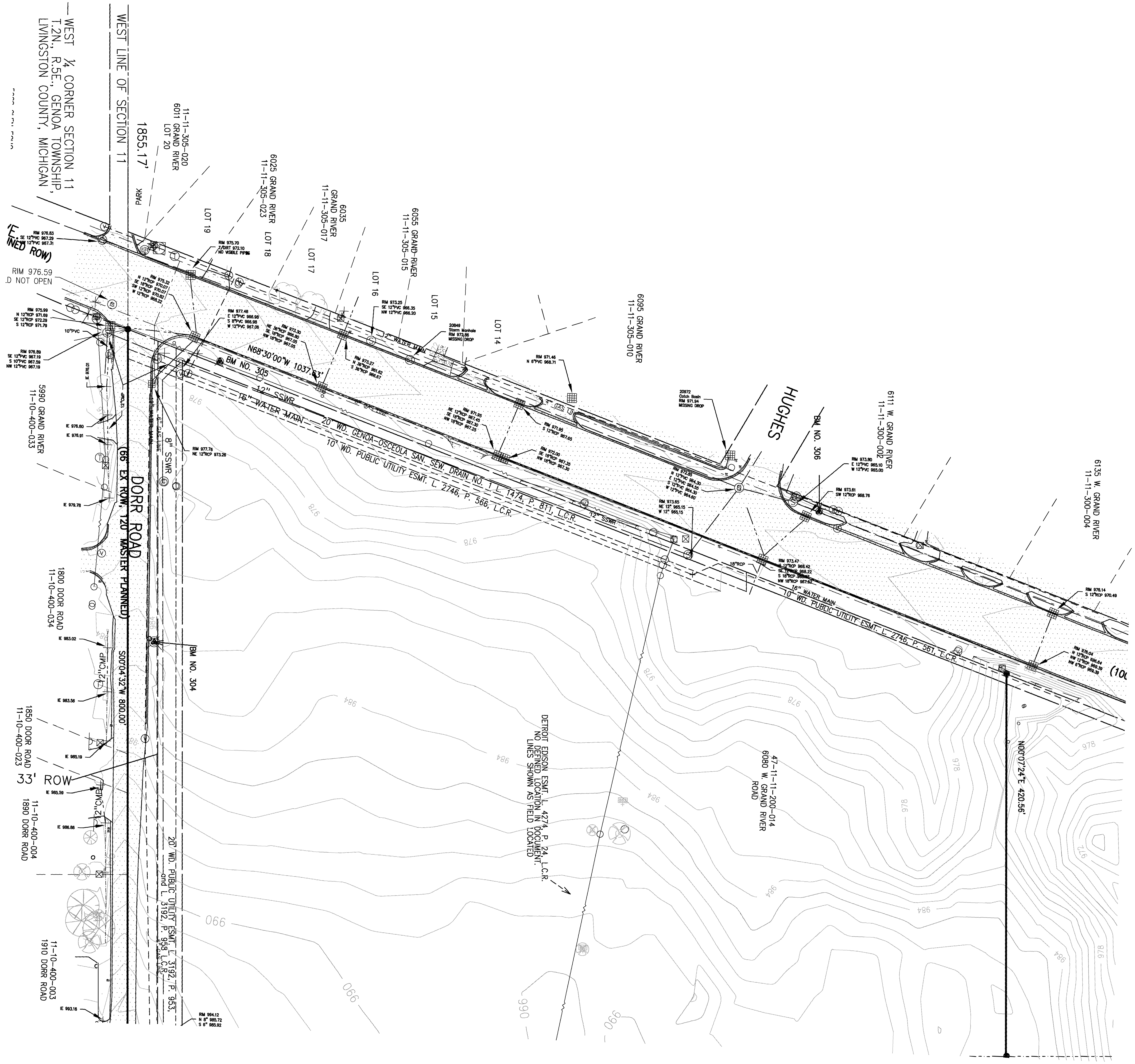
PEA JOB NO.	2021-0578
P.M.	JEC
DN.	JMR
DES.	JMR

DRAWING NUMBER:

C-1.1

NOT FOR CONSTRUCTION

S:\PROJECTS\2021\2021-0578 LAUTREC GENOA TOWNSHIP\CIVIL\SITE PLANS\[C-1.0] SP TOPO-21-0578.dwg



LEGEND:

- EX. OH. ELEC, POLE & GUY WIRE
- EX. U.G. CABLE TV & PEDESTAL
- EX. U.G. COMMUNICATION LINE, PEDESTAL & MANHOLE
- EX. U.G. ELEC,MANHOLE, METER & HANDHOLE
- EX. GAS LINE
- EX. GAS VALVE & GAS LINE MARKER
- EX. TRANSFORMER & IRRIGATION VALVE
- EX. WATER MAIN
- EX. HYDRANT, GATE VALVE & POST INDICATOR VALVE
- EX. WATER VALVE BOX & SHUTOFF
- EX. SANITARY SEWER
- EX. SANITARY CLEANOUT & MANHOLE
- EX. COMBINED SEWER MANHOLE
- EX. STORM SEWER
- EX. CLEANOUT & MANHOLE
- EX. SQUARE, ROUND & BEEHIVE CATCH BASIN
- EX. YARD DRAIN & ROOF DRAIN
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- EX. FENCE
- EX. GUARD RAIL
- EX. DEC. TREE, CONIFEROUS TREE & SHRUB
- EX. TREE TAG, & TREE LINE
- EX. SPOT ELEVATION
- EX. CONTOUR
- EX. WETLAND
- IRON FOUND / SET
- NAIL FOUND / NAIL & CAP SET
- BRASS PLUG SET
- MONUMENT FOUND / SET
- SECTION CORNER FOUND
- R M C RECORDED / MEASURED / CALCULATED

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0 25 50 100
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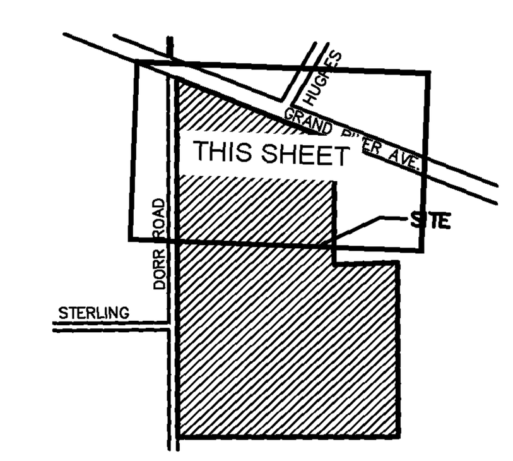


BM NO. 300
ARROW ON HYDRANT EAST SIDE OF DORR ROAD OPPOSITE ENTRANCE TO 2200 DORR ROAD.
ELEV = 980.69

BM 301
ARROW ON HYDRANT EAST SIDE DORR ROAD 100'+/- NORTH OF STERLING DRIVE.
ELEV = 990.00

BM NO. 302
MAG NAIL NORTHWEST FACE UTILITY POLE 350'+/- EAST OF DORR ROAD 250'+/- NORTH OF STERLING DRIVE.
ELEV = 987.92

BM 303
ARROW ON HYDRANT EAST SIDE DORR ROAD 100'+/- SOUTH OF 1920 DORR ROAD.
ELEV = 998.44

BM NO. 304
ARROW ON HYDRANT EAST SIDE DORR ROAD, 385'+/- SOUTH OF CENTERLINE OF GRAND RIVER ROAD.
ELEV = 986.61

BM NO. 305
ARROW ON HYDRNAT SOUTH SIDE GRAND RIVER 100'+/- EAST OF CENTERLINE OF DORR ROAD.
ELEV = 978.96

BM 306
ARROW ON HYDRANT NORTH SIDE GRAND RIVER 75'+/- EAST OF HUGHES ROAD
ELEV = 975.81

BM 307
ARROW ON HYDRANT NORTH SIDE OF GRAND RIVER AT 6161 GRAND RIVER
ELEV = 978.92

CLIENT
GRAND RIVER DORR LLC.
315550 NORTHWESTERN HIGHWAY
FARMINGTON HILLS, MI 48334

PROJECT TITLE
THE LEGACY APARTMENT HOMES
6080 W GRAND RIVER
GENOA TOWNSHIP, LIVINGSTON COUNTY, MICHIGAN

REVISIONS

REV PER TWP	5-30-23

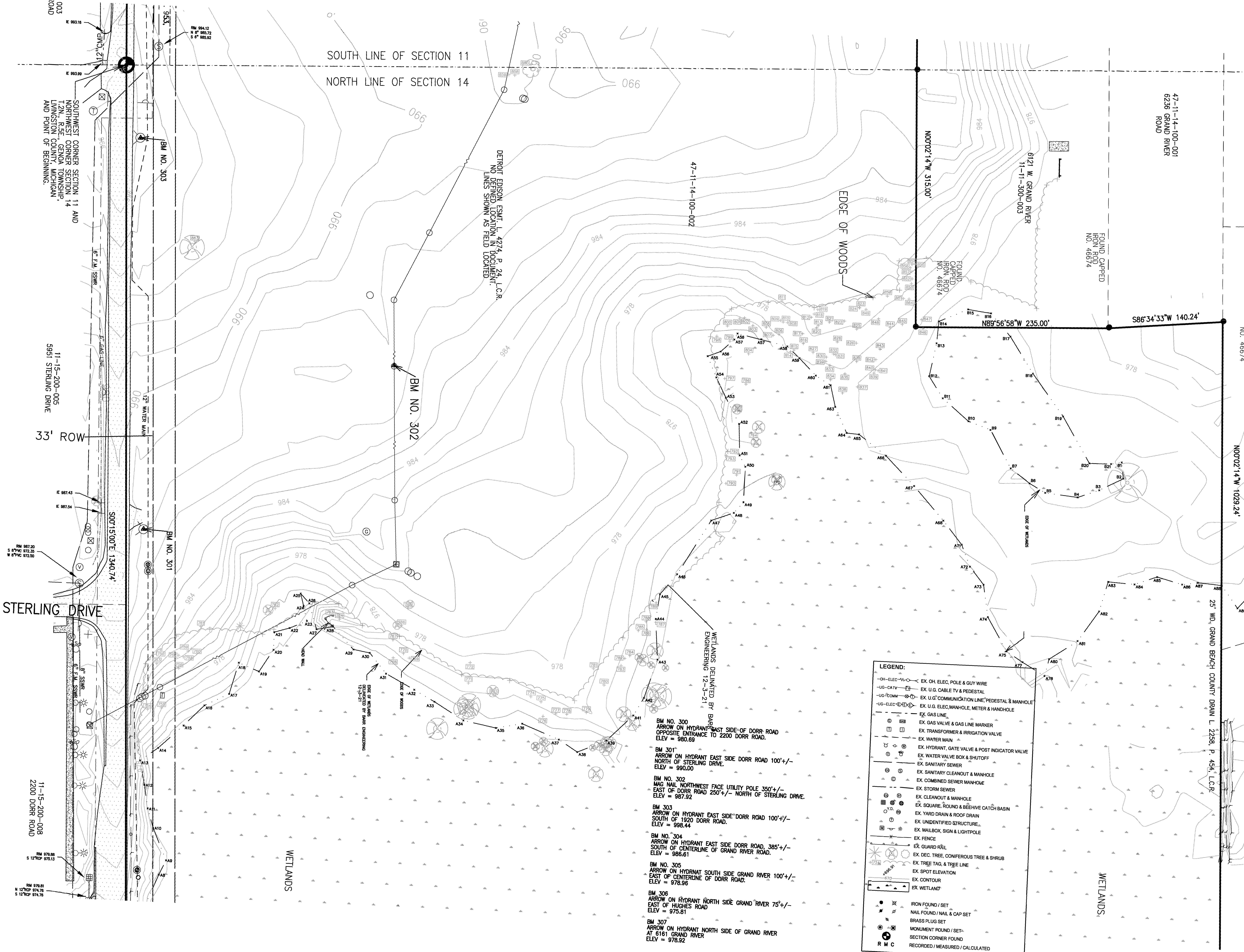
ORIGINAL ISSUE DATE:
APRIL 10, 2023

DRAWING TITLE
TOPOGRAPHIC SURVEY NORTH

PEA JOB NO.	2021-0578
P.M.	JEC
DN.	JMR
DES.	JMR

DRAWING NUMBER:
C-1.2

NOT FOR CONSTRUCTION



SOUTH LINE OF SECTION 11
NORTH LINE OF SECTION 14
SOUTHWEST CORNER SECTION 11 AND NORTHWEST CORNER SECTION 14 T.2N., R.5E., GENOA TOWNSHIP, LIVINGSTON COUNTY, MICHIGAN AND POINT OF BEGINNING.
BM NO. 303
DETROIT EDISON ESMT. L. 4274, P. 24, L.C.R. NO DEFINED LOCATION IN DOCUMENT. LINES SHOWN AS FIELD LOCATED
47-11-14-100-002
EDGE OF WOODS
N00°02'14"W 315.00'
6121 W GRAND RIVER 11-11-300-003
47-11-14-100-001 6236 GRAND RIVER ROAD
FOUND CAPPED IRON ROD NO. 46674
N89°56'58"W 235.00'
S86°34'33"W 140.24'
N00°02'14"W 1029.24'
BM NO. 302
33' ROW
11-15-200-005 5951 STERLING DRIVE
S00°15'00"E 1340.74'
BM NO. 301
STERLING DRIVE
11-15-200-008 2200 DORR ROAD
WETLANDS DELINATED BY BARR ENGINEERING 12-3-21
EDGE OF WETLANDS DELINEATED BY BARR ENGINEERING 12-3-21
EDGE OF WOODS
25' WD. GRAND BEACH COUNTY DRAIN L. 2258, P. 454, L.C.R.
WETLANDS
WETLANDS
BM NO. 300
ARROW ON HYDRANT EAST SIDE OF DORR ROAD OPPOSITE ENTRANCE TO 2200 DORR ROAD.
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EX. CONTOUR
EX. WETLAND
IRON FOUND / SET
NAIL FOUND / NAIL & CAP SET
BRASS PLUG SET
MONUMENT FOUND / SET
SECTION CORNER FOUND
R M C RECORDED / MEASURED / CALCULATED

PEA GROUP
t: 844.813.2949
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NORTH

SCALE: 1" = 50'

Know what's below. Call before you dig.

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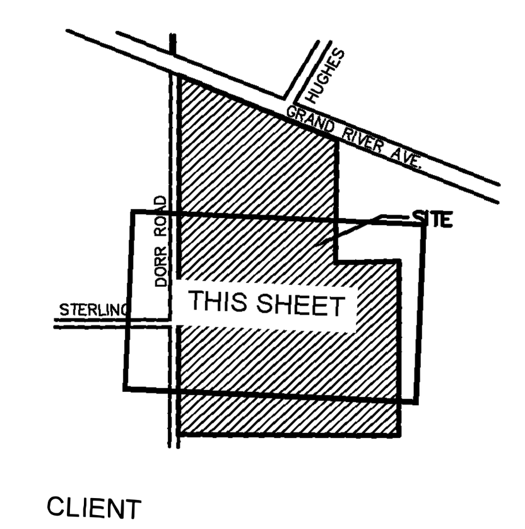

CLIENT
GRAND RIVER DORR LLC.
315550 NORTHWESTERN HIGHWAY
FARMINGTON HILLS, MI 48334

PROJECT TITLE
THE LEGACY APARTMENT HOMES
6080 W GRAND RIVER
GENOA TOWNSHIP, LIVINGSTON COUNTY, MICHIGAN

REVISIONS	
REV PER TWP	5-30-23

ORIGINAL ISSUE DATE:
APRIL 10, 2023

DRAWING TITLE
TOPOGRAPHIC SURVEY SOUTH

PEA JOB NO.	2021-0578
P.M.	JEC
DN.	JMR
DES.	JMR

DRAWING NUMBER:
C-1.3

NOT FOR CONSTRUCTION

TAG NO.	CODE	DBH	COMMON NAME	LATIN NAME	COND	COMMENTS
752	RO	10	Red Oak	Quercus rubra	Good	
753	RO	11	Red Oak	Quercus rubra	Good	
754	PN	18	Pin Cherry	Prunus pennsylvanica	Good	
755	RO	13	Red Oak	Quercus rubra	Good	
756	RO	10	Red Oak	Quercus rubra	Good	
757	RO	10	Red Oak	Quercus rubra	Good	x1
758	RO	9	Red Oak	Quercus rubra	Good	
759	RO	11	Red Oak	Quercus rubra	Good	
760	RO	8	Red Oak	Quercus rubra	Good	x1
761	RO	10	Red Oak	Quercus rubra	Good	
762	BX	21	Box elder	Acer negundo	Fair	x1
763	AP	10	Domestic Apple	Malus sylvestris	Fair	x1
764	BC	10	Wild Black Cherry	Prunus serotina	Poor	
765	BG	10	Bigtooth Aspen	Populus grandidentata	Good	
766	E	10	American Elm	Ulmus americana	Good	
767	AP	9	Domestic Apple	Malus sylvestris	Fair	
768	BC	10	Wild Black Cherry	Prunus serotina	Fair	
769	MW	12	White Mulberry	Morus alba	Fair	
770	BC	13	Wild Black Cherry	Prunus serotina	Fair	
771	BC	13	Wild Black Cherry	Prunus serotina	Fair	
772	BC	9	Wild Black Cherry	Prunus serotina	Fair	
773	BC	15	Wild Black Cherry	Prunus serotina	Fair	
774	AP	12	Domestic Apple	Malus sylvestris	Fair	
775	AP	8	Domestic Apple	Malus sylvestris	Fair	
776	AP	8	Domestic Apple	Malus sylvestris	Fair	x1
777	AP	8	Domestic Apple	Malus sylvestris	Fair	
778	RO	9	Red Oak	Quercus rubra	Good	
779	AP	10	Domestic Apple	Malus sylvestris	Fair	
780	AP	12	Domestic Apple	Malus sylvestris	Fair	
781	RO	12	Red Oak	Quercus rubra	Good	
782	AP	11	Domestic Apple	Malus sylvestris	Fair	
783	AP	10	Domestic Apple	Malus sylvestris	Fair	
784	AP	8	Domestic Apple	Malus sylvestris	Fair	x1
785	BG	8	Bigtooth Aspen	Populus grandidentata	Fair	
786	BG	10	Bigtooth Aspen	Populus grandidentata	Very Poor	
787	BG	9	Bigtooth Aspen	Populus grandidentata	Fair	
788	BG	10	Bigtooth Aspen	Populus grandidentata	Fair	
789	BG	10	Bigtooth Aspen	Populus grandidentata	Very Poor	
790	AP	8	Domestic Apple	Malus sylvestris	Fair	
791	AP	8	Domestic Apple	Malus sylvestris	Fair	x5
792	BG	9	Bigtooth Aspen	Populus grandidentata	Good	
793	RO	12	Red Oak	Quercus rubra	Fair	
794	SWO	14	Swamp White Oak	Quercus bicolor	Fair	
795	SWO	14	Swamp White Oak	Quercus bicolor	Fair	
796	SWO	16	Swamp White Oak	Quercus bicolor	Fair	
797	BX	11	Box elder	Acer negundo	Poor	x1
798	AP	18	Domestic Apple	Malus sylvestris	Fair	x5
799	BG	11	Bigtooth Aspen	Populus grandidentata	Dead	
800	BC	9	Wild Black Cherry	Prunus serotina	Fair	
801	BC	16	Wild Black Cherry	Prunus serotina	Poor	
802	BC	14	Wild Black Cherry	Prunus serotina	Fair	
803	BC	16	Wild Black Cherry	Prunus serotina	Fair	x1
804	GA	8	Green Ash	Fraxinus pennsylvanica	Poor	x1
805	BC	18	Wild Black Cherry	Prunus serotina	Fair	
806	BC	9	Wild Black Cherry	Prunus serotina	Fair	
807	BC	9	Wild Black Cherry	Prunus serotina	Fair	
808	BC	14	Wild Black Cherry	Prunus serotina	Poor	x1

TAG NO.	CODE	DBH	COMMON NAME	LATIN NAME	COND	COMMENTS
809	BC	13	Wild Black Cherry	Prunus serotina	Fair	
810	BC	11	Wild Black Cherry	Prunus serotina	Poor	
811	BC	12	Wild Black Cherry	Prunus serotina	Fair	
812	BC	16	Wild Black Cherry	Prunus serotina	Fair	x1
813	BC	13	Wild Black Cherry	Prunus serotina	Fair	
814	BC	8	Wild Black Cherry	Prunus serotina	Poor	
815	BC	9	Wild Black Cherry	Prunus serotina	Fair	
816	PN	11	Pin Cherry	Prunus pennsylvanica	Fair	check YB
817	PN	12	Pin Cherry	Prunus pennsylvanica	Fair	
818	BC	9	Wild Black Cherry	Prunus serotina	Fair	
819	BX	12	Box elder	Acer negundo	Fair	
820	BC	13	Wild Black Cherry	Prunus serotina	Fair	
821	BC	11	Wild Black Cherry	Prunus serotina	Fair	
822	PN	14	Pin Cherry	Prunus pennsylvanica	Good	
823	BX	17	Box elder	Acer negundo	Fair	x1
824	BX	8	Box elder	Acer negundo	Fair	
825	BX	10	Box elder	Acer negundo	Fair	
826	BX	8	Box elder	Acer negundo	Fair	
827	SM	21	Silver Maple	Acer saccharinum	Good	x1
828	BC	10	Wild Black Cherry	Prunus serotina	Poor	
829	BC	11	Wild Black Cherry	Prunus serotina	Very Poor	crown broke off
830	BC	8	Wild Black Cherry	Prunus serotina	Poor	
831	BC	9	Wild Black Cherry	Prunus serotina	Fair	
832	BC	8	Wild Black Cherry	Prunus serotina	Poor	
833	BC	12	Wild Black Cherry	Prunus serotina	Fair	
834	BC	9	Wild Black Cherry	Prunus serotina	Poor	
835	BX	8	Box elder	Acer negundo	Very Poor	x1
836	BX	10	Box elder	Acer negundo	Fair	
837	PN	11	Pin Cherry	Prunus pennsylvanica	Fair	
838	BC	12	Wild Black Cherry	Prunus serotina	Fair	
839	RO	18	Red Oak	Quercus rubra	Fair	
840	YB	13	Yellow Birch	Betula alleghaniensis	Fair	
841	BX	8	Box elder	Acer negundo	Poor	
842	BC	8	Wild Black Cherry	Prunus serotina	Fair	
843	BX	8	Box elder	Acer negundo	Very Poor	
844	BC	16	Wild Black Cherry	Prunus serotina	Fair	
845	BX	8	Box elder	Acer negundo	Poor	
846	BC	27	Wild Black Cherry	Prunus serotina	Fair	x1
847	BC	14	Wild Black Cherry	Prunus serotina	Fair	
848	BX	9	Box elder	Acer negundo	Fair	
849	BX	9	Box elder	Acer negundo	Very Poor	
850	BX	8	Box elder	Acer negundo	Fair	x1
851	BO	16	Black Oak	Quercus velutina	Good	x1
852	BX	9	Box elder	Acer negundo	Poor	x3
853	BX	9	Box elder	Acer negundo	Fair	
854	BC	11	Wild Black Cherry	Prunus serotina	Fair	
855	RO	13	Red Oak	Quercus rubra	Fair	
856	BC	13	Wild Black Cherry	Prunus serotina	Fair	
857	RO	11	Red Oak	Quercus rubra	Fair	
858	BC	8	Wild Black Cherry	Prunus serotina	Fair	x3
859	BC	8	Wild Black Cherry	Prunus serotina	Fair	
860	RO	17	Red Oak	Quercus rubra	Good	x1
861	AP	17	Domestic Apple	Malus sylvestris	Poor	x2
862	AP	25	Domestic Apple	Malus sylvestris	Poor	
863	WO	38	White Oak	Quercus alba	Very Poor	
864	BC	13	Wild Black Cherry	Prunus serotina	Fair	

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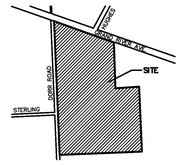


CLIENT
GRAND RIVER DORR LLC.
315550 NORTHWESTERN HIGHWAY
FARMINGTON HILLS, MI 48334

PROJECT TITLE
THE LEGACY APARTMENT HOMES
9280 W GRAND RIVER
GENOA TOWNSHIP, LIVINGSTON COUNTY, MICHIGAN

REVISIONS	
REV PER TWP	5-30-23

ORIGINAL ISSUE DATE:
APRIL 10, 2023

DRAWING TITLE
TREE LIST

PEA JOB NO.	2021-0578
P.M.	JEC
DN.	JMR
DES.	JMR

DRAWING NUMBER:
C-1.4

NOT FOR CONSTRUCTION

S:\PROJECTS\2021\2021-0578 LAI\REC GENOA TOWNSHIP\DWG\SITE PLANS\[C-1.0] SP TOPO-21-0578.dwg

SITE DATA TABLE:

		ORDINANCE	PROPOSED
SITE AREA		20.0 ACRES MIN.	51.94 ACRES GROSS (Wetland 17.29 ac, ROW 1.62 ac) 33.03 ACRES NET
DENSITY		8 UNITS/ACRE	6.18 UNITS/ACRE (NET)
ZONING:	EXISTING:	NSD AND MDR WITH TOWN CENTER OVERLAY	
	PROPOSED:	HDR, RPUD	
USE:	EXISTING:	VACANT	
	PROPOSED:	204 MULTI-FAMILY DWELLING UNITS, CLUBHOUSE AND POOL	

BUILDING INFORMATION:
MAXIMUM ALLOWABLE BUILDING HEIGHT = 40 FEET (3 STORIES)
PROPOSED BUILDING HEIGHT = 27 FEET (2 STORIES)

BUILDING FOOTPRINT AREA = 5,898 – 11,981 SQ.FT.
CLUBHOUSE – 6,658 SQ. FT.
TOTAL BUILDING FOOTPRINT AREA = 203,492 SQ.FT.

UNIT	LIVING AREA	BEDROOMS	NUMBER OF UNITS
A	1,471 SFT	2	68
B	1,829 SFT	2	68
C	1,585 SFT	3	68

	REQUIRED	PROPOSED (BASED ON NET ACRES)
LOT COVERAGE	35% MAX	14.3%
PERCENT IMPERVIOUS	50% MAX	45.4%

SETBACK REQUIREMENTS:	REQUIRED	PROPOSED
FRONT:		
INTERIOR	20'	20'
EXTERIOR	35'	75.4' MIN (Grand River), 77.9' (Dorr)
SIDE:	15'	30.0' MIN
REAR:	30'	783'

DENSITY CALCULATION

ALLOWED	PROPOSED OVERALL ACREAGE	PROPOSED USEABLE ACREAGE
8 UNITS/AC	3.92 UNITS/AC	6.18 UNITS/AC

PARKING CALCULATIONS:
TOTAL REQUIRED PARKING — REQUIRED 2 SPACES PER 2 BEDROOM OR MORE UNIT = 408 SPACES

TOTAL PROPOSED PARKING SPACES = 703
SPACES (408 GARAGE + 204 IN DRIVEWAYS + 91 ADDITIONAL SPACES INCLUDING 1 H/C SPACE)

OPEN SPACE:
MINIMUM OPEN SPACE REQUIRED = 25%
PROVIDED OPEN SPACE =22.98 AC, = 45.7% (33.03 – 12.57 (Impervious) – 1.80 (ponds) + 4.32 (25% Wetland))

SITE SOILS INFORMATION:
ACCORDING TO THE USDA NATURAL RESOURCES CONSERVATION SERVICE WEB SOIL SURVEY FOR LIVINGSTON COUNTY, THE SITE CONSISTS OF THE FOLLOWING SOIL TYPES:

FrB, MoB, MoC, MoD, Rf, W, Wh

APPROVED ORDINANCE MODIFICATIONS:

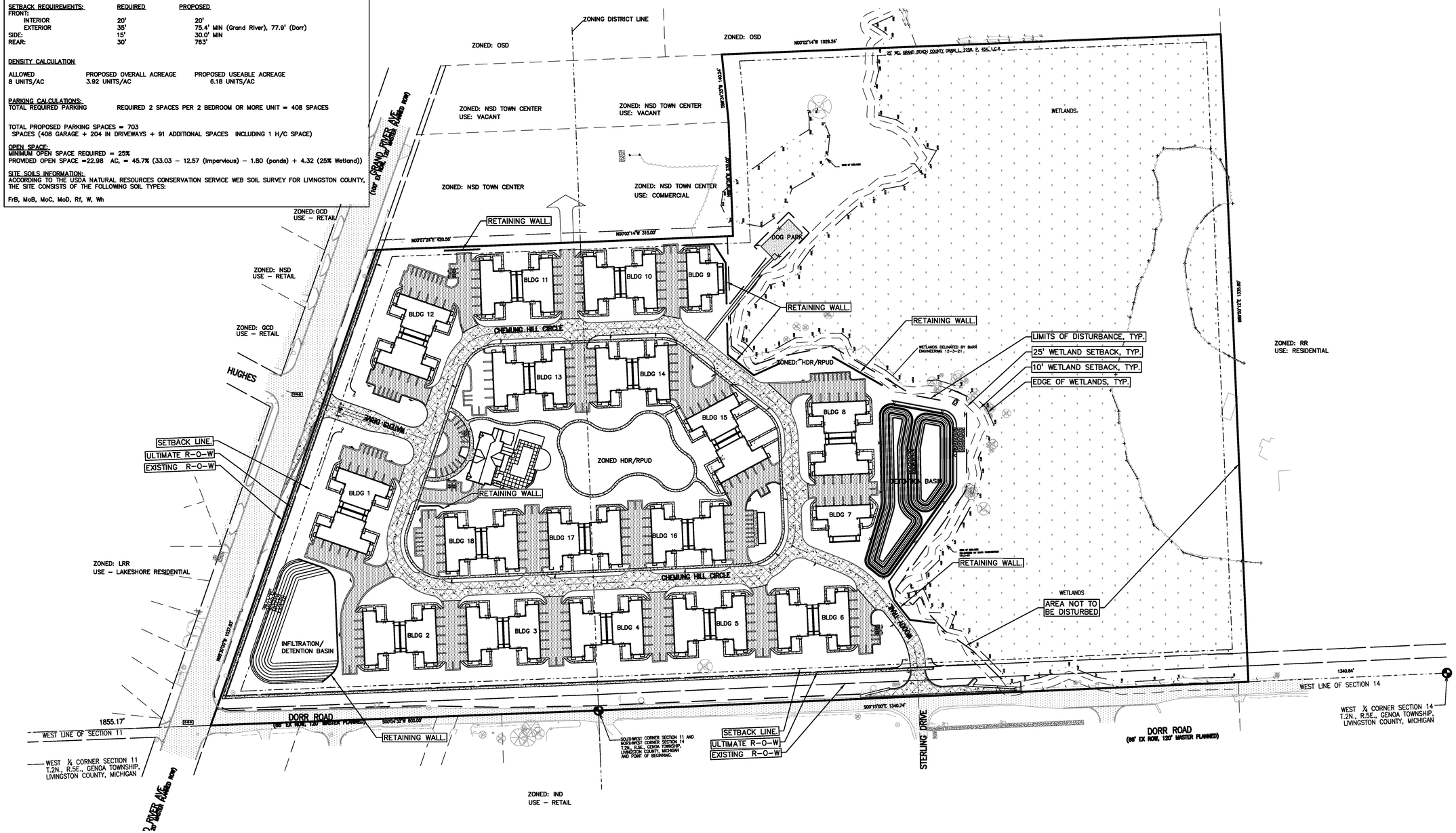
ZONING

3.05.02 (e)/ 15.05.03	MODIFICATION OF THE HORIZONTAL MINIMUM CURVE RADIUS FROM 150' TO 100', AND CURB RADII FROM ROAD TO GARAGE AND PARKING DRIVEWAYS LESS THAN 30' RADIUS.
10.03.01 (C)	THE OPEN SPACE ALONG THE EXTERIOR PUBLIC ROADS SHALL GENERALLY HAVE A DEPTH OF AT LEAST ONE HUNDRED (100) FEET EITHER LANDSCAPED OR PRESERVED IN A NATURAL WOODED CONDITION.
12.01.03	REDUCTION IN THE PERCENTAGE OR BRICK REQUIRED ON BUILDING WALLS EXPOSED TO PUBLIC AND AN INCREASE IN PERCENTAGE OF VINYL OR FIBER CEMENT SIDING AND WOOD SIDING.
13.02.04 d.	REQUEST FOR GRADING UPTO 10' FROM REGULATED WETLAND.
14.02.06	REQUEST TO EXCEED PARKING SPACE REQUIREMENT MORE THAN 20%
14.06.09	PARKING LOTS AND RELATED MANEUVERING AISLES SHALL MEET MINIMUM SETBACKS FROM ADJACENT STREET R-O-W AS SHOWN IN THE SCHEDULE OF REGULATIONS AND HAVE PARKING LOT LANDSCAPING
14.06.10	PARKING LOTS SHALL HAVE MINIMUM REAR AND SIDE YARD SETBACKS INCLUDING BERMING AND LANDSCAPING.

NOTE::

1. PROPERTY WILL BE DEVELOPED OWNED AND OPERATED BY A SINGLE OWNERSHIP ENTITY.
2. TRASH COLLECTION WILL BE PROVIDED VIA INDIVIDUAL TRASH CARTS FOR EACH UNIT WITH CURB SIDE TRASH COLLECTION.

LEGEND:
- CONCRETE PAVEMENT (STD DUTY, HEAVY DUTY, R.O.W. ONLY)
- ASPHALT PAVEMENT (BTD DUTY, HEAVY DUTY, DEEP STRENGTH)
- GRAVEL
- WETLAND
- CONCRETE CURB AND GUTTER
- REVERSE GUTTER PAN
- SETBACK LINE
- SIGN
- LIGHTPOLE
- FENCE
- GUARD RAIL



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t: 844.813.2949
www.peagroup.com

NORTH

0 50 100 200
SCALE: 1" = 100'

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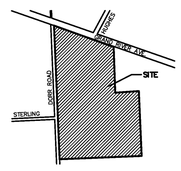

CLIENT
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315550 NORTHWESTERN HIGHWAY
FARMINGTON HILLS, MI 48334

PROJECT TITLE
THE LEGACY APARTMENT HOMES
6080 W GRAND RIVER
GENOA TOWNSHIP, LIVINGSTON COUNTY, MICHIGAN

REVISIONS	
REV PER TWP	5-30-23

ORIGINAL ISSUE DATE:
APRIL 10, 2023

DRAWING TITLE
OVERALL SITE PLAN

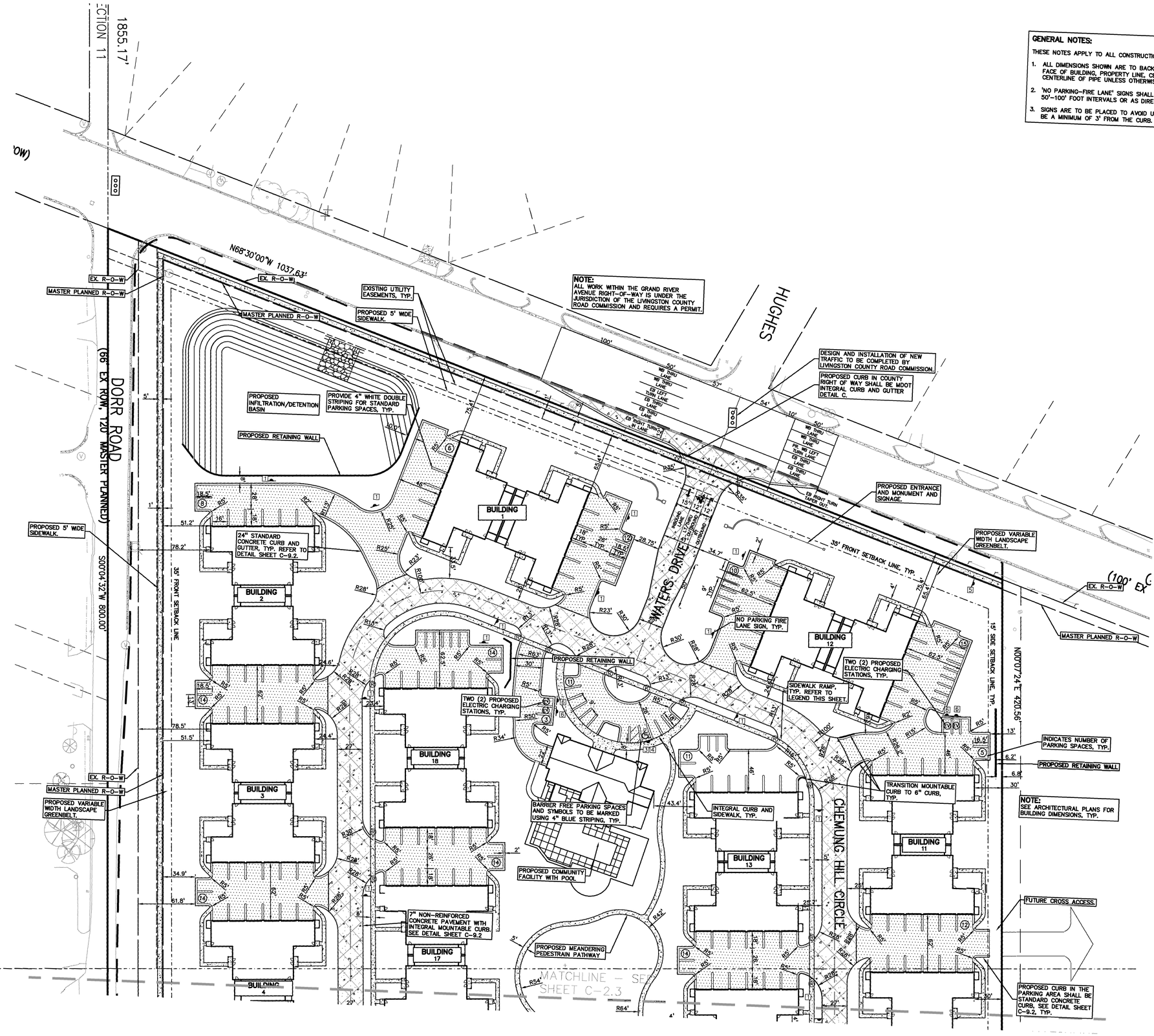
PEA JOB NO.	2021-0578
P.M.	JEC
DN.	JMR
DES.	JMR

DRAWING NUMBER:
C-2.1

NOT FOR CONSTRUCTION

229

S:\PROJECTS\2021-0578 LAUTREC GENOA TOWNSHIP\PWK\SITE PLANS\C-2.0 SP DWG-21-0578.dwg



GENERAL NOTES:

THESE NOTES APPLY TO ALL CONSTRUCTION ACTIVITIES ON THIS PROJECT.

1. ALL DIMENSIONS SHOWN ARE TO BACK OF CURB, FACE OF SIDEWALK, OUTSIDE FACE OF BUILDING, PROPERTY LINE, CENTER OF MANHOLE/CATCH BASIN OR CENTERLINE OF PIPE UNLESS OTHERWISE NOTED.
2. 'NO PARKING–FIRE LANE' SIGNS SHALL BE POSTED ALONG ALL FIRE LANES AT 50'–100' FOOT INTERVALS OR AS DIRECTED BY THE FIRE OFFICIAL.
3. SIGNS ARE TO BE PLACED TO AVOID UTILITIES. IN GENERAL SIGN POST ARE TO BE A MINIMUM OF 3' FROM THE CURB. REFER TO UTILITY SHEET.

LEGEND:

- CONCRETE PAVEMENT (STD DUTY, HEAVY DUTY, R.O.W. ONLY)
- ASPHALT PAVEMENT (STD DUTY, HEAVY DUTY, DEEP STRENGTH)
- GRAVEL
- WETLAND
- CONCRETE CURB AND GUTTER
- REVERSE GUTTER PAN
- SETBACK LINE
- SIGN
- LIGHTPOLE
- FENCE
- GUARD RAIL

SIGN LEGEND:

'NO PARKING FIRE LANE' SIGN	[1]
'STOP' SIGN	[2]
'BARRIER FREE PARKING' SIGN	[3]
'VAN ACCESSIBLE' SIGN	[4]
'SIDEWALK ENDS' SIGN	[5]
ELECTRIC VEHICLE SIGN	[6]
DO NOT MOW SIGN	[7]

REFER TO DETAIL SHEET FOR SIGN DETAILS

SIDEWALK RAMP LEGEND:

SIDEWALK RAMP 'TYPE R'	Ⓡ
CURB DROP ONLY	Ⓧ

REFER TO LATEST MDOT R-28 STANDARD RAMP AND DETECTABLE WARNING DETAILS

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NORTH

0 25 50 100

SCALE: 1" = 50'

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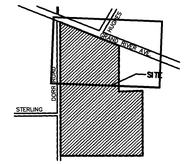

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31555D NORTHWESTERN HIGHWAY
FARMINGTON HILLS, MI 48334

PROJECT TITLE

THE LEGACY APARTMENT HOMES
6080 W GRAND RIVER
GENOA TOWNSHIP, LIVINGSTON COUNTY, MICHIGAN

REVISIONS	
REV PER TWP	5-30-23

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DRAWING TITLE

SITE PLAN NORTH

PEA JOB NO.	2021-0578
P.M.	JEC
DN.	JMR
DES.	JMR

DRAWING NUMBER: C-2.2

NOT FOR CONSTRUCTION

S:\PROJECTS\2021\2021-0578 LAUTREC GENOA TOWNSHIP\DWG\SITE PLANS\(C-2.0) SP DIM-21-0578.dwg

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2. 'NO PARKING-FIRE LANE' SIGNS SHALL BE POSTED ALONG ALL FIRE LANES AT 50'-100' FOOT INTERVALS OR AS DIRECTED BY THE FIRE OFFICIAL.
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SIGN LEGEND:

'NO PARKING FIRE LANE' SIGN	1
'STOP' SIGN	2
'BARRIER FREE PARKING' SIGN	3
'VAN ACCESSIBLE' SIGN	4
'SIDEWALK ENDS' SIGN	5
ELECTRIC VEHICLE SIGN	6
DO NOT MOW SIGN	7

REFER TO DETAIL SHEET FOR SIGN DETAILS

LEGEND:

STD DUTY / HEAVY DUTY / R.O.W ONLY — CONCRETE PAVEMENT
STD DUTY / HEAVY DUTY / DEEP STRENGTH — ASPHALT PAVEMENT
GRAVEL
WETLAND
CONCRETE CURB AND GUTTER
REVERSE GUTTER PAN
SETBACK LINE
SIGN
LIGHTPOLE
FENCE
GUARD RAIL

SIDEWALK RAMP LEGEND:

SIDEWALK RAMP 'TYPE R' Ⓡ
CURB DROP ONLY Ⓧ
REFER TO LATEST MDOT R-28 STANDARD RAMP AND DETECTABLE WARNING DETAILS

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NORTH

0 25 50 100
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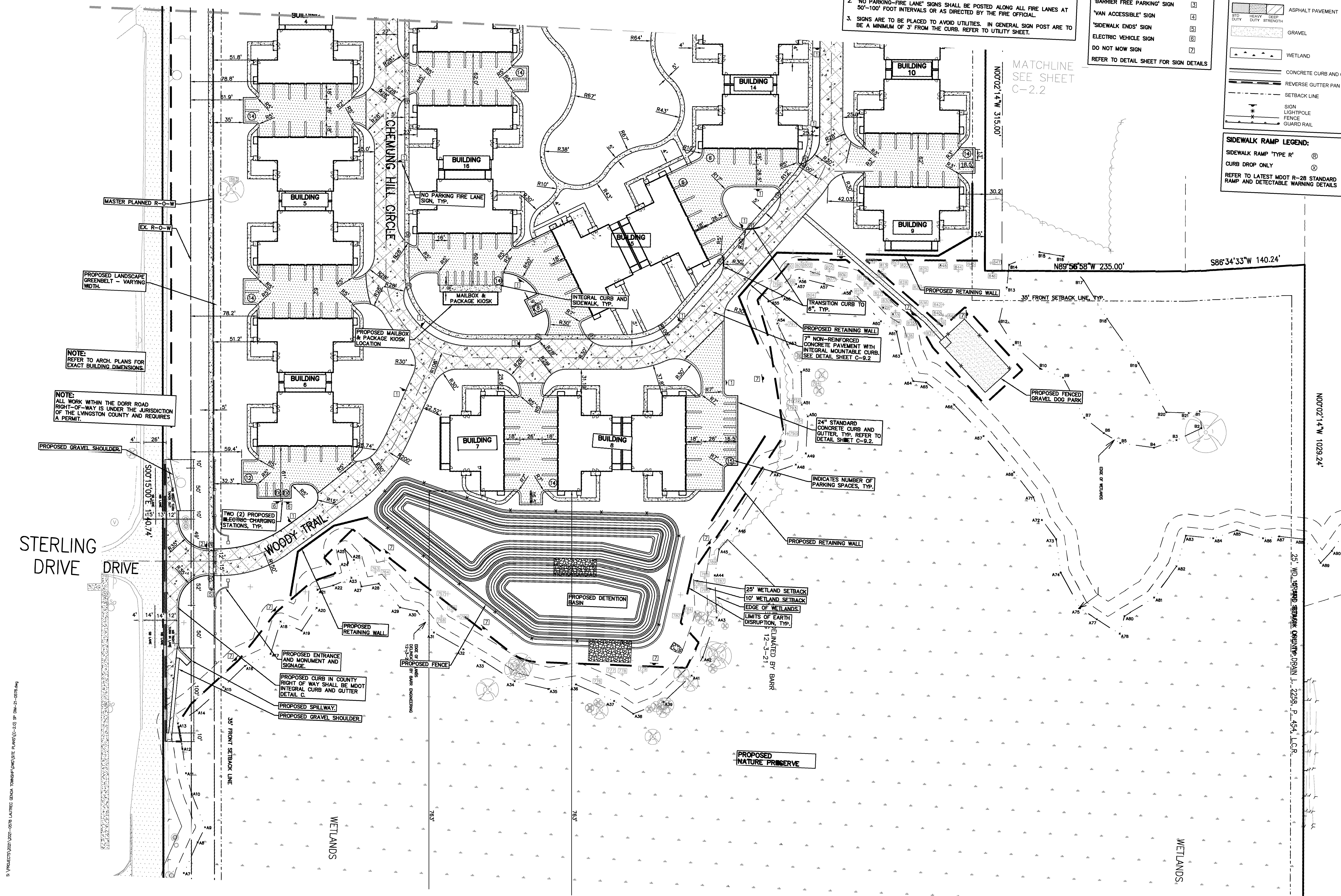

CLIENT
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31550 NORTHWESTERN HIGHWAY
FARMINGTON HILLS, MI 48334

PROJECT TITLE
THE LEGACY APARTMENT HOMES
6080 W GRAND RIVER
GENOA TOWNSHIP, LIVINGSTON COUNTY, MICHIGAN

REVISIONS	
REV PER TWP	5-30-23

ORIGINAL ISSUE DATE:
APRIL 10, 2023

DRAWING TITLE
SITE PLAN SOUTH

PEA JOB NO.	2021-0578
P.M.	JEC
DN.	JMR
DES.	JMR

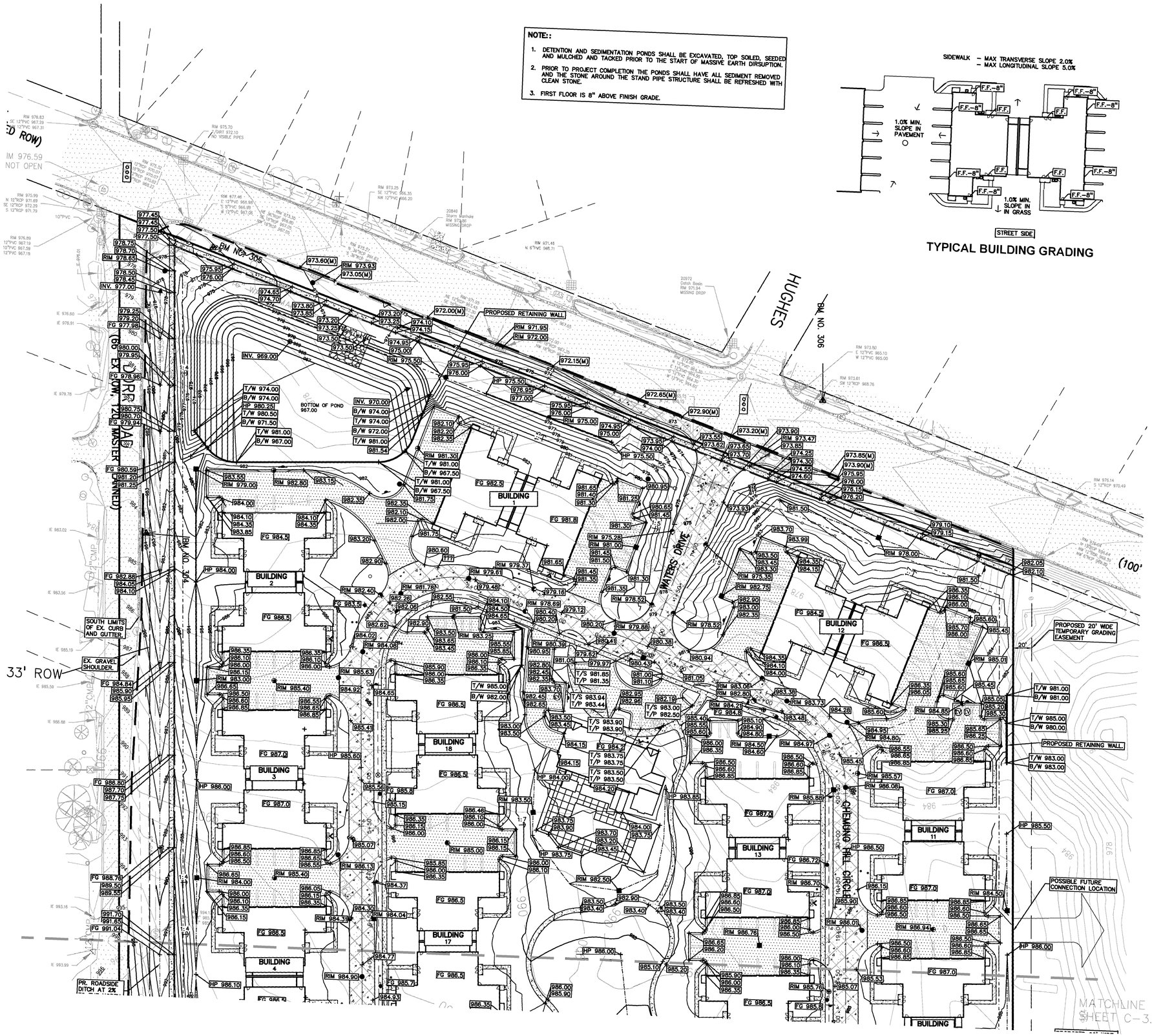
DRAWING NUMBER:
C-2.3

NOT FOR CONSTRUCTION

NOTE::

1. DETENTION AND SEDIMENTATION PONDS SHALL BE EXCAVATED, TOP SOILED, SEEDED AND MULCHED AND TACKED PRIOR TO THE START OF MASSIVE EARTH DISRUPTION.
2. PRIOR TO PROJECT COMPLETION THE PONDS SHALL HAVE ALL SEDIMENT REMOVED AND THE STONE AROUND THE STAND PIPE STRUCTURE SHALL BE REFRESHED WITH CLEAN STONE.
3. FIRST FLOOR IS 8" ABOVE FINISH GRADE.

TYPICAL BUILDING GRADING



GRADING LEGEND:

- 822.50 — EXISTING SPOT ELEVATION
- 822.50 — PROPOSED SPOT ELEVATION: TYPICALLY TOP OF PAVEMENT IN PAVED AREAS, GUTTER GRADE IN CURB LINES.
- 670 — EXISTING CONTOUR
- 922 — PROPOSED CONTOUR
- PROPOSED REVERSE GUTTER PAN
- PROPOSED RIDGE LINE
- PROPOSED SWALE/DITCH

ABBREVIATIONS

T/C = TOP OF CURB
T/P = TOP OF PAVEMENT
T/S = TOP OF SIDEWALK
T/W = TOP OF WALL
G = GUTTER GRADE
F.G. = FINISH GRADE
RIM = RIM ELEVATION
B/W = BOTTOM OF WALL

SYMBOLS: GRADING

PROPOSED SPOT ELEVATION: TYPICALLY TOP OF PAVEMENT IN PAVED AREAS, GUTTER GRADE IN CURB LINES. — 822.50

PROPOSED CONTOUR LINE — 922

ABBREVIATIONS:
T/C = TOP OF CURB
G = GUTTER GRADE
T/P = TOP OF PAVEMENT
T/S = TOP OF SIDEWALK
T/W = TOP OF WALL
B/W = BOTTOM OF WALL
F.G. = FINISH GRADE
RIM = RIM ELEVATION

RETAINING WALL NOTE:
TOP OF WALL (T/W) AND BOTTOM OF WALL (B/W) GRADES ARE THE FINISH GRADE AT THE TOP AND BOTTOM OF THE RETAINING WALL, NOT ACTUAL TOP AND BOTTOM OF THE WALL STRUCTURE.

PEA GROUP
t: 844.813.2949
www.peagroup.com

NORTH

0 25 50 100
SCALE: 1" = 50'

811. Know what's below. Call before you dig.

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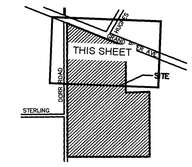

CLIENT
GRAND RIVER DORR LLC.
315550 NORTHWESTERN HIGHWAY
FARMINGTON HILLS, MI 48334

PROJECT TITLE
THE LEGACY APARTMENT HOMES
6080 W GRAND RIVER
GENOA TOWNSHIP, LIVINGSTON COUNTY, MICHIGAN

REVISIONS	
REV PER TWP	5-30-23

ORIGINAL ISSUE DATE:
APRIL 10, 2023

DRAWING TITLE
GRADING PLAN NORTH

PEA JOB NO.	2021-0578
P.M.	JEC
DN.	JMR
DES.	JMR

DRAWING NUMBER:
C-3.1

NOT FOR CONSTRUCTION

232

S:\PROJECTS\2021\2021-0578 AUTREC GENOA TOWNSHIP\DWG\SITE PLANS\C-3.1@ SP GRAD-21-0578.dwg

SOUTHWEST CORNER SECTION 11 AND NORTHWEST CORNER SECTION 14 T1N-R5E GENOA TOWNSHIP, LIVINGSTON COUNTY, MICHIGAN AND POINT OF BEGINNING.

PR. ROADSIDE DITCH AT 2% TO THE NORTH.

PR. ROADSIDE DITCH HIGH POINT.

STERLING DRIVE

WOODY TRAIL

CHEMUNG HILL CIRCLE

MATCHLINE – SEE SHEET C-4.1

BUILDING 4
BUILDING 5
BUILDING 6
BUILDING 7
BUILDING 8
BUILDING 9
BUILDING 10
BUILDING 14
BUILDING 15
BUILDING 16

PROPOSED 20' WIDE TEMPORARY GRADING EASEMENT

PROPOSED RETAINING WALL

MATCH EXISTING GRADE AT DOG PARK.

LIMITS OF DISTURBANCE, TYP.
25' WETLAND SETBACK, TYP.
10' WETLAND SETBACK, TYP.
EDGE OF WETLAND, TYP.

GRADE DOWN TO EXISTING GROUND USING A 1:3 SLOPE.

BOTTOM OF FOREBAY 972.50

BOTTOM OF POND 972.50

SYMBOLS: GRADING

PROPOSED SPOT ELEVATION: TYPICALLY TOP OF PAVEMENT IN PAVED AREAS, GUTTER GRADE IN CURB LINES. 622.50

PROPOSED CONTOUR LINE 922

ABBREVIATIONS:
T/C = TOP OF CURB
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RIM = RIM ELEVATION

GRADING LEGEND:

EXISTING SPOT ELEVATION

622.50 PROPOSED SPOT ELEVATION: TYPICALLY TOP OF PAVEMENT IN PAVED AREAS, GUTTER GRADE IN CURB LINES.

670 EXISTING CONTOUR

922 PROPOSED CONTOUR

PROPOSED REVERSE GUTTER PAN

PROPOSED RIDGE LINE

PROPOSED SWALE/DITCH

ABBREVIATIONS

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RETAINING WALL NOTE:

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NOTE::

1. DETENTION AND SEDIMENTATION PONDS SHALL BE EXCAVATED, TOP SOILED, SEEDED AND MULCHED AND TACKED PRIOR TO THE START OF MASSIVE EARTH DISRUPTION.
2. PRIOR TO PROJECT COMPLETION THE PONDS SHALL HAVE ALL SEDIMENT REMOVED AND THE STONE AROUND THE STAND PIPE STRUCTURE SHALL BE REFRESHED WITH CLEAN STONE.
3. FIRST FLOOR IS 8" ABOVE FINISH GRADE.

NORTH

0 25 50 100

SCALE: 1" = 50'

811 Know what's below. Call before you dig.

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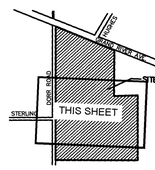


CLIENT

GRAND RIVER DORR LLC.
315550 NORTHWESTERN HIGHWAY
FARMINGTON HILLS, MI 48334

PROJECT TITLE

THE LEGACY APARTMENT HOMES
6080 W GRAND RIVER
GENOA TOWNSHIP, LIVINGSTON COUNTY, MICHIGAN

REVISIONS	
REV PER TWP	5-30-23

ORIGINAL ISSUE DATE:
APRIL 10, 2023

DRAWING TITLE

GRADING PLAN SOUTH

PEA JOB NO.	2021-0578
P.M.	JEC
DN.	JMR
DES.	JMR

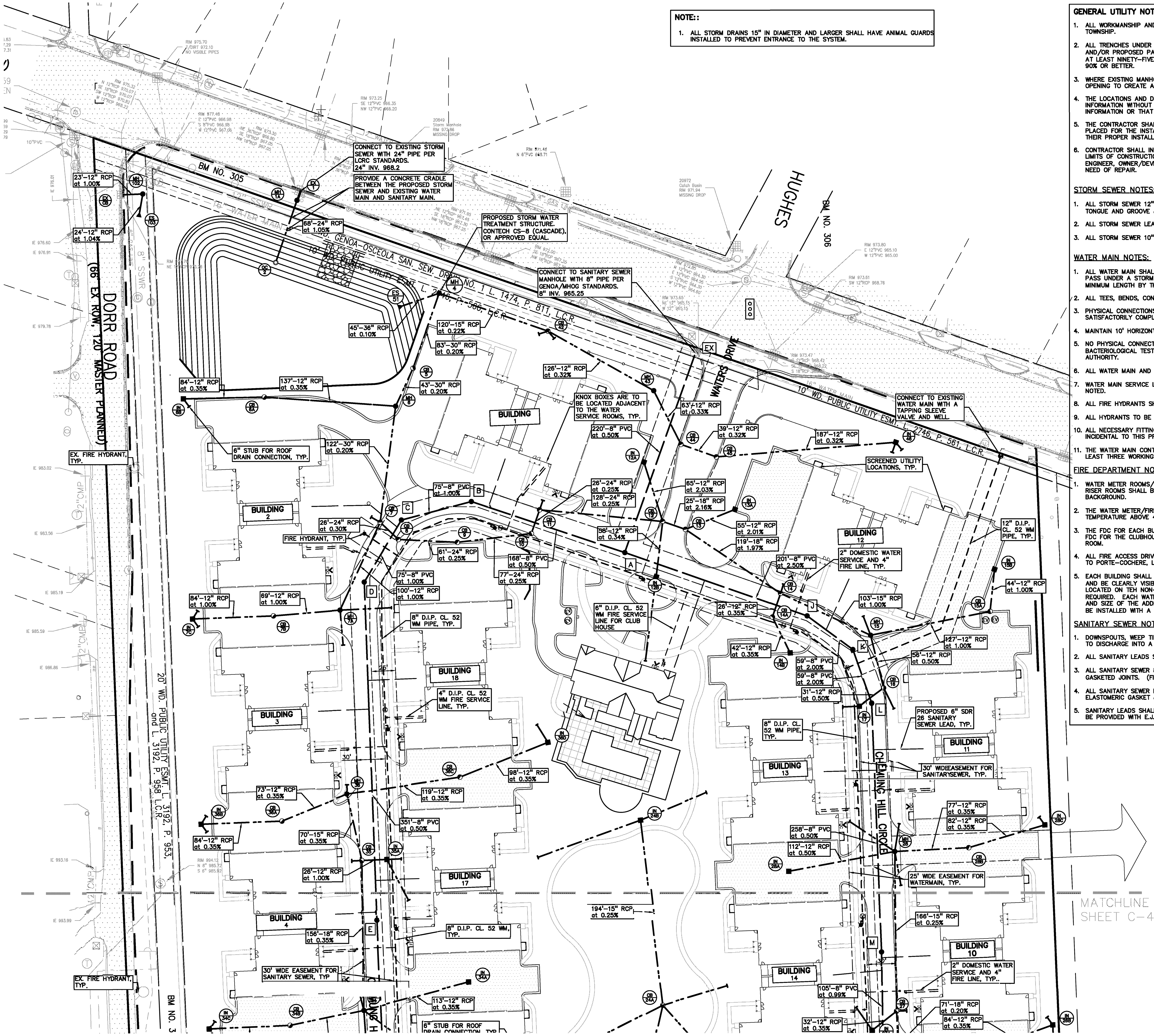
DRAWING NUMBER:

C-3.2

NOT FOR CONSTRUCTION

233

S:\PROJECTS\2021-0578 LAUTREC GENOA TOWNSHIP\DWG\SITE PLANS\C-3.0 SP GRAD-2-0578.dwg



NOTE::

1. ALL STORM DRAINS 15" IN DIAMETER AND LARGER SHALL HAVE ANIMAL GUARDS INSTALLED TO PREVENT ENTRANCE TO THE SYSTEM.

GENERAL UTILITY NOTES:

1. ALL WORKMANSHIP AND MATERIALS SHALL BE IN ACCORDANCE WITH THE STANDARDS AND SPECIFICATIONS OF MHOG AND GENOA TOWNSHIP.
2. ALL TRENCHES UNDER OR WITHIN THREE (3) FEET OR THE FORTY-FIVE (45) DEGREE ZONE OF INFLUENCE LINE OF EXISTING AND/OR PROPOSED PAVEMENT, BUILDING PAD OR DRIVE APPROACH SHALL BE BACKFILLED WITH MDOT CLII SAND COMPACTED TO AT LEAST NINETY-FIVE (95) PERCENT OF MAXIMUM UNIT WEIGHT (ASTM D-1557). ALL OTHER TRENCHES TO BE COMPACTED TO 90% OR BETTER.
3. WHERE EXISTING MANHOLES OR SEWER PIPE ARE TO BE TAPPED, DRILL HOLES 4" CENTER TO CENTER, AROUND PERIPHERY OF OPENING TO CREATE A PLANE OF WEAKNESS JOINT BEFORE BREAKING SECTION OUT.
4. THE LOCATIONS AND DIMENSIONS SHOWN ON THE PLANS FOR EXISTING UTILITIES ARE IN ACCORDANCE WITH AVAILABLE INFORMATION WITHOUT UNCOVERING AND MEASURING. THE DESIGN ENGINEER DOES NOT GUARANTEE THE ACCURACY OF THIS INFORMATION OR THAT ALL EXISTING UNDERGROUND FACILITIES ARE SHOWN. CONTRACTOR SHALL FIELD VERIFY UTILITIES.
5. THE CONTRACTOR SHALL COORDINATE TO ENSURE ALL REQUIRED PIPES, CONDUITS, CABLES AND SLEEVES ARE PROPERLY PLACED FOR THE INSTALLATION OF GAS, ELECTRIC, PHONE, CABLE, IRRIGATION, ETC. IN SUCH A MANNER THAT WILL FACILITATE THEIR PROPER INSTALLATION PRIOR TO THE PLACEMENT OF THE PROPOSED PAVEMENT AND LANDSCAPING.
6. CONTRACTOR SHALL INSPECT ALL EXISTING PUBLIC STORM SEWER, SANITARY SEWER AND WATER MAIN STRUCTURES WITHIN THE LIMITS OF CONSTRUCTION AND WITH THE GOVERNING AGENCY INSPECTOR PRIOR TO ESTABLISHING FINAL GRADE. NOTIFY THE ENGINEER, OWNER/DEVELOPER, AND GOVERNING AGENCY IF STRUCTURE IS DEEMED TO BE STRUCTURALLY UNSOUND AND/OR IN NEED OF REPAIR.

STORM SEWER NOTES:

1. ALL STORM SEWER 12" DIAMETER OR LARGER SHALL BE REINFORCED CONCRETE PIPE (RCP C-76) CLASS IV WITH MODIFIED TONGUE AND GROOVE JOINT WITH RUBBER GASKETS UNLESS SPECIFIED OTHERWISE (ASTM C-443).
2. ALL STORM SEWER LEADS SHALL BE CONSTRUCTED AT 1.00% MINIMUM SLOPE.
3. ALL STORM SEWER 10" OR LESS AND/OR LEADS SHALL BE PVC SCHEDULE 40.

WATER MAIN NOTES:

1. ALL WATER MAIN SHALL BE INSTALLED WITH A MINIMUM COVER OF 5.5' BELOW FINISH GRADE. WHEN WATER MAINS MUST DIP TO PASS UNDER A STORM SEWER OR SANITARY SEWER, THE SECTIONS WHICH ARE DEEPER THAN NORMAL SHALL BE KEPT TO A MINIMUM LENGTH BY THE USE OF VERTICAL TWENTY TWO AND A HALF (22.5°) DEGREE BENDS, PROPERLY ANCHORED.
2. ALL TEES, BENDS, CONNECTIONS, ETC. ARE CONSIDERED INCIDENTAL TO THE JOB.
3. PHYSICAL CONNECTIONS SHALL NOT BE MADE BETWEEN EXISTING AND NEW WATER MAINS UNTIL REQUIRED TESTING IS SATISFACTORILY COMPLETED.
4. MAINTAIN 10' HORIZONTAL CLEARANCE BETWEEN OUTER EDGE OF WATERMAIN AND ANY SANITARY/STORM SEWER OR STRUCTURE.
5. NO PHYSICAL CONNECTION TO THE EXISTING WATER MAIN CAN BE MADE UNTIL ALL NEW WATER MAIN PASSES PRESSURE AND BACTERIOLOGICAL TESTS TO THE SATISFACTION OF THE MARION, HOWELL, OCEOLA, GENOA (MHOG) SEWER AND WATER AUTHORITY.
6. ALL WATER MAIN AND FITTINGS (3" DIAMETER AND LARGER) DUCTILE IRON, CLASS 52.
7. WATER MAIN SERVICE LEADS SHALL BE TYPE 'K' ANNEALED SEAMLESS COPPER WITH FLARED FITTINGS, UNLESS OTHERWISE NOTED.
8. ALL FIRE HYDRANTS SHALL BE EJIW #5BR MODEL #250 PER MHOG STANDARDS.
9. ALL HYDRANTS TO BE A MINIMUM OF 5' FROM BACK OF CURB, TYP.
10. ALL NECESSARY FITTINGS, THRUST BLOCKS, RESTRAINING GLANDS, BLOW OFFS, ETC. FOR WATER MAIN ARE CONSIDERED INCIDENTAL TO THIS PROJECT. THE CONTRACTOR SHALL INSTALL THESE ITEMS AS NECESSARY AND AS REQUIRED BY THE MHOG.
11. THE WATER MAIN CONTRACTOR SHALL NOTIFY THE INSPECTION SECTION OF THE MHOG/GENOA TOWNSHIP AT 810-227-5225 AT LEAST THREE WORKING DAYS IN ADVANCE OF STARTING CONSTRUCTION.

FIRE DEPARTMENT NOTES:

1. WATER METER ROOMS/FIRE SPRINKLER ROOMS SHALL BE LOCATED ON THE STREET SIDE OF THE BUILDINGS. FIRE SPRINKLER RISER ROOMS SHALL BE PROVIDED WITH SIGNAGE IDENTIFYING THE ROOM AND ITS ADDRESS WITH RED LETTERS ON WHITE BACKGROUND.
2. THE WATER METER/FIRE SPRINKLER RISER ROOMS SHALL BE PROVIDED WITH HEAT AND INSULATION TO MAINTAIN THE ROOM TEMPERATURE ABOVE 40 DEGREES FAHRENHEIT.
3. THE FDC FOR EACH BUILDING MAY BE LOCATED IMMEDIATELY OUTSIDE THE WATER METER/FIRE SPRINKLER RISER ROOM. THE FDC FOR THE CLUBHOUSE SHALL BE LCOATED ON TEH FRONT OF THE BUILDING REGARDLESS OF THE LOCATION OF THE RISER ROOM.
4. ALL FIRE ACCESS DRIVES ARE TO BE PROVIDED WITH VERTICAL CLEARANCE OF 13.5 FEET. THIS INCLUDES BUT IS NOT LIMITED TO PORTE-COCHERE, LIGHTING, AND LARGE CANOPY TREES.
5. EACH BUILDING SHALL INCLUDE THE BUILDING NUMBERS A MINIMUM OF 6" HIGH LETTERS/NUMBERS OF CONTRASTING COLORS AND BE CLEARLY VISIBLE FROM THE STREET. EACH UNIT ADDRESS SHALL BE A MINIMUM OF 4" HIGH. WIHT UNIT ADDRESSES LOCATED ON TEH NON-STREET-SIDE OF THE BUILLDINGS, ADDITIONAL YARD SIGNS VISIBLE FROM THE PARKING AREAS WILL BE REQUIRED. EACH WATER METER/FIRE SPRINKLER RISER ROOM SHALL BE PROVIDED WITH THEIR OWN ADDRESS. THE LOCATION AND SIZE OF THE ADDRESS LABELING SHALL BE COORDINATED AND APPROVED PRIOR TO INSTALLATION.ALL WATER MAIN SHALL BE INSTALLED WITH A MINIMUM COVER OF 5.5' BELOW FINISH GRADE.

SANITARY SEWER NOTES:

1. DOWNSPOUTS, WEEP TILE, FOOTING DRAINS OR ANY CONDUIT THAT CARRIES STORM OR GROUND WATER SHALL NOT BE ALLOWED TO DISCHARGE INTO A SANITARY SEWER.
2. ALL SANITARY LEADS SHALL BE CONSTRUCTED AT 1.00% MINIMUM SLOPE.
3. ALL SANITARY SEWER 8" OR LARGER SHALL BE PVC SDR 26 TYPE PSM SEWER PIPE WITH BELL AND SPIGOT ENDS FOR GASKETED JOINTS. (FITTINGS ASTM D 3034, PVC BELL ENDS, GASKETS ASTM F 477, ELASTOMERIC SEALS).
4. ALL SANITARY SEWER LEADS SHALL BE POLYVINYL CHLORIDE (PVC) SDR 23.5 PIPE AND FITTINGS. ALL JOINTS TO BE ELASTOMERIC GASKET JOINTS PER ASTM D3212 UNLESS OTHERWISE NOTED.
5. SANITARY LEADS SHALL BE PROVIDED WITH CLEANOUTS EVERY 100 FEET AND AT EVERY BEND AS SHOWN. ALL CLEANOUTS TO BE PROVIDED WITH E.J.I.W. #1565 BOX OR EQUAL.

UTILITY LEGEND:

EX. OH. ELEC, POLE & GUY WIRE
EX. U.G. CABLE TV & PEDESTAL
EX. U.G. COMMUNICATION LINE, PEDESTAL & MANHOLE
EX. U.G. ELEC,MANHOLE, METER & HANDHOLE
EX. GAS LINE
EX. GAS VALVE & GAS LINE MARKER
EX. TRANSFORMER & IRRIGATION VALVE
EX. WATER MAIN
EX. HYDRANT, GATE VALVE & POST INDICATOR VALVE
EX. WATER VALVE BOX & SHUTOFF
EX. SANITARY SEWER
EX. SANITARY CLEANOUT & MANHOLE
EX. COMBINED SEWER MANHOLE
EX. STORM SEWER
EX. CLEANOUT & MANHOLE
EX. SQUARE, ROUND, & BEEHIVE CATCH BASIN
EX. YARD DRAIN & ROOF DRAIN
EX. UNIDENTIFIED STRUCTURE
PROPOSED WATER MAIN
PROPOSED HYDRANT AND GATE VALVE
PROPOSED TAPPING SLEEVE, VALVE & WELL
PROPOSED POST INDICATOR VALVE
PROPOSED SANITARY SEWER
PROPOSED SANITARY CLEANOUT & MANHOLE
PROPOSED STORM SEWER
PROPOSED STORM SEWER CLEANOUT & MANHOLE
PROPOSED CATCH BASIN, INLET & YARD DRAIN

NOT FOR CONSTRUCTION

PEA GROUP
t: 844.813.2949
www.peagroup.com

NORTH
SCALE: 1" = 50'

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THIS SHEET

CLIENT
GRAND RIVER DORR LLC.
31550 NORTHWESTERN HIGHWAY
FARMINGTON HILLS, MI 48334

PROJECT TITLE
THE LEGACY APARTMENT HOMES
6080 W GRAND RIVER
GENOA TOWNSHIP, LIVINGSTON COUNTY, MICHIGAN

REVISIONS
REV PER TWP 5-30-23

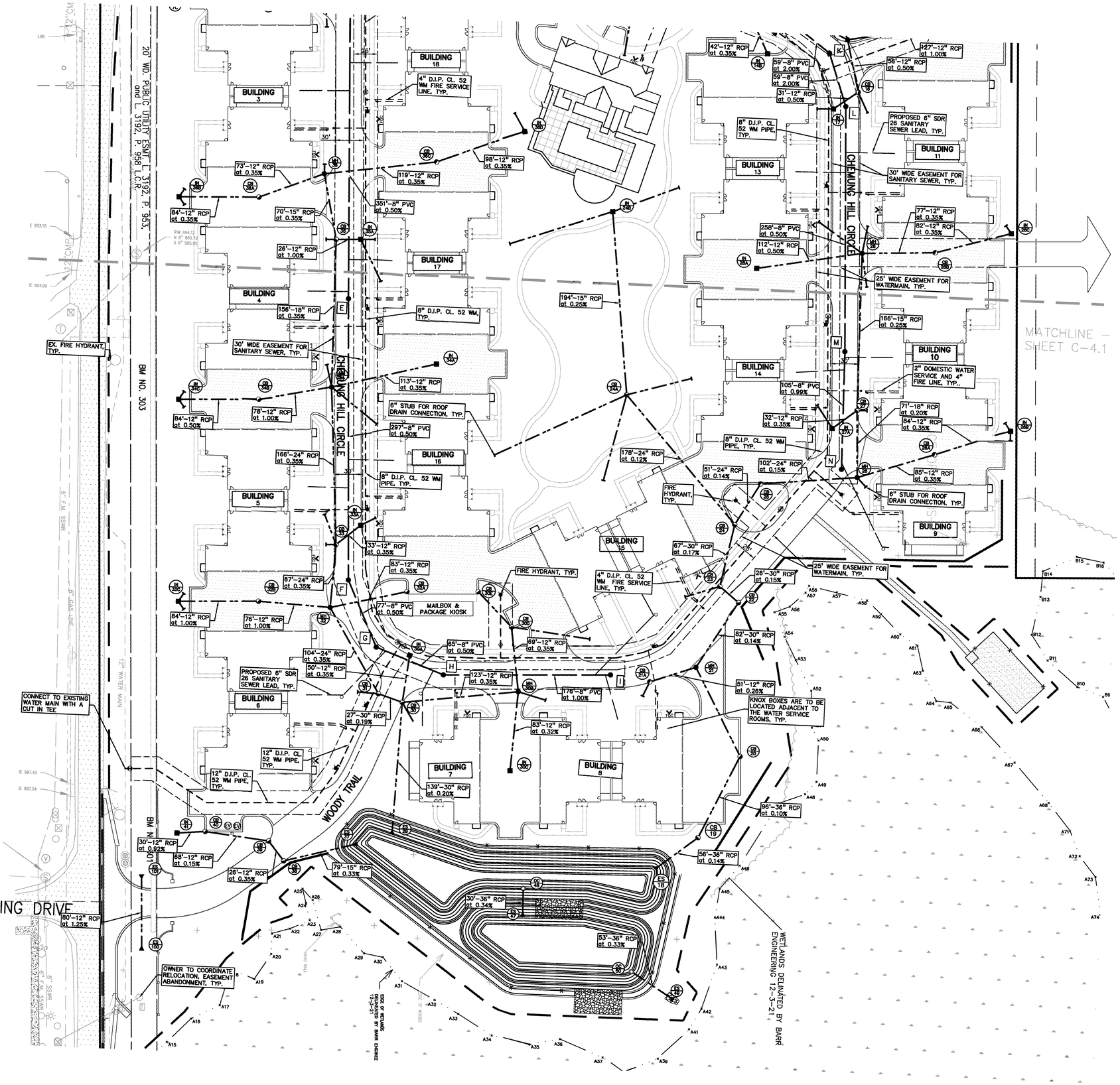
ORIGINAL ISSUE DATE:
APRIL 10, 2023

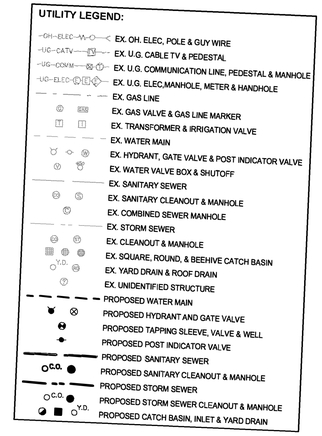
DRAWING TITLE
UTILITY PLAN NORTH

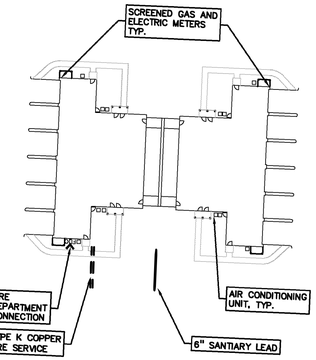
PEA JOB NO.	2021-0578
P.M.	JEC
DN.	JMR
DES.	JMR

DRAWING NUMBER:
C-4.1

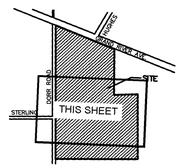
S:\PROJECTS\2021-0578 LAUTREC GENOA TOWNSHIP\DWG\SITE PLANS\C-4.0 SP UTIL-21-0578.dwg







TYPICAL BUILDING UTILITY SERVICE



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NORTH

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CLIENT
GRAND RIVER DORR LLC.
31555O NORTHWESTERN HIGHWAY
FARMINGTON HILLS, MI 48334

PROJECT TITLE
THE LEGACY APARTMENT HOMES
6080 W GRAND RIVER
GENOA TOWNSHIP, LIVINGSTON COUNTY, MICHIGAN

REVISIONS	
REV PER TWP	5-30-23

ORIGINAL ISSUE DATE:
APRIL 10, 2023

DRAWING TITLE
UTILITY PLAN SOUTH

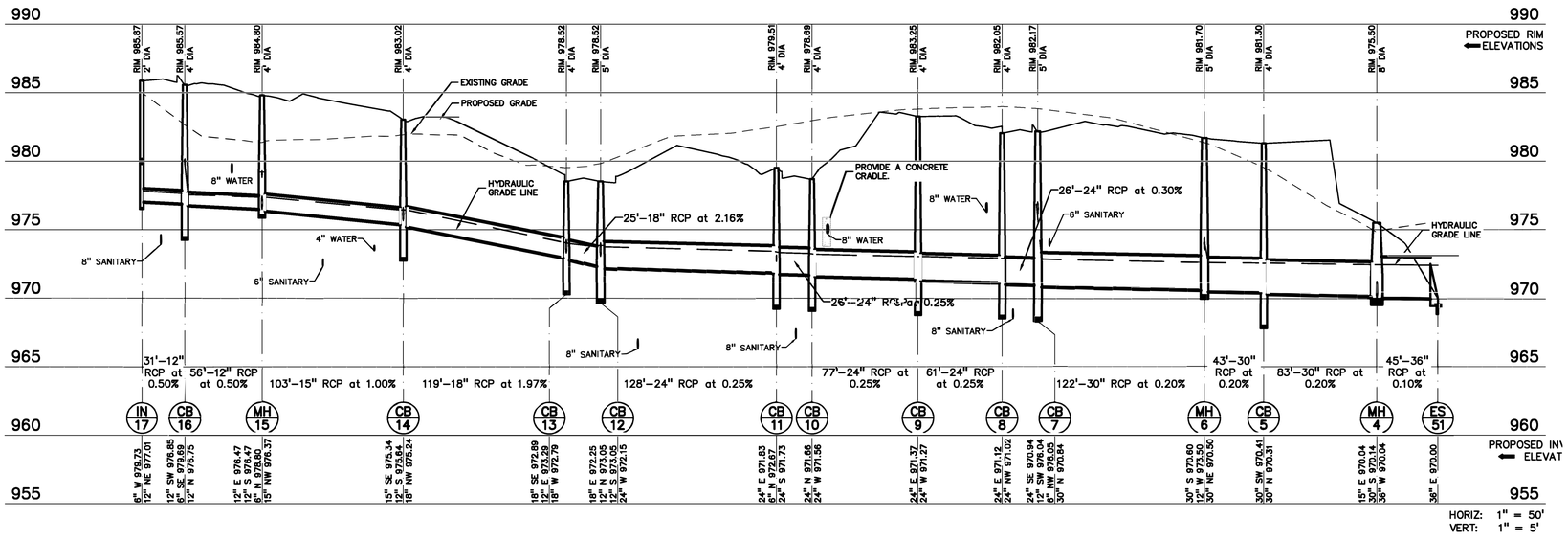
PEA JOB NO.	2021-0578
P.M.	JEC
DN.	JMR
DES.	JMR

DRAWING NUMBER: C-4.2

NOT FOR CONSTRUCTION

235

S:\PROJECTS\2021\2021-0578 LAURIES GENOA TOWNSHIP\DWG\SITE PLANS\(C-4.0) SP UTIL-21-0578.dwg



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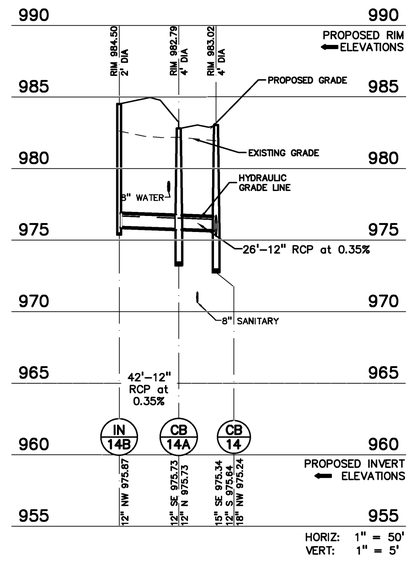

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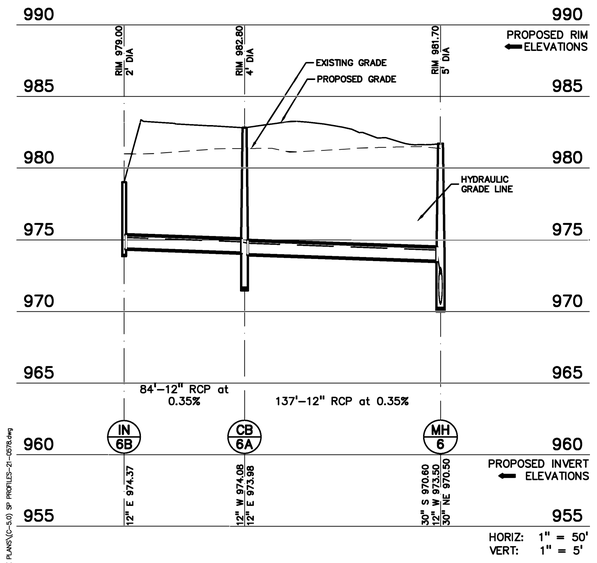

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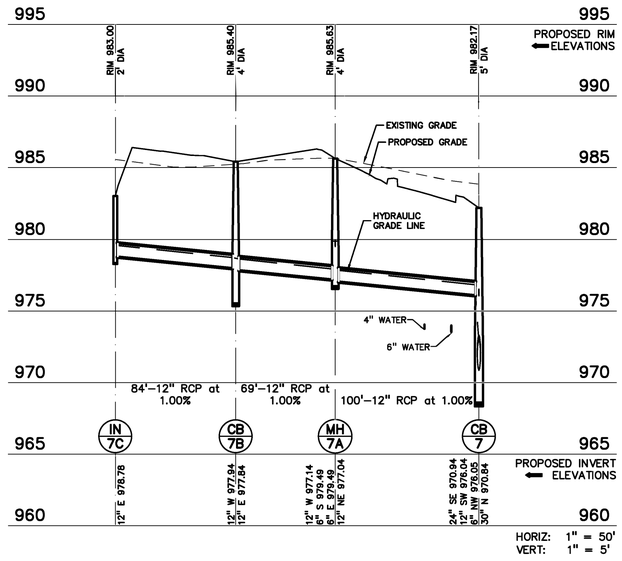

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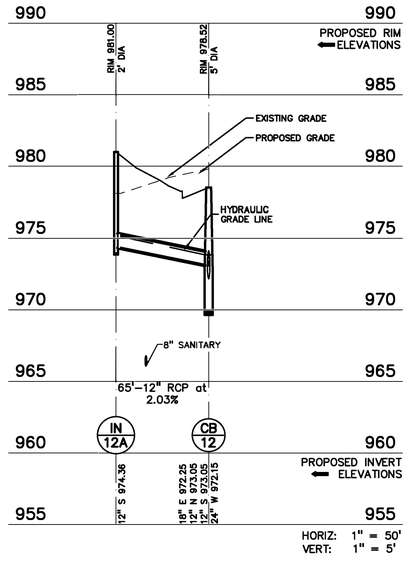

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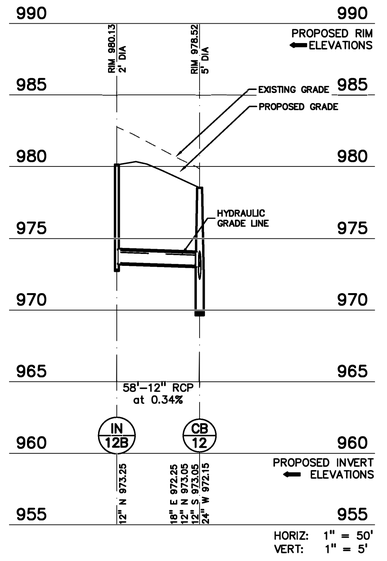

IN12B–CB12 PROFILE

PREMIUM TRENCH BACKFILL NOTE:
ALL UTILITIES UNDER PAVEMENT OR WITHIN 3' OF THE EDGE OF PAVEMENT (OR WITHIN THE 45° LINE OF INFLUENCE OF PAVEMENT) SHALL HAVE M.D.O.T. CLASS II GRANULAR BACKFILL COMPACTED TO 95% MAX. DRY DENSITY (ASTM D-1557).

NOT FOR CONSTRUCTION

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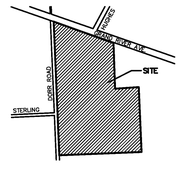

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31550 NORTHWESTERN HIGHWAY
FARMINGTON HILLS, MI 48334

PROJECT TITLE
THE LEGACY APARTMENT HOMES
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REVISIONS	
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ORIGINAL ISSUE DATE:
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DRAWING TITLE
STORM SEWER PROFILES

PEA JOB NO.	2021-0578
P.M.	JEC
DN.	JMR
DES.	JMR

DRAWING NUMBER:
C-5.1

S:\PROJECTS\2021\2021-0578 LAUTREC GENOA TOWNSHIP\PW\SITE PLANS\[C-5.0] SP PROFILES-21-0578.dwg

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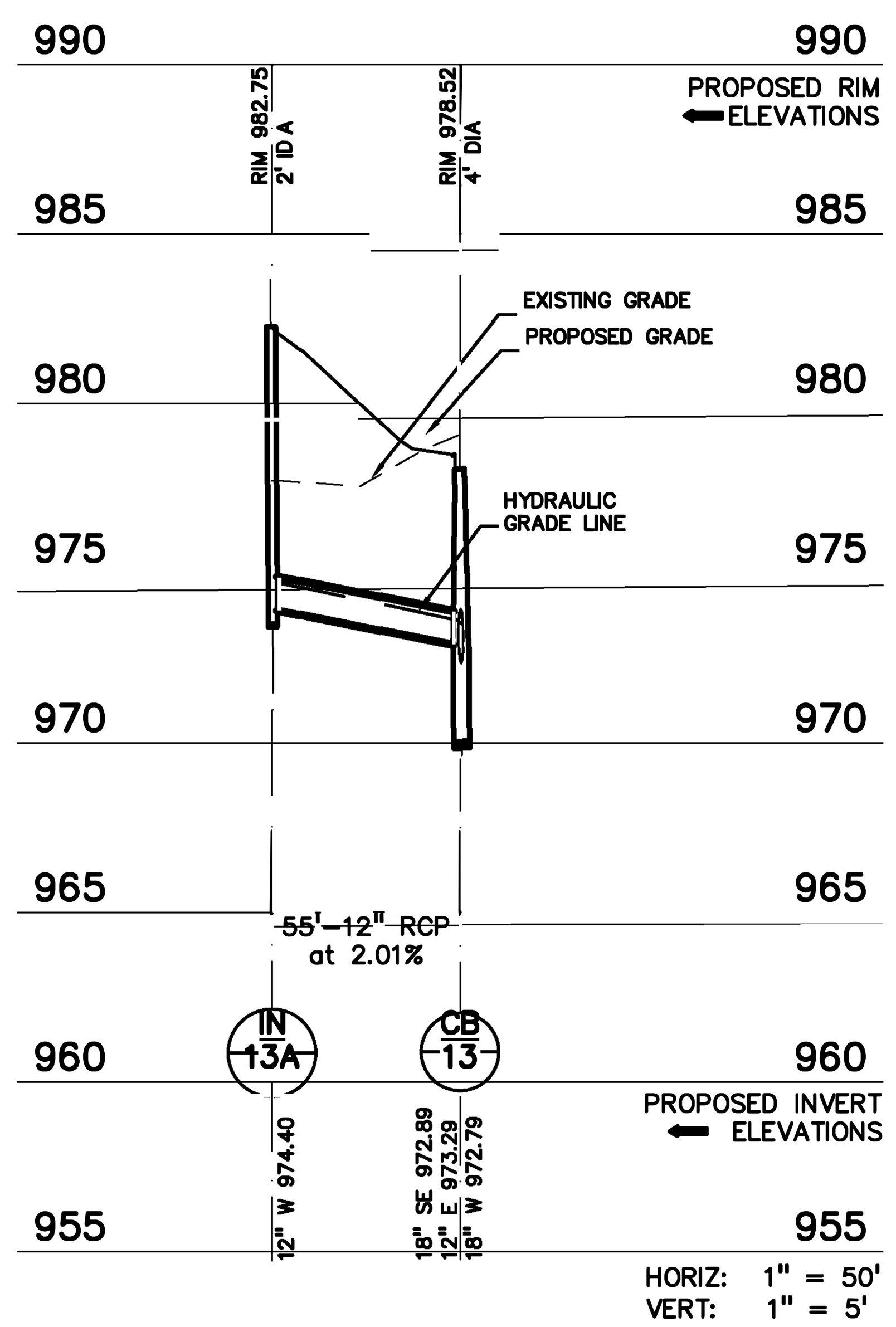

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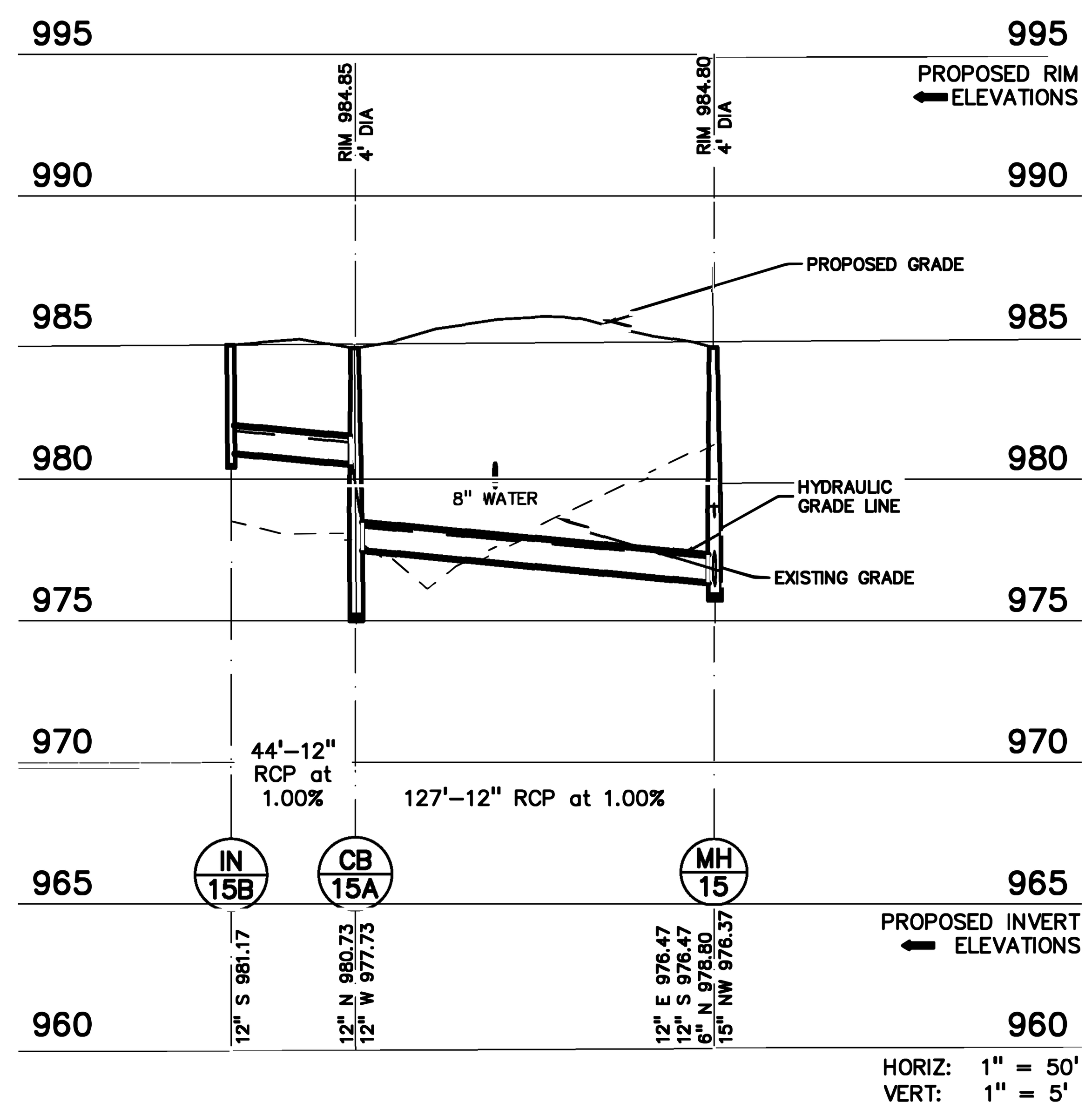

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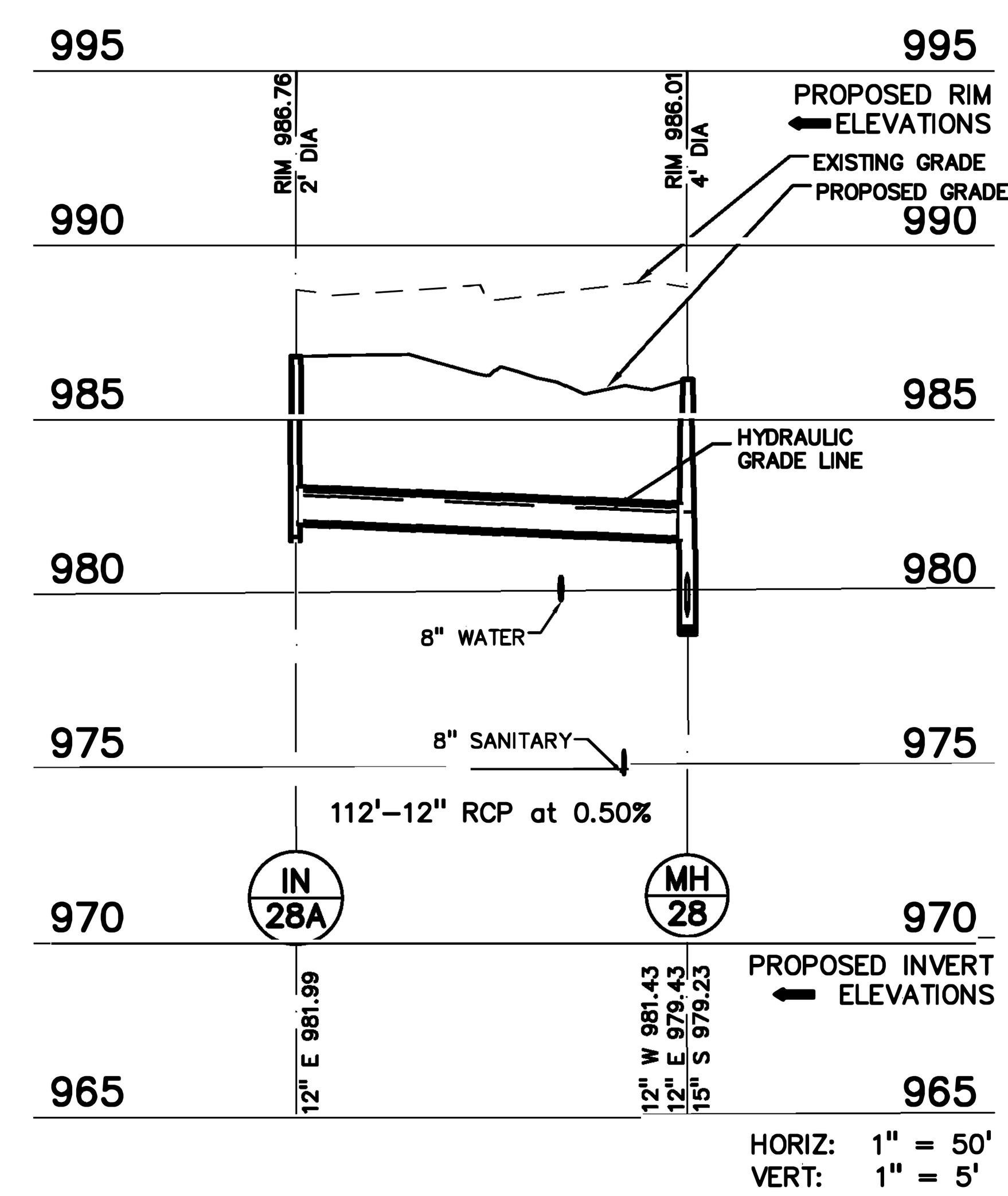
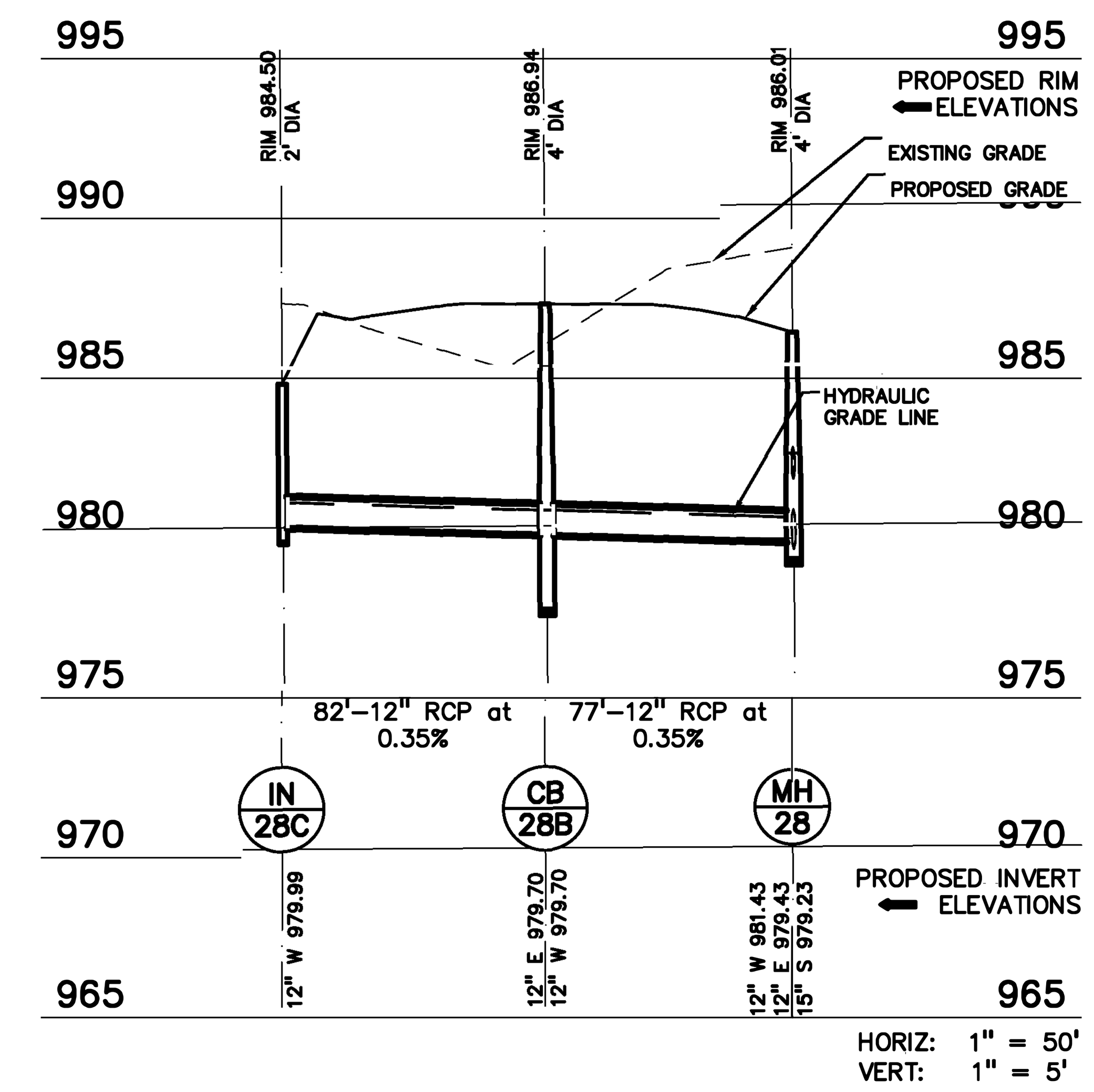
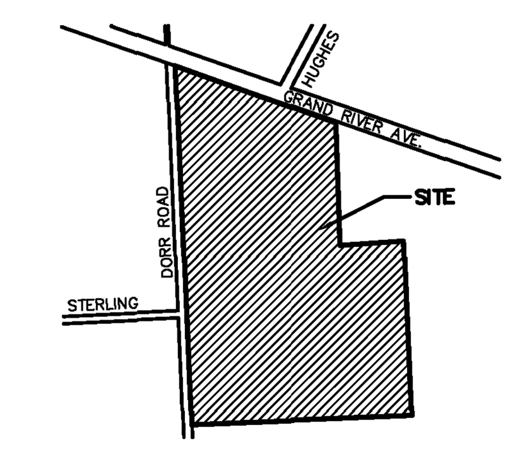


IN28A–MH28 PROFILE

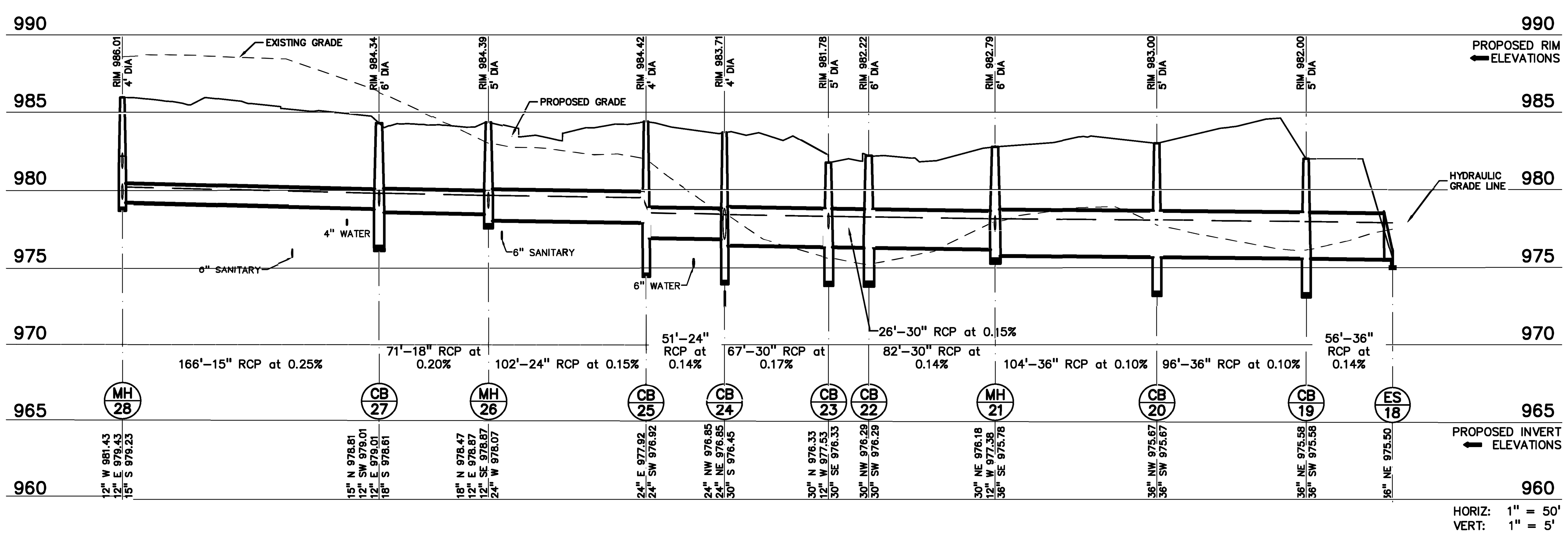


IN28C–MH28 PROFILE

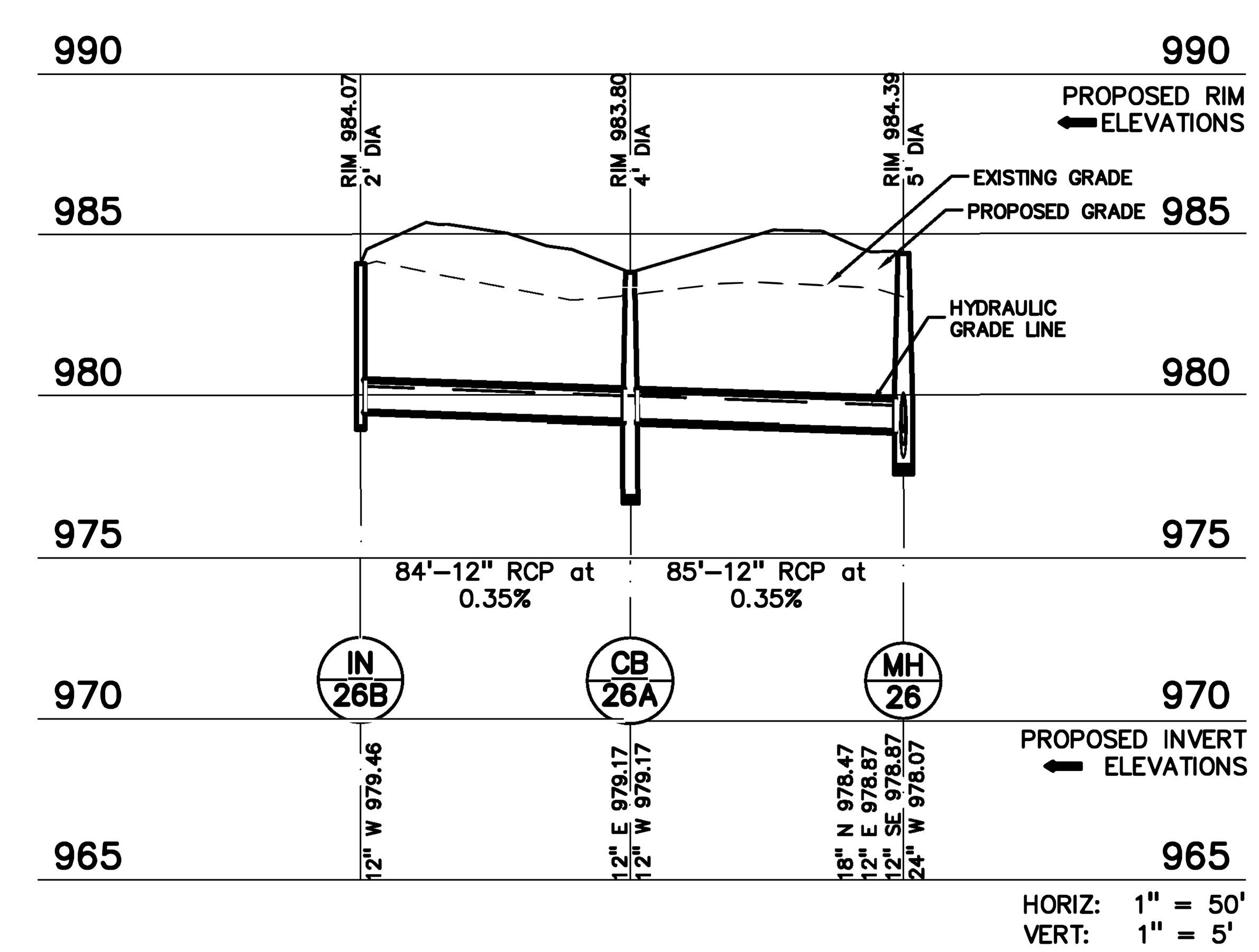


CLIENT

GRAND RIVER DORR LLC.
31550 NORTHWESTERN HIGHWAY
FARMINGTON HILLS, MI 48334



MH28–ES18 PROFILE



IN26B–MH26 PROFILE

SCALE: 1" = 50'

Know what's below. Call before you dig.

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PROJECT TITLE

THE LEGACY APARTMENT HOMES
6080 W GRAND RIVER
GENOA TOWNSHIP, LIVINGSTON COUNTY, MICHIGAN

REVISIONS

REV PER TWP	5-30-23

ORIGINAL ISSUE DATE:
APRIL 10, 2023

DRAWING TITLE

STORM SEWER PROFILES

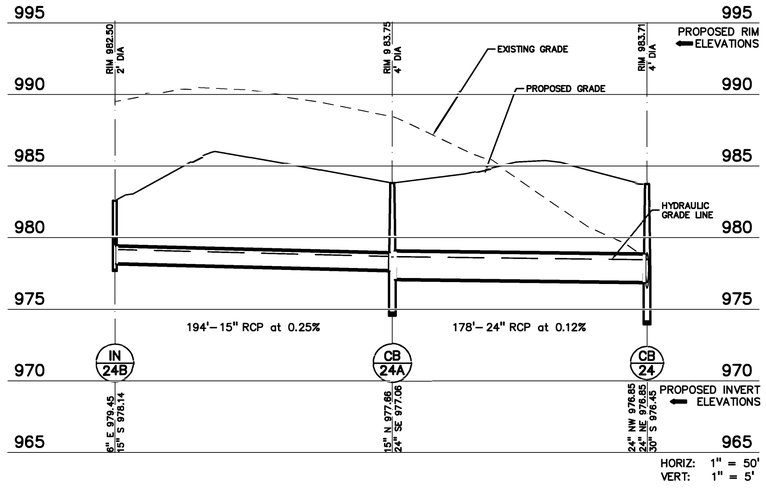
PEA JOB NO.	2021-0578
P.M.	JEC
DN.	JMR
DES.	JMR

DRAWING NUMBER:

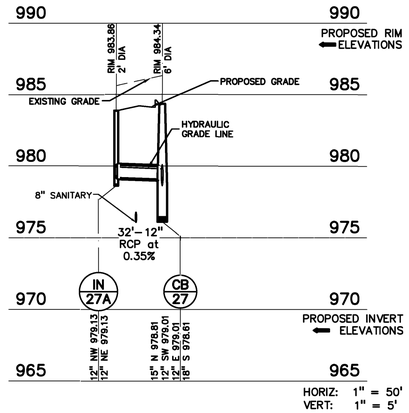
C-5.2

PREMIUM TRENCH BACKFILL NOTE:
ALL UTILITIES UNDER PAVEMENT OR WITHIN 3' OF THE EDGE OF PAVEMENT (OR WITHIN THE 45° LINE OF INFLUENCE OF PAVEMENT) SHALL HAVE M.D.O.T. CLASS II GRANULAR BACKFILL COMPACTED TO 95% MAX. DRY DENSITY (ASTM D-1557).

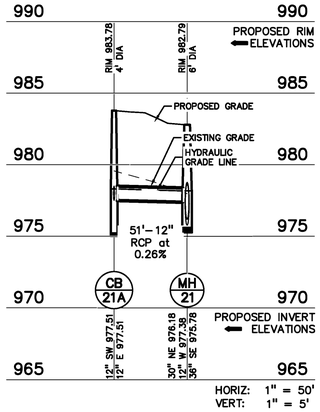
NOT FOR CONSTRUCTION



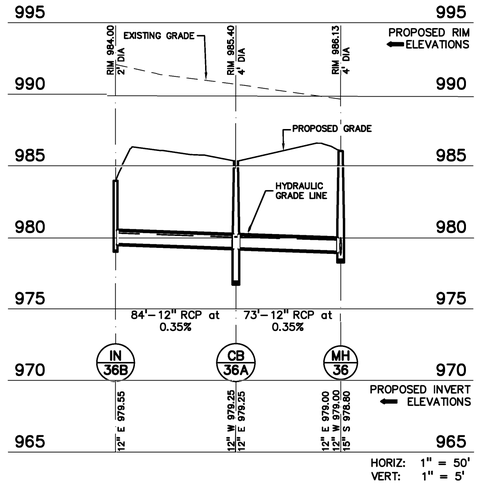
IN24B–CB24 PROFILE



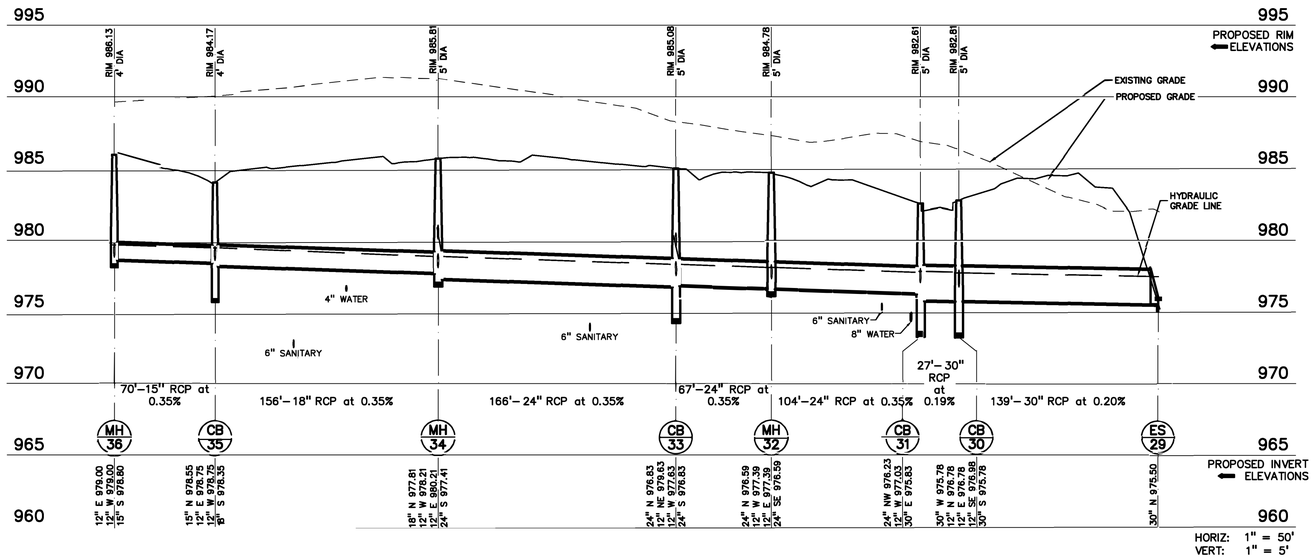
IN27A–CB27 PROFILE



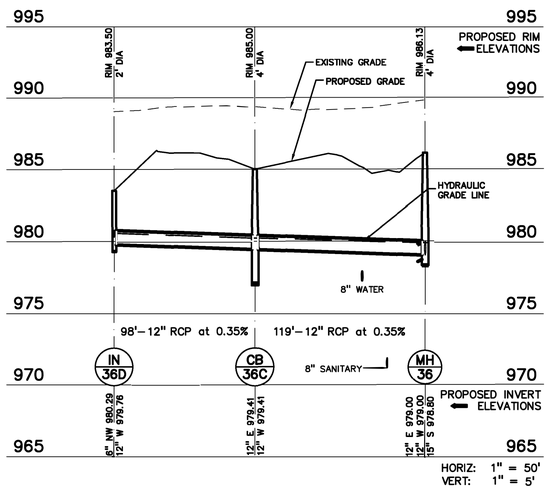
CB21A–MH21 PROFILE



MH36–ES29 (1) PROFILE



MH36–ES29 PROFILE



IN36D–MH36 PROFILE

PREMIUM TRENCH BACKFILL NOTE:
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NOT FOR CONSTRUCTION

PEA GROUP
t: 844.813.2949
www.peagroup.com

0 25 50 100
SCALE: 1" = 50'

811 Know what's below. Call before you dig.

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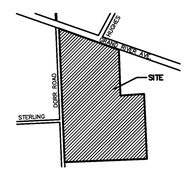


CLIENT
GRAND RIVER DORR LLC.
315550 NORTHWESTERN HIGHWAY
FARMINGSTON HILLS, MI 48334

PROJECT TITLE
THE LEGACY APARTMENT HOMES
6080 W GRAND RIVER
GENOA TOWNSHIP, LIVINGSTON COUNTY, MICHIGAN

REVISIONS	
REV PER TWP	5-30-23

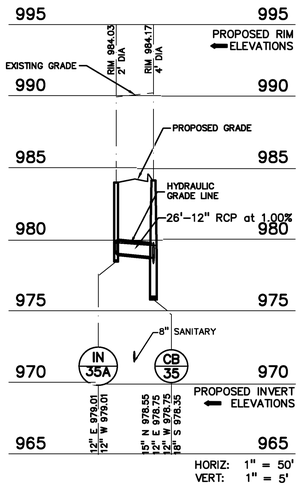
ORIGINAL ISSUE DATE:
APRIL 10, 2023

DRAWING TITLE
STORM SEWER PROFILES

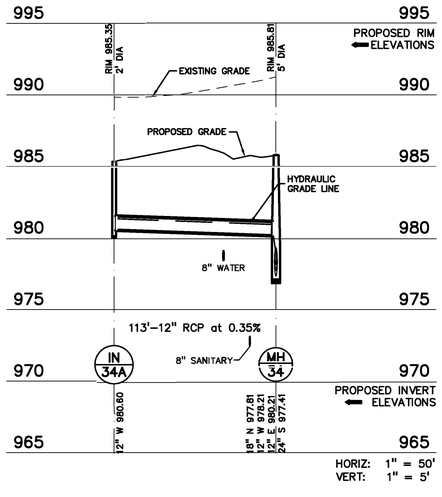
PEA JOB NO.	2021-0578
P.M.	JEC
DN.	JMR
DES.	JMR

DRAWING NUMBER:
C-5.3

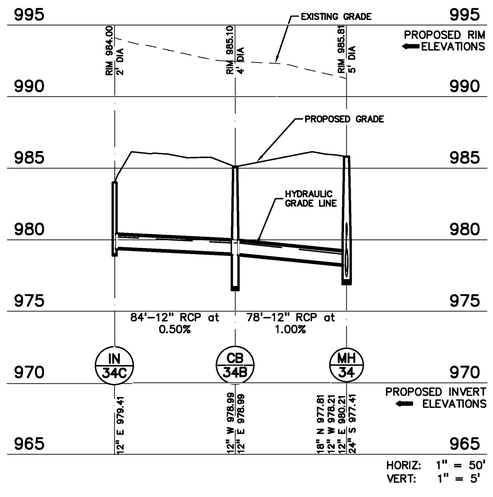
S:\PROJECTS\2021\2021-0578 (AUTREC GENOA TOWNSHIP)\PW\SITE PLANS\(C-5.0) SP PROFILES-21-0578.dwg



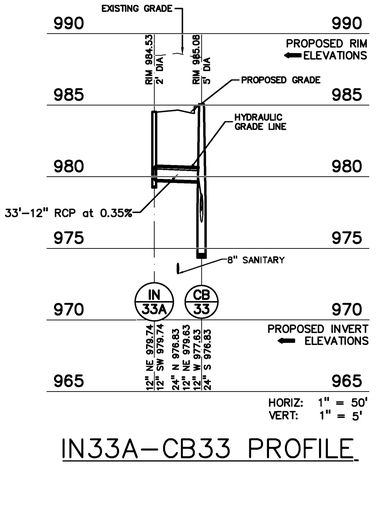
IN35A–CB35 PROFILE



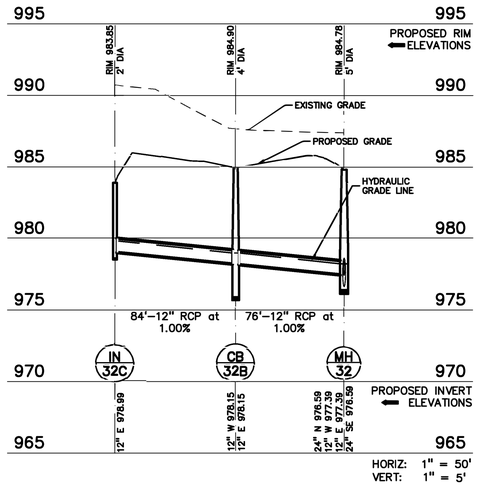
IN34A–MH34 PROFILE



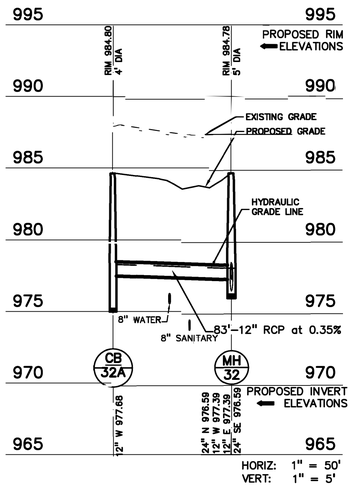
IN34C–MH34 PROFILE



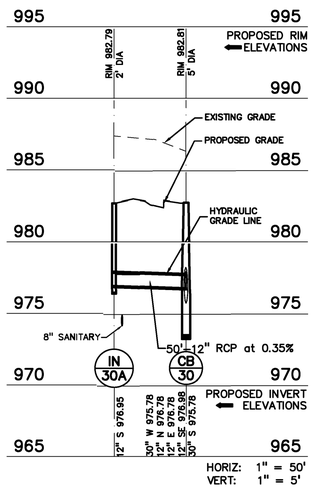
IN33A–CB33 PROFILE



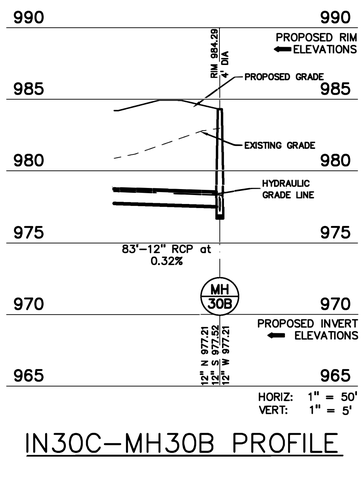
IN32C–MH32 PROFILE



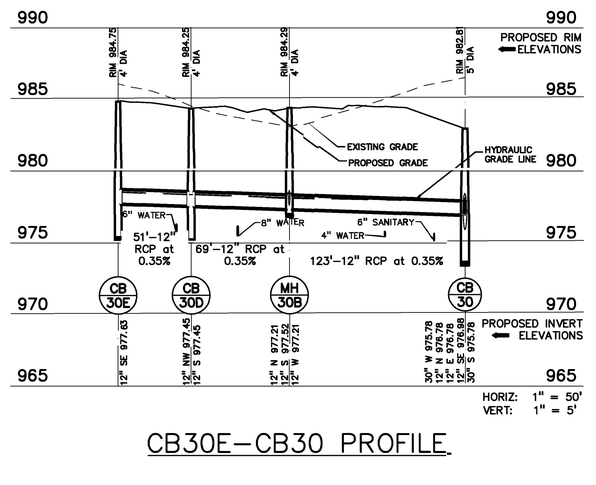
CB32A–MH32 PROFILE



IN30A–CB30 PROFILE



IN30C–MH30B PROFILE



CB30E–CB30 PROFILE

PEA GROUP
t: 844.813.2949
www.peagroup.com

0 25 50 100
SCALE: 1" = 50'

811 Know what's below. Call before you dig.

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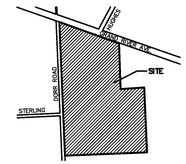

CLIENT
GRAND RIVER DORR LLC.
315550 NORTHWESTERN HIGHWAY
FARMINGTON HILLS, MI 48334

PROJECT TITLE
THE LEGACY APARTMENT HOMES
6080 W GRAND RIVER
GENOA TOWNSHIP, LIVINGSTON COUNTY, MICHIGAN

REVISIONS
REV PER TWP 5-30-23

ORIGINAL ISSUE DATE:
APRIL 10, 2023

DRAWING TITLE
STORM SEWER PROFILES

PREMIUM TRENCH BACKFILL NOTE:
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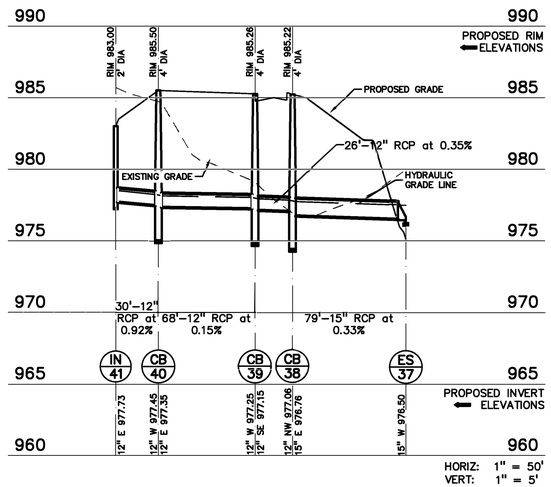
NOT FOR CONSTRUCTION

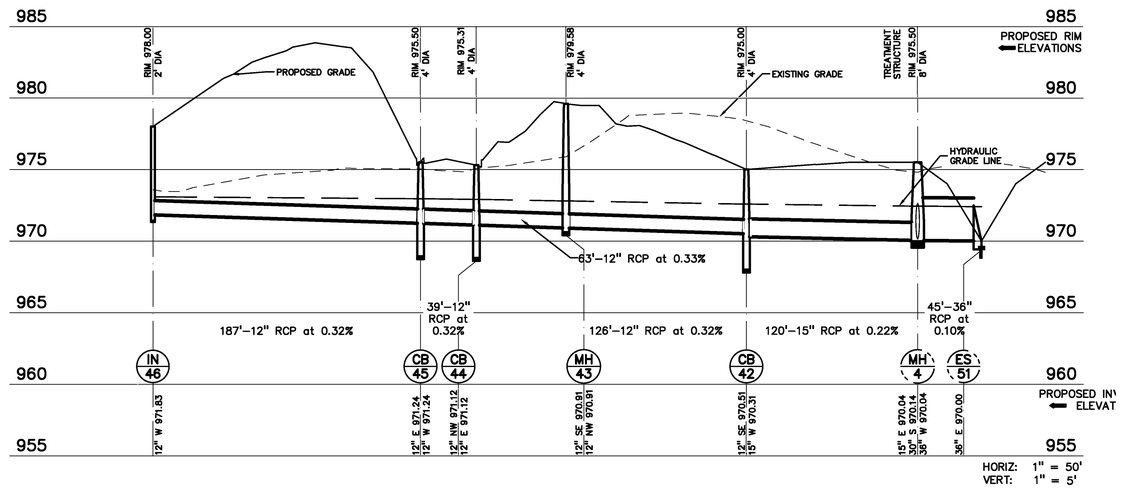
PEA JOB NO.	2021-0578
P.M.	JEC
DN.	JMR
DES.	JMR

DRAWING NUMBER:
C-5.4

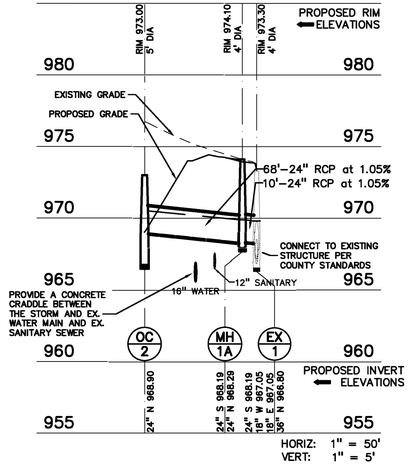
S:\PROJECTS\2021\2021-0578 LAUTREC GENOA TOWNSHIP\DWG\SITE PLANS\(C-5.0) SP PROFILES-21-0578.dwg



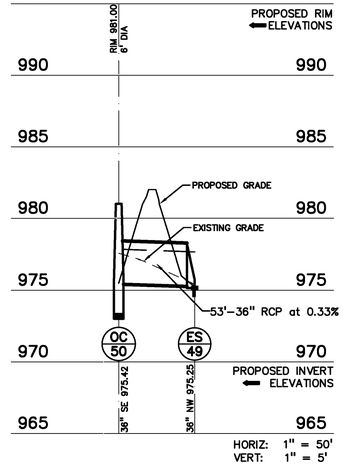
IN41–ES37 PROFILE



IN46–ES51 PROFILE



OC2–EX1 PROFILE



OC50–ES49 PROFILE

PREMIUM TRENCH BACKFILL NOTE:
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NOT FOR CONSTRUCTION

PEA GROUP
t: 844.813.2949
www.peagroup.com

0 25 50 100
SCALE: 1" = 50'

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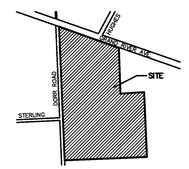


CLIENT
GRAND RIVER DORR LLC.
315550 NORTHWESTERN HIGHWAY
FARMINGTON HILLS, MI 48334

PROJECT TITLE
THE LEGACY APARTMENT HOMES
6080 W GRAND RIVER
GENOA TOWNSHIP, LIVINGSTON COUNTY, MICHIGAN

REVISIONS	
REV PER TWP	5-30-23

ORIGINAL ISSUE DATE:
APRIL 10, 2023

DRAWING TITLE
STORM SEWER PROFILES

PEA JOB NO.	2021-0578
P.M.	JEC
DN.	JMR
DES.	JMR

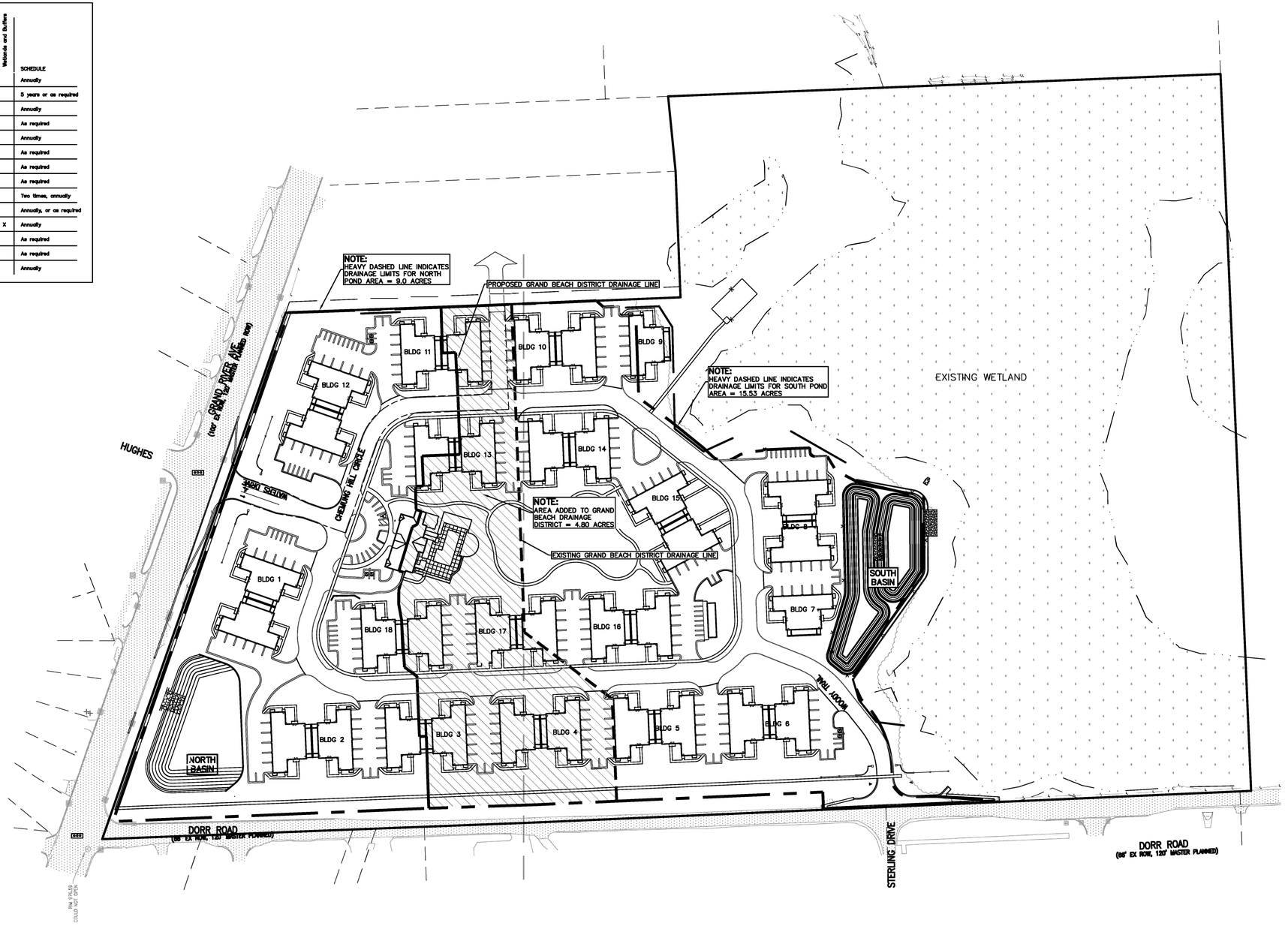
DRAWING NUMBER:
C-5.5

S:\PROJECTS\2021\2021-0578 LAURIE GENOA TOWNSHIP\DWG\SITE PLANS\[C-5.0] SP PROFILES-2-0578.dwg

STORMWATER MANAGEMENT SYSTEM MAINTENANCE TASKS AND SCHEDULE

POST CONSTRUCTION

TASKS	COMPONENTS	Storm Sewer System	Catch Basin Sumps	Catch Basin Inlets	Channels & Ditches	Basin Outlet Pipes	Basin Fenceup	Storm Basins	Overflow Structures	Discharge Outlets	Wetlands and Buffers	SCHEDULE
Inspect for accumulated sediment		x	x			x	x	x				Annually
Removal of accumulated sediment > 1" deep		x	x			x	x	x				5 years or as required
Inspect for erosion					x			x	x	x		Annually
Reestablish permanent controls, eroded areas					x			x	x	x		As required
Inspect for floatables and debris		x	x	x		x		x	x			Annually
Remove floatables and debris		x	x	x		x		x	x			As required
Replace Outlet Filter gravel jackets						x						As required
Replace rip-rap or stone check dams					x							As required
Mowing					x		x	x	x			Two times, annually
Vegetation and animal control					x		x	x	x			Annually, or as required
Professional engineer observation during rain event		x	x	x	x	x	x	x	x	x	x	Annually
Modifications per engineering recommendation		x	x	x	x	x	x	x	x			As required
Professional engineer, emergency observations												As required
Maintenance & inspection records by Owner												Annually



OVERALL STORMWATER MANAGEMENT PLAN

PEA GROUP
t: 844.813.2949
www.peagroup.com

NORTH

0 50 100 200

SCALE: 1" = 100'

811 Know what's below. Call before you dig.

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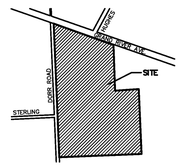


CLIENT
GRAND RIVER DORR LLC.
315550 NORTHWESTERN HIGHWAY
FARMINGTON HILLS, MI 48334

PROJECT TITLE
THE LEGACY APARTMENT HOMES
6090 W GRAND RIVER
GENOA TOWNSHIP, LIVINGSTON COUNTY, MICHIGAN

REVISIONS	
REV PER TWP	5-30-23

ORIGINAL ISSUE DATE:
APRIL 10, 2023

DRAWING TITLE
OVERALL STORMWATER MANAGEMENT PLAN

PEA JOB NO.	2021-0578
P.M.	JEC
DN.	JMR
DES.	JMR

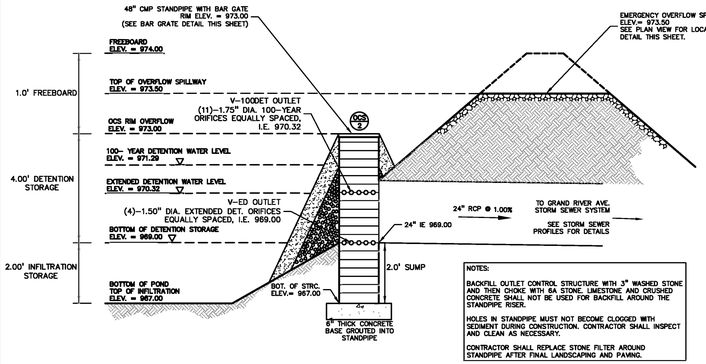
DRAWING NUMBER:
C-6.1

NOT FOR CONSTRUCTION

241

S:\PROJECTS\2021\2021-0578 LIVING GENOA TOWNSHIP\PWORK\SITE PLANS\C-6.0 SP STRM-21-0578.dwg

NORTH DETAILS



NOTES:

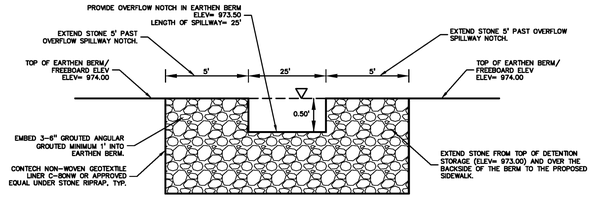
BACKFILL OUTLET CONTROL STRUCTURE WITH #3 WASHED STONE AND THEN CHOKE WITH 6A STONE. LIMESTONE AND CRUSHED CONCRETE SHALL NOT BE USED FOR BACKFILL AROUND THE STANDPIPE RISER.

HOLES IN STANDPIPE MUST NOT BECOME CLOGGED WITH SEDIMENT DURING CONSTRUCTION. CONTRACTOR SHALL INSPECT AND CLEAN AS NECESSARY.

CONTRACTOR SHALL REPLACE STONE FILTER AROUND STANDPIPE AFTER FINAL LANDSCAPING AND PAVING.

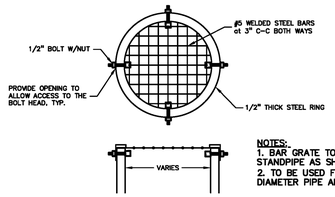
NORTH INFILTRATION/DETENTION BASIN OUTLET CONTROL STRUCTURE DETAIL

NOT TO SCALE



NORTH INFILTRATION/DETENTION BASIN OVERFLOW SPILLWAY CROSS-SECTION

NOT TO SCALE

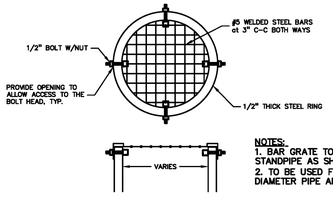


NOTES:
1. BAR GRATE TO BE BOLTED TO STANDPIPE AS SHOWN.
2. TO BE USED FOR 60" INNER DIAMETER PIPE AND SMALLER.

BAR GRATE FOR OUTLET CONTROL STRUCTURE

NOT TO SCALE

SOUTH DETAILS



NOTES:
1. BAR GRATE TO BE BOLTED TO STANDPIPE AS SHOWN.
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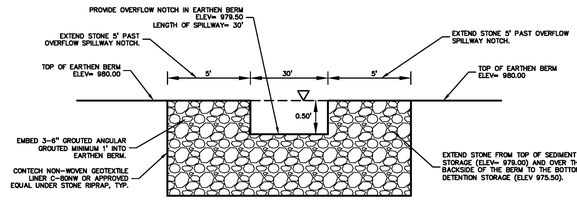
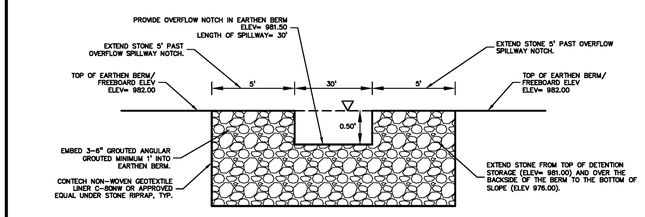
BAR GRATE FOR OUTLET CONTROL STRUCTURE

NOT TO SCALE



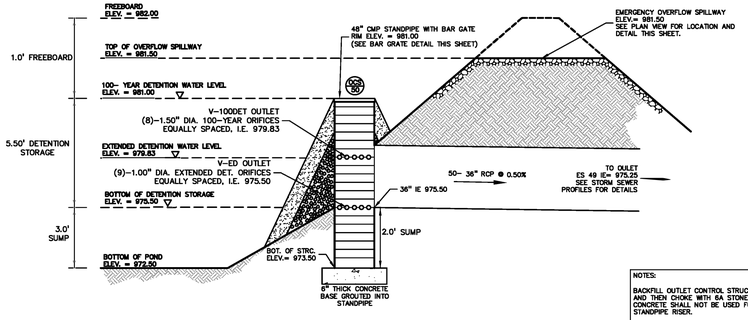
SOUTH SEDIMENT FOREBAY OVERFLOW SPILLWAY CROSS-SECTION

NOT TO SCALE



SOUTH DETENTION BASIN OVERFLOW SPILLWAY CROSS-SECTION

NOT TO SCALE



NOTES:

BACKFILL OUTLET CONTROL STRUCTURE WITH #3 WASHED STONE AND THEN CHOKE WITH 6A STONE. LIMESTONE AND CRUSHED CONCRETE SHALL NOT BE USED FOR BACKFILL AROUND THE STANDPIPE RISER.

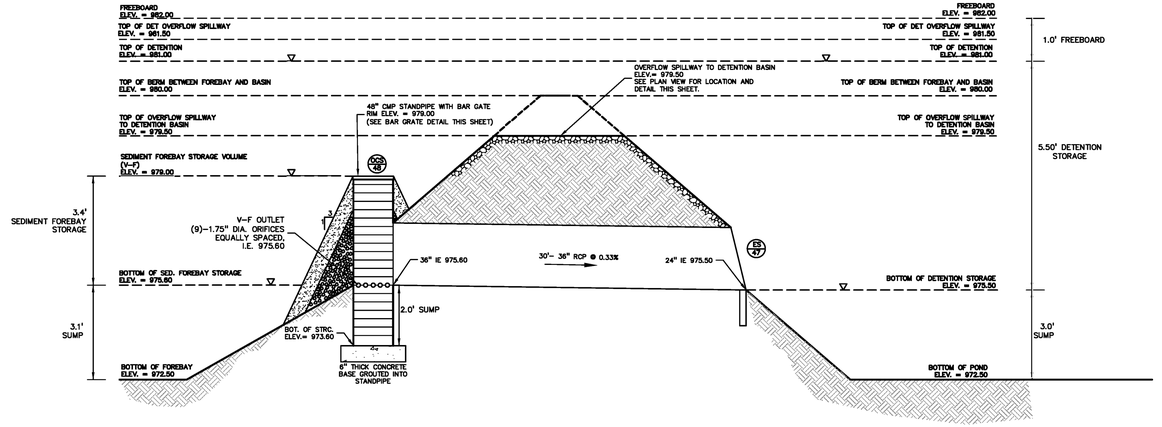
HOLES IN STANDPIPE MUST NOT BECOME CLOGGED WITH SEDIMENT DURING CONSTRUCTION. CONTRACTOR SHALL INSPECT AND CLEAN AS NECESSARY.

CONTRACTOR SHALL REPLACE STONE FILTER AROUND STANDPIPE AFTER FINAL LANDSCAPING AND PAVING.

PROVIDE RIP RAP AT THE END SECTION PER PLAN DETAILS.

SOUTH DETENTION BASIN OUTLET CONTROL STRUCTURE DETAIL

NOT TO SCALE



NOTES:

BACKFILL OUTLET CONTROL STRUCTURE WITH #3 WASHED STONE AND THEN CHOKE WITH 6A STONE. LIMESTONE AND CRUSHED CONCRETE SHALL NOT BE USED FOR BACKFILL AROUND THE STANDPIPE RISER.

HOLES IN STANDPIPE MUST NOT BECOME CLOGGED WITH SEDIMENT DURING CONSTRUCTION. CONTRACTOR SHALL INSPECT AND CLEAN AS NECESSARY.

CONTRACTOR SHALL REPLACE STONE FILTER AROUND STANDPIPE AFTER FINAL LANDSCAPING AND PAVING.

PROVIDE RIP RAP AT THE END SECTION PER PLAN DETAILS.

SOUTH SEDIMENT FOREBAY OUTLET CONTROL STRUCTURE DETAIL

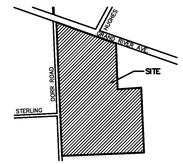
NOT TO SCALE

NOT FOR CONSTRUCTION

PEA GROUP
t: 844.813.2949
www.peagroup.com

811. Know what's below. Call before you dig.

CAUTION!!
THE LOCATIONS AND ELEVATIONS OF EXISTING UNDERGROUND UTILITIES AS SHOWN ON THIS DRAWING ARE ONLY APPROXIMATE. NO GUARANTEE IS EITHER EXPRESSED OR IMPLIED AS TO THE COMPLETENESS OR ACCURACY THEREOF. THE CONTRACTOR SHALL BE EXCLUSIVELY RESPONSIBLE FOR DETERMINING THE EXACT LOCATIONS AND ELEVATIONS PRIOR TO THE START OF CONSTRUCTION.



CLIENT
GRAND RIVER DORR LLC.
31555O NORTHWESTERN HIGHWAY
FARMINGTON HILLS, MI 48334

PROJECT TITLE
THE LEGACY APARTMENT HOMES
6080 W GRAND RIVER
GENOA TOWNSHIP, LIVINGSTON COUNTY, MICHIGAN

REVISIONS

REV PER TWP	5-30-23

ORIGINAL ISSUE DATE:
APRIL 10, 2023

DRAWING TITLE
POND DESIGN DETAILS

PEA JOB NO.	2021-0578
P.M.	JEC
DN.	JMR
DES.	JMR

DRAWING NUMBER:
C-6.2

S:\PROJECTS\2021\2021-0578 LAUTREC GENOA TOWNSHIP\ENGR\SITE PLANS\(C-6.0) SP STRM-21-0578.dwg

NORTH STORM WATER REQUIRED CALCULATIONS

Project: Legacy Genoa- North Pond
Location: Genoa Township, Livingston County, Michigan
Project No: 2021-0578

BY: JAH
CK:
Date: 5/23/2023

Infiltration and Detention Calculations
Using Livingston County Procedures and Design Criteria for Stormwater Management Systems
Version 5.6 (March 2022)

1 Pre-Development Site Drainage to Grand River Drainage District

Pre-Development Site Conditions:

Pervious Area (B soil):	13.80 acres
Impervious Area	0.00 acres
Water Area	0.00 acres
Total Tributary Area:	13.80 acres
Pervious Runoff Coefficient 'C' (B SOIL):	0.20
Impervious Runoff Coefficient 'C':	0.90
Water Runoff Coefficient 'C':	1.00
Weighted Runoff Coefficient 'C':	0.20

2 Post Development Site Drainage to Grand Beach Drainage District

Post-Development Site Conditions:

Pervious Area (B soil):	4.63 acres
Impervious Area	4.37 acres
Water Area	0.00 acres
Total Tributary Area:	9.00 acres
Pervious Runoff Coefficient 'C' (B SOIL):	0.20
Impervious Runoff Coefficient 'C':	0.90
Water Runoff Coefficient 'C':	1.00
Weighted Runoff Coefficient 'C':	0.54

3 Water Quality Volume- V (WQ)

1.0 inch rainfall depth over the Trib Area
This requirment is considered met if the full CPVC infiltrated on site

V (WQ)= Required Volume in CF
A= Contributing Area in Ac
C= Post Development Runoff Coefficient

V (WQ)= (3,630)(C)(A)

A	9.00 acres
C	0.54
V (WQ)	17,642 CF

4 Channel Protection Volume (CPVC)- V (CP)

1.3 inch rainfall depth over the Trib Area
This volume is required to be captured and infiltrated on site to the Maximum Extent Practical

V (CP)= Required Volume in CF
A= Contributing Area in Ac
C= Post Development Runoff Coefficient

V (CP)= (4,719)(C)(A)

A	9.00 acres
C	0.54
V (CP)	22,934 CF

5 Extended Detention Volume- V (ED)

1.9 inch rainfall depth over the Trib Area and released over 48 hrs
Also called the Channel Protection Rate Volume Control (CPRC)

V (ED)= Required Volume in CF
A= Contributing Area in Ac
C= Post Development Runoff Coefficient

V (ED)= (6,897)(C)(A)

A	9.00 acres
C	0.54
V (ED)	33,519 CF

6 Extended Detention Outlet Rate for Sediment Forebay and Detention Basin- Q (ED)

required flowrate to release V (ED) in 48 hours

Q (ED)= Outlet rate for both forebay and detention basin in cfs
V (ED)= Required Volume in CF

Q (ED)= (V (ED))/ ((48 hr)(60 min/hr)(60 sec/min))= V (ED) / 172,800

V (ED)	33,519 CF
Q (ED)	0.19 CFS

7 100 Year Peak Intensity- I (100)

I (100)= Peak Intensity of storm in in/hr
Tc= Time of Concentration from Storm Sewer Design (farthest point in trib area to ES into pond)
I (100)= (83.3)/ (Tc + 9.17)^0.81

Tc	18.70 minutes
I (100)	5.62 in/hr

8 100 Year Post Development Peak Inflow Rate- Q (100 IN)

Q (100 IN)= 100 Year Peak inflow rate in CFS
A= Contributing Area in Ac
C= Post Development Runoff Coefficient
I (100)= Peak Intensity of storm in in/hr

Q (100 IN)= (C)(A)(I 100)

A	9.00 acres
C	0.54
I (100)	5.62 in/hr
Q (100 IN)	27.34 CFS

9 100 Year Variable Release Rate- Q (VRR)

Q (VRR)= 100 Year variable release rate in cfs/acre
A= Contributing Area in Ac

Q (VRR)= 1.1055 - (0.206)ln(A))

A	9.00 acres
Q (100 VRR)	0.65 cfs/acre

10 100 Year Allowable Post Development Peak Flow rate- Q (100 P)

use Q (VRR) to calculate unless there is a LCDC specefied restricted rate
Per LCDC restricted release rate is 0.15 cfs/acre

Q (100 P)= 100 Allowable 100 Year post development peak flow rate in cfs
Q (VRR)= 100 Year variable release rate in cfs/acre
A= Contributing Area in Ac

Q (100 P)= (Q (VRR)) (A)

Q (100 VRR)	0.15 cfs/acre (Per LCDC)
A	9.00 acres
Q (100 P)	1.35 CFS

11 Post Development 100 Year Peak Runoff Volume- V (100 R)

V (100 R)= Post Development 100 Year peak runoff volume in CF
C= Post Development Runoff Coefficient
A= Contributing Area in Ac

V (100 R)= (18985)(C)(A)

A	9.00 acres
C	0.54
V (100 R)	92,267 CF

11A Pre Development 100 Year Peak Runoff Volume-V (Pre- 100 R)

V (Pre- 100 R)= Pre Development 100 Year peak runoff volume in CF
C= Pre Development Runoff Coefficient
A= Contributing Area in Ac

V (100 R)= (18985)(C)(A)

A	13.80 acres
C	0.20
V (100 R)	52,399 CF

11B Difference in Pre and Post 100 Year Peak Runoff Volumes

Per LCRC, the difference in the Pre and Post 100 Year peak runoff volumes is required to be infiltrated

V (100 R)= Post Development 100 Year peak runoff volume in CF
V (100 R-Pre)= Pre Development 100 Year peak runoff volume in CF

Infiltration Volume Required (Per LCRC)= V (100 R) - V (100 R-Pre)

V (100 R)	92,267 CF
V (100 R- Pre)	52,399 CF
Infiltration Volume Required (Per LCRC)=	39,869 CF

12 Storage Curve Factor- R

R= Storage Curve Factor for the 100 Year detention Volume (dimensionless)
Q (100 P)= 100 Allowable 100 Year post development peak flow rate in cfs
Q (100 IN)= 100 Year Peak inflow rate in CFS

R= [0.206- 0.15ln(Q100P/Q100IN)]

Q (100 P)	1.35 cfs
Q (100 IN)	27.34 cfs
R	0.66

13 100 Year Detention Basin Size- V (100 D)

V (100 D)= Required 100 year detention volume in CF
V (100 R)= Post Development 100 Year peak runoff volume in CF
R= Storage Curve Factor for the 100 Year detention Volume (dimensionless)
V (CP-P)= Provided Infiltration Volume in CF
Note: V (100 D) must be greater than or equal to V (ED)

V (100 D) = V (100 R) * R - V (CP-P)

V (100 R)	92,267 CF
R	0.66
V (CP-P)	0 CF
V(100 D)	60,639 CF

14 Mechanical Pre- Treatment Requirment- Q (WQ)

Required Water quality treatment is 80 MG/L TSS or 80% TSS Removal

Q (WQ)= 1 year water quality peak flow rate in CFS that the unit needs to be able to treat per criteria above
A= Contributing Area in Ac
C= Post Development Runoff Coefficient
Tc= Time of Concentration from Storm Sewer Design (farthest point in trib area to ES into pond)

Q (WQ)= (C)(A)97/(Tc+30))

A	9.00 acres
C	0.54
Tc	18.70 min
Q (WQ)	9.68 CFS

15 Detention Basin Emergency Overflow Spillway

Sized for 100 Year Peak Inflow- Q (100 IN)

Q (100 IN)= 100 Year Peak Inflow in CFS
H= Depth of Water over Spillway in ft
W= Width of spillway in ft
Q (Spillway)= Capacity of Spillway in CFS calculated using the Cipoletti Weir Equation

Q (Spillway)= (3.367)(W)(H^1.5)

Q (100 IN)	27.34 CFS
H	0.50 ft
W	25.00 ft
Q (Spillway)	29.76 cfs

NORTH STORM WATER PROVIDED CALCULATIONS

Project: Legacy Genoa- North Pond
Location: Genoa Township, Livingston County, Michigan
Project No: 2021-0578

BY: JAH
CK:
Date: 4/7/2023

Detention Storage, Infiltration Storage and Outlet Calculations
Using Livingston County Procedures and Design Criteria for Stormwater Management Systems
Version 5.6 (March 2022)

1 Infiltration Volume

Infiltration Volume Required (Per LCRC)= 39,869 CF

Infiltration Volume During 6 Hour Storm

Bottom Bed Area (969.00 Contour Area)=	23,534 sf
Infiltration Design Rate =	1 in/hr
Infiltration Period =	6.00 hrs
Infiltration Volume = Bed Bottom Area * in/hr * infiltration period * 1/12 =	11,767 CF

Infiltration Volume After Storm

Surface Storage Volume (CF) (967.00 to 969.00)

	CONTOUR ELEV	Contour AREA	INCR. VOLUME	CUMUL. VOLUME
Bottom of Detention	969.00	23,534	22,330	42,286
	968.00	21,126	19,956	19,956
Top of Infiltration	967.00	18,786	-	-

Surface Storage Volume Provided= 42,286 CF

Total Infiltration Volume Provided= (Volume During Storm) + (Surface Storage Volume) 54,053 CF

3 Required Storage Volume In Detention Basin

Storage Volume Required in Detention Basin Req= V (100 D)

60,639 CF

4 Detention Volume Provided

BASIN SIZING

	CONTOUR ELEV	Contour AREA	INCR. VOLUME	CUMUL. VOLUME	CONTOUR INTERPOLATION CALCS. V (100 D)	V (ED)
					60,639	33,519
Top of Detention	973.00	33,453	32,205	113,898	-	-
	972.00	30,956	29,710	81,693	**971.29**	-
	971.00	28,463	27,224	51,984	-	**970.32**
	970.00	25,985	24,760	24,760	-	-
Bottom of Detention	969.00	23,534	-	-	-	-

5 Total 100 Year Detention Volume= Detention Volume Provided
Total Volume Provided= 113,898 CF

6 Extended Detention Volume- V (ED)
Outlet Calcs

V (ED)= Required Extended Detention Volume in CF
Q (ED)= Ved Outlet rate in cfs
H (w)= Average Head over outlet orfice= 0.4 * Distance from Storage Elev to Outlet
A= Total Area of orfice Required= Q (ED)/ (0.62 *SQRT (2*G*H(w)))
Q (actual)= 0.62 * A (total) * SQRT (2* G* H(w))
Drain time = V (ED) / Q (actual)*3600

V (ED)=	33,519 CF
Q (ED)=	0.19 CFS
V (ED) Storage Elevation=	970.22
V(ED) Outlet Elevation=	969.00
H (w)=	0.49 ft
A=	0.06 SF
Outlet Hole Diameter:	1.5 in
Restriction Hole Area:	0.0123 sft
Number of Restriction Holes:	4
A (Total)= Total Restriction Hole Area:	0.049 sft
Q (actual)	0.17 cfs
Drain Time:	54.60 hrs

7 100 Year Outlet Calcs

V (100 D)= Required 100 year detention volume in CF
Q (P)= 100 Year allowable release rate in cfs
Q (through V-ED outlet when 100 year storm)= 0.62 *(A(total V ED)) * SQRT(2*32.2*(X100 -Xbot))
A= Area of orfice= Q (100 VRR)/ (0.62 *SQRT (2*G*(X100- X VED)))

V(100 D=)	60,639 CF
Q (P)=	1.35 cfs

100 Year storm Flow through V (ED) orfices

Xbot= Bottom of Det Elev (V ED outlet elev)=	969.00
X100= V (100 D) Storage Elev=	971.29
Head= X100-Xbot	2.29 ft
Q (through V-ED outlet for 100 year storm)=	0.37 cfs

Remaining flow to pass through the V (100) orfices

Q (max 100)= Q (P) - Q (through V-ED outlet for 100 year storm)= 0.98 cfs

100 Year flow through V(100) orfices

XVed= Elev of VED Storage (V 100 outlet elev)=	970.32
X100=V (100 D) Storage Elev=	971.29
Head= X100-Xved	0.97 ft
A (max 100)= Q (max 100) / 0.62* sqrt(2*32.2*Head)	0.20 SF
Outlet Hole Diameter:	1.75 in
Restriction Hole Area:	0.0167 sft
Number of Restriction Holes:	11
A (Total)= Total Restriction Hole Area:	0.18 sft
Q (through V-100 outlet for 100 year storm)=	0.90 cfs
Drain Time:	13.27 hrs

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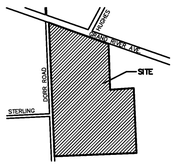

CLIENT
GRAND RIVER DORR LLC.
315550 NORTHWESTERN HIGHWAY
FARMINGTON HILLS, MI 48334

PROJECT TITLE
THE LEGACY APARTMENT HOMES
6080 W GRAND RIVER
GENOA TOWNSHIP, LIVINGSTON COUNTY, MICHIGAN

REVISIONS	
REV PER TWP	5-30-23

ORIGINAL ISSUE DATE:
APRIL 10, 2023

DRAWING TITLE
NORTH POND DESIGN CALCULATIONS

PEA JOB NO.	2021-0578
P.M.	JEC
DN.	JMR
DES.	JMR

DRAWING NUMBER:
C-6.3

NOT FOR CONSTRUCTION

S:\PROJECTS\2021\2021-0578 LAURIES GENOA TOWNSHIP\PLANS\SITE PLANS\[C-6.03 SP STRM- 21-0578.dwg]

SOUTH STORM WATER REQUIRED CALCULATIONS

Project:	Legacy Genoa- South Pond
Location:	Genoa Township, Livingston County, Michigan
Project No:	2021-0578
BY:	JAH
CK:	
Date:	5/23/2023

Infiltration and Detention Calculations
Using Livingston County Procedures and Design Criteria for Stormwater Management Systems
Version 5.6 (March 2022)

1 Pre-Development Site Drainage to Grand Beach Drainage District

Pre-Development Site Conditions:

Pervious Area (B soil):	10.70	acres
Impervious Area	0.00	acres
Water Area	0.00	acres
Total Tributary Area:	10.70	acres
Pervious Runoff Coefficient 'C' (B SOIL):	0.20	
Impervious Runoff Coefficient 'C':	0.90	
Water Runoff Coefficient 'C':	1.00	
Weighted Runoff Coefficient 'C':	0.20	

2 Post Development Site Drainage to Grand Beach Drainage District

Post-Development Site Conditions:

Pervious Area (B soil):	7.04	acres
Impervious Area	8.49	acres
Water Area	0.00	acres
Total Tributary Area:	15.53	acres
Pervious Runoff Coefficient 'C' (B SOIL):	0.20	
Impervious Runoff Coefficient 'C':	0.90	
Water Runoff Coefficient 'C':	1.00	
Weighted Runoff Coefficient 'C':	0.58	

3 Water Quality Volume- V (WQ)

1.0 inch rainfall depth over the Trib Area
This requirment is considered met if the full CPVC infiltrated on site

V (WQ)= Required Volume in CF
A= Contributing Area in Ac
C= Post Development Runoff Coefficient

V (WQ)= (3,630)(C)(A)

A	15.53	acres
C	0.58	
V (WQ)	32,697	CF

4 Channel Protection Volume (CPVC)- V (CP)

1.3 inch rainfall depth over the Trib Area
This volume is required to be captured and infiltrated on site to the Maximum Extent Practical

V (CP)= Required Volume in CF
A= Contributing Area in Ac
C= Post Development Runoff Coefficient

V (CP)= (4,719)(C)(A)

A	15.53	acres
C	0.58	
V (CP)	42,506	CF

5 Extended Detention Volume- V (ED)

1.9 inch rainfall depth over the Trib Area and released over 48 hrs
Also called the Channel Protection Rate Volumen Control (CPRC)

V (ED)= Required Volume in CF
A= Contributing Area in Ac
C= Post Development Runoff Coefficient

V (ED)= (6,897)(C)(A)

A	15.53	acres
C	0.58	
V (ED)	62,124	CF

6 Extended Detention Outlet Rate for Sediment Forebay and Detention Basin- Q (ED)

required flowrate to release V (ED) in 48 hours

Q (ED)= Outlet rate for both forebay and detention basin in cfs
V (ED)= Required Volume in CF

Q (ED)= (V (ED))/ ((48 hr)(60 min/hr)(60 sec/min))= V (ED) / 172,800

V (ED)	62,124	CF
Q (ED)	0.36	CFS

7 100 Year Peak Intensity- I (100)

I (100)= Peak Intensity of storm in in/hr
Tc= Time of Concentration from Storm Sewer Design (farthest point in trib area to ES into pond)
I (100)= (83.3)/ (Tc + 9.17)^0.81

Tc	20.20	minutes
I (100)	5.39	in/hr

8 100 Year Post Development Peak Inflow Rate- Q (100 IN)

Q (100 IN)= 100 Year Peak inflow rate in CFS
A= Contributing Area in Ac
C= Post Development Runoff Coefficient
I (100)= Peak Intensity of storm in in/hr

Q (100 IN)= (C)(A)I 100)

A	15.53	acres
C	0.58	
I (100)	5.39	in/hr
Q (100 IN)	48.56	CFS

9 100 Year Variable Release Rate- Q (VRR)

Q (VRR)= 100 Year variable release rate in cfs/acre
A= Contributing Area in Ac

Q (VRR)= 1.1055 - (0.206)ln(A))

A	15.53	acres
Q (100 VRR)	0.54	cfs/acre

10 100 Year Allowable Post Development Peak Flow rate- Q (100 P)

use Q (VRR) to calculate unless there is a LCDC specefied restricted rate
Per LCDC restricted release rate is 0.06 cfs/acre

Q (100 P)= 100 Allowable 100 Year post development peak flow rate in cfs
Q (VRR)= 100 Year variable release rate in cfs/acre
A= Contributing Area in Ac

Q (100 P)= (Q (VRR)) (A)

Q (100 VRR)	0.06	cfs/acre (Per LCDC)
A	15.53	acres
Q (100 P)	0.93	CFS

11 Post Development 100 Year Peak Runoff Volume- V (100 R)

V (100 R)= Post Development 100 Year peak runoff volume in CF
C= Post Development Runoff Coefficient
A= Contributing Area in Ac

V (100 R)= (18985)(C)(A)

A	15.53	acres
C	0.58	
V (100 R)	171,005	CF

12 Storage Curve Factor- R

R= Storage Curve Factor for the 100 Year detention Volume (dimensionless)
Q (100 P)= 100 Allowable 100 Year post development peak flow rate in cfs
Q (100 IN)= 100 Year Peak inflow rate in CFS

R= [0.206- 0.15ln(Q100P/Q100IN)]

Q (100 P)	0.93	cfs
Q (100 IN)	48.56	cfs
R	0.80	

13 100 Year Detention Basin Size- V (100 D)

V (100 D)= Required 100 year detention volume in CF
V (100 R)= Post Development 100 Year peak runoff volume in CF
R= Storage Curve Factor for the 100 Year detention Volume (dimensionless)
V (CP-P)= Provided Infiltration Volume in CF
Note: V (100 D) must be greater than or equal to V (ED)

V (100 D) = V (100 R) * R - V (CP-P)

V (100 R)	171,005	CF
R	0.80	
V (CP-P)	0	CF **(NO INF PROVIDED)**
V(100 D)	136,634	CF

14 Sediment Forebay Volume Required- V (F)

Sediment Forebay Volume required is 15% of the Water Quality Volume

V (WQ)= Required Water Quality Volume in CF

V (F)= 0.15 * V (WQ)

V (WQ)		
V (F)	32,697	CF
	4,905	CF

15 Detention Basin Emergency Overflow Spillway

Sized for 100 Year Peak Inflow- Q (100 IN)

Q (100 IN)= 100 Year Peak Inflow in CFS
H= Depth of Water over Spillway in ft
W= Width of spillway in ft
Q (Spillway)= Capacity of Spillway in CFS calculated using the Cipoletti Weir Equation

Q (Spillway)= (3.367)(W)(H^1.5)

Q (100 IN)	48.56	CFS
H	0.50	ft
W	40.00	ft
Q (Spillway)	47.62	cfs

16 Sediment Forebay and Detention Basin Emergency Overflow Spillway

Sized for 100 Year Peak Inflow- Q (100 IN)

Q (100 IN)= 100 Year Peak Inflow in CFS
H= Depth of Water over Spillway in ft
W= Width of spillway in ft
Q (Spillway)= Capacity of Spillway in CFS calculated using the Cipoletti Weir Equation

Q (Spillway)= (3.367)(W)(H^1.5)

Q (100 IN)	0.00	CFS
H	0.50	ft
W	40.00	ft
Q (Spillway)	47.62	cfs

SOUTH STORM WATER PROVIDED CALCULATIONS

Project:	Legacy Genoa- South Pond
Location:	Genoa Township, Livingston County, Michigan
Project No:	2021-0578
BY:	JAH
CK:	
Date:	5/23/2023

Detention Storage, Infiltration Storage and Outlet Calculations
Using Livingston County Procedures and Design Criteria for Stormwater Management Systems
Version 5.6 (March 2022)

1 Forebay Volume Provided

Forebay Sizing

CONTOUR INTERPOLATION CALCS.

	CONTOUR ELEV	Contour AREA	INCR. VOLUME	CUMUL. VOLUME	V (F)
					4,905
Top of Storage	979.00	18,432	17,283	49,605	-
	978.00	16,134	15,013	32,322	-
	977.00	13,892	12,800	17,309	**976.03**
	976.00	11,707	4,510	4,510	-
Bottom of Storage	975.60	10,841	-	-	-

2 Forebay Outlet Control Structure Design

Q (ED)= Outlet rate for both forebay and detention basin in cfs
H (w)= Average Head over outlet orfice= 0.4 * Distance from Storage Elev to Outlet Elev
A= Total Area of orfice Required= Q (ED)/ (0.62 *SQRT (2*G*H(w)))
Q (actual)= 0.62 * A (total) * SQRT (2* G* H(w))
Drain time = V (F) / Q (actual)*3600

V (F)=	4,905	CF
Q (ED)=	0.36	CFS
V (F) Storage Elevation=	976.03	
V(F) Outlet Elevation=	975.60	
H (w)=	0.17	ft
A=	0.17	SF
Outlet Hole Diameter:	1.75	in
Restriction Hole Area:	0.0167	sft
Number of Restriction Holes:	9	
A (Total)= Total Restriction Hole Area:	0.150	sft
Q (actual)	0.31	cfs
Drain Time:	4.39	hrs

3 Required Storage Volume In Detention Basin

Remaining Storage Volume in Detention Basin Req= V (100 D) - Volume Provided in Sediment Forebay

87,029	CF

4 Detention Volume Provided

BASIN SIZING

CONTOUR INTERPOLATION CALCS.

	CONTOUR ELEV	Contour AREA	INCR. VOLUME	CUMUL. VOLUME	Remaining V (100 D)	V (ED)
					87,029	62,124
Top of Detention	981.00	39,619	37,752	105,905	**980.50**	**-**
	980.00	35,885	17,484	68,153	-	**979.83**
	979.50	34,050	11,883	50,670	-	-
	979.00	13,480	12,775	38,787	-	-
	978.00	12,070	11,393	26,012	-	-
	977.00	10,718	10,067	14,619	-	-
	976.00	9,418	4,552	4,552	-	-
Bottom of Detention	975.50	8,790	-	-	-	-

5 Total 100 Year Detention Volume= Forebay Volume Provided + Detention Volume Provided

Total Volume Provided=	155,510	CF

6 Extended Detention Volume- V (ED)
Outlet Calcs

V (ED)= Required Extended Detention Volume in CF
Q (ED)= Ved Outlet rate in cfs
H (w)= Average Head over outlet orfice= 0.4 * Distance from Storage Elev to Outlet
A= Total Area of orfice Required= Q (ED)/ (0.62 *SQRT (2*G*H(w)))
Q (actual)= 0.62 * A (total) * SQRT (2* G* H(w))
Drain time = V (ED) / Q (actual)*3600

V (ED)=	62,124	CF
Q (ED)=	0.36	CFS
V (ED) Storage Elevation=	979.83	
V(ED) Outlet Elevation=	975.50	
H (w)=	1.73	ft
A=	0.05	SF
Outlet Hole Diameter:	1	in
Restriction Hole Area:	0.0055	sft
Number of Restriction Holes:	9	
A (Total)= Total Restriction Hole Area:	0.049	sft
Q (actual)	0.32	cfs
Drain Time:	53.72	hrs

7 100 Year Outlet Calcs

V (100 D)= Required 100 year detention volume in CF
Q (P)= 100 Year allowable release rate in cfs
Q (through V-ED outlet when 100 year storm)= 0.62 *(A(total V ED)) * SQRT(2*32.2*(X100 -Xbot))
A= Area of orfice= Q (100 VRR)/ (0.62 *SQRT (2*G*(X100- XVED)))

Remaining V(100 D=)	87,029 CF
Q (P)=	0.93 cfs

100 Year storm Flow through V (ED) orfices

Xbot= Bottom of Det Elev (V ED outlet elev)=	975.50
X100=Remaining V (100 D) Storage Elev=	980.50
Head= X100-Xbot	5.00 ft
Q (through V-ED outlet for 100 year storm)=	0.55 cfs

Remaining flow to pass through the V (100) orfices

Q (max 100)= Q (P) - Q (through V-ED outlet for 100 year storm)=	0.39 cfs

100 Year flow through V(100) orfices

XVed= Elev of VED Storage (V 100 outlet elev)=	979.69
X100=Remaining V (100 D) Storage Elev=	980.21
Head= X100-Xved	0.52 ft
A (max 100)= Q (max 100) / 0.62* sqrt(2*32.2*Head)	0.11 SF
Outlet Hole Diameter:	1.5 in
Restriction Hole Area:	0.0123 sft
Number of Restriction Holes:	8
A (Total)= Total Restriction Hole Area:	0.10 sft
Q (through V-100 outlet for 100 year storm)=	0.35 cfs
Drain Time:	26.92 hrs

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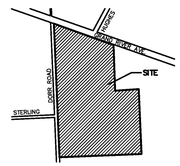


CLIENT
GRAND RIVER DORR LLC.
315550 NORTHWESTERN HIGHWAY
FARMINGTON HILLS, MI 48334

PROJECT TITLE
THE LEGACY APARTMENT HOMES
6080 W GRAND RIVER
GENOA TOWNSHIP, LIVINGSTON COUNTY, MICHIGAN

REVISIONS

REV PER TWP	5-30-23

ORIGINAL ISSUE DATE:
APRIL 10, 2023

DRAWING TITLE
SOUTH POND DESIGN CALCULATIONS

PEA JOB NO.	2021-0578
P.M.	JEC
DN.	JMR
DES.	JMR

DRAWING NUMBER:
C-6.4

NOT FOR CONSTRUCTION

S:\PROJECTS\2021\2021-0578 LAUTREC GENOA TOWNSHIP\DWG\SITE PLANS\C-6.4(I) SP STRM-21-0578.dwg

LEGEND

EXISTING		PROPOSED
IRON FOUND / IRON SET / NAIL FOUND / NAIL & CAP SET		BRASS PLUG SET / MONUMENT FOUND / MONUMENT SET / SEC. CORNER FOUND
		R RECORDED / M MEASURED / C CALCULATED
—OH—ELEC—	ELEC., PHONE OR CABLE TV O.H. LINE, POLE & GUY WIRE	
—UG—CATV—	UNDERGROUND CABLE TV, CATV PEDESTAL	
—UG—PHONE—	TELEPHONE U.G. CABLE, PEDESTAL & MANHOLE	
—UG—ELEC—	ELECTRIC U.G. CABLE, MANHOLE, METER & HANDHOLE	
	GAS MAIN, VALVE & GAS LINE MARKER	
	WATERMAIN, HYD., GATE VALVE, TAPPING SLEEVE & VALVE	
	SANITARY SEWER, CLEANOUT & MANHOLE	
	STORM SEWER, CLEANOUT & MANHOLE	
	COMBINED SEWER & MANHOLE	
	SQUARE, ROUND & BEEHIVE CATCH BASIN, YARD DRAIN	
	POST INDICATOR VALVE	
	WATER VALVE BOX/HYDRANT VALVE BOX, SERVICE SHUTOFF	
M E I	MAILBOX, TRANSFORMER, IRRIGATION CONTROL VALVE	
?	UNIDENTIFIED STRUCTURE	
+108.91	SPOT ELEVATION	671.21
670	CONTOUR LINE	671
	FENCE	
	GUARD RAIL	
	STREET LIGHT	
	SIGN	
CONC.	CONCRETE	STD DUTY / HEAVY DUTY / R.O.W. ONLY
ASPH.	ASPHALT	STD DUTY / HEAVY DUTY / DEEP STRENGTH
GRAVEL	GRAVEL SHOULDER	
	WETLAND	

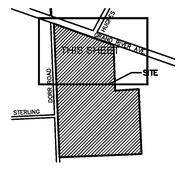
NORTH

0 50 100 200

SCALE: 1" = 100'

811 Know what's below. Call before you dig.

CAUTION!!
THE LOCATIONS AND ELEVATIONS OF EXISTING UNDERGROUND UTILITIES AS SHOWN ON THIS DRAWING ARE ONLY APPROXIMATE. NO GUARANTEE IS EITHER EXPRESSED OR IMPLIED AS TO THE COMPLETENESS OR ACCURACY THEREOF. THE CONTRACTOR SHALL BE EXCLUSIVELY RESPONSIBLE FOR VERIFYING THE LOCATIONS, DEPTHS AND ELEVATIONS PRIOR TO THE START OF CONSTRUCTION.



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PROJECT TITLE

THE LEGACY APARTMENT HOMES
6080 W GRAND RIVER
GENOA TOWNSHIP, LIVINGSTON COUNTY, MICHIGAN

REVISIONS	
REV PER TWP	5-30-23

ORIGINAL ISSUE DATE:
APRIL 10, 2023

DRAWING TITLE

NORTH STORM SEWER DRAINAGE AREAS

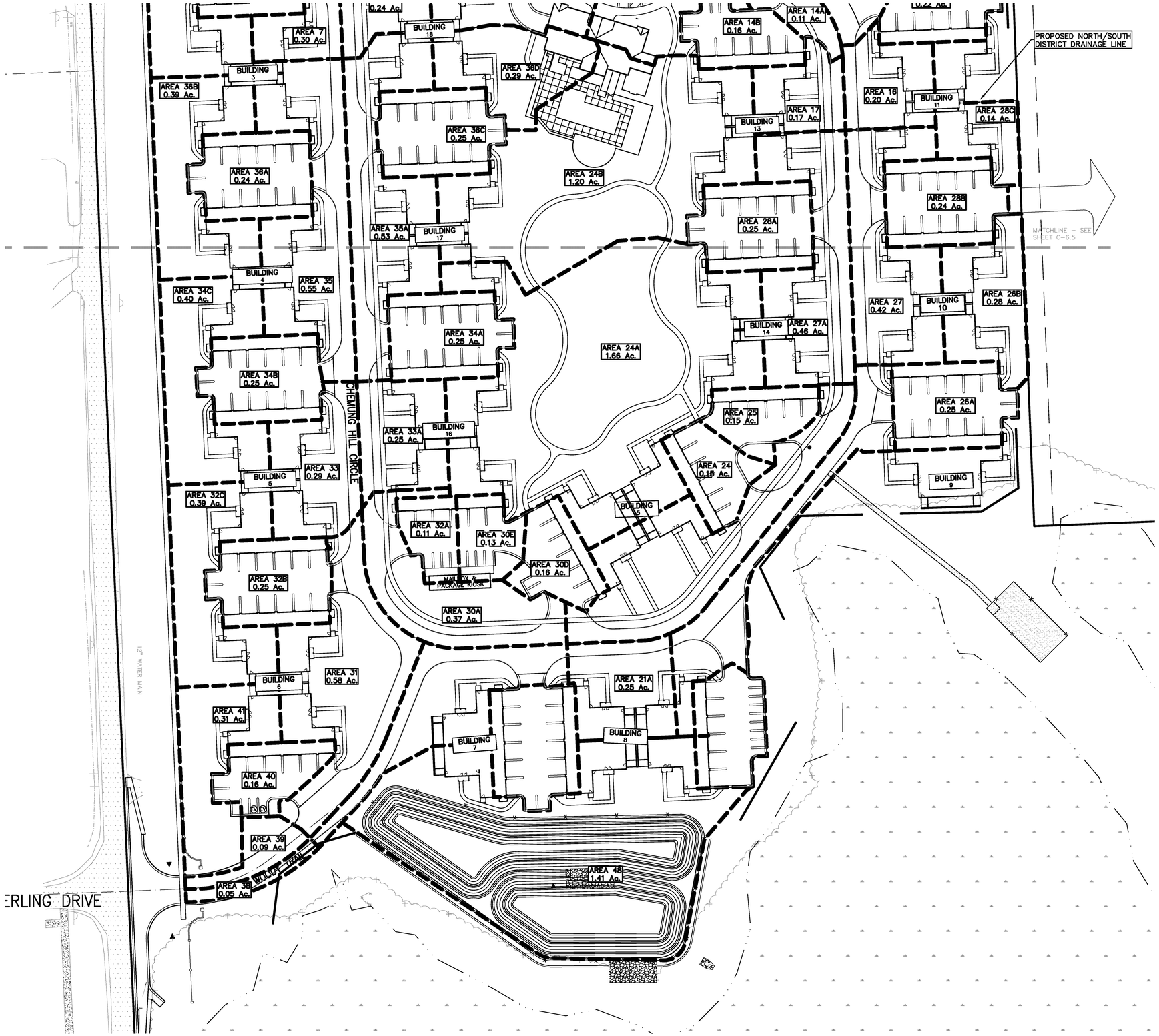
PEA JOB NO.	2021-0578
P.M.	JEC
DN.	JMR
DES.	JMR

DRAWING NUMBER:

C-6.5

NOT FOR CONSTRUCTION

S:\PROJECTS\2021\2021-0578 LAUREC GENOA TOWNSHIP\PW\SITE PLANS\C-6.0 SP STRM-21-0578.dwg



LEGEND

IRON FOUND
IRON SET
NAIL FOUND
NAIL & CAP SET
BRASS PLUG SET
MONUMENT FOUND
MONUMENT SET
SEC. CORNER FOUND
R RECORDED
M MEASURED
C CALCULATED

EXISTING	PROPOSED	
OH-ELEC-W		ELEC., PHONE OR CABLE TV O.H. LINE, POLE & GUY WIRE
UG-CATV-TV		UNDERGROUND CABLE TV, CATV PEDESTAL
UG-PHONE-T		TELEPHONE U.G. CABLE, PEDESTAL & MANHOLE
UG-ELEC-E		ELECTRIC U.G. CABLE, MANHOLE, METER & HANDHOLE
G		GAS MAIN, VALVE & GAS LINE MARKER
W		WATERMAIN, HYD., GATE VALVE, TAPPING SLEEVE & VALVE
S		SANITARY SEWER, CLEANOUT & MANHOLE
ST		STORM SEWER, CLEANOUT & MANHOLE
		COMBINED SEWER & MANHOLE
		SQUARE, ROUND & BEEHIVE CATCH BASIN, YARD DRAIN
		POST INDICATOR VALVE
		WATER VALVE BOX/HYDRANT VALVE BOX, SERVICE SHUTOFF
M T I		MAILBOX, TRANSFORMER, IRRIGATION CONTROL VALVE
		UNIDENTIFIED STRUCTURE
×699.31	671.21	SPOT ELEVATION
670	671	CONTOUR LINE
		FENCE
		GUARD RAIL
		STREET LIGHT
		SIGN
CONC.	STD DUTY / HEAVY DUTY / R.O.W. ONLY	CONCRETE
ASPH.	STD DUTY / HEAVY DUTY / DEEP STRENGTH	ASPHALT
GRAVEL		GRAVEL SHOULDER
		WETLAND

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NORTH

0 25 50 100
SCALE: 1" = 50'

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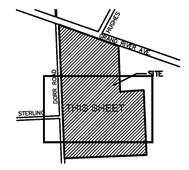

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PROJECT TITLE
THE LEGACY APARTMENT HOMES
6080 W GRAND RIVER
GENOA TOWNSHIP, LIVINGSTON COUNTY, MICHIGAN

REVISIONS	
REV PER TWP	5-30-23

ORIGINAL ISSUE DATE:
APRIL 10, 2023

DRAWING TITLE
SOUTH STORM SEWER DRAINAGE AREAS

PEA JOB NO.	2021-0578
P.M.	JEC
DN.	JMR
DES.	JMR

DRAWING NUMBER:
C-6.6

NOT FOR CONSTRUCTION

S:\PROJECTS\2021-0578 LAUTREC GENOA TOWNSHIP\DWG\SITE PLANS\C-6.6 SSW-21-0578.dwg

Location: Livingston County

I = B/(T+D) ^ E B = 175.00 D = 25.00 E = 1.00
C = varies
T = 15 (min.) Pipe "n" Value = 0.013

FROM STR	TO STR	AREA (A) (Acres)	COEF. C	A x C	TOTAL AREA (AxC)	TOTAL AREA (Acres)	TIME t (min.)	INT. I (in/hr)	FLOW Q (cfs)	PIPE CAP. (cfs)	PIPE DIA. (in.)	PIPE LENGTH (ft.)	PIPE SLOPE (%)	MIN HG PER "Q"	VEL. FULL (ft./sec)	TIME FLOW (min.)	H.G.L. ELEV. UP STREAM	H.G.L. ELEV. DOWN STREAM	RIM ELEV. UP STREAM	RIM ELEV. DOWN STREAM	INVERT ELEV. UP STREAM	INVERT ELEV. DOWN STREAM	PIPE COVER UP STREAM	PIPE COVER DOWN STREAM	HGL COVER UP STREAM	HGL COVER DOWN STREAM
28C	28B	0.14	0.55	0.07	0.07	0.14	15.00	4.38	0.33	2.11	12	82	0.35	0.01%	2.7	0.5	980.76	980.47	984.50	986.94	979.96	979.67	3.37	6.10	3.74	6.47
28B	28	0.24	0.90	0.22	0.29	0.38	15.50	4.32	1.27	2.11	12	77	0.35	0.13%	2.7	0.5	980.47	980.20	986.94	985.97	979.67	979.40	6.10	5.40	6.47	5.77
28	27	0.00	0.00	0.00	0.52	0.63	16.00	4.27	2.21	3.23	15	166	0.25	0.12%	2.6	1.0	980.20	979.79	985.97	984.12	979.20	978.79	5.33	3.90	5.77	4.33
27	26	0.42	0.66	0.28	1.11	1.51	17.00	4.17	4.61	4.70	18	71	0.20	0.19%	2.7	0.4	979.79	979.65	984.12	983.46	978.59	978.45	3.83	3.30	4.33	3.81
26	25	0.00	0.00	0.00	1.48	2.04	17.40	4.13	6.11	8.76	24	102	0.15	0.07%	2.8	0.6	979.65	979.49	983.46	983.48	978.05	977.89	3.16	3.34	3.81	3.99
25	24	0.15	1.05	0.16	1.64	2.19	18.00	4.07	6.67	8.76	24	51	0.15	0.09%	2.8	0.3	978.49	978.42	983.48	983.43	976.89	976.82	4.34	4.36	4.99	5.01
24	23	0.15	0.25	0.04	2.98	5.20	18.30	4.04	12.06	15.89	30	67	0.15	0.09%	3.2	0.3	978.42	978.32	983.43	983.46	976.42	976.32	4.22	4.35	5.01	5.14
23	22	0.57	0.54	0.31	3.29	5.77	18.60	4.01	13.20	15.89	30	26	0.15	0.10%	3.2	0.1	978.32	978.28	983.46	981.94	976.32	976.28	4.35	2.86	5.14	3.66
22	21	0.33	0.66	0.21	3.50	6.09	18.70	4.00	14.03	15.89	30	82	0.15	0.12%	3.2	0.4	978.28	978.16	981.94	982.66	976.28	976.16	2.86	3.71	3.66	4.50
21	20	0.00	0.00	0.00	3.67	6.34	19.10	3.97	14.56	21.09	36	104	0.10	0.05%	3.0	0.6	978.16	978.05	982.66	983.00	975.76	975.65	3.57	4.01	4.50	4.95
20	19	0.19	0.85	0.16	3.83	6.53	19.70	3.91	15.00	21.09	36	96	0.10	0.05%	3.0	0.5	978.05	977.96	983.00	983.09	975.65	975.56	4.01	4.20	4.95	5.14
19	18	0.00	0.00	0.00	3.83	6.53	20.20	3.87	15.00	21.09	36	56	0.10	0.05%	3.0	0.3	977.96	977.90	983.09	979.31	975.56	975.50	4.20	0.47	5.14	1.41
28A	28	0.25	0.90	0.22	0.22	0.25	15.00	4.38	0.98	2.52	12	112	0.50	0.08%	3.2	0.6	982.76	982.20	986.76	985.97	981.96	981.40	3.63	3.40	4.00	3.77
26B	26A	0.28	0.54	0.15	0.15	0.28	15.00	4.38	0.67	2.11	12	84	0.35	0.03%	2.7	0.5	980.24	979.94	984.07	983.80	979.44	979.14	3.46	3.49	3.83	3.86
26A	26	0.25	0.90	0.22	0.37	0.53	15.50	4.32	1.61	2.11	12	85	0.35	0.20%	2.7	0.5	979.94	979.65	983.80	983.46	979.14	978.85	3.49	3.44	3.86	3.81
21A	21	0.25	0.66	0.17	0.17	0.25	15.00	4.38	0.72	2.11	12	51	0.35	0.04%	2.7	0.3	978.34	978.16	983.13	982.66	977.54	977.36	4.43	4.13	4.80	4.50
36	35	0.00	0.00	0.00	0.83	1.17	15.00	4.38	3.64	3.82	15	70	0.35	0.32%	3.1	0.4	979.87	979.65	986.13	984.03	978.80	978.56	5.89	4.03	6.25	4.38
35	34	0.55	0.65	0.36	1.55	2.25	15.40	4.33	6.71	6.21	18	156	0.35	0.41%	3.5	0.7	979.65	979.01	984.03	985.73	978.36	977.81	3.96	6.21	4.38	6.72
34	33	0.00	0.00	0.00	2.13	3.14	16.10	4.26	9.06	13.38	24	166	0.35	0.16%	4.3	0.6	979.01	978.43	985.73	984.31	977.41	976.83	6.07	5.23	6.72	5.88
33	32	0.29	0.63	0.18	2.48	3.68	16.70	4.20	10.41	13.38	24	67	0.35	0.21%	4.3	0.3	978.43	978.20	984.31	984.66	976.83	976.60	5.23	5.82	5.88	6.47
32	31	0.00	0.00	0.00	2.98	4.43	17.00	4.17	12.42	13.38	24	104	0.35	0.30%	4.3	0.4	978.20	977.83	984.66	982.61	976.60	976.23	5.82	4.13	6.47	4.78
31	30	0.58	0.64	0.38	3.36	5.01	17.40	4.13	13.85	18.34	30	27	0.20	0.11%	3.7	0.1	977.83	977.78	982.61	982.58	975.83	975.78	3.99	4.01	4.78	4.80
30	29	0.35	0.64	0.22	4.03	6.02	17.50	4.12	16.60	18.34	30	139	0.20	0.16%	3.7	0.6	977.78	977.50	982.58	978.70	975.78	975.50	4.01	0.41	4.80	1.20
36D	36C	0.29	0.62	0.18	0.18	0.29	15.00	4.38	0.78	2.11	12	98	0.35	0.05%	2.7	0.6	980.56	980.22	983.50	985.00	979.76	979.42	2.57	4.42	2.94	4.78
36C	36	0.25	0.90	0.22	0.40	0.54	15.60	4.31	1.73	2.11	12	119	0.35	0.24%	2.7	0.7	980.22	979.87	985.00	986.13	979.42	979.00	4.42	5.96	4.78	6.25
36B	36A	0.39	0.54	0.21	0.21	0.39	15.00	4.38	0.92	2.11	12	84	0.35	0.07%	2.7	0.5	980.35	980.07	984.00	985.40	979.55	979.26	3.28	4.97	3.65	5.33
36A	36	0.24	0.90	0.22	0.43	0.64	15.50	4.32	1.86	2.11	12	73	0.35	0.27%	2.7	0.5	980.07	979.87	985.40	986.13	979.26	979.00	4.97	5.96	5.33	6.25
34A	34	0.25	0.90	0.22	0.22	0.25	15.00	4.38	0.97	2.11	12	113	0.35	0.07%	2.7	0.7	981.41	981.01	985.35	985.73	980.61	980.21	3.58	4.35	3.94	4.72
34C	34B	0.40	0.46	0.18	0.18	0.40	15.00	4.38	0.80	2.52	12	84	0.50	0.05%	3.2	0.4	980.21	979.79	984.00	985.10	979.41	978.99	3.42	4.94	3.79	5.31
34B	34	0.25	0.71	0.17	0.36	0.65	15.40	4.33	1.55	3.56	12	78	1.00	0.19%	4.5	0.3	979.79	979.01	985.10	985.73	978.99	978.21	4.94	6.35	5.31	6.72
35A	35	0.53	0.68	0.36	0.36	0.53	15.00	4.38	1.57	3.56	12	26	1.00	0.19%	4.5	0.1	979.82	979.65	984.03	984.03	979.02	978.76	3.84	4.10	4.21	4.38
32C	32B	0.39	0.46	0.18	0.18	0.39	15.00	4.38	0.79	3.56	12	84	1.00	0.05%	4.5	0.3	979.80	978.95	983.85	984.90	979.00	978.15	3.69	5.58	4.05	5.95
32B	32	0.25	0.90	0.22	0.40	0.64	15.30	4.34	1.75	3.56	12	76	1.00	0.24%	4.5	0.3	978.95	978.20	984.90	984.66	978.15	977.40	5.58	6.10	5.95	6.47
32A	32	0.11	0.90	0.10	0.10	0.11	15.00	4.38	0.42	2.11	12	83	0.35	0.01%	2.7	0.5	978.49	978.20	984.80	984.66	977.69	977.40	5.95	6.10	6.31	6.47
30A	30	0.37	0.52	0.19	0.19	0.37	15.00	4.38	0.85	2.11	12	50	0.35	0.06%	2.7	0.3	977.81	977.78	982.79	982.58	976.95	976.78	4.66	4.64	4.98	4.80
30E	30D	0.13	0.89	0.11	0.11	0.13	15.00	4.38	0.49	2.11	12	51	0.35	0.02%	2.7	0.3	978.43	978.25	984.75	984.25	977.63	977.45	5.96	5.64	6.32	6.00
30D	30B	0.16	0.89	0.14	0.26	0.29	15.30	4.34	1.12	2.11	12	69	0.35	0.10%	2.7	0.4	978.25	978.01	984.25	984.15	977.45	977.21	5.64	5.78	6.00	6.15
30B	30	0.00	0.00	0.00	0.26	0.29	15.70	4.30	1.12	2.11	12	123	0.35	0.10%	2.7	0.8	978.01	977.78	984.15	982.58	977.21	976.78	5.78	4.64	6.15	4.80
17	16	0.17	0.58	0.10	0.10	0.17	15.00	4.38	0.43	2.52	12	31	0.50	0.01%	3.2	0.2	977.95	977.79	985.73	985.69	977.15	976.99	7.42	7.53	7.78	7.89
16	15	0.20	0.64	0.13	0.23	0.37	15.20	4.35	0.99	2.52	12	56	0.50	0.08%	3.2	0.3	977.69	977.51	985.69	984.80	976.89	976.61	7.63	7.02	7.99	7.29
15	14	0.00	0.00	0.00	0.56	0.75	15.50	4.32	2.42	6.46	15	103	1.00	0.14%	5.3	0.3	977.51	976.58	984.80	982.93	976.51	975.48	6.85	6.01	7.29	6.35
14	13	0.34	0.62	0.21	1.00	1.36	15.80	4.29	4.29	14.85	18	125	2.00	0.17%	8.4	0.2	976.58	974.08	982.93	978.95	975.38	972.88	5.84	4.36	6.35	4.87
13	12	0.20	0.69	0.14	1.25	1.69	16.00	4.27	5.35	14.85	18	28	2.00	0.26%	8.4	0.1	973.98	973.73	978.95	979.68	972.78	972.23	4.46	5.74	4.97	5.95
12	11	0.10	0.57	0.06	1.76	2.33	16.10	4.26	7.49	11.31	24	120	0.25	0.11%	3.6	0.6	973.73	973.43	979.68	978.67	972.13	971.83	5.30	4.59	5.95	5.24
11	10	0.67	0.61	0.41	2.17	3.00	16.70	4.20	9.09	11.31	24	26	0.25	0.16%	3.6	0.1	973.33	973.26	978.67	978.69	971.73	971.66	4.69	4.78	5.34	5.43
10	9	0.57	0.49	0.28	2.45	3.58	16.80	4.19	10.24	11.31	24	77	0.25	0.20%	3.6	0.4	973.21	973.05	978.69	983.25	971.56	971.37	4.88	9.63	5.48	10.20
9	8	0.18	0.90	0.16	2.60	3.75	17.20	4.15	10.80	11.31	24	61	0.25	0.23%	3.6	0.3	973.05	972.91	983.25	982.05	971.27	971.12	9.73	8.68	10.20	9.14
8	7	0.24	0.86	0.20	2.81	3.99	17.50	4.12	11.56	12.39	24	26	0.30	0.26%	3.9	0.1	972.91	972.84	982.05	982.05	971.02	970.94	8.78	8.86	9.14	9.21
7	6	0.30	0.62	0.19	3.34	4.94	17.60	4.11	13.73	18.34	30	122	0.20	0.11%	3.7	0.5	972.84	972.62	982.05	981.70	970.84	970.60	8.42	8.31	9.21	9.08
6	5	0.00	0.00	0.00	3.62	5.30	18.10	4.06	14.69	18.34	30	43	0.20	0.13%	3.7	0.2	972.62	972.56	981.70	981.30	970.50	970.41	8.41	8.10	9.08	8.74
5	4	0.19	0.90	0.17	3.79	5.49	18.30	4.04	15.32	18.34	30	83	0.20	0.14%	3.7	0.4	972.56	972.44	981.30	975.50	970.31	970.14	8.20	2.56	8.74	3.06
4	51	0.00	0.00	0.00	4.33	6.65	18.70	4.00	17.33	21.09	36	45	0.10	0.07%	3.0	0.2	972.44	972.40	975.50	973.17	970.04	970.00	2.12	-0.17	3.06	0.77
15B	15A	0.15	0.90	0.14	0.14	0.15	15.00	4.38	0.60	3.56	12	44	1.00	0.03%	4.5	0.2	982.11	981.68	985.00	984.85	981.31	980.88	2.52	2.81	2.89	3.18
15A	15	0.22	0.88	0.20	0.33	0.38	15.20	4.35	1.45	3.56	12	127	1.00	0.17%	4.5	0.5	978.68	977.51	984.85	984.80	977.88	976.61	5.81	7.02	6.18	7.29
14B	14A	0.16	0.90	0.15	0.15	0.16	15.00	4.38	0.65	2.11	12	42	0.35	0.03%	2.7	0.3	976.82	976.67	984.50	982.69	976.02	975.87	7.31	5.65	7.68	6.02
14A	14	0.11	0.74	0.08	0.23	0.27	15.30	4.34	0.98	2.11	12	26	0.35	0.08%	2.7	0.2	976.67	976.58	982.69	982.93	975.87	975.78	5.65	5.98	6.02	6.35
13A	13	0.13	0.91	0.12	0.12	0.13	15.00	4.38	0.51	5.04	12	60	2.00	0.02%	6.4	0.2	975.28	974.08	982.75	978.95	974.48	973.28	7.10	4.50	7.47	4.87
12A	12	0.17	0.90	0.16	0.16	0.17	15.00	4.38	0.68	5.04	12	60	2.00	0.04%	6.4	0.2	975.03	973.83	981.00	979.68	974.23	973.03	5.60	5.49	5.97	5.85
12B	12	0.37	0.78	0.29	0.29	0.37	15.00	4.38	1.27	2.11	12	60	0.35	0.13%	2.7	0.4	974.04	973.83	980.13	979.68	973.24	973.03	5.73	5.49	6.09	5.85
7C	7B	0.40	0.31	0.12	0.12	0.40	15.00	4.38	0.54	3.56	12	84	1.00	0.02%	4.5	0.3	979.58	978.74	983.00	985.40	978.78	977.94	3.05	6.30	3.42	6.66
7B	7A	0.25	0.90	0.22	0.35	0.65	15.30	4.34	1.51	3.56	12	69	1.00	0.18%	4.5	0.3	978.64	977.94	985.40	985.49	977.84	977.14	6.40	7.18	6.76	7.54
7A	7	0.00	0.00	0.00	0.35	0.65	15.60	4.31	1.51	3.56	12	100	1.00	0.18%	4.5	0.4	977.84	976.84	985.49	982.05	977.04	976.04	7.28	4.84	7.64	5.21
6B	6A	0.20	0.66	0.13	0.13	0.20	15.00	4.38	0.58	2.11	12	84	0.35	0.03%	2.7	0.5	975.17	974.88	979.00	982.80	974.37	974.08	3.46	7.56	3.83	7.92
6A	6	0.16	0.90	0.14	0.27	0.36	15.50	4.32	1.19	2.11	12	137	0.35	0.11%	2.7	0.8	974.78	974.30	982.80	981.70	973.98	973.50	7.66	7.03	8.02	7.40
46	45	0.54	0.40	0.22	0.22	0.54	15.00	4.38	0.95	2.02	12	187	0.32	0.07%	2.6	1.2	973.09	972.96	978.00	976.27	971.83	971.24	5.00	3.87	4.91	3.31
45	44	0.10	0.67	0.07	0.29	0.64	16.20	4.25	1.21	2.02	12	39	0.32	0.12%	2.6	0.3	972.96	972.91	976.27	976.95	971.24	971.11	3.87	4.68	3.31	4.04
44	43	0.11	0.63	0.07	0.35	0.75	16.50	4.22	1.49	2.02	12	63	0.32	0.17%	2.6	0.4	972.91	972.80	976.95	979.56	971.11	970.91	4.68	7.48	4.04	6.75
43	42	0.00	0.00	0.00	0.35	0.75	16.90	4.18	1.49	2.02	12	126	0.32	0.17%	2.6	0.8	972.80	972.58	979.56	975.00	970.91	970.51	7.48	3.33	6.75	2.42
42	4	0.41	0.45	0.19	0.54	1.16	17.70	4.10	2.21	3.03	15	120	0.22	0.12%	2.5	0.8	972.58	972.44	975.00	975.50	970.31	970.04	3.25	4.02	2.42	3.06
41	40	0.31	0.38	0.12	0.12	0.31	15.00	4.38	0.53	2.11	12	30	0.35	0.02%	2.7	0.2	978.51	978.41	983.00	984.32	977.71	977.61	4.12	5.55	4.49	5.92
40	39	0.16	0.90	0.14	0.26	0.47	15.20	4.35	1.14	2.11	12	68	0.35	0.10%	2.7	0.4	978.31	978.07	984.32	984.94	977.51	977.27	5.65	6.50	6.02	6.87
39	38	0.09	0.96	0.09	0.35	0.56	15.60	4.31	1.50	2.11	12	26	0.35	0.18%	2.7	0.2	977.97	977.88	984.94	985.16	977.17	977.08	6.60	6.91	6.97	7.28
38	37	0.05	1.81	0.08	0.43	0.61	15.80	4.29	1.86	3.82	15	79	0.35	0.08%	3.1	0.4	977.78	977.50	985.16	978.02	976.78	976.50	6.94	0.08	7.38	0.52
24B	24A	1.20	0.51	0.60	0.60	1.20	15.00	4.38	2.64	3.23	15	194	0.25	0.17%	2.6	1.2	979.12	978.63	982.50	983.75	978.12	977.63	2.95	4.68	3.38	5.12
24A	24	1.66	0.42	0.70	1.31	2.85	16.20	4.25	5.55	7.84	24	178	0.12	0.06%	2.5	1.2	978.63	978.42	983.75	983.43	977.03	976.82	4.47	4.36	5.12	5.01
33A	33	0.25	0.68	0.17	0.17	0.25	15.00	4.38	0.74	2.11	12	33	0.35	0.04%	2.7	0.2	980.55	980.43	984.53	984.31	979.75	979.63	3.62	3.51	3.98	3.88
27A	27	0.46	0.67	0.31	0.31	0.46	15.00	4.38	1.36	2.11	12	32	0.35	0.15%	2.7	0.2	979.90	979.79	983.94	984.12	979.10	978.99	3.67	3.97	4.04	4.33
50	49	0.00	0.00	9.42	9.42	0.00	20.30	3.86	36.39	38.31	36	53	0.33	0.30%	5.4	0.2	977.82	977.65	981.00	978.92	975.42	975.25	2.24	0.33	3.18	1.27
2	1A	0.00	0.00	5.73	5.73	0.00	18.70	4.00	22.95	23.18	24	68	1.05	1.03%	7.4	0.2	970.62	969.90	973.00	974.10	969.02	968.30	1.73	3.55	2.38	4.20
1A	1	0.00	0.00	0.00	5.73	0.00	18.90	3.99	22.95	23.18	24	10	1.05	1.03%	7.4	0.0	969.90	969.80	974.10	973.30	968.30	968.20	3.55	2.85	4.20	3.50

S:\PROJECTS\2021\2021-0578 LAURIE\ CENOA TOWNSHIP\DWG\SITE PLANS\[C-6.0] SP STRM-21-0578.dwg

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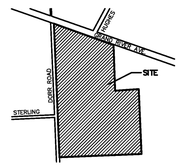
www.peagroup.com

811 Know what's below. Call before you dig.

CAUTION!!
THE LOCATIONS AND ELEVATIONS OF EXISTING UNDERGROUND UTILITIES AS SHOWN ON THIS DRAWING ARE ONLY APPROXIMATE. NO GUARANTEE IS EITHER EXPRESSED OR IMPLIED AS TO THE COMPLETENESS OR ACCURACY THEREOF. THE CONTRACTOR SHALL BE EXCLUSIVELY RESPONSIBLE FOR VERIFYING THE LOCATIONS, DEPTHS AND ELEVATIONS PRIOR TO THE START OF CONSTRUCTION.



CLIENT
GRAND RIVER DORR LLC.
315550 NORTHWESTERN HIGHWAY
FARMINGTON HILLS, MI 48334

PROJECT TITLE
THE LEGACY APARTMENT HOMES
6080 W GRAND RIVER
GENOA TOWNSHIP, LIVINGSTON COUNTY, MICHIGAN

REVISIONS	
REV PER TWP	5-30-23

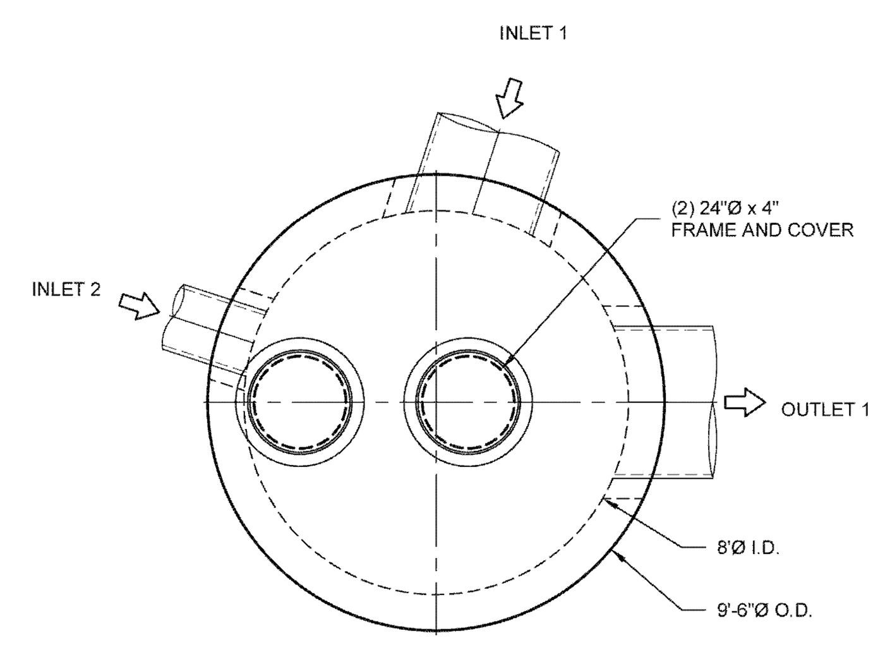
ORIGINAL ISSUE DATE:
APRIL 10, 2023

DRAWING TITLE
STORM DESIGN CALCULATIONS

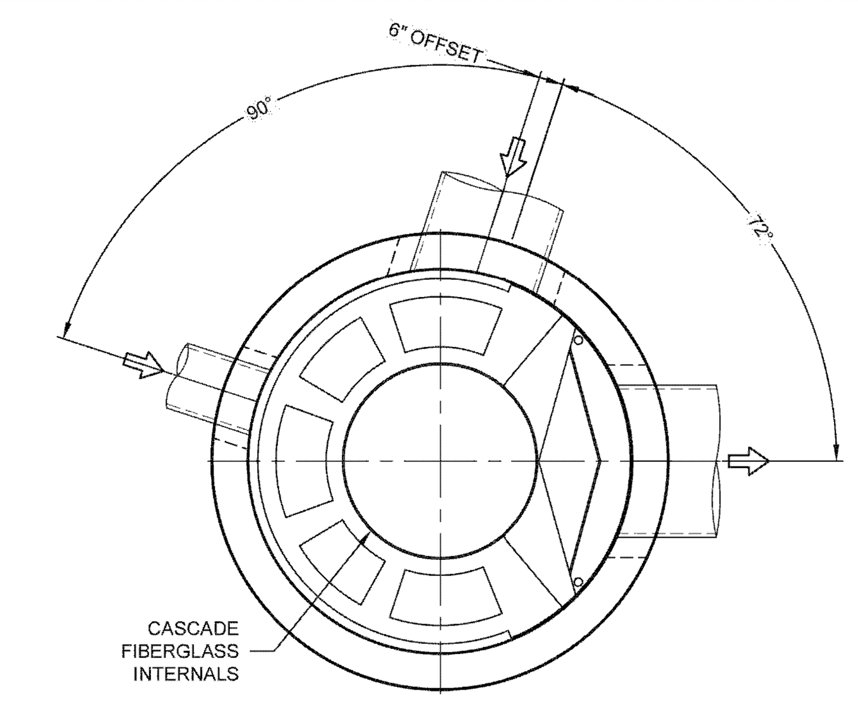
PEA JOB NO.	2021-0578
P.M.	JEC
DN.	JMR
DES.	JMR

DRAWING NUMBER:
C-6.7

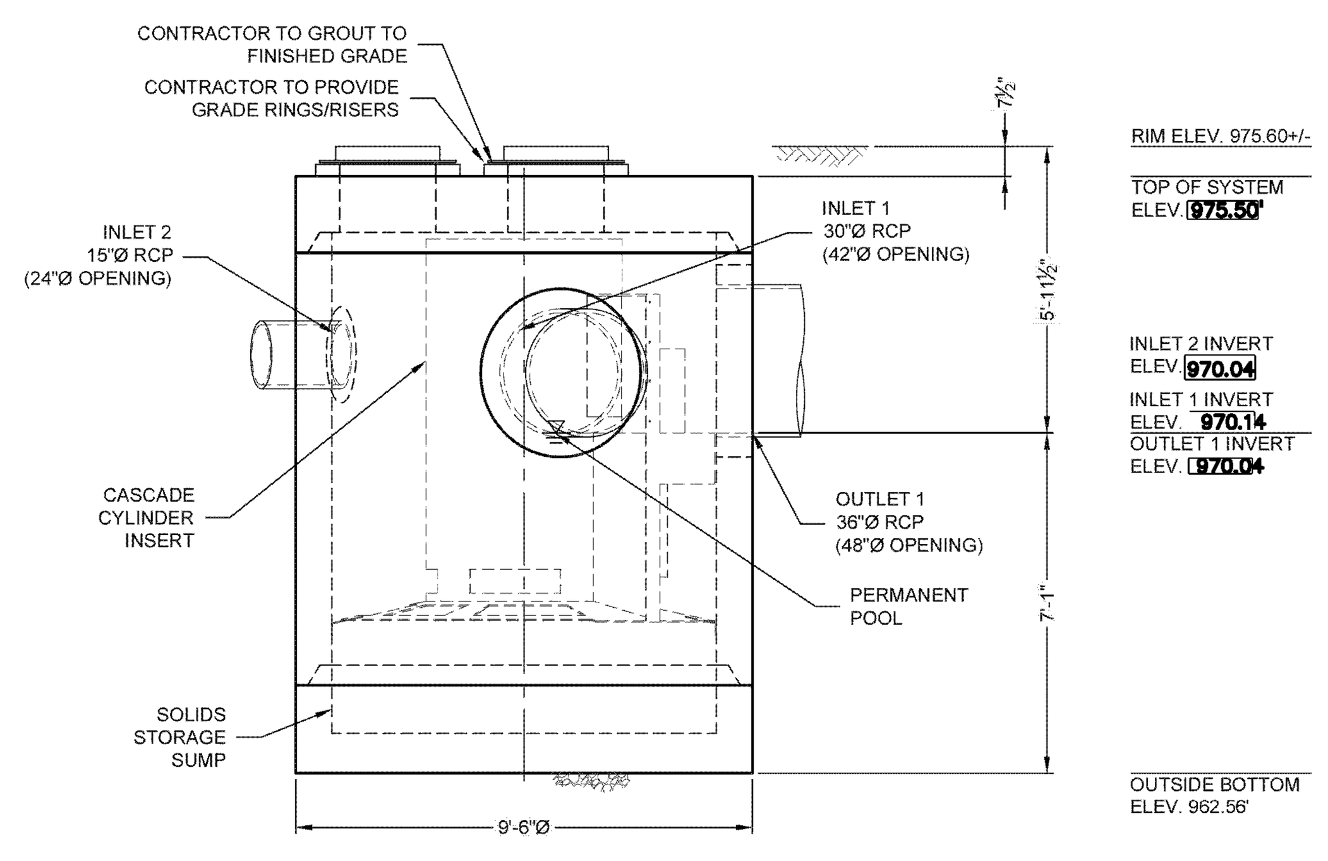
NOT FOR CONSTRUCTION



PLAN VIEW
(INTERNALS NOT SHOWN)



SECTION FOR PIPE ORIENTATION
(TOP SLAB NOT SHOWN)



ELEVATION VIEW

MATERIAL LIST (PROVIDED BY CONTECH)

COUNT	DESCRIPTION	INSTALLED BY
1	CS-8 FIBERGLASS CYLINDER INSERT, STD.	CONTECH
6	CS-8 ALUMINUM INSTALLATION BRACKET	CONTECH
1	SEALANT FOR JOINTS	CONTRACTOR
2	24"Ø x 4" FRAME AND COVER, EJ#41600389, OR EQUIV.	CONTRACTOR

GENERAL NOTES
1. CONTECH TO PROVIDE ALL MATERIALS UNLESS NOTED OTHERWISE.
2. FOR FABRICATION DRAWINGS WITH DETAILED STRUCTURE DIMENSIONS AND WEIGHTS, PLEASE CONTACT YOUR CONTECH REPRESENTATIVE. www.ContechES.com
3. CASCADE SEPARATOR WATER QUALITY STRUCTURE SHALL BE IN ACCORDANCE WITH ALL DESIGN DATA AND INFORMATION CONTAINED IN THIS DRAWING. CONTRACTOR TO CONFIRM STRUCTURE MEETS REQUIREMENTS OF PROJECT.
4. STRUCTURE SHALL MEET AASHTO HS-20 LOAD RATING, ASSUMING EARTH COVER OF 0' - 2', AND GROUNDWATER ELEVATION AT, OR BELOW, THE OUTLET PIPE INVERT ELEVATION. ENGINEER OF RECORD TO CONFIRM ACTUAL GROUNDWATER ELEVATION. CASTINGS SHALL MEET AASHTO M306 AND BE CAST WITH THE CONTECH LOGO.
5. CASCADE SEPARATOR STRUCTURE SHALL BE PRECAST CONCRETE CONFORMING TO ASTM C-478 AND AASHTO LOAD FACTOR DESIGN METHOD.

INSTALLATION NOTES
A. ANY SUB-BASE, BACKFILL DEPTH, AND/OR ANTI-FLOTATION PROVISIONS ARE SITE-SPECIFIC DESIGN CONSIDERATIONS AND SHALL BE SPECIFIED BY ENGINEER OF RECORD.
B. CONTRACTOR TO PROVIDE EQUIPMENT WITH SUFFICIENT LIFTING AND REACH CAPACITY TO LIFT AND SET THE CASCADE SEPARATOR MANHOLE STRUCTURE.
C. CONTRACTOR TO ADD JOINT SEALANT BETWEEN ALL STRUCTURE SECTIONS, AND ASSEMBLE STRUCTURE.
D. CONTRACTOR TO PROVIDE, INSTALL, AND GROUT PIPES. MATCH PIPE INVERTS WITH ELEVATIONS SHOWN. ALL PIPE CENTERLINES TO MATCH PIPE OPENING CENTERLINES.
E. CONTRACTOR TO TAKE APPROPRIATE MEASURES TO ASSURE UNIT IS WATER TIGHT, HOLDING WATER TO FLOWLINE INVERT MINIMUM. IT IS SUGGESTED THAT ALL JOINTS BELOW PIPE INVERTS ARE GROUTED.

STRUCTURE WEIGHT
APPROXIMATE HEAVIEST PICK = 26000 LBS.
OF 3 PIECES

MAXIMUM FOOTPRINT = 9'-6"Ø

CONTECH
PROPOSAL
DRAWING

NCI
LAYOUT 1A

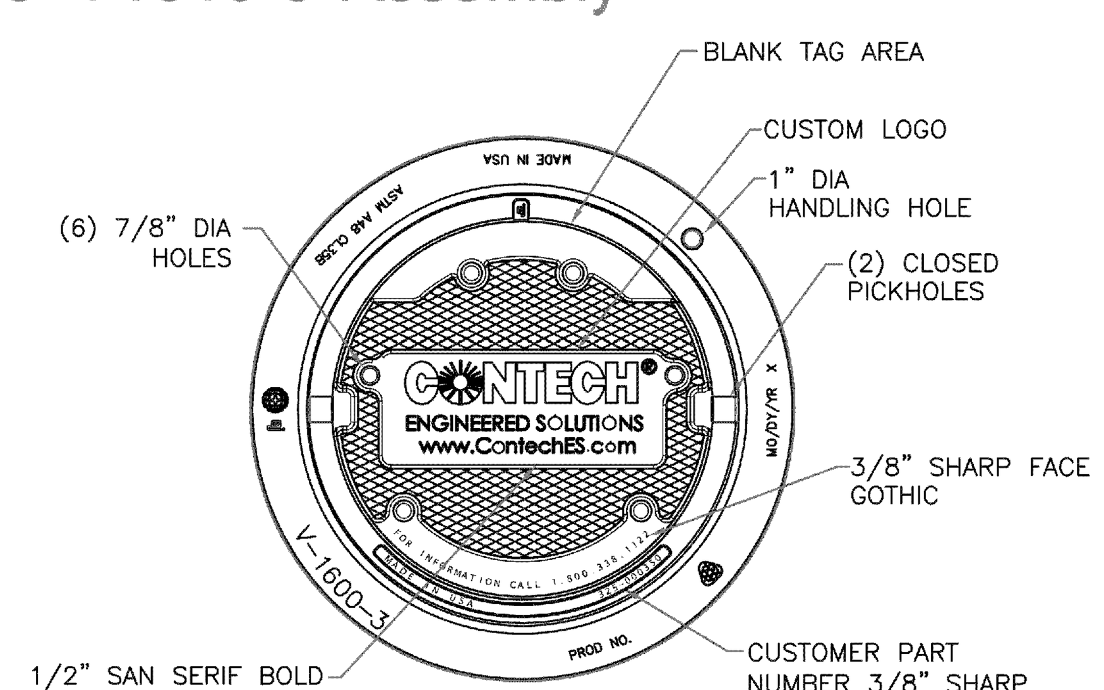
MARK	DATE	REVISION DESCRIPTION	BY

CS-8 - 730793-10
THE LEGACY APARTMENT HOMES
GENOA TOWNSHIP, MI
for SYSTEM: MH-4

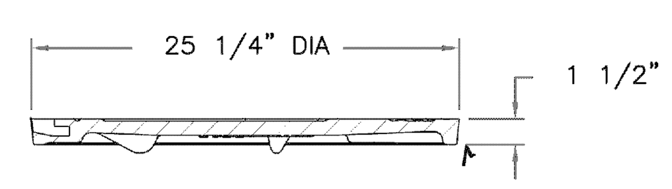
CONTECH ENGINEERED SOLUTIONS LLC
www.ContechES.com
2201 W. Royal Lane, Suite 260, Irving, TX 75063
972-590-2000 972-590-2039 FAX
CASCADE separator™

DATE: 03/09/23	
DESIGNED: CJG	DRAWN: CJG
CHECKED: MSB	APPROVED: MSB
PROJECT No.: 730793	SEQUENCE No.: 10
SHEET: 1 OF 1	

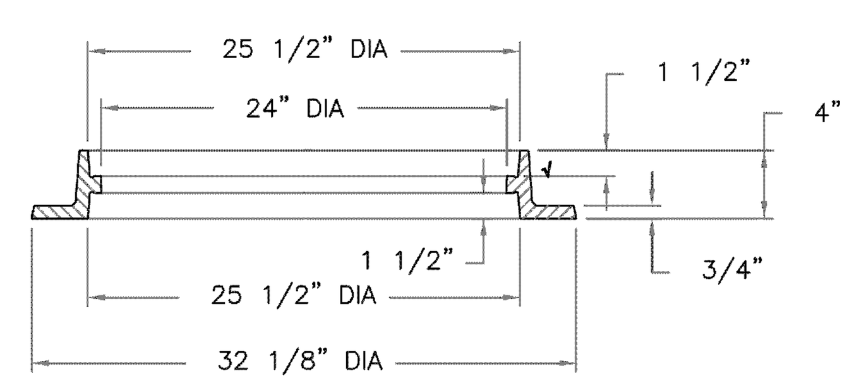
V1600-3 V1610-3 Assembly



PLAN VIEW



COVER SECTION



RING SECTION

Product Number
41600389
Design Features
-Materials
Frame
Gray Iron (CL35B)
Cover
Gray Iron (CL35B)

-Design Load
Heavy Duty
-Open Area
n/a
-Coating
Undipped
- √ Designates Machined Surface

Certification
-
- ASTM A48
-
-Country of Origin: USA

Major Components
41600310
41600374

Drawing Revision
05/02/2008 Designer: DEW
6/20/2017 Revised By: DAE

Disclaimer
Weights (lbs./kg) dimensions (inches/mm) and drawings provided for your guidance. We reserve the right to modify specifications without prior notice.

Contact
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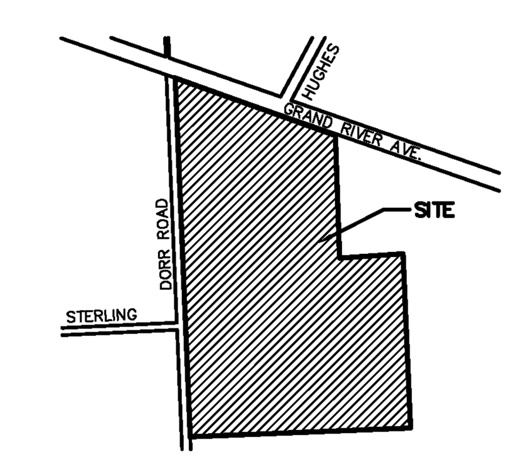


CLIENT
GRAND RIVER DORR LLC.
31550 NORTHWESTERN HIGHWAY
FARMINGTON HILLS, MI 48334

PROJECT TITLE
THE LEGACY APARTMENT HOMES
6080 W GRAND RIVER
GENOA TOWNSHIP, LIVINGSTON COUNTY, MICHIGAN

REVISIONS

REV PER TWP	5-30-23

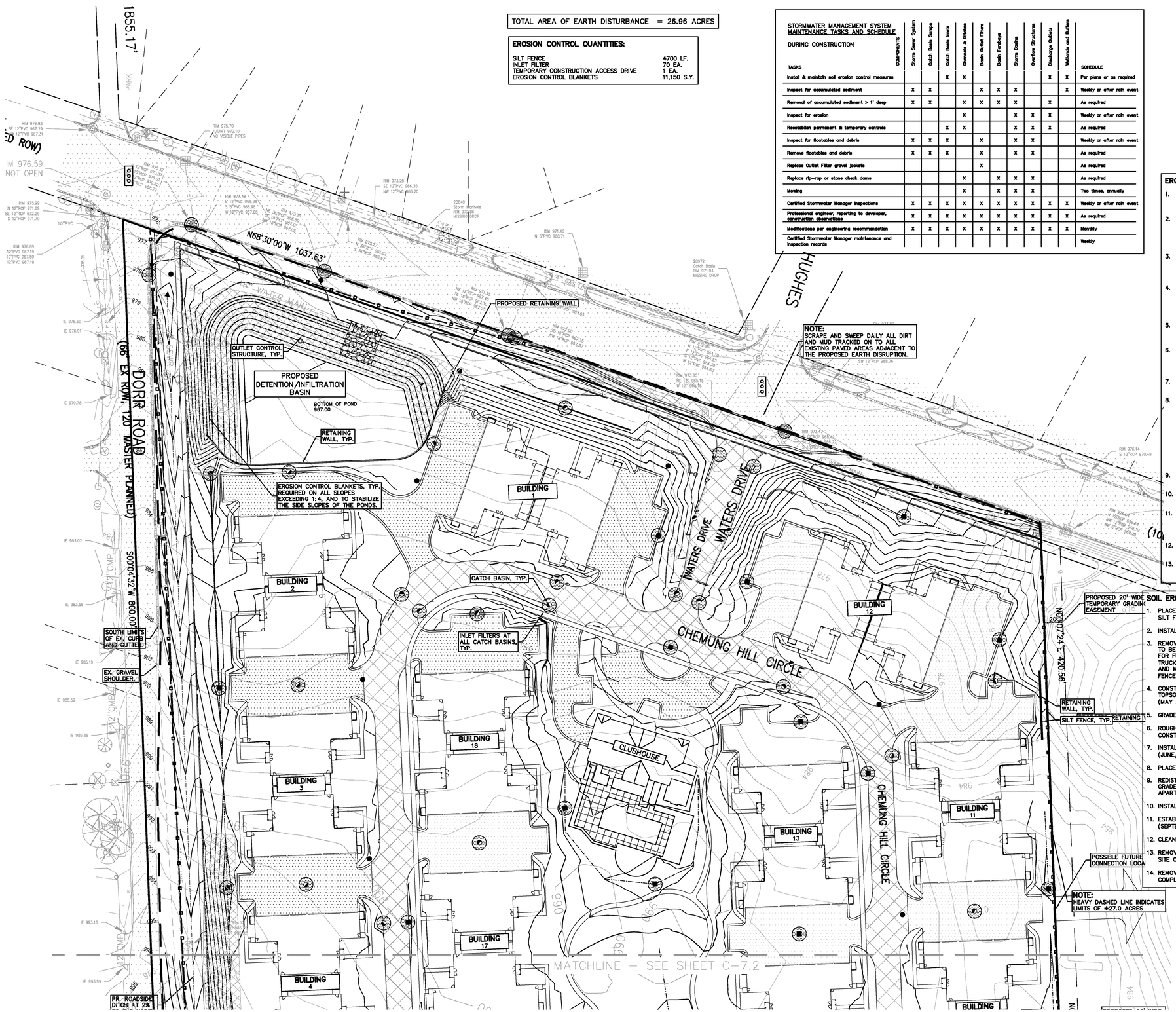
ORIGINAL ISSUE DATE:
APRIL 10, 2023

DRAWING TITLE
WATER QUALITY UNIT

PEA JOB NO.	2021-0578
P.M.	JEC
DN.	JMR
DES.	JMR

DRAWING NUMBER:
C-6.8

NOT FOR CONSTRUCTION



STORMWATER MANAGEMENT SYSTEM MAINTENANCE TASKS AND SCHEDULE DURING CONSTRUCTION	COMPONENTS											
TASKS	Storm Sewer System	Catch Basin Sumps	Catch Basin Inlets	Channels & Ditches	Basin Outlet Filters	Basin Forebays	Storm Basins	Overflow Structures	Discharge Outlets	Wetlands and Buffers	SCHEDULE
Install & maintain soil erosion control measures			X	X					X	X	Per plans or as required
Inspect for accumulated sediment	X	X			X	X	X			X	Weekly or after rain event
Removal of accumulated sediment > 1" deep	X	X		X	X	X	X		X		As required
Inspect for erosion				X			X	X	X		Weekly or after rain event
Reestablish permanent & temporary controls			X	X			X	X	X		As required
Inspect for floatables and debris	X	X	X		X		X	X			Weekly or after rain event
Remove floatables and debris	X	X	X		X		X	X			As required
Replace Outlet Filter gravel jackets					X						As required
Replace rip-rap or stone check dams				X		X	X	X			As required
Mowing				X		X	X	X			Two times, annually
Certified Stormwater Manager inspections	X	X	X	X	X	X	X	X	X	X	Weekly or after rain event
Professional engineer, reporting to developer, construction observations	X	X	X	X	X	X	X	X	X	X	As required
Modifications per engineering recommendation	X	X	X	X	X	X	X	X	X	X	Monthly
Certified Stormwater Manager maintenance and inspection records											Weekly

SYMBOLS: EROSION CONTROL

- SILT FENCE (REFER TO LIVINGSTON COUNTY SOIL EROSION AND SEDIMENTATION CONTROL DETAIL SHEET)
- INLET FILTER (REFER TO LIVINGSTON COUNTY SOIL EROSION AND SEDIMENTATION CONTROL DETAIL SHEET)
- TEMPORARY CONSTRUCTION ACCESS DRIVE (REFER TO LIVINGSTON COUNTY SOIL EROSION AND SEDIMENTATION CONTROL DETAIL SHEET)
- EROSION CONTROL BLANKETS
- RIP RAP
- APPROXIMATE TEMPORARY SEEDING LOCATIONS

NOTE:

REFER TO SHEET C-9.3 FOR EROSION CONTROL NOTES & DETAILS

EROSION CONTROL STANDARDS:

1. ALL EROSION AND SEDIMENT CONTROL WORK SHALL CONFORM TO STANDARDS AND SPECIFICATIONS OF THE JURISDICTIONAL AGENCY UNDER PART 91 OF ACT 451 OF 1994, AS AMENDED.
2. DAILY INSPECTIONS SHALL BE MADE BY CONTRACTOR WHILE WORKING TO DETERMINE THE EFFECTIVENESS OF EROSION AND SEDIMENT CONTROL MEASURES. ANY NECESSARY REPAIRS SHALL BE PERFORMED WITHOUT DELAY. ALL SOIL EROSION CONTROL PROVISIONS SHALL BE PROPERLY MAINTAINED DURING CONSTRUCTION.
3. EROSION AND ANY SEDIMENTATION FROM WORK ON THIS SITE SHALL BE CONTAINED ON THE SITE AND NOT ALLOWED TO COLLECT ON ANY OFF- SITE AREAS OR IN WATERWAYS. WATERWAYS INCLUDE BOTH NATURAL AND MAN-MADE OPEN DITCHES, STREAMS, STORM DRAINS, LAKES, AND PONDS.
4. CONTRACTOR SHALL APPLY TEMPORARY EROSION AND SEDIMENTATION CONTROL MEASURES WHEN REQUIRED AND AS DIRECTED ON THESE PLANS. CONTRACTOR SHALL REMOVE TEMPORARY MEASURES AS SOON AS PERMANENT PERMANENT STABILIZATION OF SLOPES, DITCHES, AND OTHER EARTH CHANGE AREAS HAVE BEEN COMPLETED.
5. STAGING THE WORK WILL BE DONE BY THE CONTRACTOR AS DIRECTED IN THESE PLANS AND AS REQUIRED TO ENSURE PROGRESSIVE STABILIZATION OF DISTURBED EARTH.
6. SOIL EROSION CONTROL PRACTICES WILL BE ESTABLISHED IN EARLY STAGES OF CONSTRUCTION BY THE CONTRACTOR. SEDIMENT CONTROL PRACTICES WILL BE APPLIED AS A PERIMETER DEFENSE AGAINST ANY TRANSPORTING OF SILT OFF THE SITE.
7. DUST SHALL BE CONTROLLED BY WATERING OR BY OTHER APPROVED MEANS THROUGHOUT ALL CONSTRUCTION OPERATIONS.
8. PERMANENT SOIL EROSION CONTROL MEASURES FOR SLOPES, CHANNELS, DITCHES OR ANY DISTURBED LAND AREA SHALL BE COMPLETED WITHIN 5 CALENDAR DAYS AFTER FINAL GRADING OR THE FINAL EARTH CHANGE HAS BEEN COMPLETED. WHEN IT IS NOT POSSIBLE TO PERMANENTLY STABILIZE A DISTURBED AREA AFTER AN EARTH CHANGE HAS BEEN COMPLETED OR WHERE SIGNIFICANT EARTH CHANGE HAS BEEN COMPLETED OR WHERE SIGNIFICANT EARTH CHANGE ACTIVITY CEASES, TEMPORARY SOIL EROSION CONTROL MEASURES SHALL BE IMPLEMENTED WITHIN 5 CALENDAR DAYS. ALL TEMPORARY SOIL EROSION CONTROL MEASURES SHALL BE MAINTAINED UNTIL PERMANENT SOIL EROSION CONTROL MEASURES ARE IMPLEMENTED AND ESTABLISHED BEFORE A CERTIFICATE OF COMPLIANCE IS ISSUED.
9. THE CONTRACTOR SHALL PRESERVE NATURAL VEGETATION AS MUCH AS POSSIBLE.
10. ANY WORK OUTSIDE OF THE LIMITS OF DISTURBANCE SHALL REQUIRE A SEPARATE GRADING PERMIT.
11. FOLLOWING THE PLACEMENT OF 4" OF TOPSOIL AND HYDROSEED, STRAW MULCH BLANKET IS TO BE INSTALLED PERPENDICULAR ALONG THE PROPOSED SLOPES 1:4 OR STEEPER FROM TOP OF SLOPE TO TOE OF SLOPE, INCLUDING DITCH BOTTOMS, AND IT MUST BE PEGGED IN PLACE.
12. ALL MUD/DIRT TRACKED ONTO EXISTING COUNTY/CITY ROADS FROM THIS SITE, DUE TO CONSTRUCTION, SHALL BE PROMPTLY REMOVED BY THE CONTRACTOR.
13. TEMPORARY STABILIZATION OF THE ENTIRE SITE SHALL BE COMPLETED AND APPROVAL OBTAINED FROM THE LIVINGSTON COUNTY DRAIN COMMISSIONERS OFFICE PRIOR TO THE ISSUANCE OF ANY SINGLE FAMILY DWELLING PERMITS.

SOIL EROSION SCHEDULE AND SEQUENCE OF CONSTRUCTION:

1. PLACE SILT FENCE AND SEDIMENT TRAPS AS INDICATED ON PLANS. NOTE THAT ALL SILT FENCE SHALL BE 36" HIGH, NO EXCEPTIONS.(APRIL 2023)
2. INSTALL MUD MAT AT SITE ENTRANCE. (APRIL 2023)
3. REMOVE ALL TOPSOIL, ORGANIC MATTER, AND DELETERIOUS MATERIALS FROM AREAS TO BE GRADED. TOPSOIL MAY BE STORED ON SITE IN AREAS INDICATED AND USED FOR FUTURE PLANTING AND FILL AREAS IN GREENSPACE, BERMS, AND REAR YARDS. TRUCK TOPSOIL OFF SITE AT OWNER'S REQUEST. STOCKPILE AREAS SHALL BE SEEDED AND MULCHED OR MATTED WITH STRAW, AND PROVIDED WITH A PERIMETER OF SILT FENCE IMMEDIATELY FOLLOWING THE STRIPPING PROCESS. (APRIL 2023)
4. CONSTRUCT DETENTION PONDS AND SEDIMENTATION PONDS. PONDS SHALL BE TOPSOILED, SEEDED, MULCHED AND TACKED PRIOR TO ANY OTHER EARTH DISRUPTION. (MAY 2023)
5. GRADE ROADS TO PAVEMENT SUBGRADE ELEVATION. (MAY 2023)
6. ROUGH GRADE SITE TO WITHIN 0.5' OF FINAL GRADE PRIOR TO BEGINNING UTILITY CONSTRUCTION. (MAY/JUNE 2023)
7. INSTALL UTILITIES. PLACE INLET FILTERS ON ALL CATCH BASINS AND INLETS. (JUNE/JULY 2023)
8. PLACE ROAD PAVING. (AUGUST 2023)
9. REDISTRIBUTE TOPSOIL. SITE SHALL BE GRADED ACCORDING TO GRADING PLAN. FINAL GRADES WILL BE SET AT THE TIME SITE PLANS ARE AVAILABLE FOR EACH APARTMENT BUILDING.
10. INSTALL FRANCHISE UTILITIES (ELECTRIC, GAS, TELEPHONE). (SEPTEMBER 2023)
11. ESTABLISH VEGETATION AND/OR LANDSCAPE ANY REMAINING DISTURBED AREAS. (SEPTEMBER 2023)
12. CLEAN PAVEMENT AND STORM SEWERS. (YEARLY UNTIL SITE COMPLETION)
13. REMOVE ALL SEDIMENT FROM SEDIMENT BASIN AND DETENTION POND. (YEARLY UNTIL SITE COMPLETION)
14. REMOVE ALL TEMPORARY SEDIMENTATION AND EROSION CONTROLS. (UPON SITE COMPLETEION)

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NORTH

0 25 50 100
SCALE: 1" = 50'

811 Know what's below. Call before you dig.

CAUTION!!
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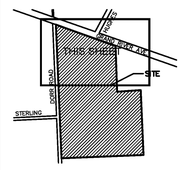


CLIENT

GRAND RIVER DORR LLC.
315550 NORTHWESTERN HIGHWAY
FARMINGTON HILLS, MI 48334

PROJECT TITLE

THE LEGACY APARTMENT HOMES
6080 W GRAND RIVER
GENOA TOWNSHIP, LIVINGSTON COUNTY, MICHIGAN

REVISIONS

REV PER TWP	5-30-23

ORIGINAL ISSUE DATE:
APRIL 10, 2023

DRAWING TITLE

SOIL EROSION AND SEDIMENTATION CONTROL NORTH

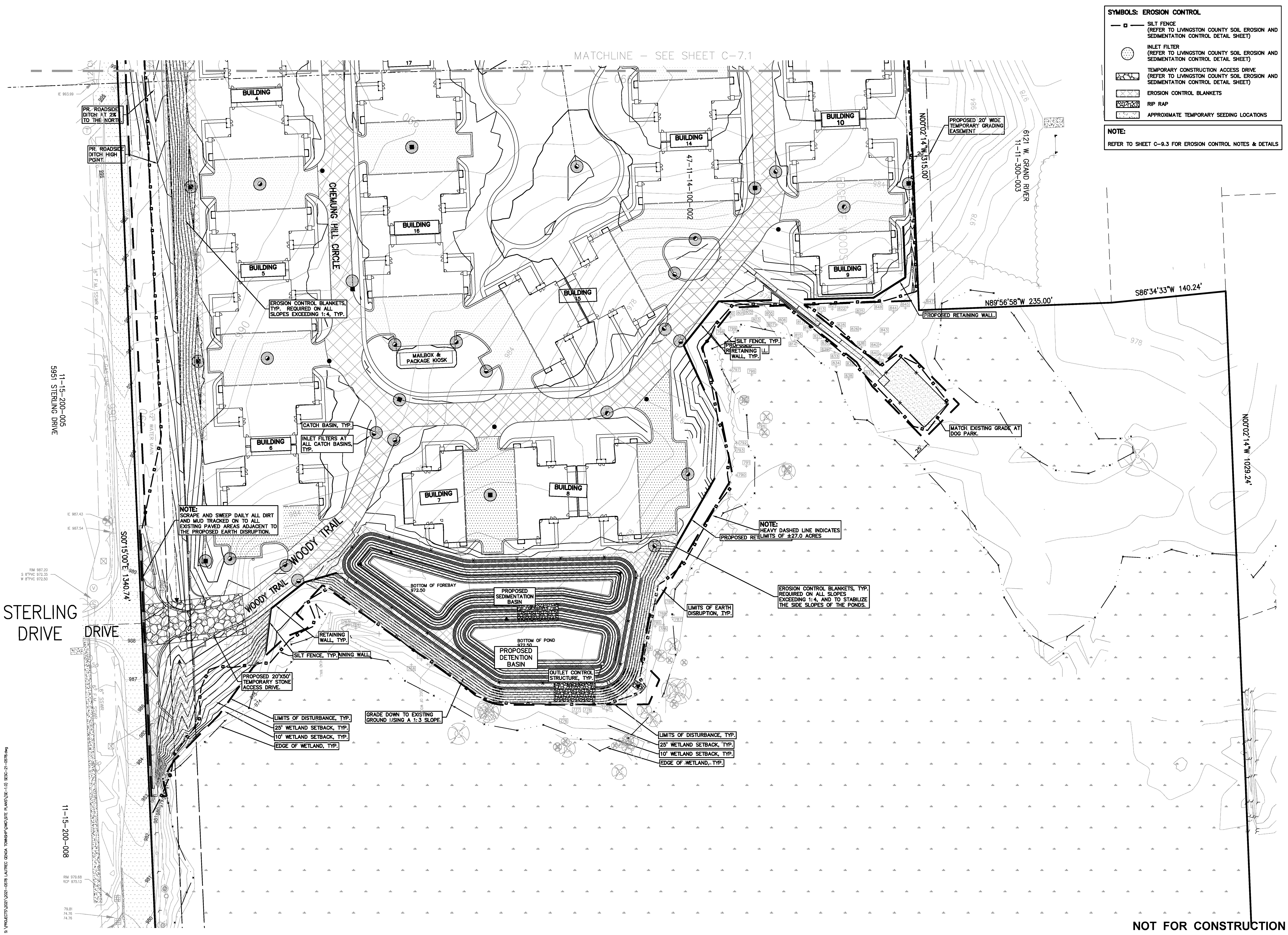
PEA JOB NO.	2021-0578
P.M.	JEC
DN.	JMR
DES.	JMR

DRAWING NUMBER:

C-7.1

NOT FOR CONSTRUCTION

S:\PROJECTS\2021\2021-0578 LAURIES GENOA TOWNSHIP\DWG\SITE PLANS\SE-1.0 SESC-21-0578.dwg



MATCHLINE - SEE SHEET C-7.1
BUILDING 4
BUILDING 5
BUILDING 6
BUILDING 7
BUILDING 8
BUILDING 9
BUILDING 10
BUILDING 14
BUILDING 15
BUILDING 16
CHEMUNG HILL CIRCLE
WOODY TRAIL
STERLING DRIVE
11-15-200-005
5951 STERLING DRIVE
11-15-200-008
47-11-14-100-002
6121 W. GRAND RIVER
11-11-300-003
S00°15'00"E 1340.74'
N00°02'14"W 315.00'
N89°56'58"W 235.00'
S86°34'33"W 140.24'
N00°02'14"W 1029.24'
PR. ROADSIDE DITCH AT 2% TO THE NORTH
PR. ROADSIDE DITCH HIGH POINT
EROSION CONTROL BLANKETS, TYP. REQUIRED ON ALL SLOPES EXCEEDING 1:4, TYP.
MAILBOX & PACKAGE KIOSK
CATCH BASIN, TYP.
INLET FILTERS AT ALL CATCH BASINS, TYP.
NOTE: SCRAPE AND SWEEP DAILY ALL DIRT AND MUD TRACKED ON TO ALL EXISTING PAVED AREAS ADJACENT TO THE PROPOSED EARTH DISRUPTION.
PROPOSED 20' WIDE TEMPORARY GRADING EASEMENT
PROPOSED RETAINING WALL.
SILT FENCE, TYP.
MATCH EXISTING GRADE AT DOG PARK.
NOTE: HEAVY DASHED LINE INDICATES LIMITS OF ±27.0 ACRES
EROSION CONTROL BLANKETS, TYP. REQUIRED ON ALL SLOPES EXCEEDING 1:4, AND TO STABILIZE THE SIDE SLOPES OF THE PONDS.
LIMITS OF EARTH DISRUPTION, TYP.
BOTTOM OF FOREBAY 972.50
PROPOSED SEDIMENTATION BASIN
BOTTOM OF POND 972.50
PROPOSED DETENTION BASIN
OUTLET CONTROL STRUCTURE, TYP.
RETAINING WALL, TYP.
SILT FENCE, TYP.
PROPOSED 20'X50' TEMPORARY STONE ACCESS DRIVE.
GRADE DOWN TO EXISTING GROUND USING A 1:3 SLOPE.
LIMITS OF DISTURBANCE, TYP.
25' WETLAND SETBACK, TYP.
10' WETLAND SETBACK, TYP.
EDGE OF WETLAND, TYP.

SYMBOLS: EROSION CONTROL

- SILT FENCE (REFER TO LIVINGSTON COUNTY SOIL EROSION AND SEDIMENTATION CONTROL DETAIL SHEET)
- INLET FILTER (REFER TO LIVINGSTON COUNTY SOIL EROSION AND SEDIMENTATION CONTROL DETAIL SHEET)
- TEMPORARY CONSTRUCTION ACCESS DRIVE (REFER TO LIVINGSTON COUNTY SOIL EROSION AND SEDIMENTATION CONTROL DETAIL SHEET)
- EROSION CONTROL BLANKETS
- RIP RAP
- APPROXIMATE TEMPORARY SEEDING LOCATIONS

NOTE:

REFER TO SHEET C-9.3 FOR EROSION CONTROL NOTES & DETAILS

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NORTH

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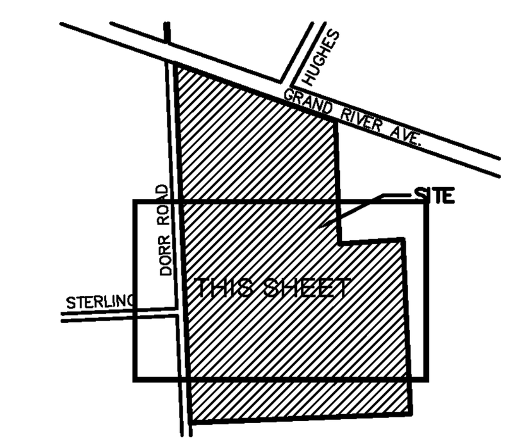

CLIENT

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FARMINGTON HILLS, MI 48334

PROJECT TITLE

THE LEGACY APARTMENT HOMES
6080 W GRAND RIVER
GENOA TOWNSHIP, LIVINGSTON COUNTY, MICHIGAN

REVISIONS

REV PER TWP	5-30-23

ORIGINAL ISSUE DATE:
APRIL 10, 2023

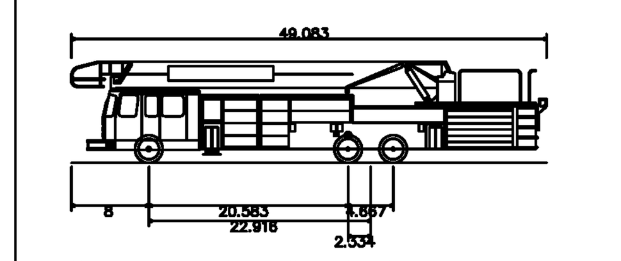
DRAWING TITLE

SOIL EROSION AND SEDIMENTATION CONTROL SOUTH

PEA JOB NO.	2021-0578
P.M.	JEC
DN.	JMR
DES.	JMR

DRAWING NUMBER:
C-7.2

NOT FOR CONSTRUCTION



Genoa Township Fire Truck

Overall Length	49.083ft
Overall Width	8.167ft
Overall Body Height	10.461ft
Min Body Ground Clearance	0.891ft
Track Width	8.167ft
Lock-to-lock time	5.00s
Max Steering Angle (Virtual)	45.00°

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NORTH

0 50 100 200
SCALE: 1" = 100'

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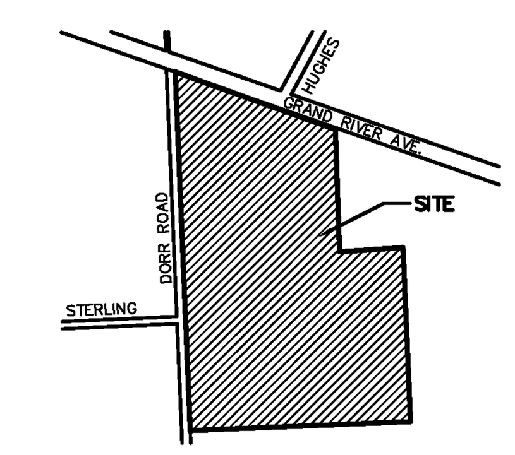

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PROJECT TITLE
THE LEGACY APARTMENT HOMES
6080 W GRAND RIVER
GENOA TOWNSHIP, LIVINGSTON COUNTY, MICHIGAN

REVISIONS	
REV PER TWP	5-30-23

ORIGINAL ISSUE DATE:
APRIL 10, 2023

DRAWING TITLE
VEHICLE TRACKING

PEA JOB NO.	2021-0578
P.M.	JEC
DN.	JMR
DES.	JMR

DRAWING NUMBER:
C-8.1

NOT FOR CONSTRUCTION

GENERAL NOTES:

THESE NOTES APPLY TO ALL CONSTRUCTION ACTIVITIES ON THIS PROJECT.

1. ALL CONSTRUCTION, WORKMANSHIP AND MATERIALS SHALL BE IN ACCORDANCE WITH CURRENT OSHA, LIVINGSTON COUNTY ROAD AND DRAIN COMMISSION AND MUNICIPALITY STANDARDS AND REGULATIONS.
2. THE CONTRACTOR SHALL NOTIFY THE COUNTY AND TOWNSHIP ENGINEERS AND/OR THE AUTHORITY HAVING JURISDICTION 3 BUSINESS DAYS PRIOR TO THE BEGINNING OF CONSTRUCTION.
3. THE CONTRACTOR SHALL CONTACT THE ENGINEER SHOULD THEY ENCOUNTER ANY DESIGN ISSUES DURING CONSTRUCTION. IF THE CONTRACTOR MAKES DESIGN MODIFICATIONS WITHOUT THE WRITTEN DIRECTION OF THE DESIGN ENGINEER, THE CONTRACTOR DOES SO AT HIS OWN RISK.
4. ALL NECESSARY PERMITS, TESTING, BONDS AND INSURANCES ETC., SHALL BE PAID FOR BY THE CONTRACTOR. THE OWNER SHALL PAY FOR ALL COUNTY AND TOWNSHIP INSPECTION FEES.
5. THE CONTRACTOR SHALL NOTIFY THE APPROPRIATE 811/ONE CALL UTILITY LOCATING CENTER, THE CITY ENGINEER AND/OR THE AUTHORITY HAVING JURISDICTION 3 BUSINESS DAYS PRIOR TO THE BEGINNING OF CONSTRUCTION. IF NO NOTIFICATION IS GIVEN AND DAMAGE RESULTS, SAID DAMAGE WILL BE REPAIRED AT SOLE EXPENSE OF THE CONTRACTOR. IF EXISTING UTILITY LINES ARE ENCOUNTERED THAT CONFLICT IN LOCATION WITH NEW CONSTRUCTION, THE CONTRACTOR SHALL NOTIFY THE DESIGN ENGINEER SO THAT THE CONFLICT MAY BE RESOLVED.
6. CONTRACTOR SHALL VERIFY THAT THE PLANS AND SPECIFICATIONS ARE THE VERY LATEST PLANS AND SPECIFICATIONS AND FURTHERMORE, VERIFY THAT THESE PLANS AND SPECIFICATIONS HAVE BEEN APPROVED. ALL ITEMS CONSTRUCTED BY THE CONTRACTOR PRIOR TO RECEIVING FINAL APPROVAL, HAVING TO BE ADJUSTED OR RE-DONE, SHALL BE AT THE CONTRACTORS EXPENSE. SHOULD THE CONTRACTOR ENCOUNTER A CONFLICT BETWEEN THESE PLANS AND/OR SPECIFICATIONS, THEY SHALL SEEK CLARIFICATION IN WRITING FROM THE ENGINEER BEFORE COMMENCEMENT OF CONSTRUCTION. FAILURE TO DO SO SHALL BE AT SOLE EXPENSE TO THE CONTRACTOR.
7. ANY WORK WITHIN THE STREET OR HIGHWAY RIGHTS-OF-WAY SHALL BE PERFORMED IN ACCORDANCE WITH THE REQUIREMENTS OF THE AGENCIES HAVING JURISDICTION AND SHALL NOT BEGIN UNTIL ALL NECESSARY PERMITS HAVE BEEN ISSUED FOR THE WORK.
8. ALL PROPERTIES OR FACILITIES IN THE SURROUNDING AREAS, PUBLIC OR PRIVATE, DESTROYED OR OTHERWISE DISTURBED DUE TO CONSTRUCTION, SHALL BE REPLACED AND/OR RESTORED TO THE ORIGINAL CONDITION BY THE CONTRACTOR.
9. THE CONTRACTOR SHALL PROVIDE ALL NECESSARY BARRICADING, SIGNAGE, LIGHTS AND TRAFFIC CONTROL DEVICES TO PROTECT THE WORK AND SAFELY MAINTAIN TRAFFIC IN ACCORDANCE WITH LOCAL REQUIREMENTS AND THE MANUAL OF UNIFORM TRAFFIC CONTROL DEVICES (LATEST EDITION). THE DESIGN ENGINEER, OWNER, LIVINGSTON COUNTY AND STATE SHALL NOT BE HELD LIABLE FOR ANY CLAIMS RESULTING FROM ACCIDENTS OR DAMAGES CAUSED BY THE CONTRACTOR'S FAILURE TO COMPLY WITH TRAFFIC AND PUBLIC SAFETY REGULATIONS DURING THE CONSTRUCTION PERIOD.
10. THE USE OF CRUSHED CONCRETE IS PROHIBITED ON THE PROJECT WITHIN 100 FEET OF ANY WATER COURSE (STREAM, RIVER, COUNTY DRAIN, ETC.) AND LAKE, REGARDLESS OF THE APPLICATION OR LOCATION OF THE WATER COURSE OR LAKE RELATIVE TO THE PROJECT LIMITS.
11. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO ADJUST THE TOP OF ALL EXISTING AND PROPOSED STRUCTURES (MANHOLES, CATCH BASINS, INLETS, GATE WELLS ETC.) WITHIN GRADED AND /OR PAVED AREAS TO FINAL GRADE SHOWN ON THE PLANS. ALL SUCH ADJUSTMENTS SHALL BE INCIDENTAL TO THE JOB AND WILL NOT BE PAID FOR SEPARATELY.

PAVING NOTES:

1. IN AREAS WHERE NEW PAVEMENTS ARE BEING CONSTRUCTED, THE TOPSOIL AND SOIL CONTAINING ORGANIC MATTER SHALL BE REMOVED PRIOR TO PAVEMENT CONSTRUCTION.
2. REFER TO ARCHITECTURAL PLANS FOR DETAILS OF FROST SLAB AT EXTERIOR BUILDING DOORS.
3. CONSTRUCTION TRAFFIC SHOULD BE MINIMIZED ON THE NEW PAVEMENT. IF CONSTRUCTION TRAFFIC IS ANTICIPATED ON THE PAVEMENT STRUCTURE, THE INITIAL LIFT THICKNESS COULD BE INCREASED AND PLACEMENT OF THE FINAL LIFT COULD BE DELAYED UNTIL THE MAJORITY OF THE CONSTRUCTION ACTIVITIES HAVE BEEN COMPLETED. THIS ACTION WILL ALLOW REPAIR OF LOCALIZED FAILURE, IF ANY DOES OCCUR, AS WELL AS REDUCE LOAD DAMAGE ON THE PAVEMENT SYSTEM.
4. ALL EXPANSION JOINTS AND CONCRETE PAVEMENT JOINTS TO BE SEALED.
5. CONCRETE PAVEMENT JOINTING – UNLESS SHOWN OTHERWISE IN THE PLANS OR REQUIRED BY THE AUTHORITY HAVING JURISDICTION;
   - 5.1. WHERE PROPOSED CONCRETE ABUTS A STRUCTURE, PROVIDE A MINIMUM 1/2" EXPANSION JOINT. THE JOINT FILLER BOARD MUST BE AT LEAST THE FULL DEPTH OF THE CONCRETE AND HELD DOWN A 1/2" TO ALLOW FOR SEALING.
   - 5.2. WHERE PROPOSED CONCRETE ABUTS EXISTING CONCRETE OR IN BETWEEN POURS OF PROPOSED CONCRETE (CONSTRUCTION JOINT), PROVIDE 5/8" DOWELS EVERY 30' CENTER TO CENTER HALF WAY ALONG THE THICKNESS OF THE PROPOSED PAVEMENT. ALTERNATE DOWELS SIZES AND SPACING MUST BE APPROVED THE ENGINEER PRIOR TO COMMENCING WORK AND VIA THE SUBMITTAL PROCESS.
   - 5.3. WHERE PROPOSED CONCRETE ABUTS EXISTING OR PROPOSED SIDEWALK OR CURBING, PROVIDE A MINIMUM 1/2" EXPANSION JOINT.
   - 5.4. CONTROL, LONGITUDINAL AND/OR TRANSVERSE JOINTS SHALL BE PLACED TO PROVIDE PANELS WITHIN THE PAVEMENT AS SQUARE AS POSSIBLE WITH THE FOLLOWING MAXIMUM SPACING PARAMETERS:
     - 5.4.1. 6-INCH THICK CONCRETE PAVEMENT: 12' X 12'
     - 5.4.2. 8-INCH THICK CONCRETE PAVEMENT: 15' X 15'
   - 5.5. IRREGULAR-SHAPED PANELS MAY REQUIRE THE USE OF REINFORCING MESH OR FIBER MESH AS DETERMINED BY THE ENGINEER. THE USE OF MESH MUST BE APPROVED THE ENGINEER PRIOR TO COMMENCING WORK AND VIA THE SUBMITTAL PROCESS.
   - 5.6. IF A JOINT PLAN IS NOT PROVIDED IN THE PLANS, THE CONTRACTOR SHALL SUBMIT ONE TO THE ENGINEER FOR REVIEW PRIOR TO COMMENCING WORK AND VIA THE SUBMITTAL PROCESS.
6. CONCRETE CURBING JOINTING – UNLESS SHOWN OTHERWISE IN THE PLANS OR REQUIRED BY THE AUTHORITY HAVING JURISDICTION
   - 6.1. JOINTS WHEN ADJACENT TO ASPHALT PAVEMENT
     - 6.1.1. PLACE CONTRACTION JOINTS AT 10' INTERVALS
     - 6.1.2. PLACE 1/2" EXPANSION JOINT AT CATCH BASINS, EXISTING AND PROPOSED SIDEWALK OR EXISTING CURBING.
     - 6.1.3. PLACE 1" EXPANSION JOINT:
       - 6.1.3.1. AT SPRING POINTS OF INTERSECTIONS OR ONE OF THE END OF RADIUS LOCATIONS IN A CURVE
       - 6.1.3.2. AT 400' MAXIMUM INTERVALS ON STRAIGHT RUNS
       - 6.1.3.3. AT THE END OF RADIUS AT OPPOSITE ENDS IN A CURBED LANDSCAPE ISLAND
   - 6.2. JOINTS WHEN TIED TO CONCRETE PAVEMENT
     - 6.2.1. PLACE CONTRACTION JOINTS OPPOSITE ALL TRANSVERSE CONTRACTION JOINTS IN PAVEMENT
     - 6.2.2. PLACE 1/2" EXPANSION JOINT AT CATCH BASINS, EXISTING AND PROPOSED SIDEWALK OR EXISTING CURBING.
     - 6.2.3. PLACE 1"EXPANSION JOINT OPPOSITE ALL TRANSVERSE EXPANSION JOINTS IN PAVEMENT
     - 6.2.4. CURB AND GUTTER AND CONCRETE SHALL BE TIED TOGETHER SIMILAR TO A LONGITUDINAL LANE TIE JOINT (MDOT B1 JOINT)
   - 6.3. IN BETWEEN POURS OF PROPOSED CONCRETE CURBING (CONSTRUCTION JOINT):
     - 6.3.1. CARRY THE REBAR CONTINUOUSLY BETWEEN POURS
     - 6.3.2. IF THE REBAR IS NOT LONG ENOUGH TO CARRY CONTINUOUSLY, THEN TIE TWO PIECES OF REBAR PER THE LATEST MDOT SPECIFICATIONS
7. CONCRETE SIDEWALK JOINTING – UNLESS SHOWN OTHERWISE IN THE PLANS OR REQUIRED BY THE AUTHORITY HAVING JURISDICTION
   - 7.1. PLACE TRANSVERSE CONTRACTION JOINTS EQUAL TO THE WIDTH OF THE WALK WHEN WIDTH IS LESS THAN 8'
   - 7.2. PLACE TRANSVERSE AND LONGITUDINAL CONTRACTION JOINTS EQUAL TO 1/2 THE WIDTH OF THE WALK WHEN WIDTH IS EQUAL TO OR GREATER THAN 8'
   - 7.3. PLACE 1" EXPANSION JOINT WHERE ABUTTING SIDEWALK RAMP AND/OR RADIUS IN INTERSECTION
   - 7.4. PLACE TRANSVERSE 1/2" EXPANSION JOINT AT MAXIMUM OF 100' SPACING
   - 7.5. PLACE 1/2" EXPANSION JOINT WHEN ABUTTING A FIXED STRUCTURE, OTHER PAVEMENT (CONCRETE PAVEMENT AND DRIVE APPROACHES), UTILITY STRUCTURES, LIGHT POLE BASES AND COLUMNS

CONSTRUCTION MATERIAL SUBMITTALS

UNLESS REQUIRED OTHERWISE IN THE PROJECT SPECIFICATIONS, THE CONTRACTOR SHALL ONLY SUBMIT THE FOLLOWING CONSTRUCTION MATERIAL SUBMITTALS, AS APPLICABLE TO THE PLANS, FOR REVIEW BY THE ENGINEER. UNLESS APPROVED IN ADVANCE AND IN WRITING BY THE ENGINEER, ANY MATERIAL SUBMITTALS PROVIDED TO THE ENGINEER FOR REVIEW IN ADDITION TO THIS LIST SHALL BE RETURNED TO THE CONTRACTOR WITHOUT A REVIEW BEING PERFORMED.

1. SOIL EROSION AND SEDIMENTATION CONTROL MEASURES
2. UTILITY TRENCH BACKFILL MATERIAL WITH ALL MATERIAL DATA INCLUDED IN THE SUBMITTAL BEING DATED WITHIN 60 DAYS OF THE SUBMITTAL UNLESS APPROVED OTHERWISE BY THE ENGINEER
3. RIP RAP MATERIAL WITH ALL MATERIAL DATA INCLUDED IN THE SUBMITTAL BEING DATED WITHIN 60 DAYS OF THE SUBMITTAL UNLESS APPROVED OTHERWISE BY THE ENGINEER
4. STORM AND SANITARY SEWER PIPING INCLUDING JOINTS
5. STORM AND SANITARY SEWER STRUCTURES
6. STORM AND SANITARY SEWER STRUCTURE FRAME AND COVERS INCLUDING CLEAN OUTS
7. WATER DISTRIBUTION SYSTEM PIPING INCLUDING JOINTS
8. WATER DISTRIBUTION SYSTEM STRUCTURES
9. WATER DISTRIBUTION SYSTEM STRUCTURE FRAME AND COVERS
10. WATER DISTRIBUTION SYSTEM SHUT OFF BOXES
11. WATER DISTRIBUTION SYSTEM FIRE HYDRANTS
12. WATER DISTRIBUTION SYSTEM GATE VALVES
13. STORM WATER MANAGEMENT OUTLET CONTROL STRUCTURES INCLUDING COVERS OR GRATES
14. STORM WATER MANAGEMENT OUTLET SEDIMENTATION BASIN RISERS INCLUDING GRATES
15. STORM WATER MANAGEMENT MECHANICAL PRE-TREATMENT UNITS INCLUDING COVERS
16. STORM WATER MANAGEMENT OIL/GREASE SEPARATORS
17. STORM WATER MANAGEMENT UNDERGROUND DETENTION SYSTEM MATERIAL AND SHOP DRAWINGS DEPICTING THE LAYOUT OF THE SYSTEM
18. PAVEMENT AGGREGATE BASE MATERIAL WITH ALL MATERIAL DATA INCLUDED IN THE SUBMITTAL BEING DATED WITHIN 60 DAYS OF THE SUBMITTAL UNLESS APPROVED OTHERWISE BY THE ENGINEER
19. PAVEMENT UNDERDRAIN MATERIAL AND BACKFILL WITH ALL BACKFILL MATERIAL DATA INCLUDED IN THE SUBMITTAL BEING DATED WITHIN 60 DAYS OF THE SUBMITTAL UNLESS APPROVED OTHERWISE BY THE ENGINEER
20. PAVEMENT MIX DESIGNS SUBMITTED FOR REVIEW BY THE ENGINEER MUST FOLLOW THE CURRENT MDOT REVIEW CHECKLISTS AS SUMMARIZED BELOW AND ALL MATERIAL DATA INCLUDED IN THE SUBMITTAL BEING DATED WITHIN 60 DAYS OF THE SUBMITTAL UNLESS APPROVED OTHERWISE BY THE ENGINEER:
    - 8.1. CONCRETE MIX DESIGN REVIEW CHECKLIST (FORM 2000)
    - 8.2. SUPERPAVE MIX DESIGN CHECKLIST (FORM 1862)
    - 8.3. MARSHALL MIX DESIGN CHECKLIST (FORM 1849)
21. SITE FENCING AND GATES INCLUDING FOOTINGS
22. SITE RAILINGS INCLUDING FOOTING OR EMBEDMENTS
23. ANY ITEMS SHOWN IN THE PLANS OR DETAIL SHEETS THAT SPECIFICALLY STATE FOR THE CONTRACTOR TO SUBMIT A SHOP DRAWING TO THE ENGINEER FOR REVIEW. THESE ITEMS INCLUDE, BUT ARE NOT LIMITED TO:

- ** RETAINING WALL MATERIAL AND STRUCTURAL CALCULATIONS
- ** TRENCH DRAIN MATERIAL AND SHOP DRAWING DEPICTING THE LAYOUT OF THE SYSTEM
- ** ANY SPECIALITY ITEMS SHOWN IN THE PLANS OR DETAIL SHEETS THAT SPECIFICALLY DO NOT STATE FOR THE CONTRACTOR SHALL SUBMIT A SHOP DRAWING TO THE ENGINEER FOR REVIEW BUT THE CONTRACTOR REQUESTS TO BE REVIEWED. THE CONTRACTOR'S REQUEST FOR REVIEW MUST BE IN WRITING AND APPROVED BY THE ENGINEER PRIOR TO SUBMITTING THE INFORMATION.

GENERAL GRADING AND EARTHWORK NOTES:

THESE NOTES APPLY TO ALL CONSTRUCTION ACTIVITIES ON THIS PROJECT

1. CONTRACTOR SHALL FIELD VERIFY ALL EXISTING TREES AND BRUSH AND REMOVE ALL THAT ARE NECESSARY TO GRADE SITE.
2. ALL GRADES ARE TO TOP OF PAVEMENT UNLESS OTHERWISE NOTED.
3. THE STAGING OF CONSTRUCTION ACTIVITIES SHALL OCCUR ONLY WITHIN THE SITE BOUNDARIES. ANY CONSTRUCTION ACTIVITIES OUTSIDE OF THE SITE BOUNDARIES SHALL BE AT THE SOLE RESPONSIBILITY AND RISK OF THE CONTRACTOR.
4. ALL SOIL EROSION AND SEDIMENTATION CONTROL MEASURES SHALL MEET THE REQUIREMENTS OF THE AUTHORIZED PUBLIC AGENCY OF JURISDICTION. AN EROSION CONTROL PERMIT MUST BE SECURED FROM THE LVINGSTON COUNTY DRAIN COMMISSION OFFICE PRIOR TO CONSTRUCTION.
5. ALL EARTHWORK AND GRADING OPERATIONS SHALL BE PERFORMED IN ACCORDANCE WITH THE SOILS INVESTIGATION AND REPORT.
6. REFER TO SOIL EROSION CONTROL PLAN FOR ADDITIONAL SOIL EROSION AND SEDIMENTATION CONTROL MEASURES AND NOTES.
7. THE DETENTION BASIN SIDE SLOPES AND ALL SLOPE EXCEEDING 1:5 MUST BE STABILIZED BY SODDING OR BY PLACING A MULCH BLANKET PEGGED IN PLACE OVER SEED.
8. ALL DISTURBED AREAS SHALL BE SEEDED AND MULCHED OR SODDED IN ACCORDANCE WITH THE LANDSCAPE PLANS. PROVIDE A MINIMUM OF 3" OF TOPSOIL IN THESE AREAS UNLESS OTHERWISE NOTED.
9. THE CONTRACTOR SHALL NOTE EXISTING UNDERGROUND UTILITIES WITHIN AND ADJACENT TO THE SITE. BACKFILL FOR EXISTING UTILITY TRENCHES SHALL BE EXAMINED CRITICALLY. ANY TRENCHES FOUND TO HAVE SOFT, UNSTABLE OR UNSUITABLE BACKFILL MATERIAL, IN THE OPINION OF THE THIRD PARTY TESTING COMPANY, THAT ARE TO BE WITHIN THE ZONE OF INFLUENCE OF PROPOSED BUILDINGS OR PAVEMENT SHALL BE COMPLETELY EXCAVATED AND BACKFILLED WITH SUITABLE MATERIAL.
10. ON-SITE FILL CAN BE USED IF THE SPECIFIED COMPACTION REQUIREMENTS CAN BE ACHIEVED. IF ON-SITE SOIL IS USED, IT SHOULD BE CLEAN AND FREE OF FROZEN SOIL, ORGANICS, OR OTHER DELETERIOUS MATERIALS.
11. THE FINAL SUBGRADE/EXISTING AGGREGATE BASE SHOULD BE THOROUGHLY PROOFROLLED USING A FULLY LOADED TANDEM AXLE TRUCK OR FRONT END LOADER UNDER THE OBSERVATION OF A GEOTECHNICAL/PAVEMENT ENGINEER. LOOSE OR YIELDING AREAS THAT CANNOT BE MECHANICALLY STABILIZED SHOULD BE REINFORCED USING GEOGRIDS OR REMOVED AND REPLACED WITH ENGINEERED FILL OR AS DICTATED BY FIELD CONDITIONS.
12. SUBGRADE UNDERCUTTING, INCLUDING BACKFILLING SHALL BE PERFORMED TO REPLACE MATERIALS SUSCEPTIBLE TO FROST HEAVING AND UNSTABLE SOIL CONDITIONS. ANY EXCAVATIONS THAT MAY BE REQUIRED BELOW THE TOPSOIL IN FILL AREAS OR BELOW SUBGRADE IN CUT AREAS WILL BE CLASSIFIED AS SUBGRADE UNDERCUTTING.
13. SUBGRADE UNDERCUTTING SHALL BE PERFORMED WHERE NECESSARY AND THE EXCAVATED MATERIAL SHALL BECOME THE PROPERTY OF THE CONTRACTOR. ANY SUBGRADE UNDERCUTTING SHALL BE BACKFILLED AS RECOMMENDED IN THE GEOTECHNICAL ENGINEERING REPORT FOR THE PROJECT.
14. ANY SUB-GRADE WATERING REQUIRED TO ACHIEVE REQUIRED DENSITY SHALL BE CONSIDERED INCIDENTAL TO THE JOB.

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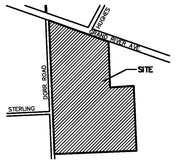

CLIENT
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31550 NORTHWESTERN HIGHWAY
FARMINGTON HILLS, MI 48334

PROJECT TITLE
THE LEGACY APARTMENT HOMES
6080 W GRAND RIVER
GENOA TOWNSHIP, LIVINGSTON COUNTY, MICHIGAN

REVISIONS

REV	PER	TWP	5-30-23

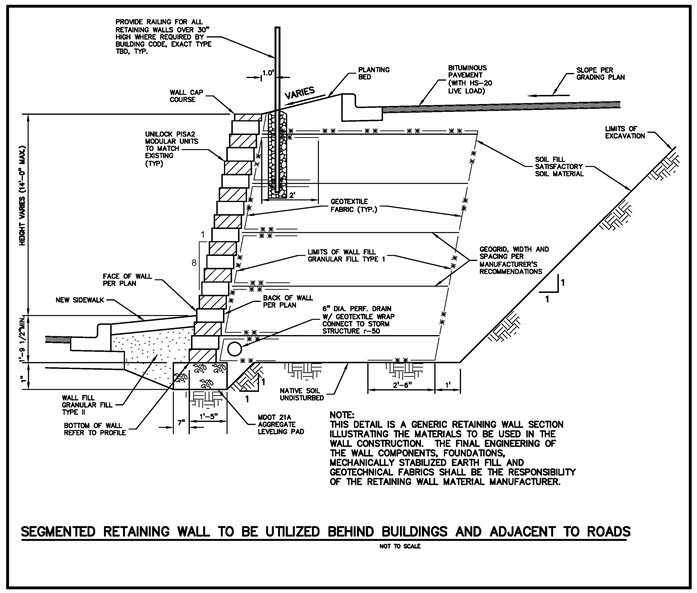
ORIGINAL ISSUE DATE:
APRIL 10, 2023

DRAWING TITLE
CONSTRUCTION NOTES

PEA JOB NO.	2021-0578
P.M.	JEC
DN.	JMR
DES.	JMR

DRAWING NUMBER:
C-9.1

NOT FOR CONSTRUCTION



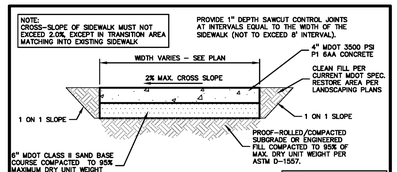
NOTE:
THIS DETAIL IS A GENERIC RETAINING WALL SECTION ILLUSTRATING THE MATERIALS TO BE USED IN THE WALL CONSTRUCTION. THE FINAL ENGINEERING OF THE WALL COMPONENTS, FOUNDATIONS, MECHANICALLY STABILIZED EARTH FILL AND GEOTECHNICAL FABRICS SHALL BE THE RESPONSIBILITY OF THE RETAINING WALL MATERIAL MANUFACTURER.

SEGMENTED RETAINING WALL TO BE UTILIZED BEHIND BUILDINGS AND ADJACENT TO ROADS

NOT TO SCALE

NOTE:
CROSS-SLOPE OF SIDEWALK MUST NOT EXCEED 2.0%, EXCEPT IN TRANSITION AREA MATCHING INTO EXISTING SIDEWALK

PROVIDE 1" DEPTH SAWCUT CONTROL JOINTS AT INTERVALS EQUAL TO THE WIDTH OF THE SIDEWALK (NOT TO EXCEED 8' INTERVAL).

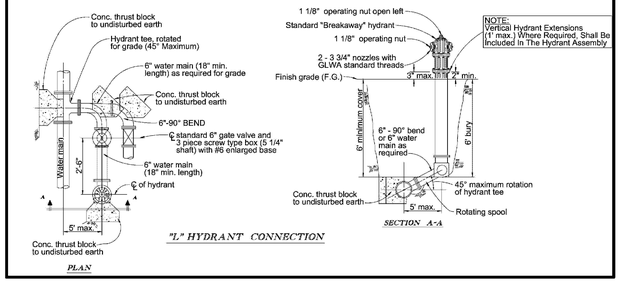


NOTE:
SIDEWALK IS TO BE THICKENED THROUGH DRIVE APPROACH AND 10 FEET EACH SIDE, THICKNESS WILL BE 7".

CONCRETE SIDEWALK

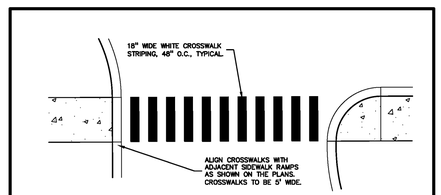
NOT TO SCALE

NOTE:
1) I. Megalug Retainer Gland Or Swivel Glands Are Required On All Joints Between Hydrant Tee And Hydrant Inlet



NOTE:
Vertical Hydrant Extensions (1' max.) Where Required, Shall Be Included In The Hydrant Assembly.

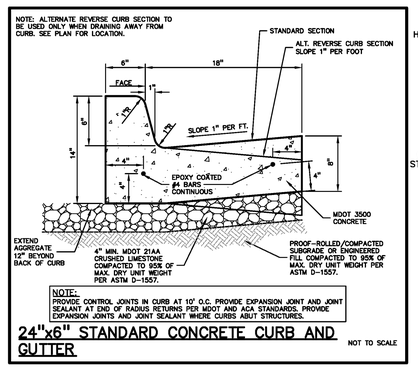
"L" HYDRANT CONNECTION



STRIPED CROSSWALK DETAIL

NOT TO SCALE

NOTE: ALTERNATE REVERSE CURB SECTION TO BE USED ONLY WHEN DRAINING AWAY FROM CURB. SEE PLAN FOR LOCATION.



NOTE:
PROVIDE CONTROL JOINTS IN CURB AT 10' O.C. PROVIDE EXPANSION JOINT AND JOINT SEALANT AT END OF RADIUS RETURNS PER MDOT AND ADA STANDARDS. PROVIDE EXPANSION JOINTS AND JOINT SEALANT WHERE CURBS ABUT STRUCTURES.

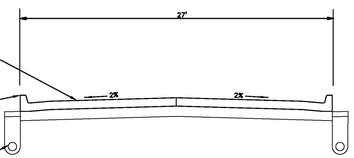
24"x6" STANDARD CONCRETE CURB AND GUTTER

NOT TO SCALE

HEAVY DUTY 7" NON-REINFORCED CONCRETE SECTION. SEE DETAIL THIS SHEET. JOINTING PER MDOT STANDARD SPECIFICATIONS.

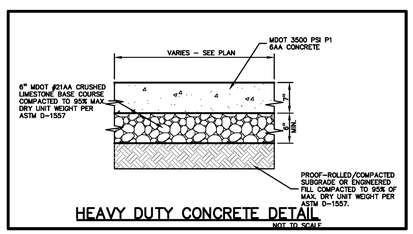
MOUNTABLE INTEGRAL CURB AND GUTTER

UNDERDRAIN, TYP. SEE DETAIL THIS SHEET. CONNECT UNDERDRAIN TO STORM STRUCTURES IN THE CURBLINES.



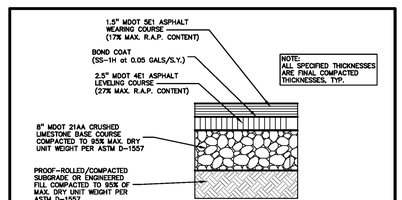
PRIVATE ROAD TYPICAL CROSS SECTION

NOT TO SCALE



HEAVY DUTY CONCRETE DETAIL

NOT TO SCALE

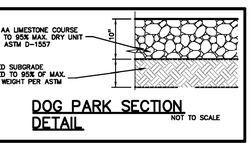


HEAVY DUTY ASPHALT DETAIL AND PARKING AREA

NOT TO SCALE

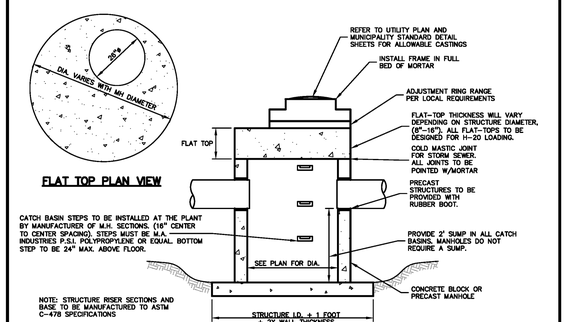
AGGREGATE BASE NOTE:
THIS PAVEMENT SECTION DESIGN ASSUMES THE USE OF MDOT 21AA CRUSHED LIMESTONE BASE MATERIAL THAT MEETS THE REQUIREMENTS OF MDOT STANDARD SPECIFICATION SECTION 902 FOR AGGREGATES. IF CRUSHED CONCRETE AGGREGATE BASE IS PROPOSED IN LIEU OF THE SPECIFIED CRUSHED LIMESTONE MATERIAL, PEA GROUP WILL REQUIRE A MINIMUM 25% INCREASE IN BASE THICKNESS. HOWEVER, IF TESTING DOCUMENTATION IS PROVIDED TO PEA GROUP THAT SHOWS THAT THE CRUSHED CONCRETE MATERIAL MEETS ALL REQUIREMENTS OF MDOT SPECIFICATION SECTION 902, THEN THE 25% INCREASE IN THICKNESS MAY BE REEVALUATED.

ASPHALT MATERIAL NOTES:
HOT-MIX ASPHALT MIXTURES UTILIZING RECYCLED ASPHALT PAVEMENT (RAP) MUST MEET MDOT SPECIAL PROVISION 12SP503(E), THE BINDER GRADE FOR THIS WORK IS PG64-28. IF ASPHALT MIXES CONTAINING RAP ARE TO BE SUPPLIED FOR THIS PROJECT, THE ASPHALT BINDER MUST BE REVISED PER MDOT TIER 1' OR 'TIER 2' REQUIREMENTS (RAP CONTENT UP TO 27% MAXIMUM). TIER 3 MIXES ARE NOT ACCEPTABLE ON THIS PROJECT. AN ASPHALT MIX DESIGN FOR ALL SPECIFIED MIXES SHOULD BE FORWARDED TO PEA GROUP. FOR REVIEW PRIOR TO CONSTRUCTION.



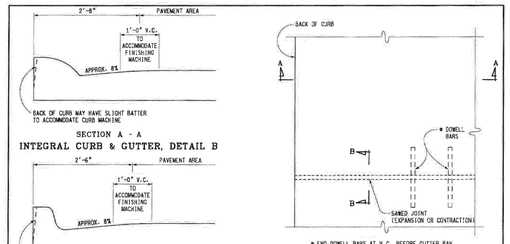
DOG PARK SECTION DETAIL

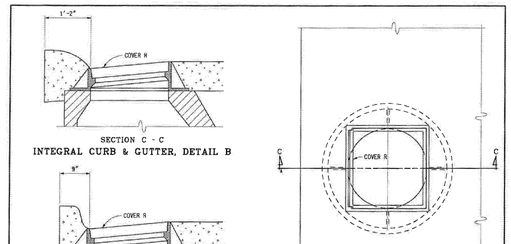
NOT TO SCALE



TYPICAL LOW HEAD CATCH BASIN WITH FLAT TOP DETAIL

NOT TO SCALE





NOTES:

DETAILS OF CURB FACES ARE SPECIFIED ON STANDARD PLAN R-30-SERIES.

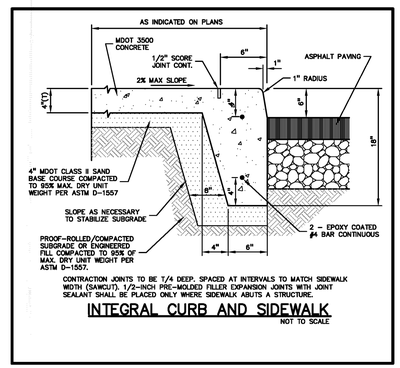
WHEN THE CURB PORTION IS POURED SEPARATE FROM THE INTEGRAL PAVEMENT AND GUTTER, AND DELAY EXCEEDS 30 MINUTES, EPOXY COATED #4 VERTICAL BARS SPACED AT 1'-6" CENTER TO CENTER SHALL BE USED TO TIE CURB AND UNDERLYING CONCRETE.

AGGREGATE BASE, WHEN SPECIFIED ON TYPICAL CROSS SECTIONS, SHALL EXTEND 2'-0" BEYOND THE BACK OF INTEGRAL CURB AND GUTTER. EVEN IF THE GRADING SECTION MUST BE WIDENED TO DO SO. NO PAYMENT WILL BE MADE FOR THE ADDITIONAL AGGREGATE BASE THAT IS REQUIRED TO CONSTRUCT THE INTEGRAL CURB AND GUTTER ALTERNATE.

TRANSVERSE JOINTS IN THE INTEGRAL CURB SHALL BE AS SPECIFIED ON THIS STANDARD PLAN.

FIBER FILLER USED FOR PAVEMENT EXPANSION JOINTS SHALL EXTEND TO BACK OF CURB.

CATCH BASIN "COVER R" OR OTHER APPROVED COVERS SHALL BE SUBSTITUTED FOR COVERS SPECIFIED ON THE PLANS ONLY WHEN THE INTEGRAL CURB AND GUTTER ALTERNATE IS USED.



CONTRACTION JOINTS TO BE 1/4 DEEP, SPACED AT INTERVALS TO MATCH SIDEWALK WIDTH (SAWCUT). 1/2-INCH PRE-MOLDED FILLER EXPANSION JOINTS WITH JOINT SEALANT SHALL BE PLACED ONLY WHERE SIDEWALK ABUTS A STRUCTURE.

INTEGRAL CURB AND SIDEWALK

NOT TO SCALE

MDOT — Michigan Department of Transportation

PREPARED BY DESIGN DIVISION
DRAWN BY: B.L.L.
CHECKED BY: K.V.C.

DEPARTMENT DIRECTOR
Kirk T. Steudle

APPROVED BY: DIRECTOR, BUREAU OF FIELD SERVICES
APPROVED BY: DIRECTOR, BUREAU OF HIGHWAY DEVELOPMENT

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF HIGHWAY DEVELOPMENT STANDARD PLAN FOR

INTEGRAL CURB AND INTEGRAL CURB & GUTTER

1-25-2013	10-22-2012	R-31-F	SHEET 1 OF 2
F.H.W.A. APPROVAL	PLAN DATE		

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF HIGHWAY DEVELOPMENT STANDARD PLAN FOR

INTEGRAL CURB AND INTEGRAL CURB & GUTTER

1-25-2013	10-22-2012	R-31-F	SHEET 2 OF 2
F.H.W.A. APPROVAL	PLAN DATE		

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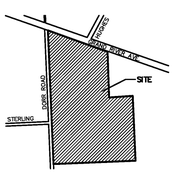

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FARMINGTON HILLS, MI 48334

PROJECT TITLE

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6080 W GRAND RIVER
GENOA TOWNSHIP, LIVINGSTON COUNTY, MICHIGAN

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REV PER TWP	5-30-23

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NOTES AND DETAILS I

PEA JOB NO.	2021-0578
P.M.	JEC
DN.	JMR
DES.	JMR

DRAWING NUMBER:

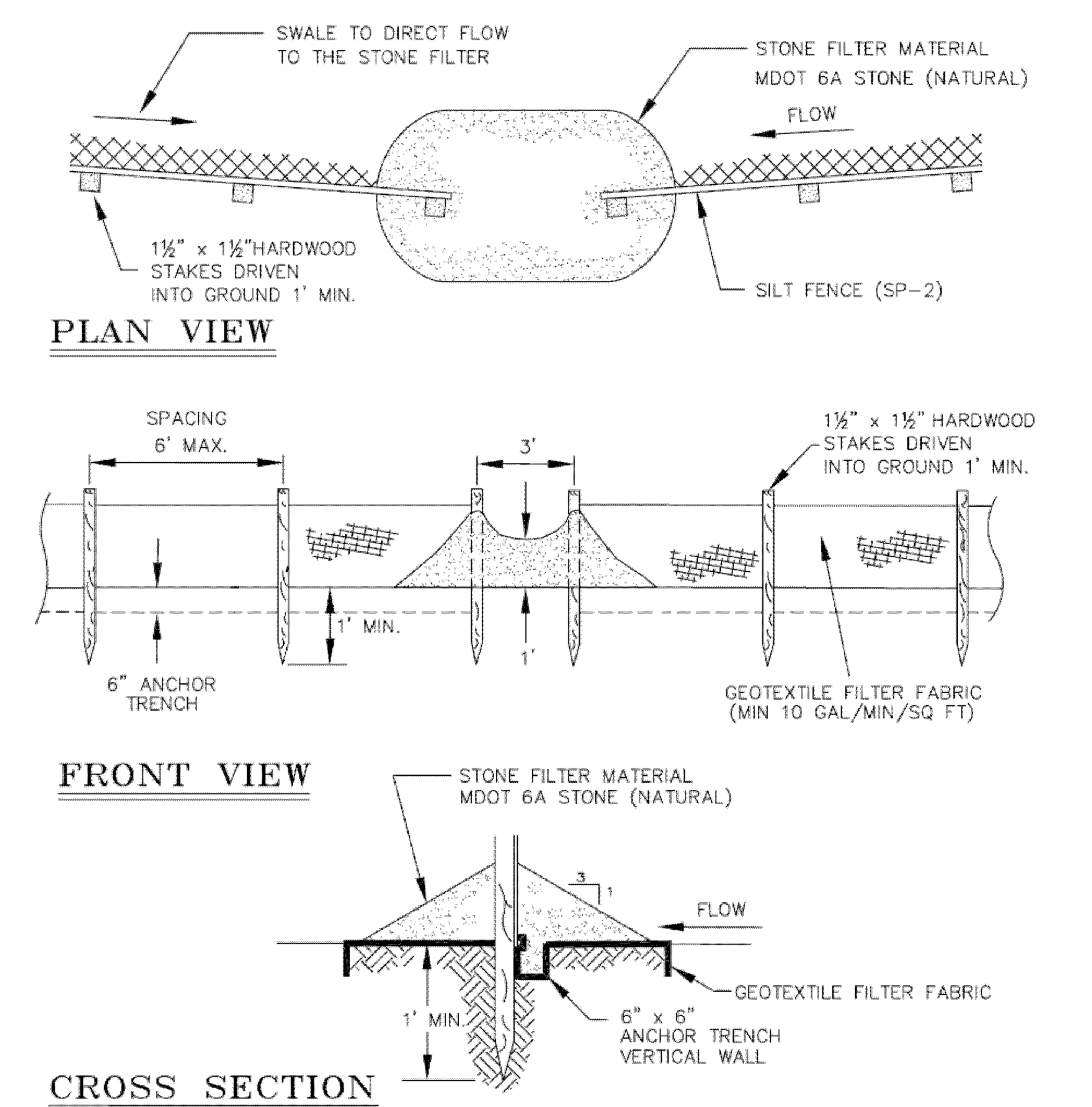
NOT FOR CONSTRUCTION

C-9.2

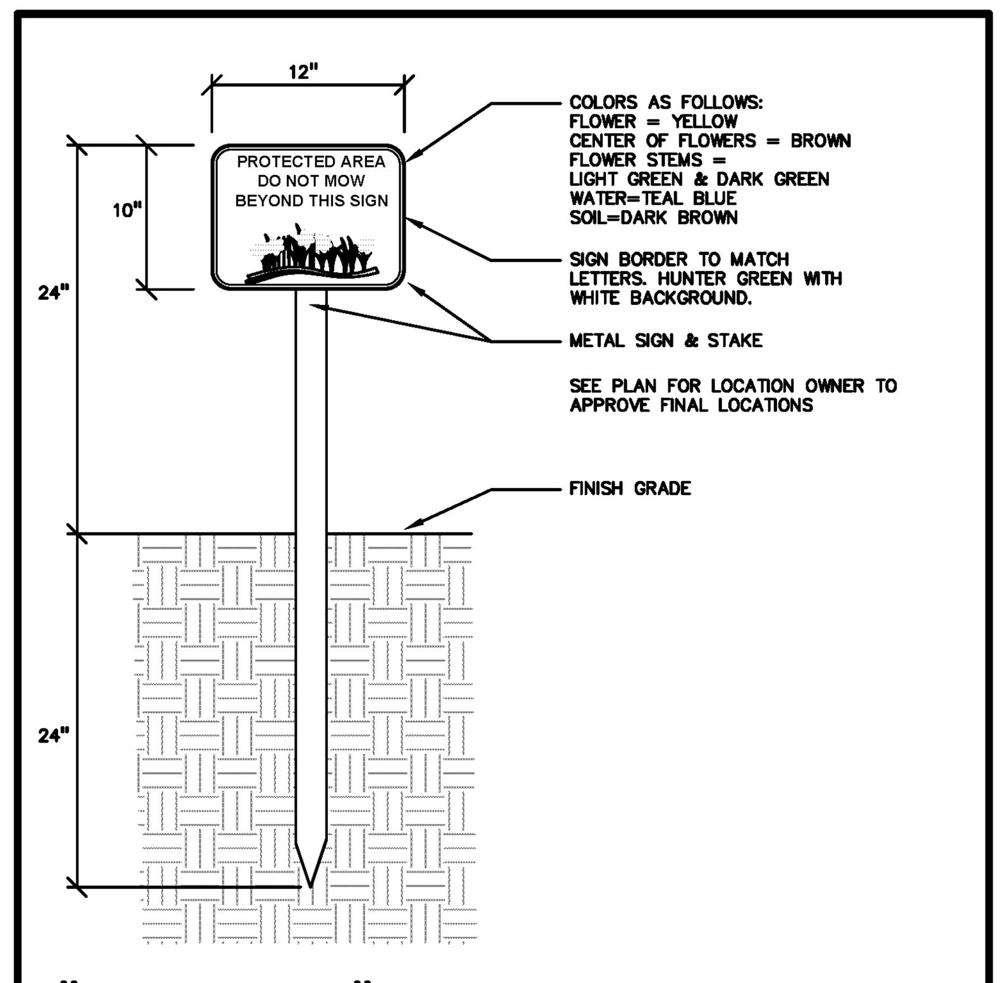
S:\PROJECTS\2021\2021-0578 LAUTREC GENOA TOWNSHIP\CIVIL\SITE PLANS\C-9.0 SP DTL 21-0578.dwg

36" SILT FENCE GRAVEL FILTER
STANDARD CONTROL

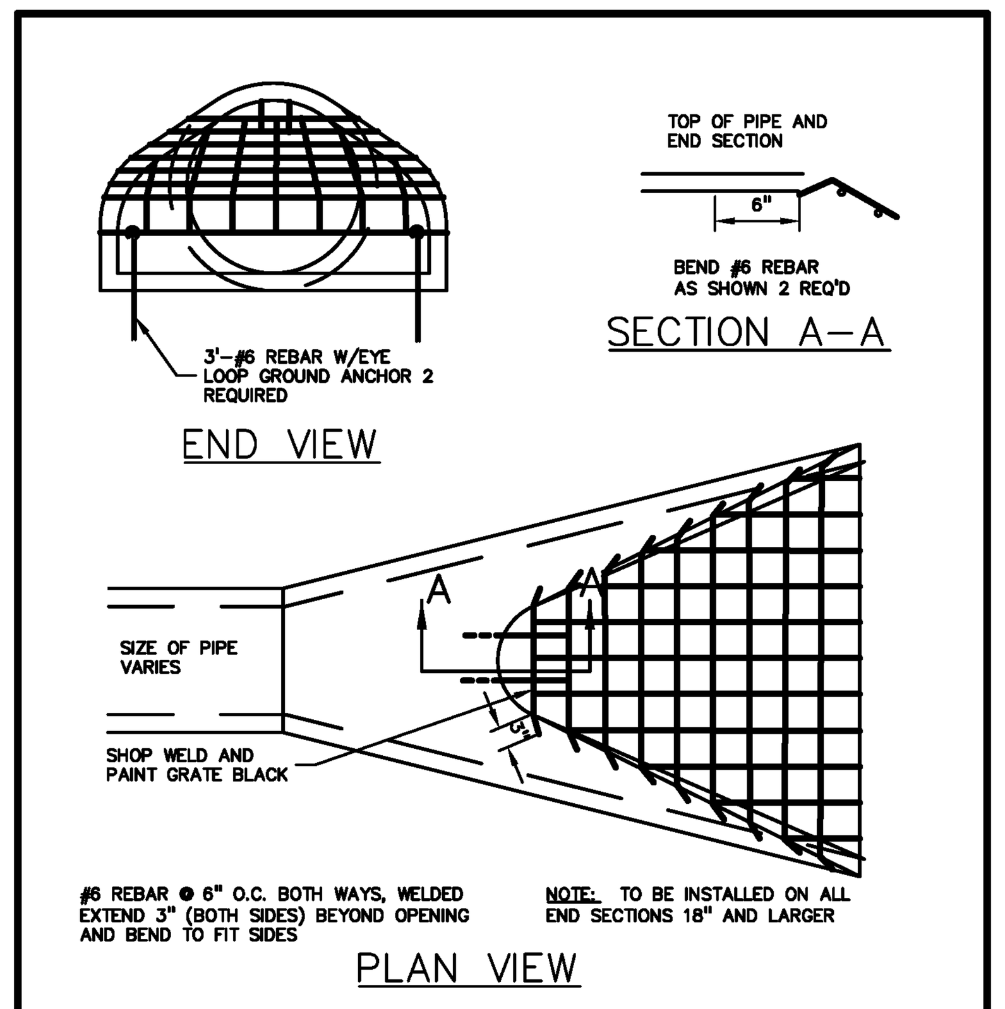
(ALL ALTERNATIVES MUST BE PRE-APPROVED BY THE INSPECTOR ON A CASE BY CASE BASIS)



-PLACE GEOTEXTILE FABRIC UNDER STONE WITH 6 INCH MIN. OVERLAP AND TRENCHED IN 6 INCH MIN.



"DO NOT MOW" SIGN DETAIL
NOT TO SCALE



BAR GRATE DETAIL
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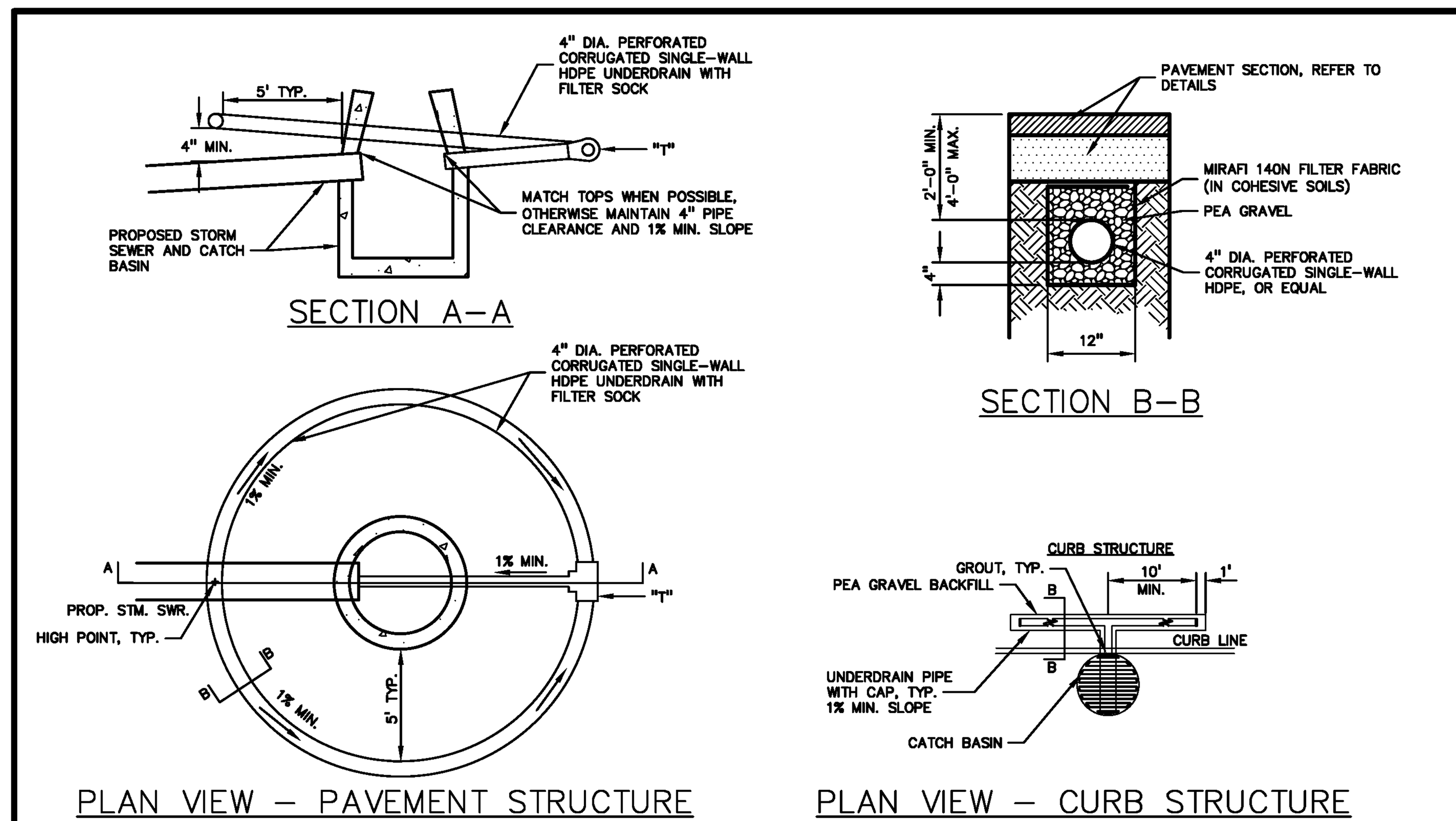
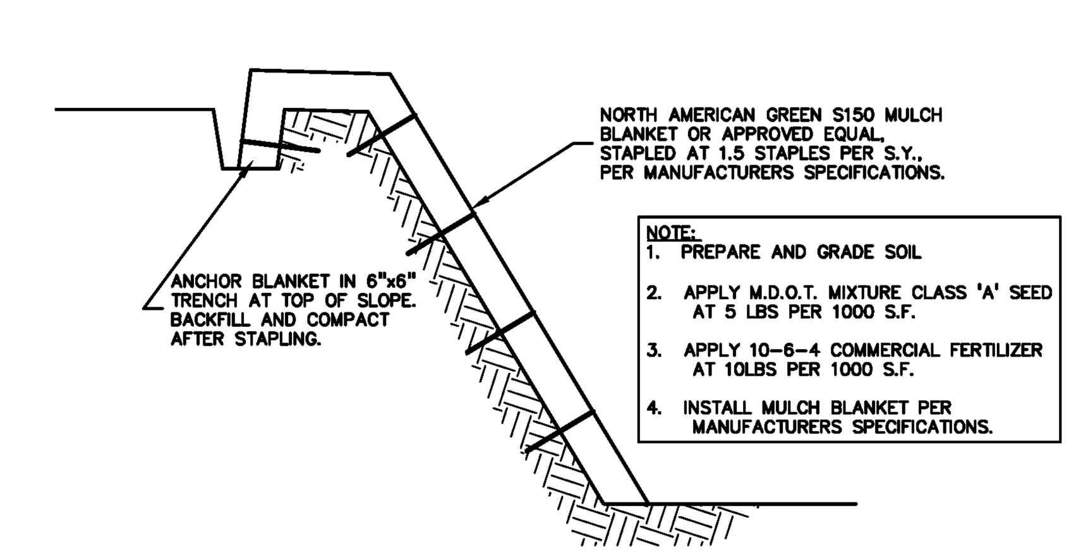
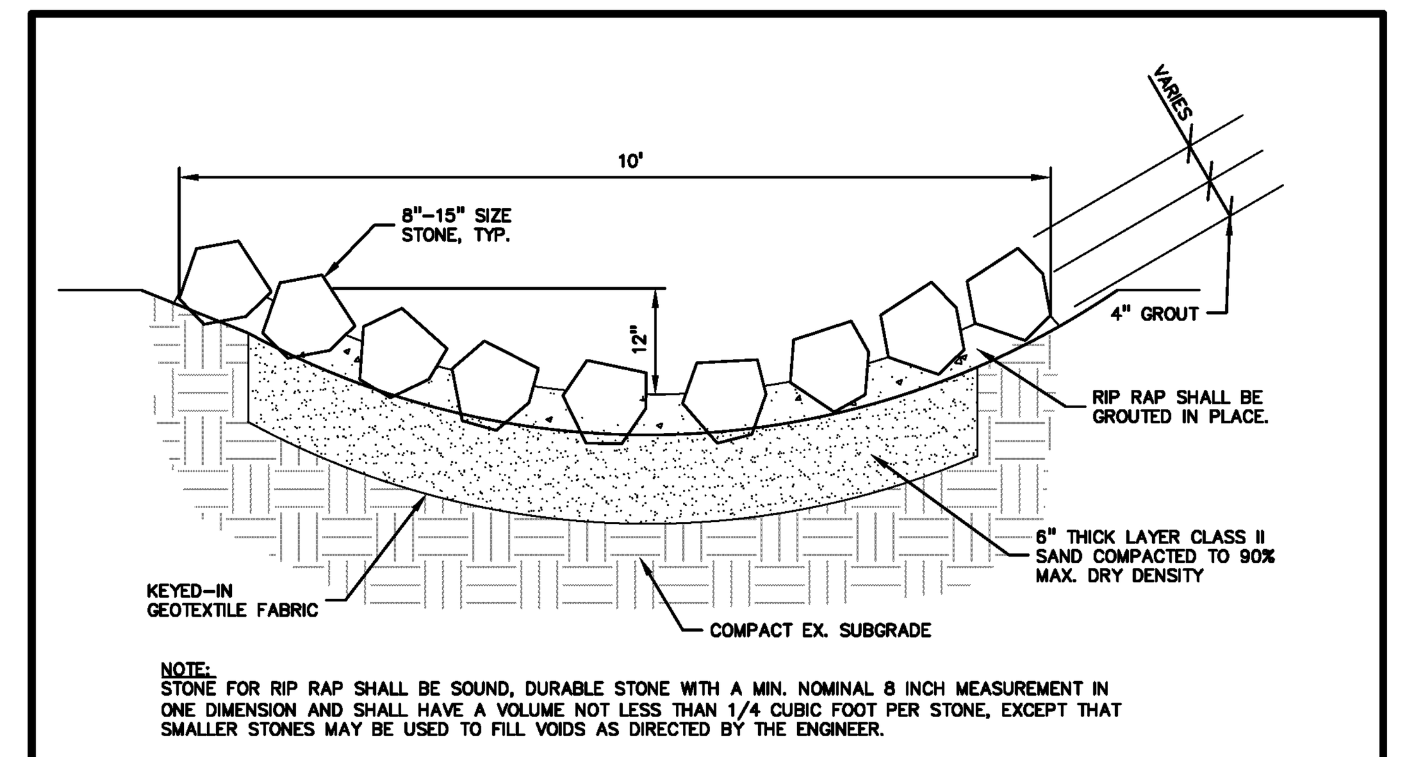


PAVEMENT INLET/CATCH BASIN UNDERDRAIN DETAIL
NOT TO SCALE



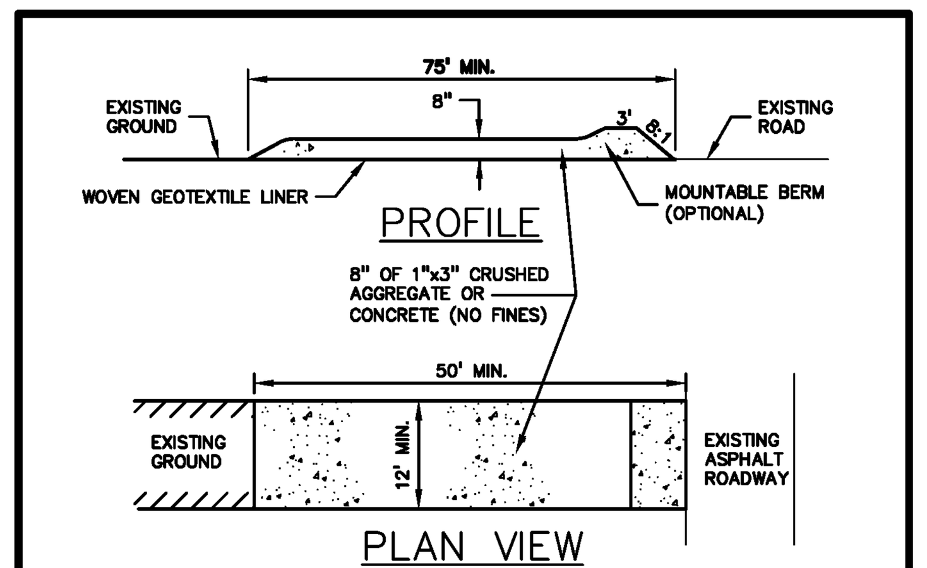
TEMPORARY EROSION BLANKET DETAIL
NOT TO SCALE



NOTE:
STONE FOR RIP RAP SHALL BE SOUND, DURABLE STONE WITH A MIN. NOMINAL 8 INCH MEASUREMENT IN ONE DIMENSION AND SHALL HAVE A VOLUME NOT LESS THAN 1/4 CUBIC FOOT PER STONE, EXCEPT THAT SMALLER STONES MAY BE USED TO FILL VOIDS AS DIRECTED BY THE ENGINEER.

(TO BE USED AT ALL SEDIMENTATION BASINS)

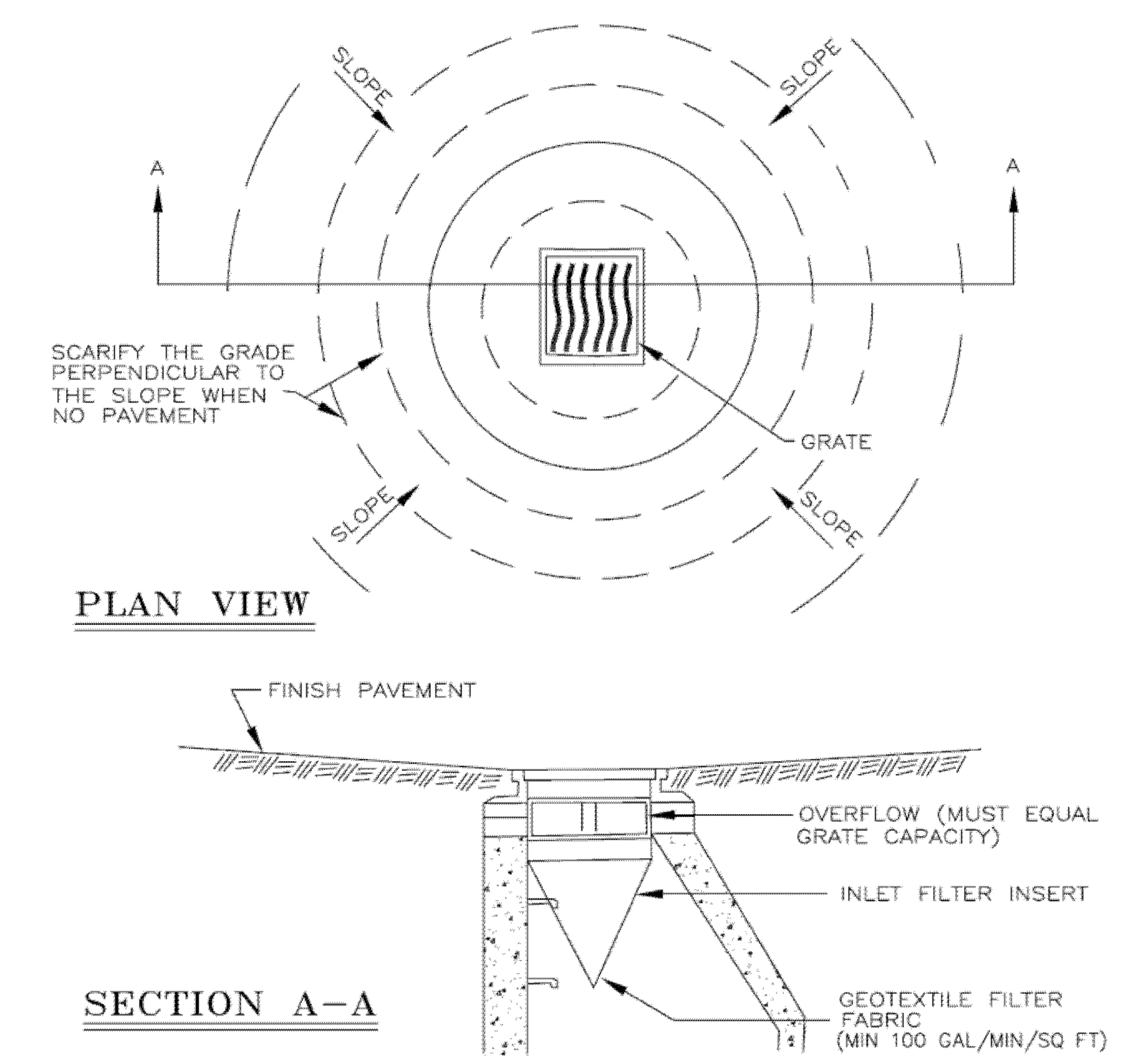
RIP-RAP SPILLWAY
NOT TO SCALE

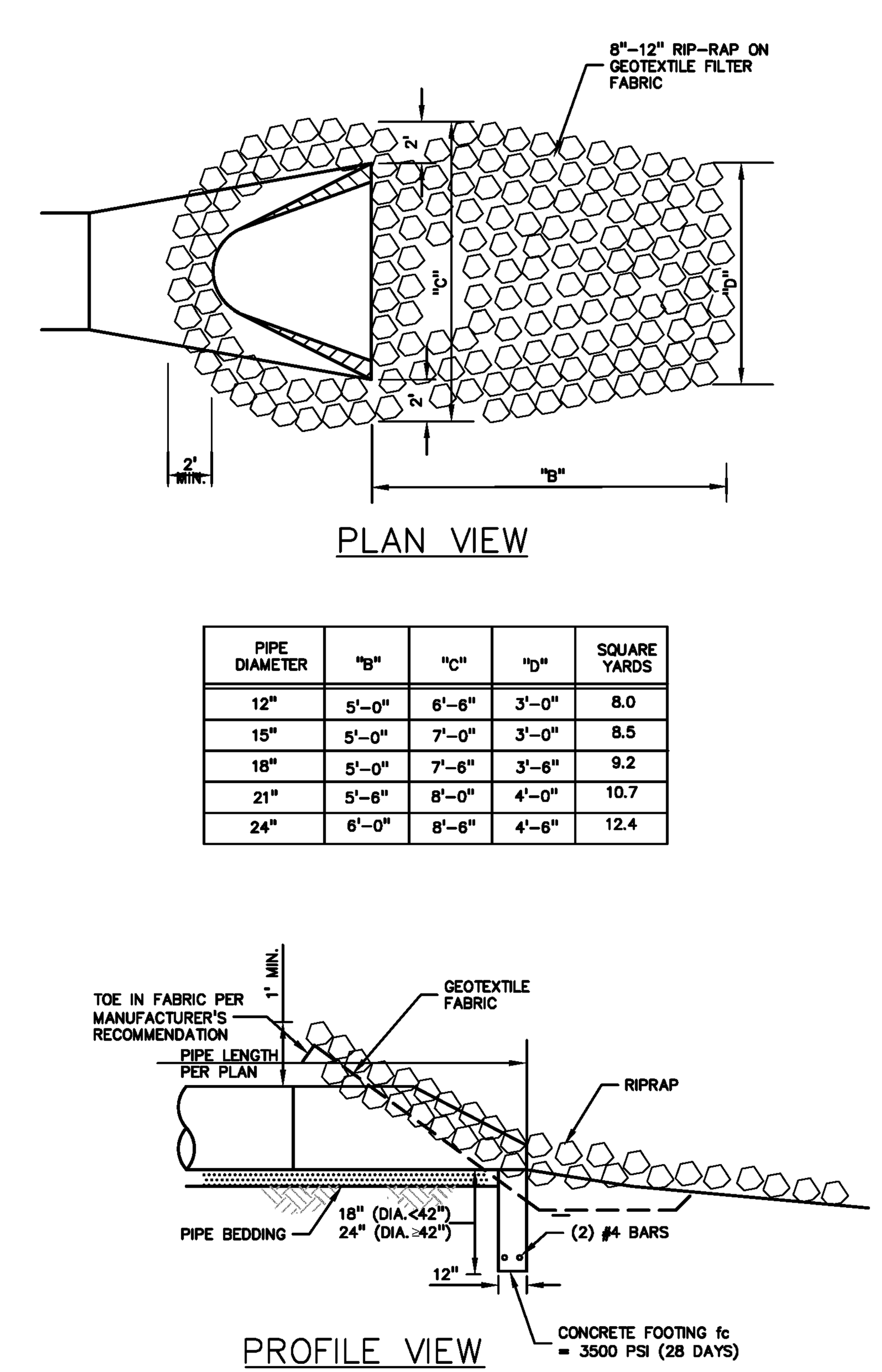


TRACKING MAT DETAIL AT CONSTRUCTION ENTRANCE
NOT TO SCALE

SILT SACK OR APPROVED EQUAL LOW POINT/YARD INLET FILTER
STANDARD CONTROL YEAR ROUND OR WINTER USE

APPROVED FOR USE DURING WINTER MONTHS OR IN AREAS THAT MAY BECOME A SAFETY HAZARD DUE TO FLOODING OR FREEZING



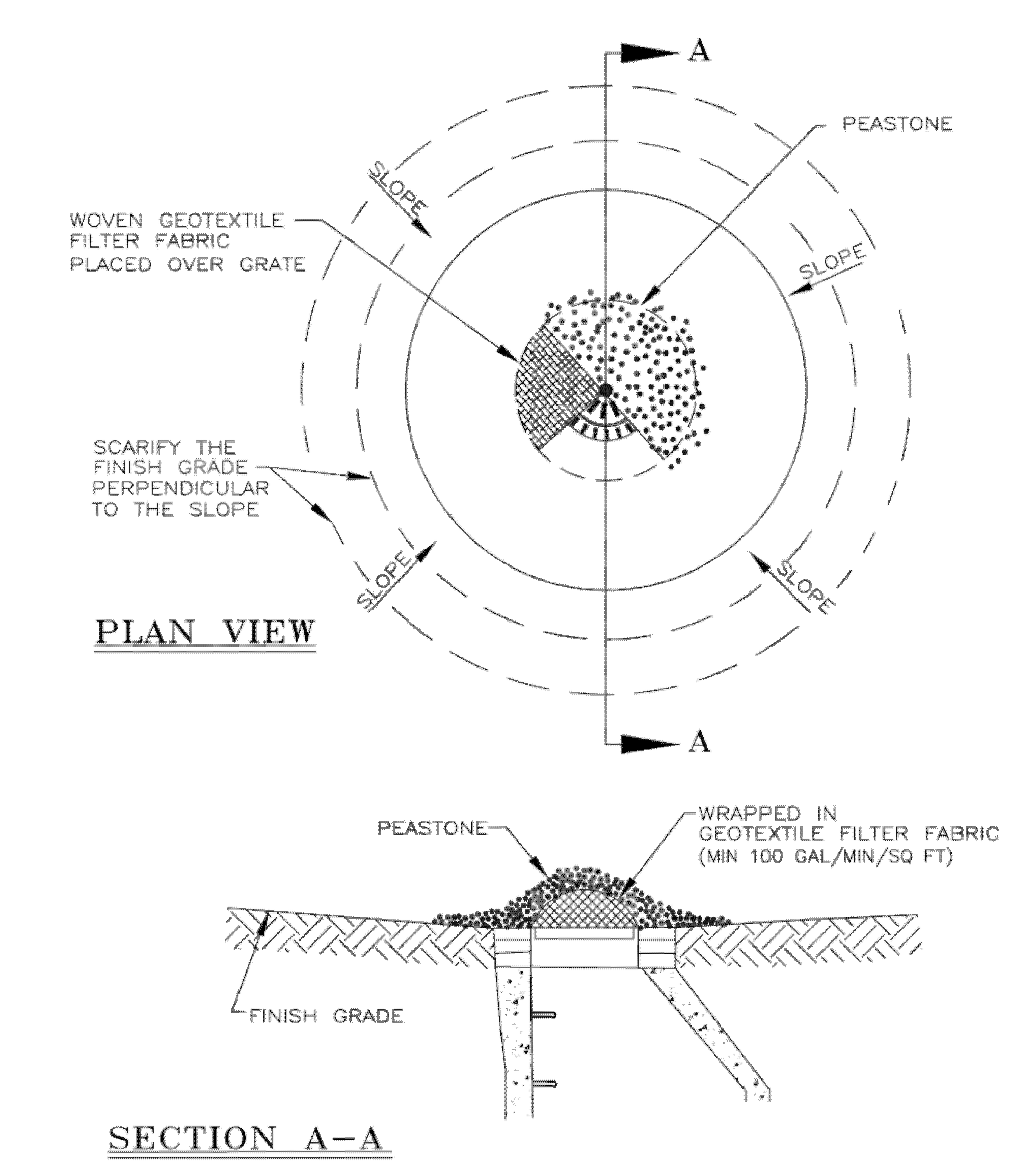


PIPE DIAMETER	"B"	"C"	"D"	SQUARE YARDS
12"	5'-0"	6'-6"	3'-0"	8.0
15"	5'-0"	7'-0"	3'-0"	8.5
18"	5'-0"	7'-6"	3'-6"	9.2
21"	5'-6"	8'-0"	4'-0"	10.7
24"	6'-0"	8'-6"	4'-6"	12.4

END SECTION & RIPRAP DETAIL
NOT TO SCALE

GEOTEXTILE & PEASTONE LOW POINT/YARD INLET FILTER
STANDARD CONTROL NON-WINTER USE

NOT FOR USE IN WINTER MONTHS OR IN AREAS THAT MAY BECOME A SAFETY HAZARD DUE TO FLOODING OR FREEZING



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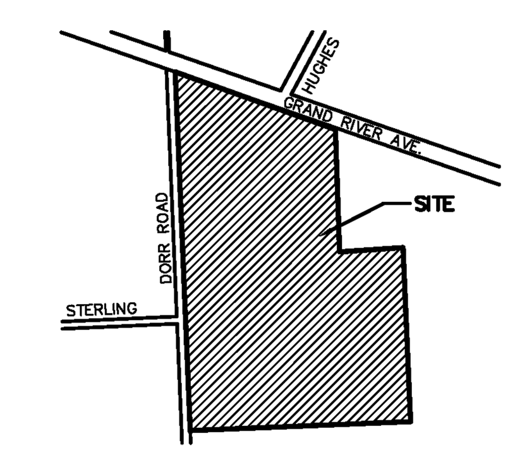

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NOTES AND DETAILS II

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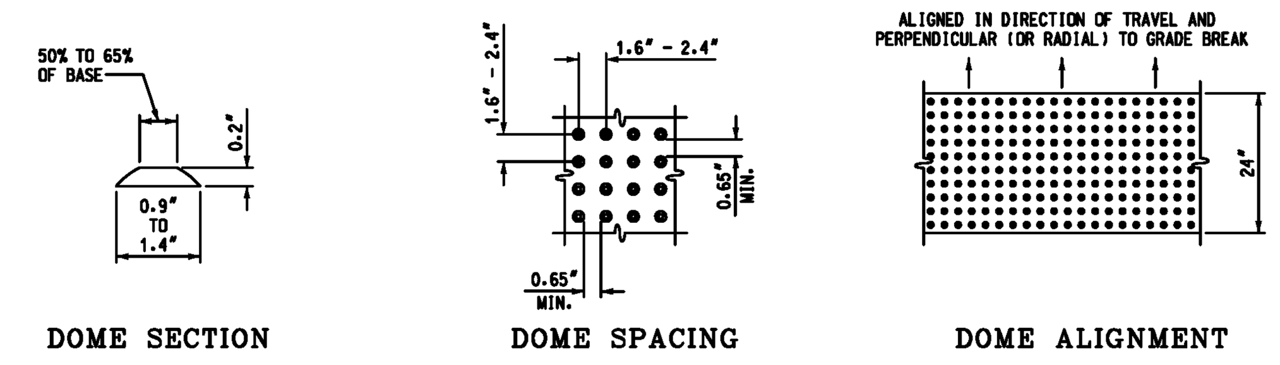
P.M.	JEC
DN.	JMR
DES.	JMR

DRAWING NUMBER:
C-9.3

NOT FOR CONSTRUCTION



DETECTABLE WARNING DETAILS

NOTES:

DETAILS SPECIFIED ON THIS PLAN APPLY TO ALL CONSTRUCTION, RECONSTRUCTION, OR ALTERATION OF STREETS, CURBS, OR SIDEWALKS IN THE PUBLIC RIGHT OF WAY.

SIDEWALK RAMPS ARE TO BE LOCATED AS SPECIFIED ON THE PLANS OR AS DIRECTED BY THE ENGINEER.

RAMPS SHALL BE PROVIDED AT ALL CORNERS OF AN INTERSECTION WHERE THERE IS EXISTING OR PROPOSED SIDEWALK AND CURB. RAMPS SHALL ALSO BE PROVIDED AT MARKED AND/OR SIGNALIZED MID-BLOCK CROSSINGS.

SURFACE TEXTURE OF THE RAMP SHALL BE THAT OBTAINED BY A COARSE BROOMING, TRANSVERSE TO THE RUNNING SLOPE.

SIDEWALK SHALL BE RAMPED WHERE THE DRIVEWAY CURB IS EXTENDED ACROSS THE WALK.

CARE SHALL BE TAKEN TO ASSURE A UNIFORM GRADE ON THE RAMP. WHERE CONDITIONS PERMIT, IT IS DESIRABLE THAT THE SLOPE OF THE RAMP BE IN ONLY ONE DIRECTION, PARALLEL TO THE DIRECTION OF TRAVEL.

RAMP WIDTH SHALL BE INCREASED, IF NECESSARY, TO ACCOMMODATE SIDEWALK SNOW REMOVAL EQUIPMENT NORMALLY USED BY THE MUNICIPALITY.

WHEN 5' MINIMUM WIDTHS ARE NOT PRACTICABLE, RAMP WIDTH MAY BE REDUCED TO NOT LESS THAN 4' AND LANDINGS TO NOT LESS THAN 4' x 4'.

CURB RAMPS WITH A RUNNING SLOPE ≤5% DO NOT REQUIRE A TOP LANDING. HOWEVER, ANY CONTINUOUS SIDEWALK OR PEDESTRIAN ROUTE CROSSING THROUGH OR INTERSECTING THE CURB RAMP MUST INDEPENDENTLY MAINTAIN A CROSS SLOPE NOT GREATER THAN 2% PERPENDICULAR TO ITS OWN DIRECTION(S) OF TRAVEL.

DETECTABLE WARNING SURFACE COVERAGE IS 24" MINIMUM IN THE DIRECTION OF RAMP/PATH TRAVEL AND THE FULL WIDTH OF THE RAMP/PATH OPENING EXCLUDING CURBED OR FLARED CURB TRANSITION AREAS. A BORDER OFFSET NOT GREATER THAN 2" MEASURED ALONG THE EDGES OF THE DETECTABLE WARNING IS ALLOWABLE. FOR RADIAL CURB THE OFFSET IS MEASURED FROM THE ENDS OF THE RADIUS.

FOR NEW ROADWAY CONSTRUCTION, THE RAMP CROSS SLOPE MAY NOT EXCEED 2.0%. FOR ALTERATIONS TO EXISTING ROADWAYS, THE CROSS SLOPE MAY BE TRANSITIONED TO MEET AN EXISTING ROADWAY GRADE. THE CROSS SLOPE TRANSITION SHALL BE APPLIED UNIFORMLY OVER THE FULL LENGTH OF THE RAMP.

THE MAXIMUM RUNNING SLOPE OF 8.3% IS RELATIVE TO A FLAT (0%) REFERENCE. HOWEVER, IT SHALL NOT REQUIRE ANY RAMP OR SERIES OF RAMPS TO EXCEED 15 FEET IN LENGTH NOT INCLUDING LANDINGS OR TRANSITIONS.

DRAINAGE STRUCTURES SHOULD NOT BE PLACED IN LINE WITH RAMPS. THE LOCATION OF THE RAMP SHOULD TAKE PRECEDENCE OVER THE LOCATION OF THE DRAINAGE STRUCTURE. WHERE EXISTING DRAINAGE STRUCTURES ARE LOCATED IN THE RAMP PATH OF TRAVEL, USE A MANUFACTURER'S ADA COMPLIANT GRATE. OPENINGS SHALL NOT BE GREATER THAN ½". ELONGATED OPENINGS SHALL BE PLACED SO THAT THE LONG DIMENSION IS PERPENDICULAR TO THE DOMINANT DIRECTION OF TRAVEL.

THE TOP OF THE JOINT FILLER FOR ALL RAMP TYPES SHALL BE FLUSH WITH THE ADJACENT CONCRETE.

CROSSWALK AND STOP LINE MARKINGS, IF USED, SHALL BE SO LOCATED AS TO STOP TRAFFIC SHORT OF RAMP CROSSINGS. SPECIFIC DETAILS FOR MARKING APPLICATIONS ARE GIVEN IN THE "MICHIGAN MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES".

FLARED SIDES WITH A SLOPE OF 10% MAXIMUM, MEASURED ALONG THE ROADSIDE CURB LINE, SHALL BE PROVIDED WHERE AN UNOBSTRUCTED CIRCULATION PATH LATERALLY CROSSES THE SIDEWALK RAMP. FLARED SIDES ARE NOT REQUIRED WHERE THE RAMP IS BORDERED BY LANDSCAPING, UNPAVED SURFACE OR PERMANENT FIXED OBJECTS. WHERE THEY ARE NOT REQUIRED, FLARED SIDES CAN BE CONSIDERED IN ORDER TO AVOID SHARP CURB RETURNS AT RAMP OPENINGS.

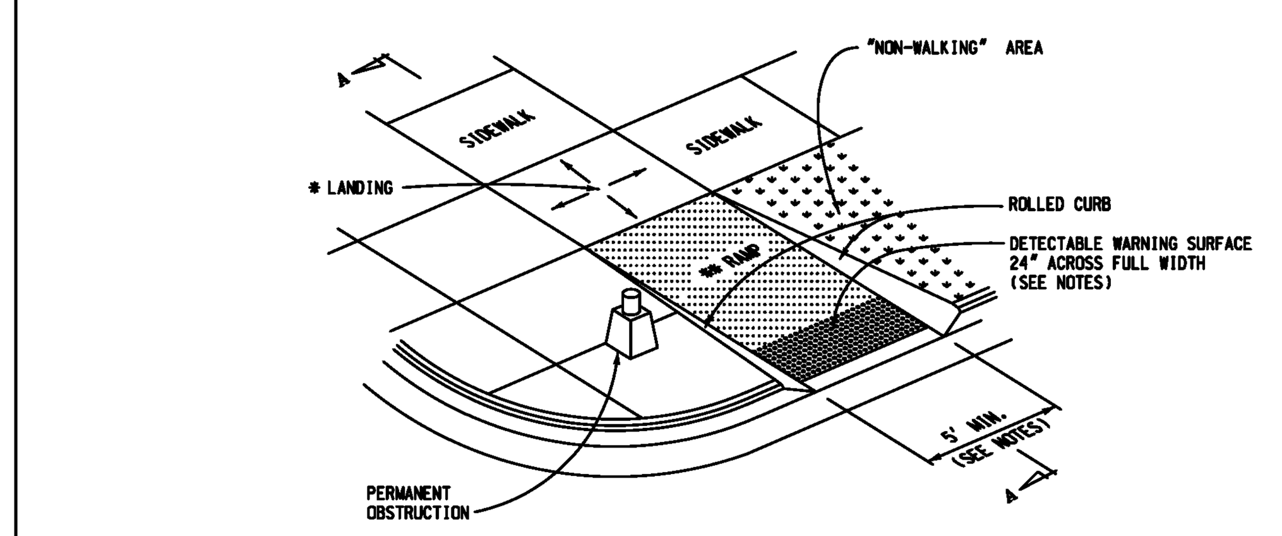
DETECTABLE WARNING PLATES MUST BE INSTALLED USING FABRICATED OR FIELD CUT UNITS CAST AND/OR ANCHORED IN THE PAVEMENT TO RESIST SHIFTING OR HEAVING.

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR
SIDEWALK RAMP AND DETECTABLE WARNING DETAILS

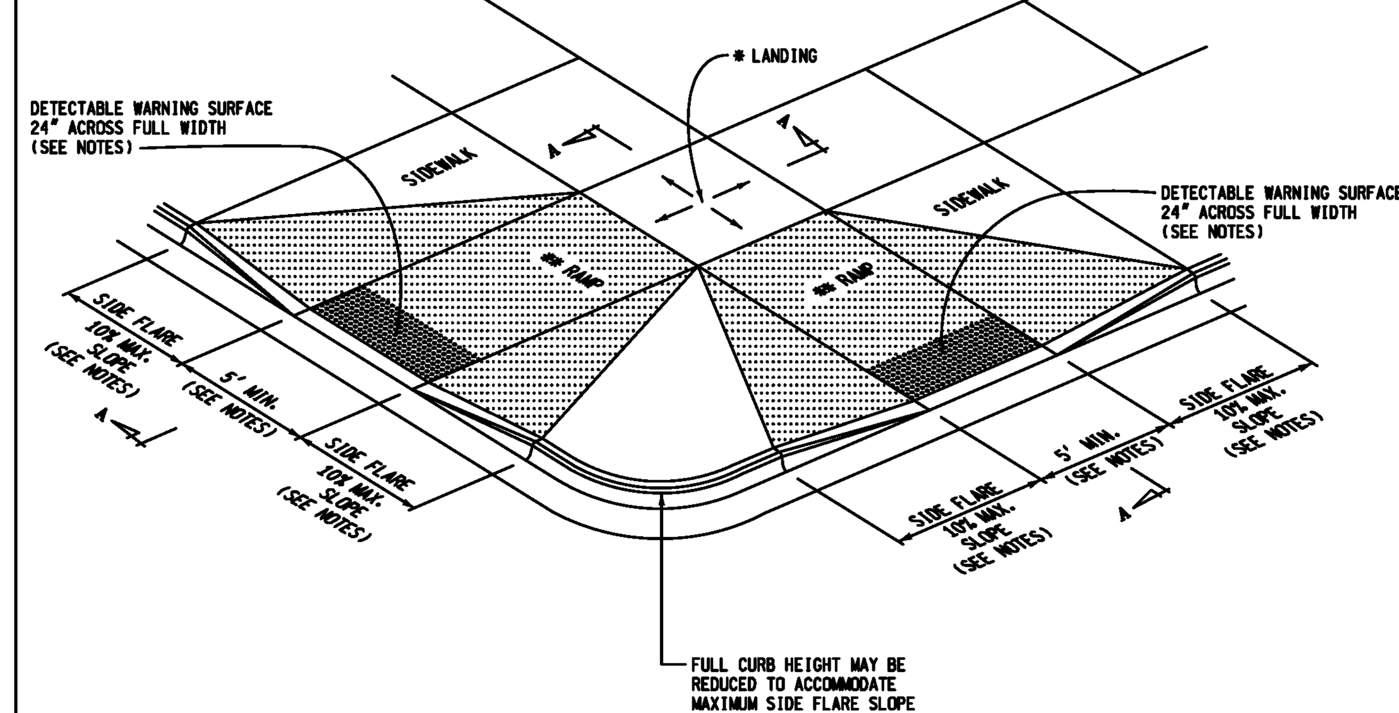
F.H.W.A. APPROVAL	7-26-2019 PLAN DATE	R-28-J	SHEET 7 OF 7

* MAXIMUM LANDING SLOPE IS 2.0% IN EACH DIRECTION OF TRAVEL. LANDING MINIMUM DIMENSIONS 5' x 5'. SEE NOTES.

** MAXIMUM RAMP CROSS SLOPE IS 2.0%. RUNNING SLOPE 5% - 7% (8.3% MAXIMUM). SEE NOTES.



SIDEWALK RAMP TYPE R
(ROLLED SIDES)



SIDEWALK RAMP TYPE F
(FLARED SIDES, TWO RAMPS SHOWN)

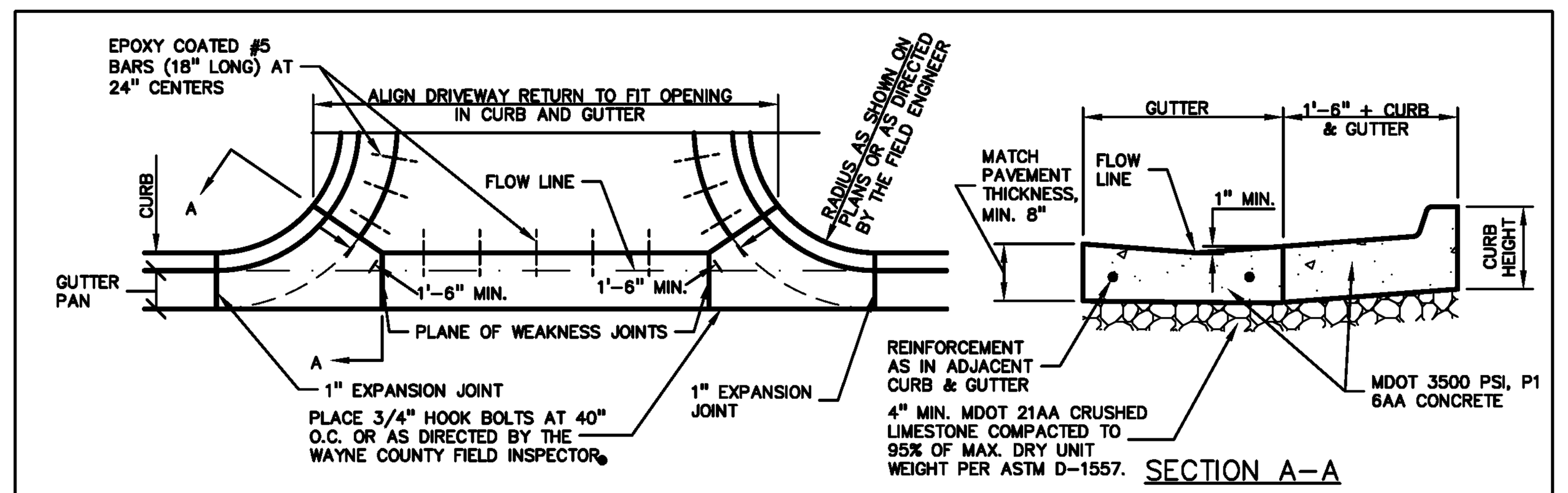
MDOT
PREPARED BY DESIGN DIVISION
DRAWN BY: B.L.T.
CHECKED BY: B.K.P.

DEPARTMENT DIRECTOR
Paul C. Ajegba

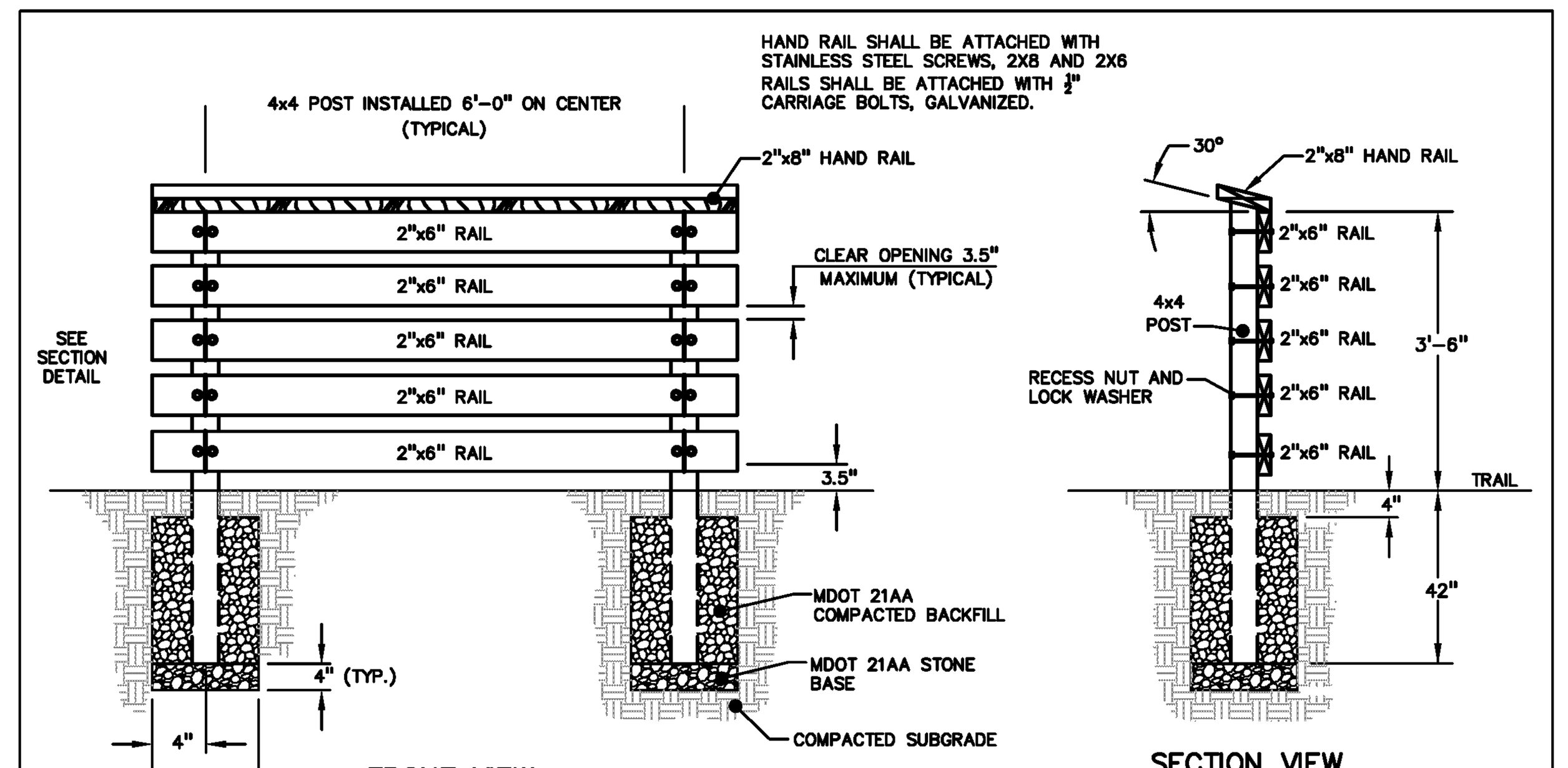
APPROVED BY: DIRECTOR, BUREAU OF FIELD SERVICES
APPROVED BY: DIRECTOR, BUREAU OF DEVELOPMENT

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR
SIDEWALK RAMP AND DETECTABLE WARNING DETAILS

F.H.W.A. APPROVAL	7-26-2019 PLAN DATE	R-28-J	SHEET 1 OF 7



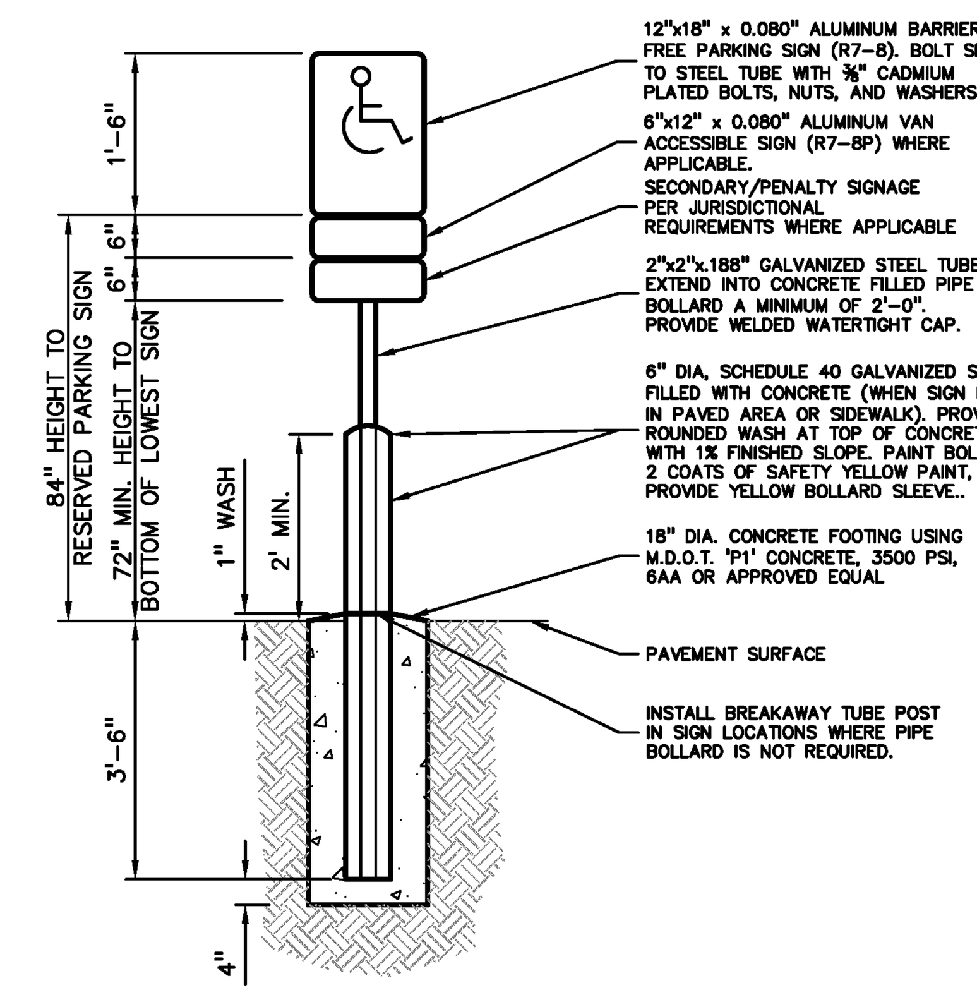
MDOT DRIVEWAY OPENING—DETAIL 'M'
NOT TO SCALE



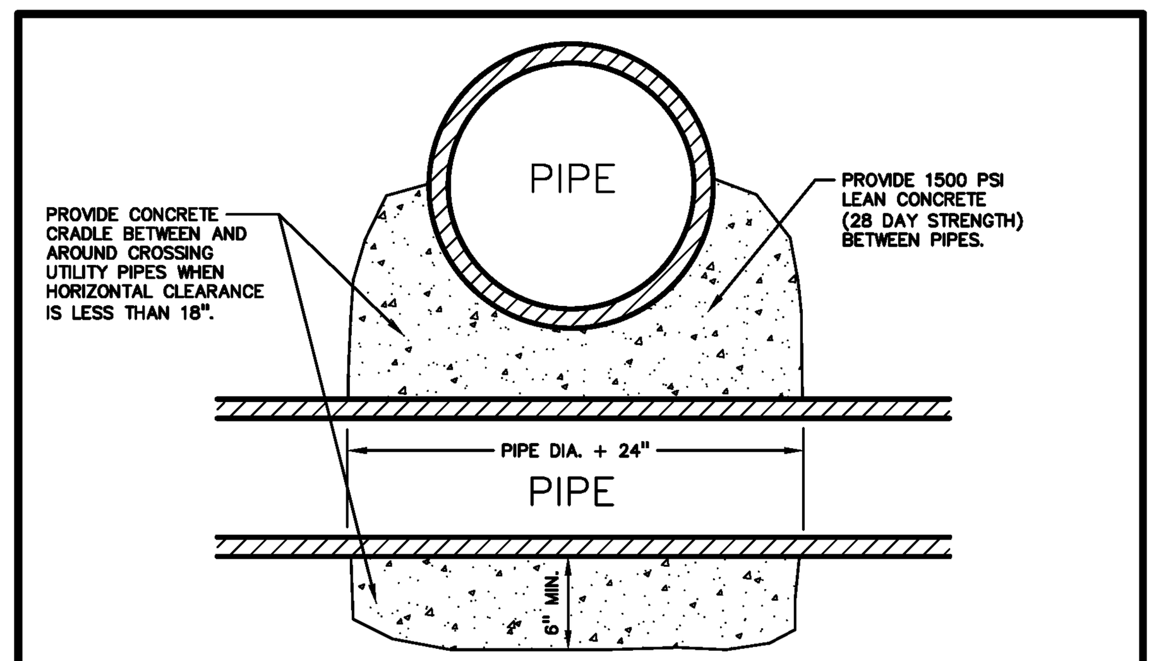
FENCE DETAIL
NOT TO SCALE

BARRIER FREE SIGN NOTES:

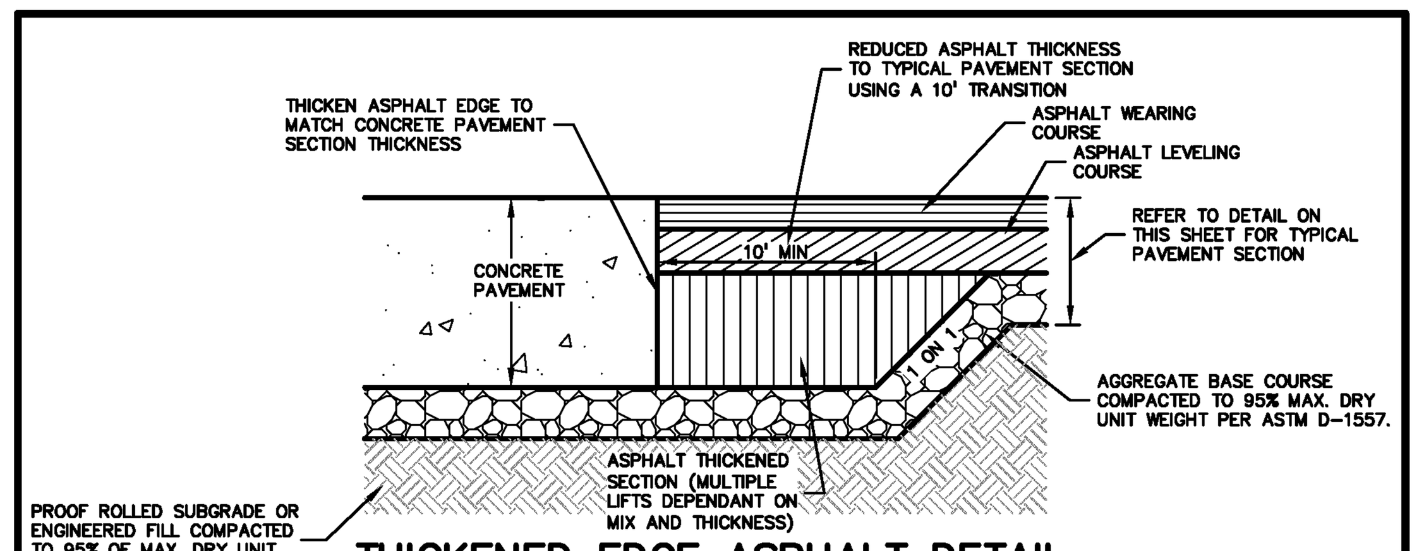
1. ONE SIGN IS REQUIRED AT EACH BARRIER FREE PARKING SPACE.
2. ALL SIGNS SHALL COMPLY WITH THE LATEST STANDARDS OF THE MICHIGAN MANUAL OF UNIFORM TRAFFIC CONTROL DEVICES (MMUTCD).
3. WHEN TWO BARRIER FREE PARKING SPACES ARE ADJACENT AND FACING EACH OTHER, TWO SIGNS ARE REQUIRED, BUT CAN BE MOUNTED ON THE SAME POST.
4. SIGN POSTS SHALL BE 2" NOM. SQUARE 14-GAUGE GALVANIZED STEEL TUBE WITH 7/16" HOLES AT 1" CENTERS. POSTS SHALL TELESCOPE INSIDE ANCHOR POSTS A MINIMUM OF 12".
5. ANCHOR POSTS SHALL BE 2.25" NOM. SQUARE 12-GAUGE GALVANIZED STEEL POST, A MINIMUM OF 3 FEET LONG.
6. IF THESE NOTES AND DETAILS CONFLICT WITH LOCAL CODES AND ORDINANCES, THE STRICTER REQUIREMENT SHOULD BE USED.
7. ALTERNATE MATERIALS MAY BE USED IF IN COMPLIANCE WITH A.D.A. GUIDELINES AND LOCAL REQUIREMENTS.



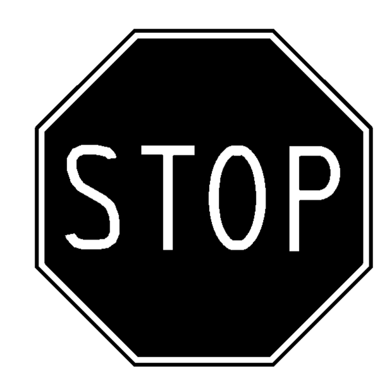
BARRIER FREE SIGN AND POST DETAIL
NOT TO SCALE



CONCRETE CRADLE DETAIL
NOT TO SCALE



THICKENED EDGE ASPHALT DETAIL
NOT TO SCALE



30" x 30"
WHITE ON RED REFLECTORIZED
7'-0" MOUNTING HEIGHT
(R1-1)

STOP SIGN DETAIL
NOT TO SCALE

12" x 18" (R7-8)
GREEN BORDER AND LEGEND
WHITE SYMBOL, BLUE BACKGROUND.
REFLECTORIZED

DET 2 BARRIER FREE PARKING SIGN DETAIL
NOT TO SCALE

12" x 18" (R7-8)
GREEN BORDER AND LEGEND
WHITE SYMBOL, BLUE BACKGROUND.
REFLECTORIZED

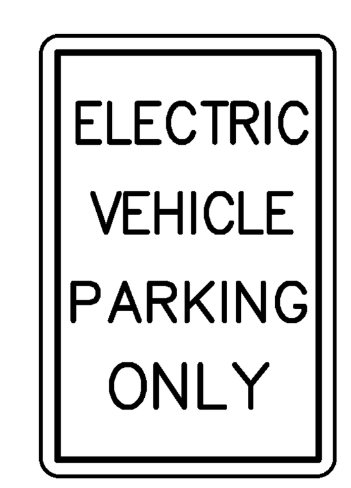
NOTE:
MAY ONLY BE USED AT 11' WIDE SPACES LOCATED ON THE LEFT SIDE OF A 5' WIDE AISLE, OR 8' WIDE SPACES LOCATED TO THE LEFT OF 8' WIDE AISLES

6" x 12" (R7-8P)
GREEN BORDER AND LEGEND
REFLECTORIZED

DET 3 VAN ACCESSIBLE PARKING SIGN DETAIL
NOT TO SCALE

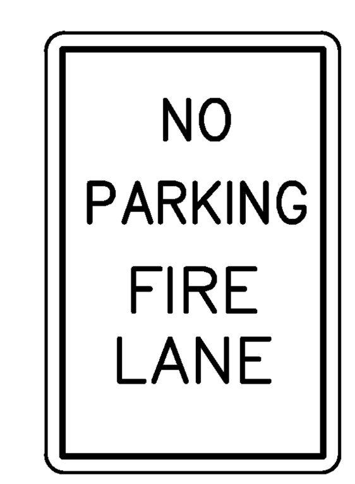
18"x12"
BLACK ON YELLOW REFLECTORIZED
7'-0" MOUNTING HEIGHT

SIDEWALK ENDS SIGN DETAIL
NOT TO SCALE



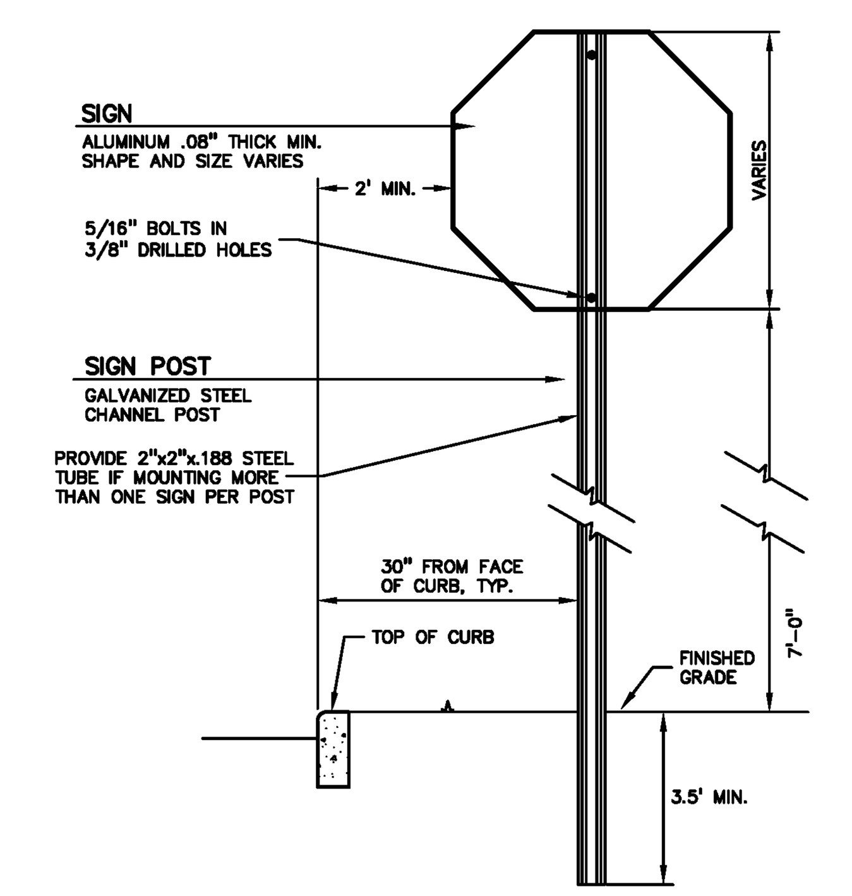
12" x 18"
BLACK ON WHITE REFLECTORIZED
7'-0" MOUNTING HEIGHT

ELECTRIC VEHICLE PARKING SIGN DETAIL
NOT TO SCALE



12" x 18"
RED ON WHITE REFLECTORIZED
7'-0" MOUNTING HEIGHT
(R7-22)

NO PARKING SIGN DETAIL
NOT TO SCALE

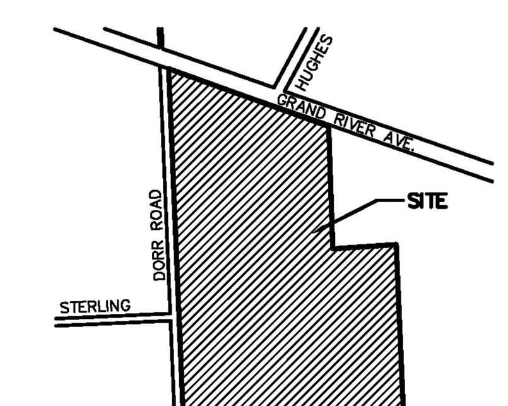


SIGN AND POST INSTALLATION IN LANDSCAPED AREAS
NOT TO SCALE

PEA GROUP
t: 844.813.2949
www.peagroup.com

811 Know what's below. Call before you dig.

CAUTION!!
THE LOCATIONS AND ELEVATIONS OF EXISTING UNDERGROUND UTILITIES AS SHOWN ON THIS DRAWING ARE ONLY APPROXIMATE. NO GUARANTEE IS EITHER EXPRESSED OR IMPLIED AS TO THE COMPLETENESS OR ACCURACY THEREOF. THE CONTRACTOR SHALL BE EXCLUSIVELY RESPONSIBLE FOR DETERMINING THE EXACT UTILITY LOCATIONS AND ELEVATIONS PRIOR TO THE START OF CONSTRUCTION.



CLIENT
GRAND RIVER DORR LLC.
315550 NORTHWESTERN HIGHWAY
FARMINGTON HILLS, MI 48334

PROJECT TITLE
THE LEGACY APARTMENT HOMES
6080 W GRAND RIVER
GENOA TOWNSHIP, LIVINGSTON COUNTY, MICHIGAN

REVISIONS

REVISION	DATE
REV PER TWP	5-30-23

ORIGINAL ISSUE DATE:
APRIL 10, 2023

DRAWING TITLE
NOTES AND DETAILS III

PEA JOB NO.	2021-0578
P.M.	JEC
DN.	JMR
DES.	JMR

DRAWING NUMBER:
C-9.4

NOT FOR CONSTRUCTION

S:\PROJECTS\2021\2021-0578 LAUTREC GENOA TOWNSHIP\DWG\SITE PLANS\[C-9.0] SP 9TC-21-0578.dwg

PIPE RESTRAINT SCHEDULE

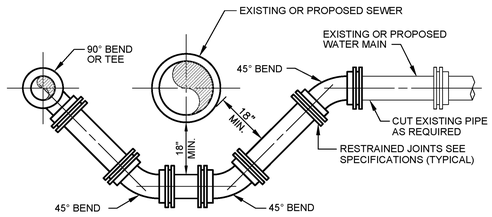
GROUND BURIED PRESSURE PIPE - POLYETHYLENE ENCASED DUCTILE IRON PIPE

PIPE DIAMETER	TEES, 90° BENDS	45° BENDS	22-1/2° BENDS	11-1/4° BENDS	DEAD ENDS	REDUCERS (ONE SIZE REDUCTION)*	REDUCERS (TWO SIZE REDUCTIION)*
4	13	5	3	1	40	--	--
6	19	8	4	2	58	31	--
8	24	10	5	2	75	30	70
12	34	14	7	3	107	57	116
16	43	18	9	4	139	59	137
20	52	22	10	5	169	59	134
24	61	25	12	6	199	60	132
30	73	30	15	7	242	85	168
36	84	35	17	8	281	84	168

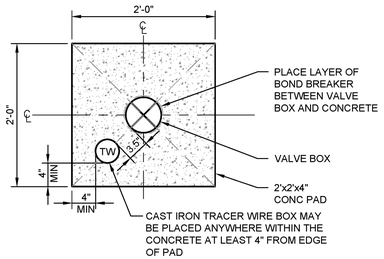
1. LENGTHS OF PIPE RESTRAINT ARE GIVEN IN FEET.
2. IF REQUIRED PIPE DIAMETER IS NOT LISTED IN THIS TABLE, THE NEXT LARGEST PIPE DIAMETER SHALL BE USED.
3. THIS TABLE IS BASED ON A TEST PRESSURE OF 180 PSI (OPERATING PRESSURE PLUS WATER HAMMER. FOR OTHER TEST PRESSURES, ALL VALUES TO BE INCREASED OR DECREASED PROPORTIONALLY.
4. THE VALUES PROVIDED OF RESTRAINT LENGTH ARE IN EACH DIRECTION FROM THE POINT OF DEFLECTION OR TERMINATION EXCEPT FOR TEES, AT WHICH ONLY THE BRANCH IN THE DIRECTION OF THE STEM.
5. IF TIE RODS ARE USED, USE FOUR RODS MINIMUM AND ADD 1/8-INCH TO BAR DIAMETER AS CORROSION ALLOWANCE.

* SIZE REDUCTION IS BASED UPON THE PIPE DIAMETER SHOWN IN THIS TABLE.

BASED UPON:
INTERNAL PRESSURE: 180
PIPE DEPTH: 5
BEDDING CLASS: TYPE 4
SOIL TYPE: GOOD SAND
SAFETY FACTOR: 2

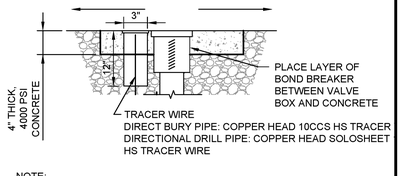


WATER MAIN UTILITY OFFSET



NOTE: ALL BOXES & ADJOINING TW BOXES SHALL BE ENCASED IN A CONC. PAD UNLESS OTHERWISE DETERMINED BY MHOG.

PLAN

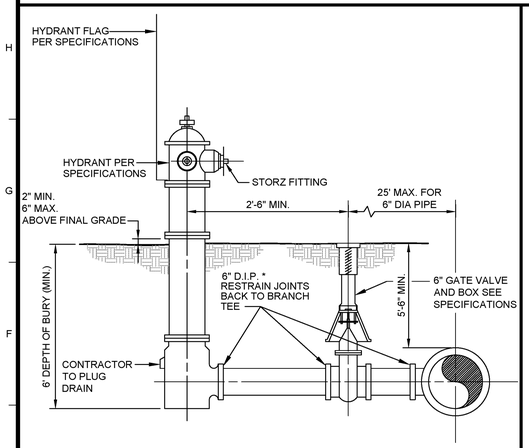


NOTE:
1. TRACER WIRE BOXES LOCATED WITHOUT A VALVE BOX ONLY REQUIRE AN 18" X 18" CONCRETE PAD.
2. TRACER WIRE BOX SHALL HAVE A LOCKING LID W/STANDARD AWWA PENTAGON KEY.
3. TRACER WIRE BOX SHALL BE COPPERHEAD RB14*TP IN ASPHALT INSTALLATIONS AND CD14*TP FOR ALL OTHER INSTALLATIONS.

SECTION

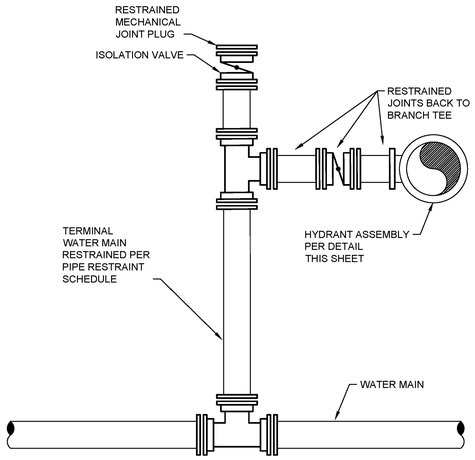
VALVE/TRACER WIRE BOX IN CONCRETE DETAIL

NO SCALE

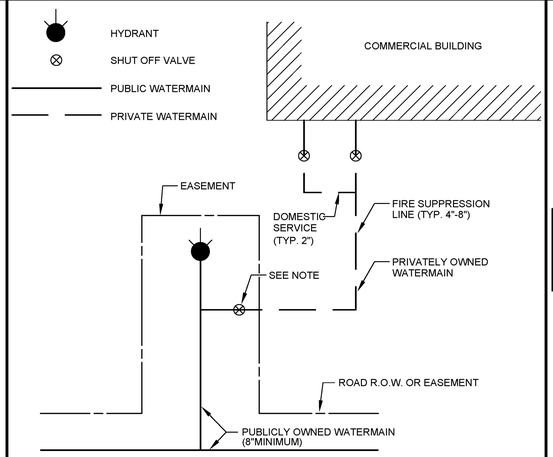


* THE LENGTH OF 6" PIPE FROM THE MAIN TO THE HYDRANT ASSEMBLY CANNOT EXCEED 25'. ANY PIPE OVER 25 FEET SHALL BE 8" DIAMETER MINIMUM AND DESIGNED PER MHOG SPECIFICATIONS.

FIRE HYDRANT ASSEMBLY

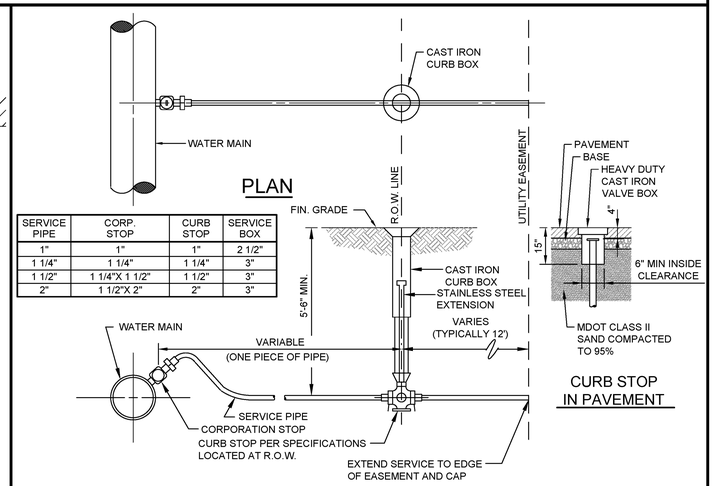


TERMINAL HYDRANT DETAIL



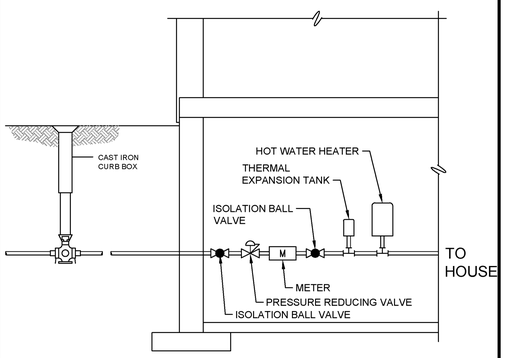
NOTE: PUBLICLY OWNED SHUT OFF VALVE TO BE LOCATED IN EASEMENT.

COMMERCIAL BUILDING WATER SERVICE LAYOUT

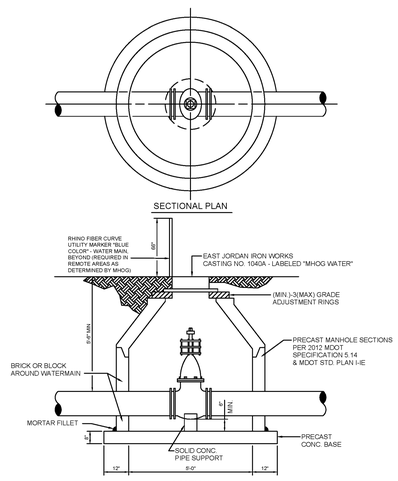


SERVICE PIPE	CORP. STOP	CURB STOP	SERVICE BOX
1"	1"	1"	2 1/2"
1 1/4"	1 1/4"	1 1/4"	3"
1 1/2"	1 1/4"X 1 1/2"	1 1/2"	3"
2"	1 1/2"X 2"	2"	3"

SECTION
WATER SERVICE LATERAL

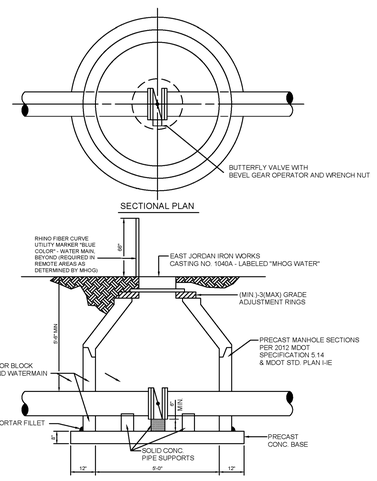


PRIVATE RESIDENCE
PRESSURE REDUCING VALVE (PRV)



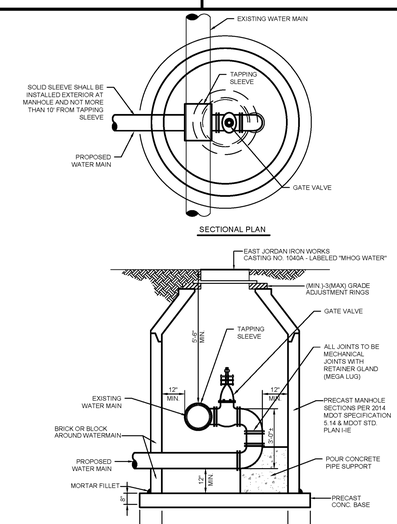
NOTES:
1. ALL LIFT HOLES AND JOINTS SHALL BE MORTARED BOTH INSIDE AND OUTSIDE.
2. BLOCK MANHOLES TO BE USED ONLY WITH ENGINEERS PERMISSION.
3. NO STEPS PERMITTED.

VALVE AND GATE WELL



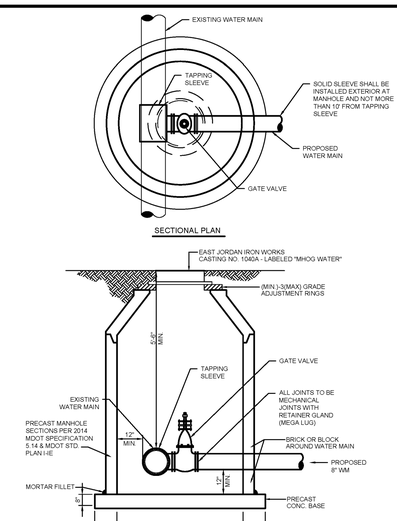
NOTES:
1. ALL LIFT HOLES AND JOINTS SHALL BE MORTARED BOTH INSIDE AND OUTSIDE.
2. BLOCK MANHOLES TO BE USED ONLY WITH ENGINEERS PERMISSION.
3. NO STEPS PERMITTED.

BUTTERFLY VALVE AND WELL



NOTES:
1. ALL LIFT HOLES AND JOINTS SHALL BE MORTARED BOTH INSIDE AND OUTSIDE.
2. BLOCK MANHOLES TO BE USED ONLY WITH ENGINEERS PERMISSION.
3. NO STEPS PERMITTED.

REVERSE TAP GATE WELL



NOTES:
1. ALL LIFT HOLES AND JOINTS SHALL BE MORTARED BOTH INSIDE AND OUTSIDE.
2. BLOCK MANHOLES TO BE USED ONLY WITH ENGINEERS PERMISSION.
3. NO STEPS PERMITTED.

REGULAR TAP GATE WELL

MARION HOWELL OCEOLA GENOA
Sewer and Water Authority

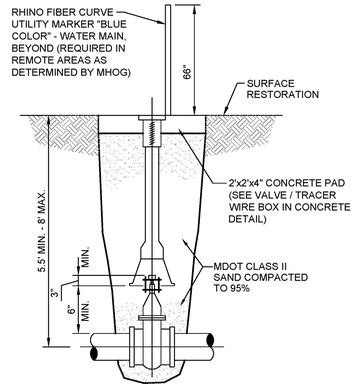
STANDARD DETAILS

Scale: NONE

Issued Date JANUARY - 2014

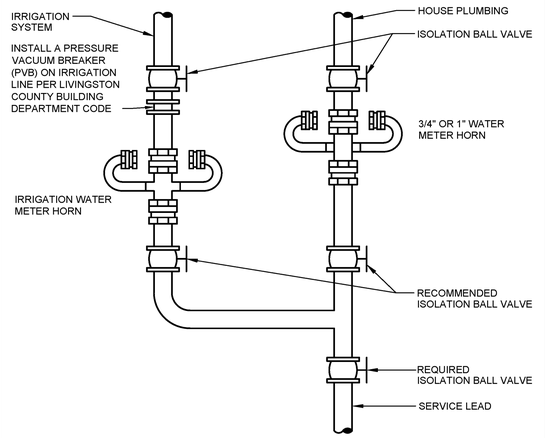
UPDATED: MAY 2015
UPDATED: FEBRUARY 2016
UPDATED: APRIL 2016
UPDATED: OCTOBER 2017
UPDATED: FEBRUARY 2019

Tuesday, February 26, 2019 4:02:14 PM DRAWING: P:\IER\12719\200-12719-00-000\CAD\SheetFiles\Mhog-std.DWG



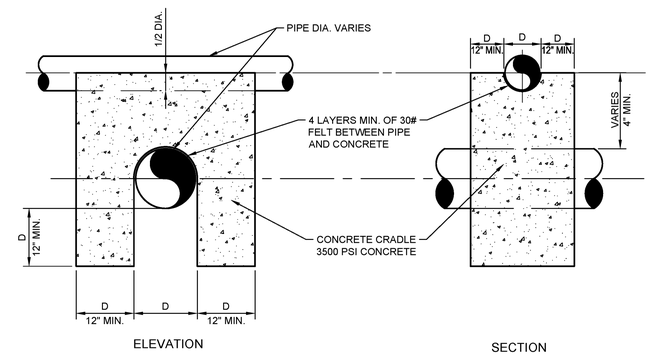
NOTES:
1. VALVE BOX SHALL NOT REST ON VALVE OR MAIN LINE PIPE.
2. A VALVE STEM EXTENSION WITH CENTERING RING IS REQUIRED FOR VALVES BURIED DEEPER THAN 6'.

GATE VALVE AND BOX



NOTES:
1. ALL METERS ARE TO BE INSTALLED HORIZONTALLY IN A DRY, CLEAN, SANITARY LOCATION THAT IS READILY ACCESSIBLE. THIS DRAWING IS NOT TO SCALE & IS ONLY A REPRESENTATION OF HOW THE METERS SHOULD BE INSTALLED. THE SECOND METER IS OPTIONAL FOR IRRIGATION USAGE. METERS SHOULD NOT BE INSTALLED IN LINE (ONE RIGHT AFTER THE OTHER).
2. PROPERTIES DESIGNATED "HIGH HAZARD" PER THE MHOG CROSS CONNECTION RULES MANUAL WILL REQUIRE THE INSTALLATION OF A REDUCED PRESSURE ZONE (RPZ) BACK FLOW PREVENTION DEVICE.

TYPICAL METER HORN INSTALLATION



CONCRETE CRADLE DETAIL

SCALE: NONE

MHOG CASTING DETAIL

NO SCALE

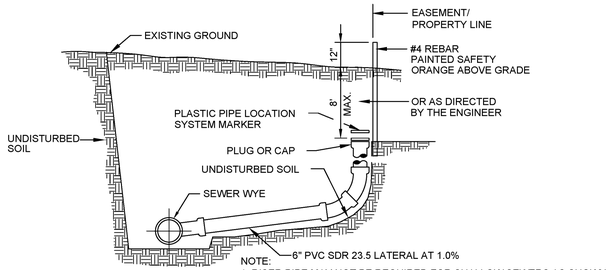
MARION HOWELL OCEOLA GENOA
Sewer and Water Authority

STANDARD DETAILS

Scale: NONE

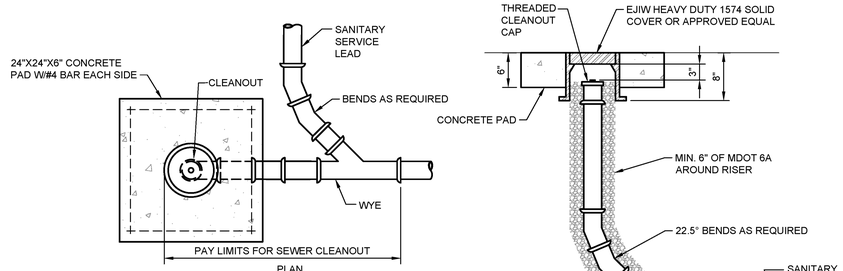
Issued Date JANUARY - 2014

UPDATED: MAY 2015
UPDATED: FEBRUARY 2016
UPDATED: APRIL 2016
UPDATED: OCTOBER 2017
UPDATED: FEBRUARY 2019



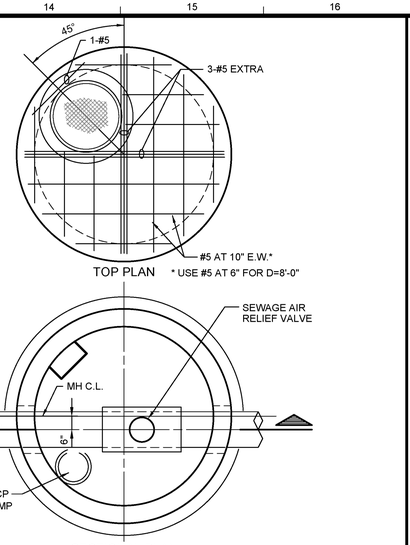
NOTE:
1. RISER PIPE MAY NOT BE REQUIRED FOR SHALLOW SEWERS AS SHOWN.
2. WHEN CONNECTING TO AN EXISTING SEWER THE AUTHORITY MAY REQUIRE CORING OF THE EXISTING PIPE AND INSTALLATION OF A SEWER SADDLE. SADDLE SHALL BE ROMAC "CB" SEWER SADDLE OR APPROVED EQUAL.

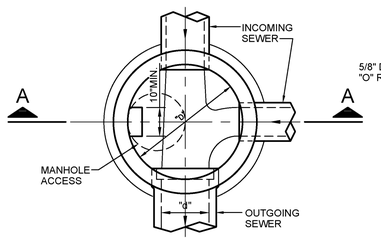
SANITARY SEWER LATERAL

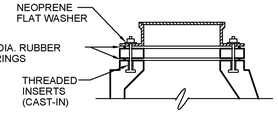


NOTES:
1. ALL CONNECTION SHALL BE BELL AND SPIGOT TYPE.
2. CLEANOUT IS TO BE SAME DIAMETER AS SERVICE LEAD.
3. CONCRETE PAD REQUIRED UNLESS OTHERWISE DETERMINED BY MHOG.
4. THERE MUST BE A 3" GAP FROM THE BOTTOM OF THE CLEAN OUT LID TO THE TOP OF THE THREADED CAP.

SEWER CLEANOUT DETAIL

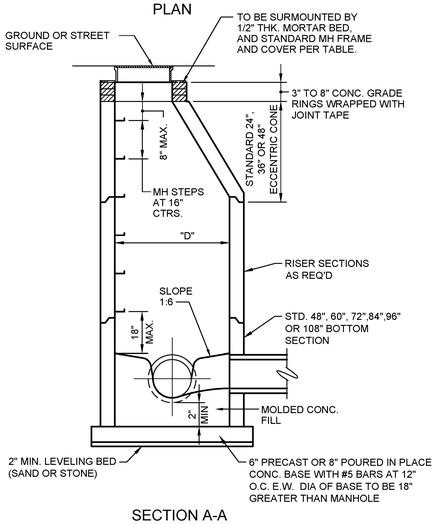






WATERTIGHT COVER ANCHORAGE

MANHOLE SCHEDULE	
PIPE SIZE (" d")	D
8"-24"	48"
27"-36"	60"
42"-48"	72"
54"	84"

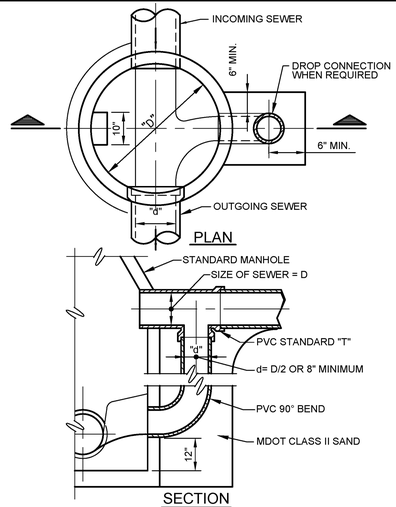


SECTION A-A

NOTES:
1. ALL SANITARY MANHOLES TO BE PRECAST REINFORCED CONCRETE WITH PREMIUM JOINTS. SEE SPECIFICATIONS FOR BASE SLAB AND PIPE OPENINGS AND CONNECTIONS.
2. MANHOLE CONES SHALL BE THE ECCENTRIC TYPE.
3. PROVIDE 6" OF COMPACTED GRANULAR MATERIAL UNDER ALL PRECAST CONCRETE BASE SLPVC.
4. FORCE MAINS CONNECT DIRECTLY TO A MANHOLE SHALL BE INSTALLED SO THAT THE ELEVATION OF THE PIPE CROWNS MATCH. THE FORCE MAIN SHALL BE DIRECTED DOWNWARD INTO THE FLOW CHANNEL.
5. FOR SANITARY SEWERS ALL PIPES SHALL ENTER MANHOLE THROUGH RUBBER BOOTED CONNECTION.

FRAME & COVER FOR SANITARY SEWER MANHOLES			
		MANUFACTURER OR EQUAL	
TYPE	TYPE OF COVER	EAST JORDAN	NEENAH
MH	SANITARY - SOLID SELF-SEALING	1040.0000	R-1642
MH	SANITARY - SOLID WATERTIGHT	1040-APT	R-1916-F
CO	SOLID	1574A	R-1973-A

STANDARD MANHOLE



REQUIRED WHEN AN INLET PIPE IS 24" OR MORE ABOVE THE OUTLET PIPE IN A MANHOLE

DROP CONNECTION

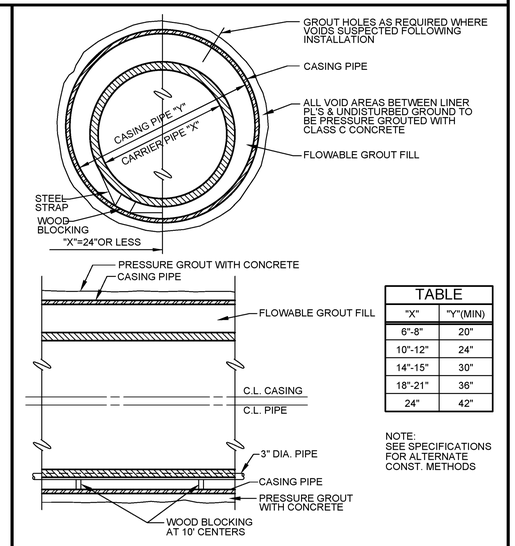
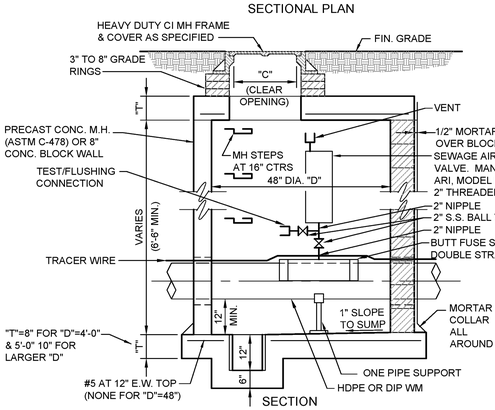


TABLE	
"X"	"Y"(MIN)
6"-8"	20"
10"-12"	24"
14"-15"	30"
18"-21"	36"
24"	42"

NOTE:
SEE SPECIFICATIONS FOR ALTERNATE CONST. METHODS

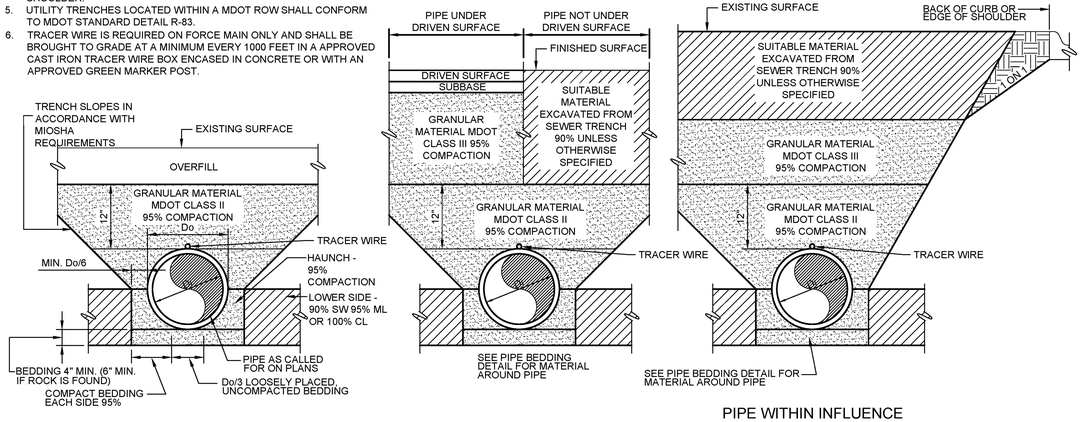
CASING PIPE



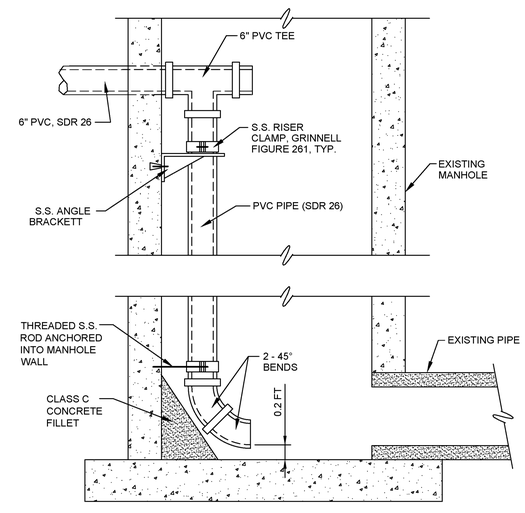
NOTE: ALL PLUMBING MATERIALS TO BE NON-CORROSIVE, ALL FITTINGS SHALL BE STAINLESS STEEL.

AIR RELIEF STRUCTURE

NOTES:
1. COMPACTION PRESENTED AS MINIMUM STANDARD PROCTOR VALUES.
2. MATERIALS AROUND THERMOPLASTIC PIPE WITH DIAMETER < 6 INCHES SHALL PASS 0.5 INCH SIEVE, MATERIALS AROUND OTHER PIPES SHALL PASS 1.5 INCH SIEVE.
3. MATERIALS AROUND HDPE PIPE TO BE MDOT 6A OR 21AA.
4. DRIVEN SURFACE IS DRIVEWAY, PARKING AREA, ROAD BED OR SHOULDER.
5. UTILITY TRENCHES LOCATED WITHIN A MDOT ROW SHALL CONFORM TO MDOT STANDARD DETAIL R-83.
6. TRACER WIRE IS REQUIRED ON FORCE MAIN ONLY AND SHALL BE BROUGHT TO GRADE AT A MINIMUM EVERY 1000 FEET IN A APPROVED CAST IRON TRACER WIRE BOX ENCASED IN CONCRETE OR WITH AN APPROVED GREEN MARKER POST.



TRENCH EXCAVATION & PIPE BEDDING



INTERIOR SEWER LATERAL DROP CONNECTION

MARION HOWELL OCEOLA GENOA
Sewer and Water Authority

STANDARD DETAILS

Scale: NONE
Issued Date JANUARY - 2014

UPDATED: MAY 2015
UPDATED: FEBRUARY 2016
UPDATED: APRIL 2016
UPDATED: OCTOBER 2017
UPDATED: FEBRUARY 2019

Friday, February 8, 2019 9:07:00 AM DRAWING: P:\IER\12719\200-12719-00-000\CAD\SheetFiles\Mhog-std.DWG

site plan study for:

The Legacy Apartment Homes

Genoa Township, Michigan

north

note
preliminary concept plan for inspection purposes only and in no way official or approved for record purposes.

scale: 0' 50' 100' 200' 300'
1" = 100'- 0"

landscape requirements:

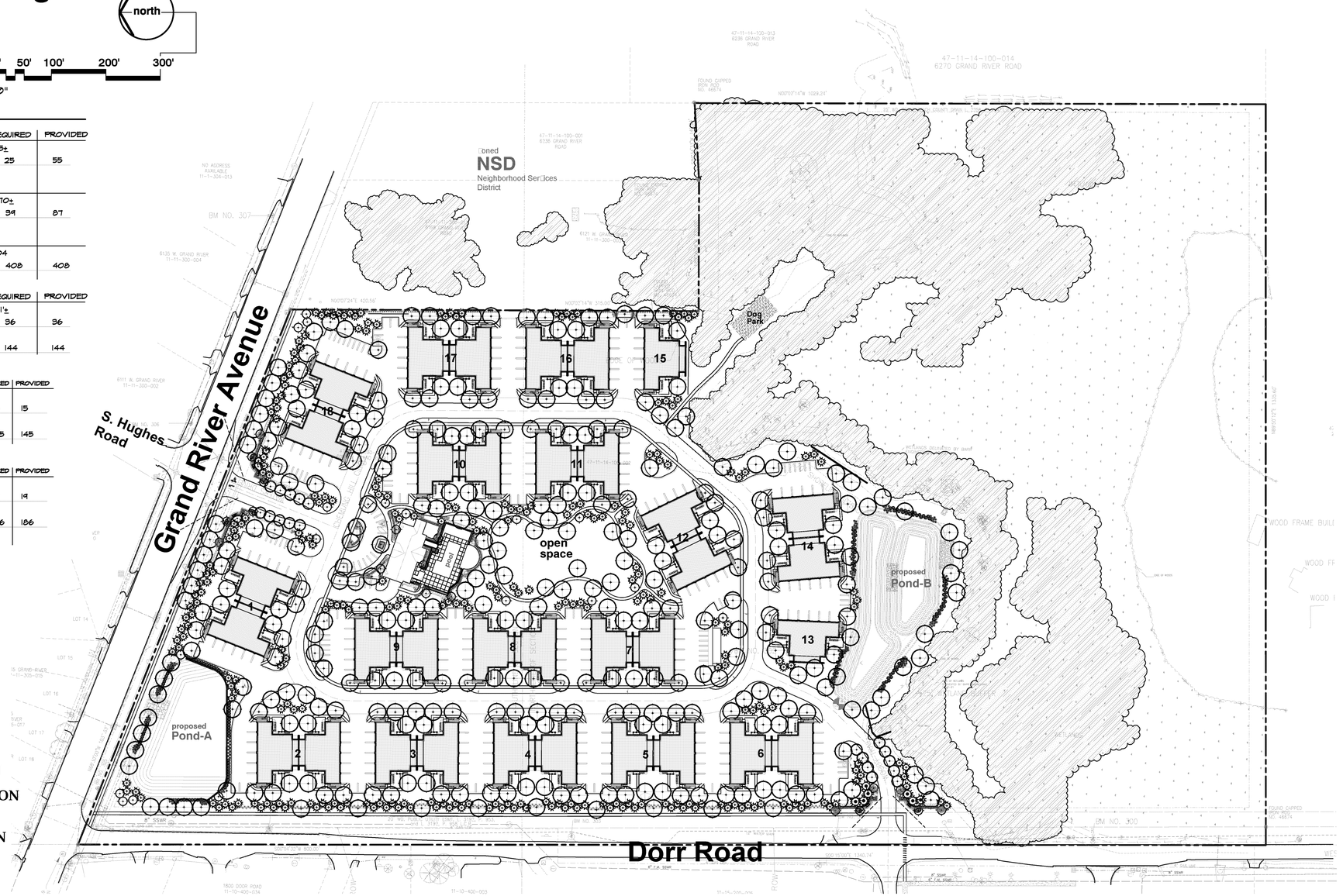
	REQUIRED	PROVIDED
greenbelt (Grand River Avenue)		
TOTAL LIN.FT. OF GREENBELT FRONTAGE	995±	
ONE (1) 2 1/2" CANOPY OR EVERGREEN TREE PER 40 LIN.FT. (995 LIN.FT. / 40 LIN.FT. = 24.8 TREES)	25	55
greenbelt (Dorr Road)		
TOTAL LIN.FT. OF GREENBELT FRONTAGE	1,570±	
ONE (1) 2 1/2" CANOPY OR EVERGREEN TREE PER 40 LIN.FT. (1,570 LIN.FT. / 40 LIN.FT. = 39.25 TREES)	39	87
street trees (interior residential streets)		
TOTAL NO. OF RESIDENTIAL UNITS PROVIDED	204	
TWO (2) 2 1/2" CANOPY TREES PER RESIDENTIAL UNIT (204 UNITS X 2 TREES = 408 TREES)	408	408
landscape screening	REQUIRED	PROVIDED
TOTAL LIN.FT. OF BOUNDARY FRONTAGE	721'±	
ONE (1) 2 1/2" CANOPY OR EVERGREEN TREE PER 20 LIN.FT. (721' LIN.FT. / 20 LIN.FT. = 36.05 TREES)	36	36
OR FOUR (4) SHRUBS PER 20 LIN.FT. (721' LIN.FT. / 20 LIN.FT. = 36.05 X 4-SHRUBS=144.2)	144	144

detention pond-A	REQUIRED	PROVIDED
TOTAL LIN.FT. OF POND PERIMETER	727±	
ONE (1) DECIDUOUS OR EVERGREEN TREE PER 50 LIN.FT. (727 LIN.FT. / 50 LIN.FT. = 14.5 TREES)	15	15
TEN (10) SHRUBS PER 50 LIN.FT. (727 LIN.FT. / 50 LIN.FT. = 14.5 X 10-SHRUBS=145)	145	145

detention pond-B	REQUIRED	PROVIDED
TOTAL LIN.FT. OF POND PERIMETER	932±	
ONE (1) DECIDUOUS OR EVERGREEN TREE PER 50 LIN.FT. (932 LIN.FT. / 50 LIN.FT. = 18.64 TREES)	19	19
TEN (10) SHRUBS PER 50 LIN.FT. (932 LIN.FT. / 50 LIN.FT. = 18.64 X 10-SHRUBS=186.4)	186	186

landscape sheet index

LS-1 OVERALL LANDSCAPE PLAN VIEW
LS-2 GENERAL PLANTING DETAIL PLAN
LS-3 GENERAL PLANTING DETAIL PLAN
LS-4 MATERIAL LIST, PLANT DETAILS & LANDSCAPE NOTE
LS-5 ENTRANCE PLANTING DETAIL PLAN
LS-6 CLUBHOUSE & BUILDING FOUNDATION PLANTING DETAIL PLAN
LS-7 DETENTION PLANTING DETAIL PLAN
LS-8 ENTRY DETAIL PLAN
LS-9 SITE AMENITY PLAN



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seal:
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client:
LAUTREC
31550 Northwestern HWY. Suite 200
Farmington Hills, Michigan 48334

project:
THE LEGACY APARTMENT HOMES

project location:
Genoa Township, Michigan
Grand River Avenue & Dorr Road

sheet title:
CONCEPTUAL LANDSCAPE PLAN

job no./issue/revision date:
LS22.028.11 SPA 11-2-2022
LS23.053.05 SPA 5-1-2023

drawn by:
JP, HP, DK
checked by:
FP
date:
4-15-2023

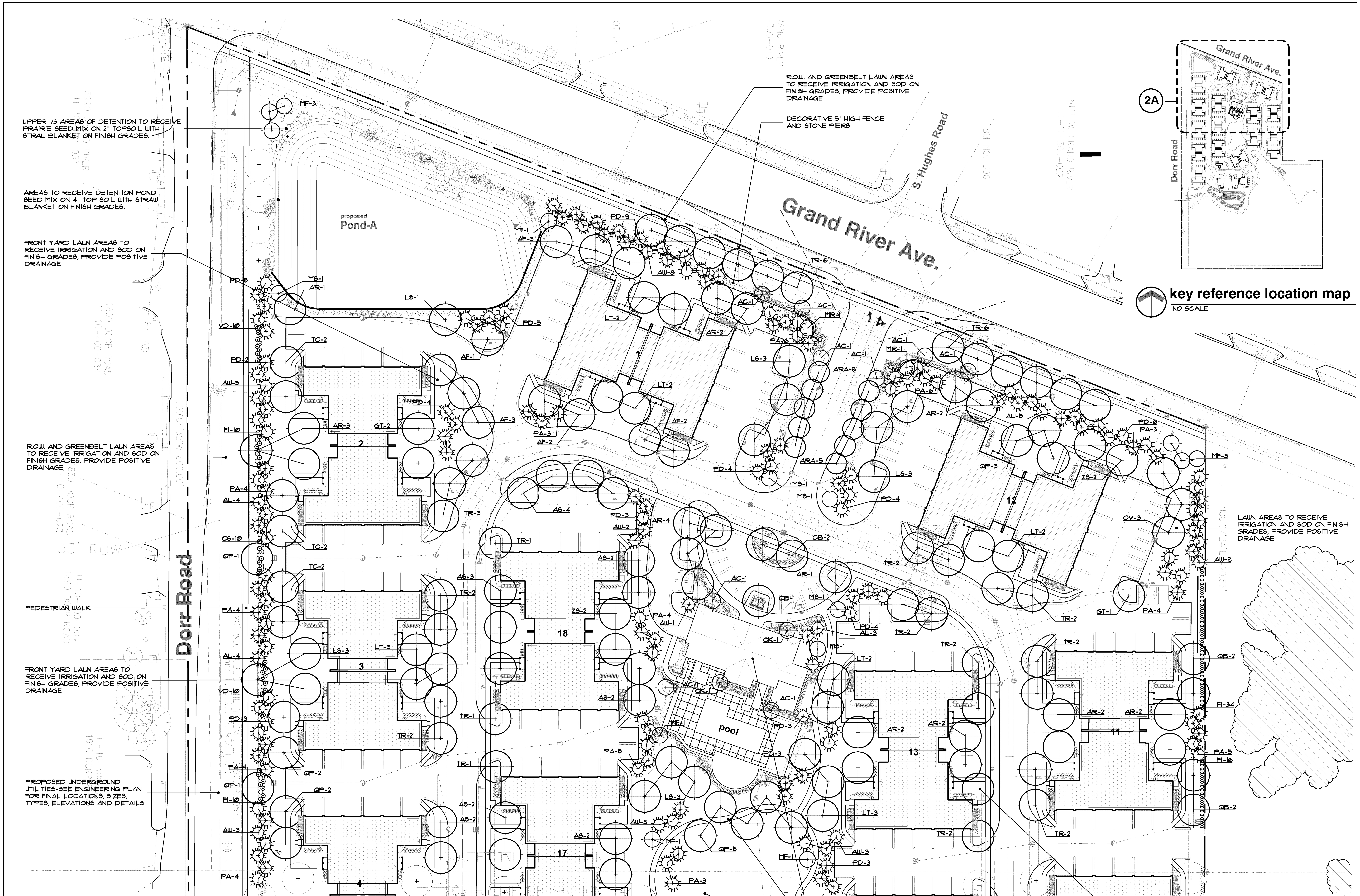
notice:

3 WORKING DAYS BEFORE YOU DIG CALL MISS DIG 1-800-482-7171
for free location of public utility lines

The location and elevations of existing underground utilities as shown on this drawing are only approximate. no guarantee is either expressed or implied as to the completeness of accuracy. contractor shall be exclusively responsible for determining the exact location and elevation prior to the start of construction

project no:
LS23.053.05

sheet no:
LS-1 of 9


UPPER 1/3 AREAS OF DETENTION TO RECEIVE PRAIRIE SEED MIX ON 2" TOPSOIL WITH STRAW BLANKET ON FINISH GRADES.
AREAS TO RECEIVE DETENTION POND SEED MIX ON 4" TOP SOIL WITH STRAW BLANKET ON FINISH GRADES.
FRONT YARD LAWN AREAS TO RECEIVE IRRIGATION AND SOD ON FINISH GRADES, PROVIDE POSITIVE DRAINAGE
R.O.W. AND GREENBELT LAWN AREAS TO RECEIVE IRRIGATION AND SOD ON FINISH GRADES, PROVIDE POSITIVE DRAINAGE
PEDESTRIAN WALK
FRONT YARD LAWN AREAS TO RECEIVE IRRIGATION AND SOD ON FINISH GRADES, PROVIDE POSITIVE DRAINAGE
PROPOSED UNDERGROUND UTILITIES-SEE ENGINEERING PLAN FOR FINAL LOCATIONS, SIZES, TYPES, ELEVATIONS AND DETAILS
R.O.W. AND GREENBELT LAWN AREAS TO RECEIVE IRRIGATION AND SOD ON FINISH GRADES, PROVIDE POSITIVE DRAINAGE
DECORATIVE 5' HIGH FENCE AND STONE PIERS
LAWN AREAS TO RECEIVE IRRIGATION AND SOD ON FINISH GRADES, PROVIDE POSITIVE DRAINAGE
STREET TREES TO BE LOCATED BETWEEN WALK AND BUILDING. NO TREES TO BE INSTALLED OVER ANY EXISTING OR PROPOSED IN GROUND UTILITIES. SEE ENGINEERING PLANS FOR LOCATION
Community Facility Building
MEANDERING PEDESTRIAN WALK
OPEN SPACE LAWN AREAS TO RECEIVE SEEDING ON FINISH GRADES. PROVIDE POSITIVE DRAINAGE
proposed
Pond-A
Grand River Ave.
S. Hughes Road
Dorr Road
pool
2A
key reference location map
NO SCALE

2A general landscape planting detail
SCALE: 1" =40' - 0"

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THE LEGACY APARTMENT HOMES

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GENERAL LANDSCAPE PLANTING DETAIL

job no./issue/revision date:
LS22.028.11 SPA 11-2-2022
LS23.053.05 SPA 5-1-2023

drawn by: JP, HP, DK
checked by: FP
date: 4-15-2023

project no:
LS23.053.05

sheet no:
LSC-2 of 9

PROPOSED ADJACENT LANDSCAPE PLANTINGS. SEE SHT. LS-2 FOR DETAILS

PEDESTRIAN WALK

LAWN AREAS TO RECEIVE IRRIGATION AND SOD ON FINISH GRADES, PROVIDE POSITIVE DRAINAGE

FRONT YARD LAWN AREAS TO RECEIVE IRRIGATION AND SOD ON FINISH GRADES, PROVIDE POSITIVE DRAINAGE

PROPOSED UNDERGROUND UTILITIES-SEE ENGINEERING PLAN FOR FINAL LOCATIONS, SIZES, TYPES, ELEVATIONS AND DETAILS

DECORATIVE 5' HIGH FENCE AND STONE PIERS

PROPOSED ENTRANCE MONUMENT AND SIGN LOCATION. SEE SHEET LS-4 FOR DETAILS

25' WETLAND SETBACK LINE

LIMITS OF WETLAND LINE

LAWN AREAS TO RECEIVE IRRIGATION AND SOD ON FINISH GRADES, PROVIDE POSITIVE DRAINAGE

STREET TREES TO BE LOCATED BETWEEN WALK AND BUILDING. NO TREES TO BE INSTALLED OVER ANY EXISTING OR PROPOSED IN GROUND UTILITIES. SEE ENGINEERING PLANS FOR LOCATION

HATCHING DENOTES EXISTING WOODS AND VEGETATION TO REMAIN

PROPOSED MAILBOX KIOSK LOCATION- SEE SHEET LSC FOR DETAILS

DISTURBED AREAS TO RECIEVE LAWN SEEDING ON FINISH GRADES

25' WETLAND SETBACK LINE

SEE SHT. LS-7 FOR DETENTION POND PLANTINGS

LIMITS OF WETLAND LINE

AREAS TO RECEIVE DETENTION POND SEED MIX ON 4" TOP SOIL WITH STRAW BLANKET ON FINISH GRADES.

UPPER 1/3 AREAS OF DETENTION TO RECEIVE PRAIRIE SEED MIX WITH STRAW ON FINISH GRADES.

landscape legend

deciduous trees
(Maples, Hackberry, Zelkova , Oaks, Lindens, Locust, etc...)

ornamental trees
(Redbud, Crabs, Hawthorn, Serviceberry, Dogwood, etc...)

evergreen trees
(Pines, Spruces, Fir)

deciduous shrubs
(Viburnum, Forsythia, Hydrangea, Hollies, Dogwood, etc.)

evergreen shrubs
(Junipers, Yews, Arborvitae, Boxwood, etc.)

perennials and/or seasonal flowers
(Daylily, Sedum, Ornamental Grasses, Black Eyed Susan, Coneflowers, etc..)

3A **general landscape planting detail**
SCALE: 1" =40' - 0"

key reference location map
NO SCALE

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project no:
LS23.053.05

sheet no:
LSC-3 of 9

general landscape notes:

1. LANDSCAPE CONTRACTOR SHALL VISIT THE SITE, INSPECT EXISITING CONDITIONS, REVIEW PROPOSED PLANTINGS AND RELATED WORK. CONTACT THE OWNER AND/OR LANDSCAPE ARCHITECT WITH ANY CONCERNS OR DISCREPANCY BETWEEN THE PLAN, PLANT MATERIAL LIST, AND/OR SITE CONDITIONS.

2. PRIOR TO BEGINING OF CONSTRUCTION ON ANY WORK, CONTRACTORS SHALL VERIFY LOCATIONS OF ALL ON SITE UTILITIES, GAS, ELECTRIC, TELEPHONE, CABLE TO BE LOCATED BY CONTACTING MISS DIG 1-800-482-7171. ANY DAMAGE OR INTERRUPTION OF SERVICES SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR. COORDINATE ALL RELATED WORK ACTIVITIES WITH OTHER TRADES AND REPORT ANY UNACCEPTABLE JOB CONDITIONS TO OWNER PRIOR TO COMMENCING

3. NUMERICAL VALUE ON THE LANDSCAPE QUANTITIES SPECIFIED ON THE PLAN TAKE PRECEEDENCE OVER GRAPHIC REPRESENTATION. VERIFY ANY CONCERN-DISCREPANCY WITH LANDSCAPE ARCHITECT.

4. ALL CONSTRUCTION AND PLANT MATERIAL LOCATION TO BE ADJUSTED ON SITE IF NECESSARY

5. ALL SUBSTITUTIONS OR DEVIATIONS FROM THE LANDSCAPE PLAN MUST BE APPROVED BY GENOA TOWNSHIP AND LANDSCAPE ARCHITECT

6. ALL LARGE TREES AND EVERGREENS TO BE STAKED, GUYED AND WRAPPED AS DETAIL SHOWN ON PLAN.

7. PLANT BEDS TO BE DRESSED WITH MIN. 4" OF FINELY DOUBLE SHREDDED HARDBARK MULCH.

8. DIG SHRUB PITS 1' LARGER THAN SHRUB ROOT BALLS AND TREE PITS 2' LARGER THAN ROOT BALL. BACK FILL WITH ONE PART TOP SOIL AND ONE PART SOIL FROM EXCAVATED PLANTING HOLE.

9. NATURAL COLOR, FINELY SHREDDED HARDWOOD BARK MULCH REQUIRED FOR ALL PLANTINGS.

10. REMOVE ALL TWINE, WIRE AND BURLAP FROM TREE AND SHRUB EARTH BALLS, AND FROM TREE TRUNKS. 4" THICK BARK MULCH FOR TREES IN 4' DIA. CIRCLE WITH 3" PULLED AWAY FROM TRUNK . 4" THICK BARK MULCH FOR SHRUBS AND 4" THICK BARK MULCH FOR PERENNIALS.

11. PLANT MATERIAL QUALITY & INSTALLATION SHALL BE IN ACCORDANCE WITH THE CURRENT AMERICAN ASSOCIATION OF NURSERYMEN LANDSCAPE STANDARDS.

12. PROVIDE PEAT SOD FOR ALL NEW AND DISTURBED LAWN AREAS UNLESS NOTED OTHERWISE.

13. ALL PLANTING AREAS TO BE PREPARED WITH APPROPRIATE SOIL MIXTURES AND FERTILIZER BEFORE PLANT INSTALLATION.

14. PLANT TREES AND SHRUBS GENERALLY NO CLOSER THEN THE FOLLOWING DISTANCES FROM SIDEWALKS, CURBS AND PARKING STALLS:
   a.). SHADE TREES_____5 FT.
   b.). ORNAMENTAL AND EVERGREEN TREES (CRAB, PINE, SPRUCE, ETC.)_____10 FT.
   c.). SHRUBS THAT ARE LESS THAN 1 FOOT TALL AND WIDE AT MATURITY_____2 FT.

15. NO TREES OR EVERGREENS TO BE INSTALLED OVER ANY PROPOSED OR EXISTING UTILITY LINES AS SHOWN ON THE OVERALL LANDSCAPE PLAN. SEE ENGINEERING PLANS FOR LOCATION AND DETAILS.

16. ALL LAWN AREAS AND LANDSCAPE BEDS TO BE FULLY IRRIGATED WITH A AUTOMATIC UNDERGROUND SYSTEMS. IRRIGATION SYSTEM TO HAVE SEPARTE ZONES FOR LAWN AREAS, PARKING ISLANDS, AND SHRUB BEDS WITH DIFFERENT CONTROL MOISTURE LEVEL ADJUSTMENT PER ZONE AS REQUIRED

17. UNLESS NOTED OTHERWISE, LANDSCAPE BEDS ADJACENT TO LAWN TO RECIEVE EDGING. EDGING SHALL BE 4" X 1/8" METAL (FINISH BLACK OR GREEN) OR APPROVED EQUAL AND TO BE INSTALLED WITH HORIZONTAL METAL STAKES AT 32" O.C. OR PER MANUFACTERER'S SPECIFICATION.

18. ALL NEW PARKING ISLANDS AND LANDSCAPE BEDS ADJACENT AND NEXT TO BUILDING SHALL BE EXCAVATED OF ALL BUILDING MATERIALS AND POOR SOILS A MIN. OF 16"-18" DEPTH. BACK FILL WITH GOOD, MEDIUM TEXTURED PLANTING SOILS. ADD A MIN. 4" OF TOPSOIL OVERFILL TO FINISH GRADE. PROVIDE POSITIVE DRAINAGE.

19. WATERING OF ALL PLANTS AND TREES TO BE PROVIDED IMMEDIATELY AND MULCHING WITHIN 24 HOURS AFTER INSTALLATION.

20. ALL TREE PITS TO BE TESTED FOR PROPER DRAINAGE PRIOR TO TREE PLANTING. PROVIDE APPROPERATES DRAINAGE SYSTEM AS REQUIRED IF THE TREE PIT DOES NOT DRAIN SUFFICIENTLY.

21. THE LANDSCAPE CONTRACTOR SHALL GUARANTEE ALL LANDSCAPE PLANT MATERIALS AND IRRIGATION INSTALLATION FOR A PERIOD OF TWO YEAR BEGINNING AFTER THE COMPLETION OF LANDSCAPE INSTALLTION DATE APPROVED BY THE CITY OR LANDSCAPE ARCHITECT. THE CONTRACTOR SHALL REPLACE DURING AND AT THE END OF THE GUARANTEE PERIOD, ANY DEAD OR UNACCEPTABLE PLANTS, AS DETERMINED BY THE TOWNSHIP OR LANDSCAPE ARCHITECT, WITHOUT COST TO THE OWNER.

planting landscape notes:

GENERAL NOTES:

1. PLANT MATERIALS TO BE INSTALLED ACCORDING TO THE GENOA TOWNSHIP AND CURRENT AMERICAN ASSOCIATION OF NURSERYMEN'S STANDARDS.

2. PLANT MATERIALS TO BE GUARANTEED FOR 2 YEARS. REPLACE FALLING MATERIAL WITHIN 1 YEAR, OR THE NEXT APPROPRIATE PLANTING PERIOD.

3. PLANT MATERIALS TO BE OF PREMIUM QUALITY, NO. 1 GRADE NORTHERN NURSURY GROWN, IN HEALTHY CONDITION, FREE OF PESTS AND DISEASES.

4. MULCH IS TO BE NATURAL COLORED, FINELY SHREDDED HARDWOOD BARK OF 4" THICK BARK MULCH FOR TREES IN 4' DIA. CIRCLE W/3" PULLED AWAY FROM TRUNK, 3" THICK BARK MULCH FOR SHRUBS AND 2" THICK BARK MULCH FOR PERRENIALS.

5. CALL MISS DIG AT 1-800-482-7171 PRIOR TO ANY CONSTRUCTION.

DECIDUOUS & EVERGREEN TREE:

1. TREE SHALL BE INSTALLED SAME RELATIONSHIP TO FINISH GRADE AS IT BORE ORIGINALLY OR SLIGHTLY HIGHER THAN FINISH GRADE UP TO 6" ABOVE GRADE, IF DIRECTED BY LANDSCAPE ARCHITECT FOR HEAVY CLAY SOIL AREAS.
2. DO NOT PRUNE TERMINAL LEADER. PRUNE ONLY DEAD OR BROKEN BRANCHES.
3. REMOVE ALL TAGS, STRING, PLASTICS ETC..
4. GUY TREES ABOVE 3' CAL.. STAKE DECIDUOUS TREES BELOW 3" CAL.

SHRUB:

1. SHRUB SHALL BE INSTALLED SAME RELATIONSHIP TO FINISH GRADE AS IT BORE ORIGINALLY OR SLIGHTLY HIGHER THAN FINISH GRADE UP TO 4" ABOVE GRADE, IF DIRECTED BY LANDSCAPE ARCHITECT FOR HEAVY CLAY SOIL AREAS.
2. DO NOT PRUNE TERMINAL LEADER. PRUNE ONLY DEAD OR BROKEN BRANCHES.
3. REMOVE ALL TAGS, STRING, PLASTICS ETC..

landscape maintenance notes:

LANDSCAPE MAINTENANCE PROCEDURES AND FREQUENCIES TO BE FOLLOWED SHALL BE SPECIFIED ON THE LANDSCAPE PLAN, ALONG WITH THE MANNER IN WHICH THE EFFECTIVENESS, HEALTH AND INTENDED FUNCTIONS OF THE VARIOUS LANDSCAPE AREAS ON THE SITE WILL BE ENSURED.

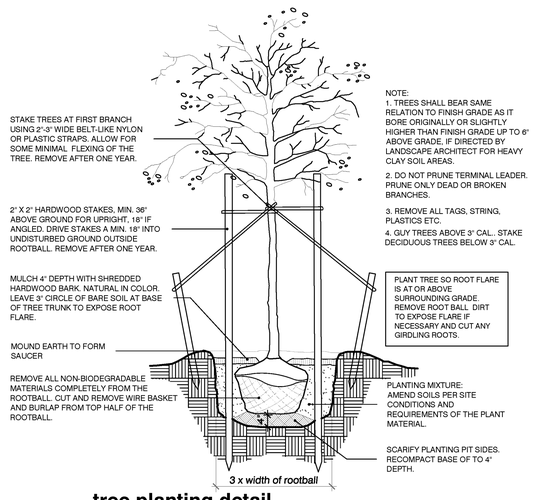
1. LANDSCAPING SHALL BE KEPT IN A NEAT, ORDERLY AND HEALTHY GROWING CONDITION, FREE FROM DEBRIS AND REFUSE.

2. PRUNING SHALL BE MINIMAL AT THE TIME OF INSTALLATION, ONLY TO REMOVE DEAD OR DISEASED BRANCHES. SUBSEQUENT PRUNING SHALL ASSURE PROPER MATURATION OF PLANTS TO ACHIEVE THEIR APPROVED PURPOSE.

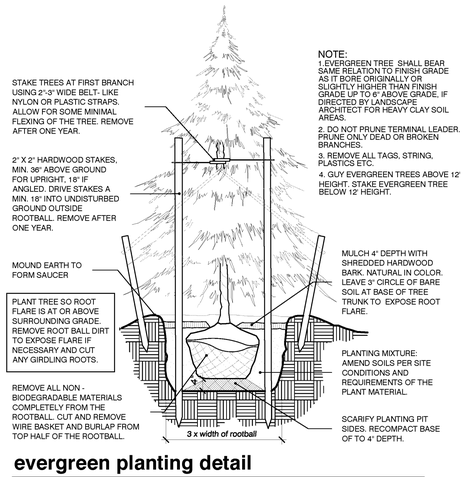
3. ALL DEAD OR DISEASED PLANT MATERIAL SHALL BE REMOVED AND REPLACED WITHIN SIX (6) MONTHS AFTER IT DIES OR IN THE NEXT PLANTING SEASON, WHICHEVER OCCURS FIRST. THE PLANTING SEASON FOR DECIDUOUS PLANTS SHALL BE BETWEEN MARCH 15 AND NOVEMBER 15 OR UNTIL THE PREPARED SOIL BECOMES FROZEN. THE PLANTING SEASON FOR EVERGREEN PLANTS SHALL BE BETWEEN MARCH 1 AND JUNE 1. PLANT MATERIAL INSTALLED TO REPLACE DEAD OR DISEASED MATERIAL SHALL BE AS CLOSE AS PRACTICAL TO THE SIZE OF THE MATERIAL IT IS INTENDED TO REPLACE.

plant material list

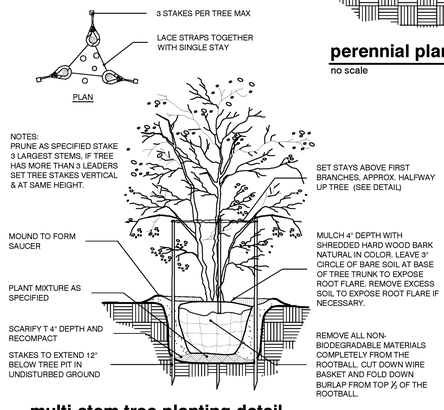
key	quant. 2A	quant. 3A	botanical name	common name	size	comments
			DECIDUOUS TREES			
LT	10	15	LIRIODENDRON TULIPIFERA	TULIPTREE	2 1/2" BB	
GT	3	19	GLEDITSIA TRI. INERMIS 'SKYCOLE'	SKYLINE LOCUST	2 1/2" BB	
TR	36	4	TILIA AMERICANA 'REDMOND'	REDMOND LINDEN	2 1/2" BB	
CO	-	13	CELTIS OCCIDENTALIS	NORTHERN HACKBERRY	2 1/2" BB	
TC	6	5	TILIA CORDATA 'GREENSPIRE'	GREENSPIRE LINDEN	2 1/2" BB	
AF	11	14	ACER X. FREEMANII'	AUTUMN BLAZE RED MAPLE	2 1/2" BB	
AR	21	10	ACER RUBRUM	RED MAPLE	2 1/2" BB	
ARA	10	9	ACER RUBRUM 'ARMSTRONG'	ARMSTRONG RED MAPLE	2 1/2" BB	
LS	16	19	LIQUIDAMBAR STYRACIFLUA	AMERICAN SWEETGUM	2 1/2" BB	
OV	3	3	QUERCUS RUBRA	RED OAK	2 1/2" BB	
QP	14	8	QUERCUS PALUSTRIS	PIN OAK	2 1/2" BB	
AS	17	9	ACER SACCHARUM	SUGAR MAPLE	2 1/2" BB	
QB	4	12	QUERCUS 'BICOLOR'	SWAMP WHITE OAK	2 1/2" BB	
ZS	4	12	ZELKOVA SERATA 'GREENVASE'	GREENVASE ZELKOVA	2 1/2" BB	
CB	3	2	CARPINUS BETULUS 'FASTIGIATA'	COLUMNAR EUROPEAN HORNBEAM	2 1/2" BB	
MF	10	2	MALUS FLORIBUNDA	JAPANESE FLOWERING CRABAPPLE	2" BB	
AC	9	4	AMECHANCIER CANADENSIS	AUTUMN BRILLIANCE SERVICEBERRY	8' BB	
CK	2	1	CORNUS KOUSA	KOUSA DOGWOOD	2" BB	
MS	5	-	MALUS SNOWDRIFT	SNOWDRIFT CRABAPPLE	2" BB	
MR	2	3	MALUS RED VELVET	RED VELVET CRABAPPLE	2" BB	
			EVERGREEN TREES			
AW	30	42	ABIES CONCOLOR	CONCOLOR WHITE FIR	8' BB	
PD	60	29	PICEA PUNGENS	COLORADO SPRUCE	6' BB	
PA	54	35	PICEA GLAUCA	WHITE SPRUCE	6' BB	
PAL	-	7	PICEA GLAUCA	WHITE SPRUCE	10' BB	
			SHRUBS			
FI	20	20	FORSYTHIA INTERMEDIA	BORDER FORSYTHIA	#5 CONT.	60" O.C. SPACING
CS	10	20	CORNUS STOLONIFERA	REDTWIG DOGWOOD	#5 CONT.	60" O.C. SPACING
VD	20	20	VIBURNUM D. 'BYNNE8TVEDT'	CHICAGO LUSTRE VIBURNUM	#5 CONT.	60" O.C. SPACING



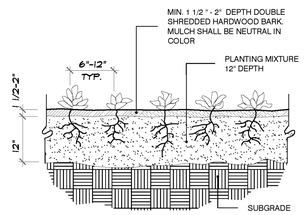
tree planting detail
no scale



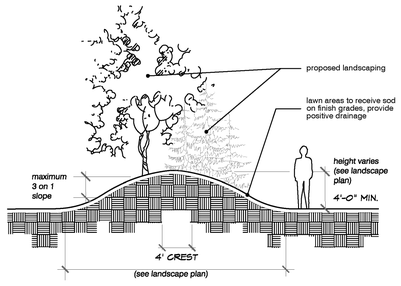
evergreen planting detail
no scale



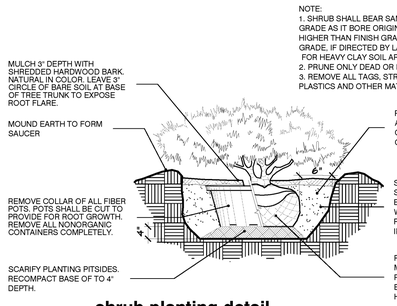
multi-stem tree planting detail
no scale



perennial planting detail
no scale



berm planting detail
no scale



shrub planting detail
no scale

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31550 Northwestern HWY. Suite 200
Farmington Hills, Michigan 48334

project:
THE LEGACY APARTMENT HOMES

project location:
Genoa Township, Michigan
Grand River Avenue & Dorr Road

sheet title:
LANDSCAPE MATERIAL LIST, PLANT DETAILS & NOTES

job no./issue/revision date:
LS22.028.11 SPA 11-2-2022
LS23.053.05 SPA 5-1-2023

drawn by:
JP, HP, DK

checked by:
FP

date:
4-15-2023

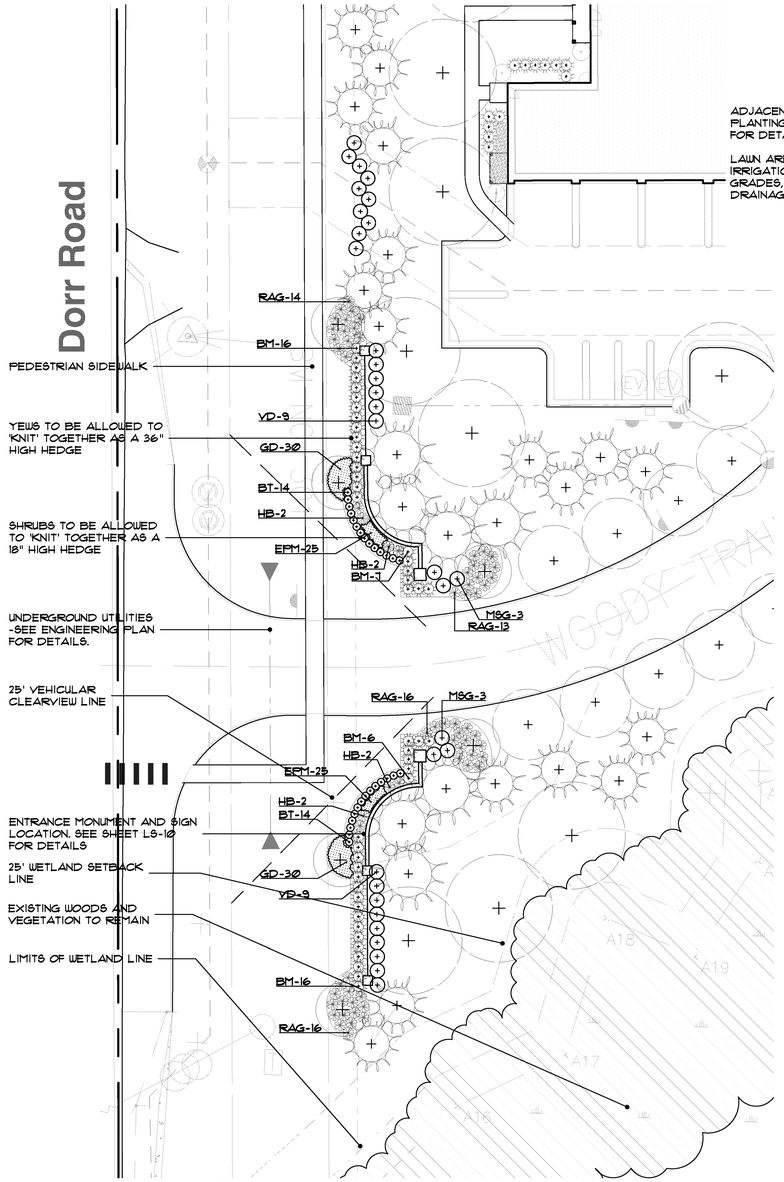
notice:

3 WORKING DAYS BEFORE YOU DIG CALL MISS DIG 1-800-482-7171 (or free location of public utility lines)

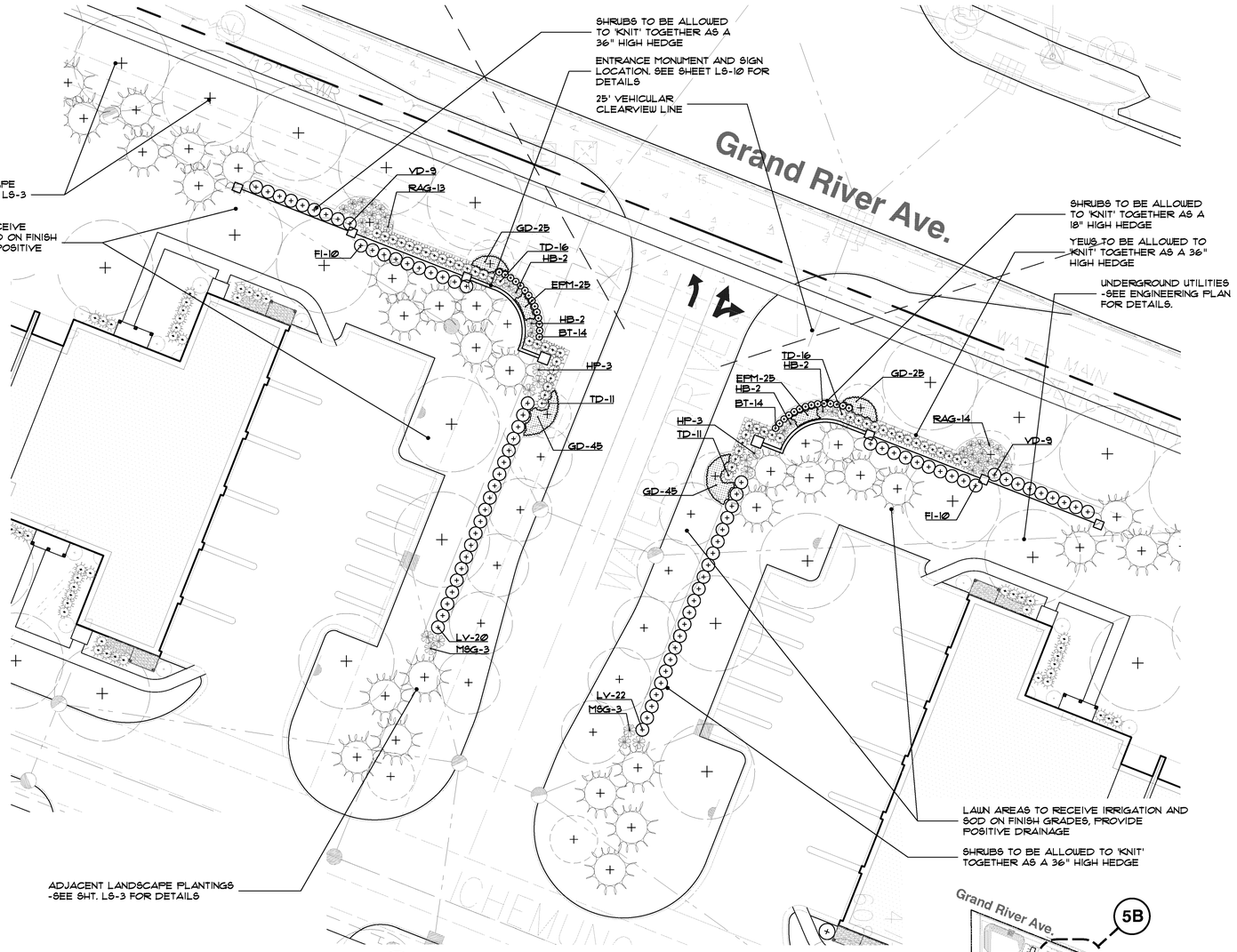
The location and elevations of existing underground utilities as shown on this drawing are only approximate. no guarantee is either expressed or implied as to the completeness of accuracy. contractor shall be exclusively responsible for determining the exact location and elevation prior to the start of construction

project no:
LS23.053.05

sheet no:
LS-4 of 9



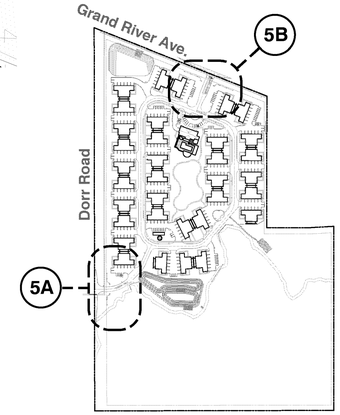
5A landscape planting detail
SCALE: 1" =40' - 0"



5B landscape planting detail
SCALE: 1" =40' - 0"

plant material list

key	quant. 5A	quant. 5B	botanical name	common name	size	comments
			SHRUBS			
TD	-	54	TAXUS X.M. DENSIFORMIS	JAPANESE DENSE YEW	#3 CONT.	36" O.C. SPACING
BM	45	-	BUXUS 'GREEN MOUNTAIN'	GREEN MOUNTAIN BOXWOOD	30" CONT	36" O.C. SPACING
VD	18	18	VIBURNUM DENSATA 'SYNNESTVEDT'	CHICAGO LUSTRE VIBURNUM	#3 CONT.	60" O.C. SPACING
LV	-	42	LIGUSTRUM X. 'VICARYI'	VICARY PRIVET	#5 CONT.	60" O.C. SPACING
RAG	51	27	RHUS AROMATICA 'GRO-LOW'	GRO-LOW FRAGRANT SUMAC	#5 CONT	42" O.C. SPACING
FI	-	20	FORSYTHIA INTERMEDIA	BORDER FORSYTHIA	#5 CONT	60" O.C. SPACING
BT	28	28	BERBERIS THUNBERGII 'CRIMSON PYGMY'	CRIMSON PYGMY BARBERRY	#3 CONT.	24" O.C. SPACING
HP	-	6	HYDRANGEA P. 'BULK'	QUICK FIRE HYDRANGEA	#5 CONT.	36" O.C. SPACING
HB	8	8	HYDRANGEA P. 'IILVOBO'	BOBO HYDRANGEA	#5 CONT	36" O.C. SPACING
			PERENNIALS AND GRASSES			
M8G	6	6	MISCANTHUS SINENSIS 'GRACILLIMUS'	JAPANESE SILVER MAIDEN GRASS	#3 CONT.	36" O.C. SPACING
EPM	50	50	ECHINACEA 'PIXIE MEADOWBRITE'	'PIXIE MEADOWBRITE' PURPLE CONEFLOWERS	#1 CONT.	12" O.C. SPACING
GD	60	140	GERANIUM 'DILY'S'	DILY'S HARDY GERANIUM	#1 CONT.	16" O.C. SPACING



key reference location map
NO SCALE

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31550 Northwestern HWY. Suite 200
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project:
THE LEGACY APARTMENT HOMES

project location:
Genoa Township, Michigan
Grand River Avenue & Dorr Road

sheet title:
ENTRANCE LANDSCAPE PLANTING DETAIL

job no./issue/revision date:
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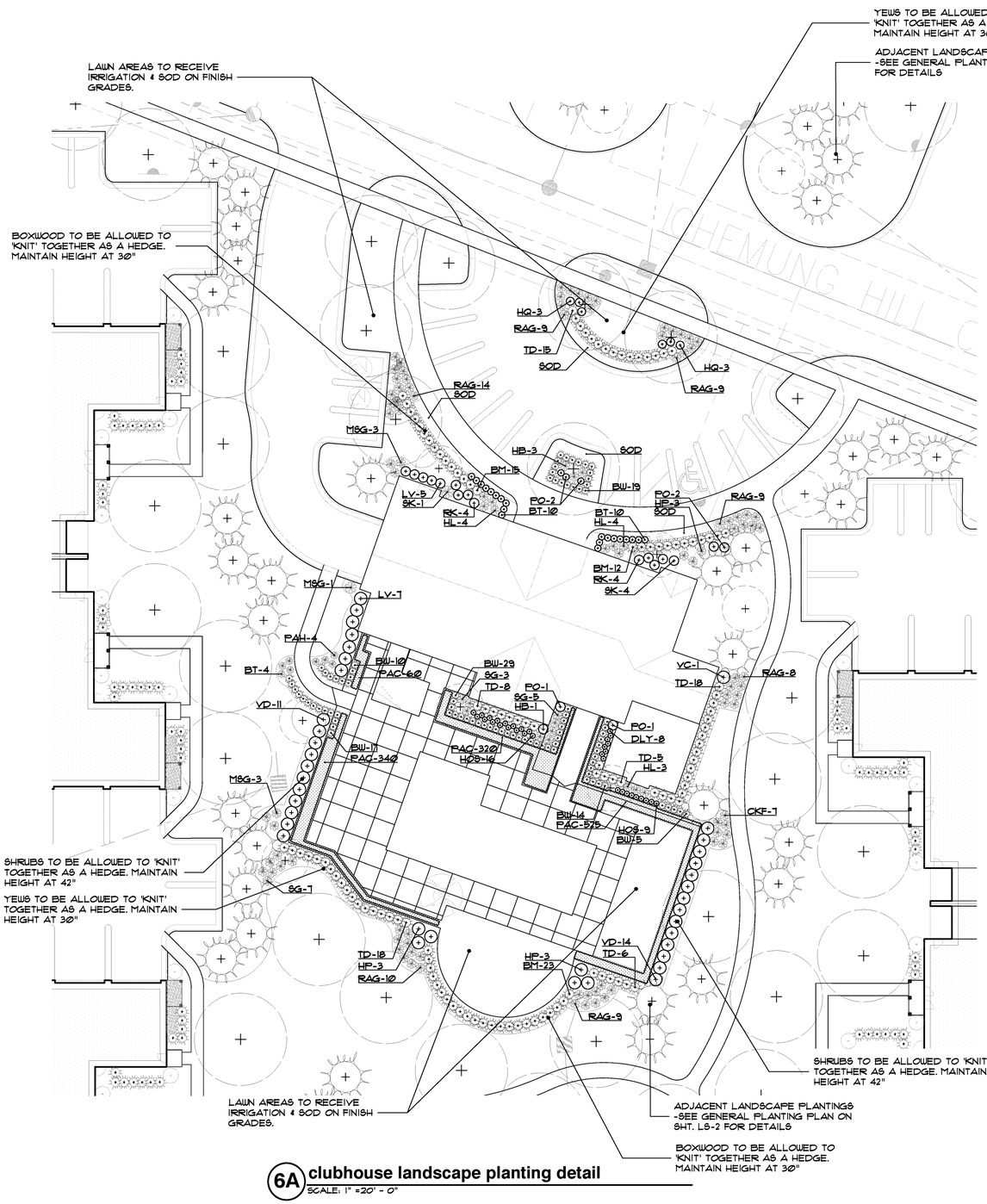
JP, HP, DK
checked by:
FP
date:
4-15-2023
notice:

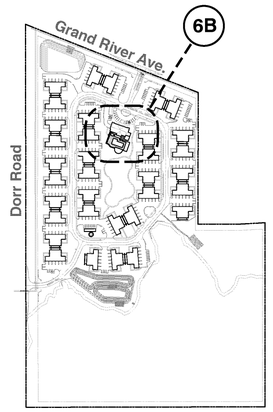
project no:
LS23.053.05

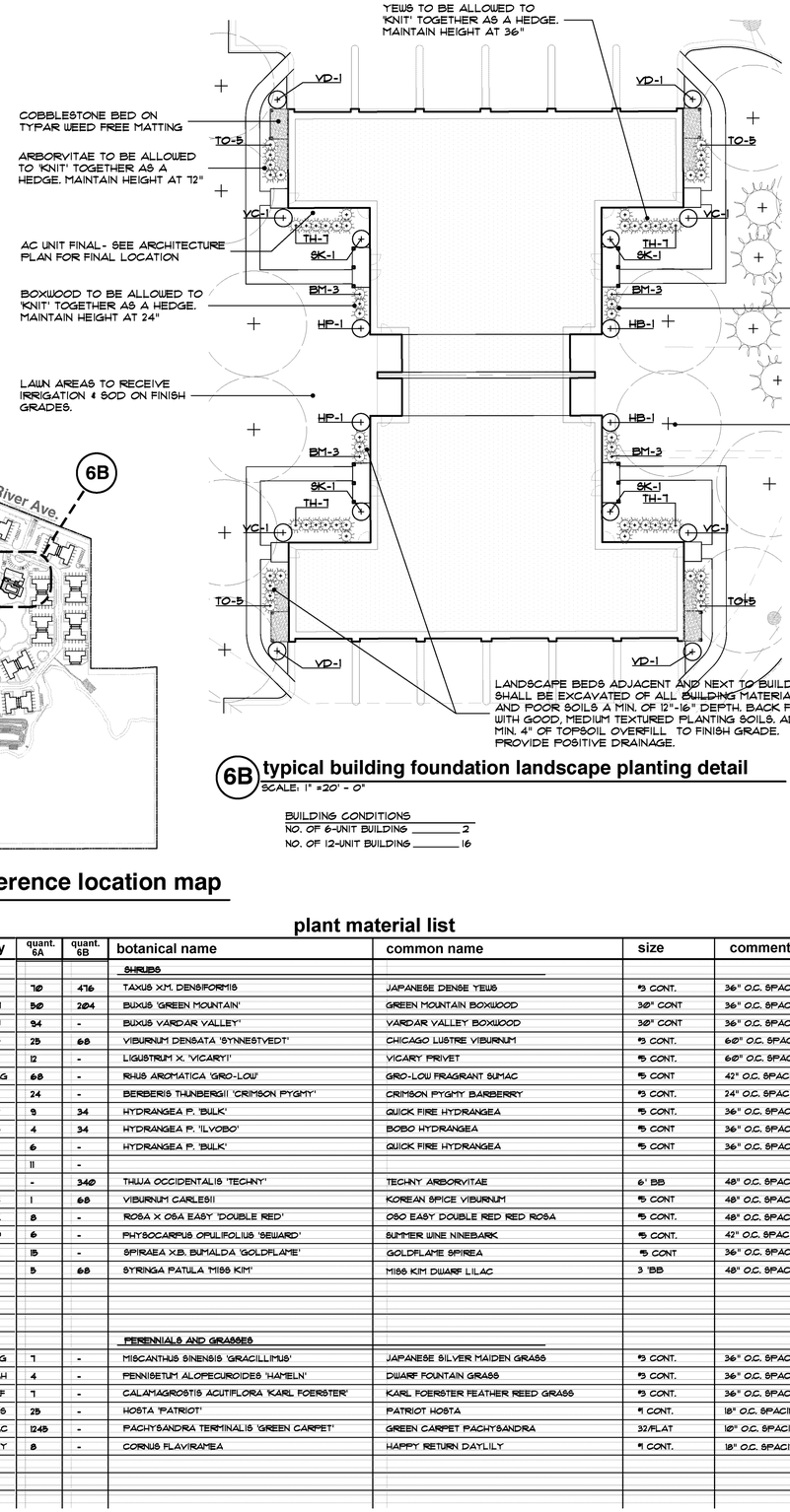
sheet no:
LS-5 of 9



6A clubhouse landscape planting detail

SCALE: 1" =20' - 0"





6B typical building foundation landscape planting detail

SCALE: 1" =20' - 0"

BUILDING CONDITIONS
NO. OF 6-UNIT BUILDING _____ 2
NO. OF 12-UNIT BUILDING _____ 16

key reference location map

NO SCALE

plant material list

key	quant. 6A	quant. 6B	botanical name	common name	size	comments
			SHRUBS			
TD	70	476	TAXUS X.M. DENSIFORMIS	JAPANESE DENSE YEWS	#3 CONT.	36" O.C. SPACING
BM	50	204	BUXUS 'GREEN MOUNTAIN'	GREEN MOUNTAIN BOXWOOD	30" CONT	36" O.C. SPACING
BW	34	-	BUXUS 'VARDAR VALLEY'	VARDAR VALLEY BOXWOOD	30" CONT	36" O.C. SPACING
VD	25	68	VIBURNUM DENSATA 'SYNNESTVEDT'	CHICAGO LUSTRE VIBURNUM	#3 CONT.	60" O.C. SPACING
LV	12	-	LIGUSTRUM X. 'VICARYI'	VICARY PRIVET	#5 CONT.	60" O.C. SPACING
RAG	68	-	RHUS AROMATICA 'GRO-LOW'	GRO-LOW FRAGRANT SUMAC	#5 CONT	42" O.C. SPACING
BT	24	-	BERBERIS THUNBERGII 'CRIMSON PYGMY'	CRIMSON PYGMY BARBERRY	#3 CONT.	24" O.C. SPACING
HP	9	34	HYDRANGEA P. 'BULK'	QUICK FIRE HYDRANGEA	#5 CONT.	36" O.C. SPACING
HB	4	34	HYDRANGEA P. 'ILVOBO'	BOBO HYDRANGEA	#5 CONT	36" O.C. SPACING
HQ	6	-	HYDRANGEA P. 'BULK'	QUICK FIRE HYDRANGEA	#5 CONT	36" O.C. SPACING
HL	11	-				
TO	-	340	THUJA OCCIDENTALIS 'TECHNY'	TECHNY ARBORVITAE	6' B&B	48" O.C. SPACING
VC	1	68	VIBURNUM CARLESII	KOREAN SPICE VIBURNUM	#5 CONT	48" O.C. SPACING
RK	8	-	ROSA X OSA EASY 'DOUBLE RED'	OSO EASY DOUBLE RED RED ROSA	#5 CONT.	48" O.C. SPACING
PO	6	-	PHYSOCARPUS OPULIFOLIUS 'SEWARD'	SUMMER WINE NINEBARK	#5 CONT.	42" O.C. SPACING
SG	15	-	SPIRAEA X.B. BUMALDA 'GOLDFLAME'	GOLDFLAME SPIREA	#5 CONT	36" O.C. SPACING
9K	5	68	SYRINGA PATULA 'MISS KIM'	MISS KIM DWARF LILAC	3 'BB	48" O.C. SPACING
			PERENNIALS AND GRASSES			
MSG	7	-	MISCANTHUS SINENSIS 'GRACILLIMUS'	JAPANESE SILVER MAIDEN GRASS	#3 CONT.	36" O.C. SPACING
PAH	4	-	PENNISETUM ALOPECUROIDES 'HAMELN'	DWARF FOUNTAIN GRASS	#3 CONT.	36" O.C. SPACING
CKF	7	-	CALAMAGROSTIS ACUTIFLORA 'KARL FOERSTER'	KARL FOERSTER FEATHER REED GRASS	#3 CONT.	36" O.C. SPACING
HOS	25	-	HOSTA 'PATRIOT'	PATRIOT HOSTA	#1 CONT.	18" O.C. SPACING
PAC	1245	-	PACHYSANDRA TERMINALIS 'GREEN CARPET'	GREEN CARPET PACHYSANDRA	32/FLAT	10" O.C. SPACING
DLY	8	-	CORNUS FLAVIRAMEA	HAPPY RETURN DAYLILY	#1 CONT.	18" O.C. SPACING

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seal:

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client:
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Farmington Hills, Michigan 48334

project:
THE LEGACY APARTMENT HOMES

project location:
Genoa Township, Michigan
Grand River Avenue & Dorr Road

sheet title:
CLUBHOUSE & BUILDING FOUNDATION LANDSCAPE PLANTING PLAN

job no./issue/revision date:
LS22.028.11 SPA 11-2-2022
LS23.053.05 SPA 5-1-2023

drawn by: JP, HP, DK
checked by: FP
date: 4-15-2023

notice:

3 WORKING DAYS BEFORE YOU DIG CALL MISS DIG 1-800-482-7171
For the Protection of Buried Utility Lines

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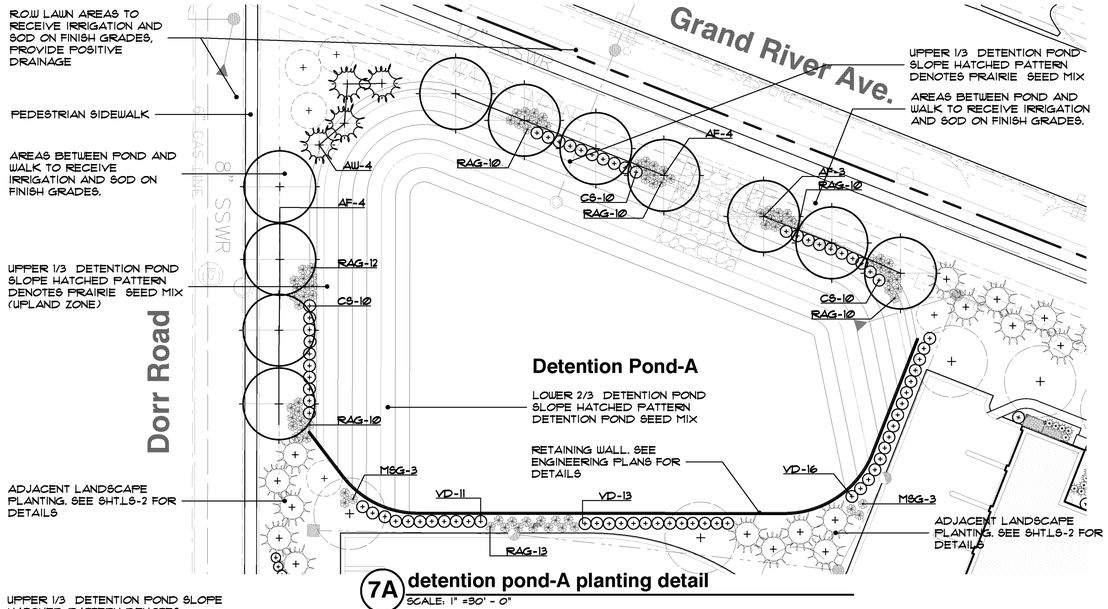
project no: LS23.053.05

sheet no: **LS-6** of 9

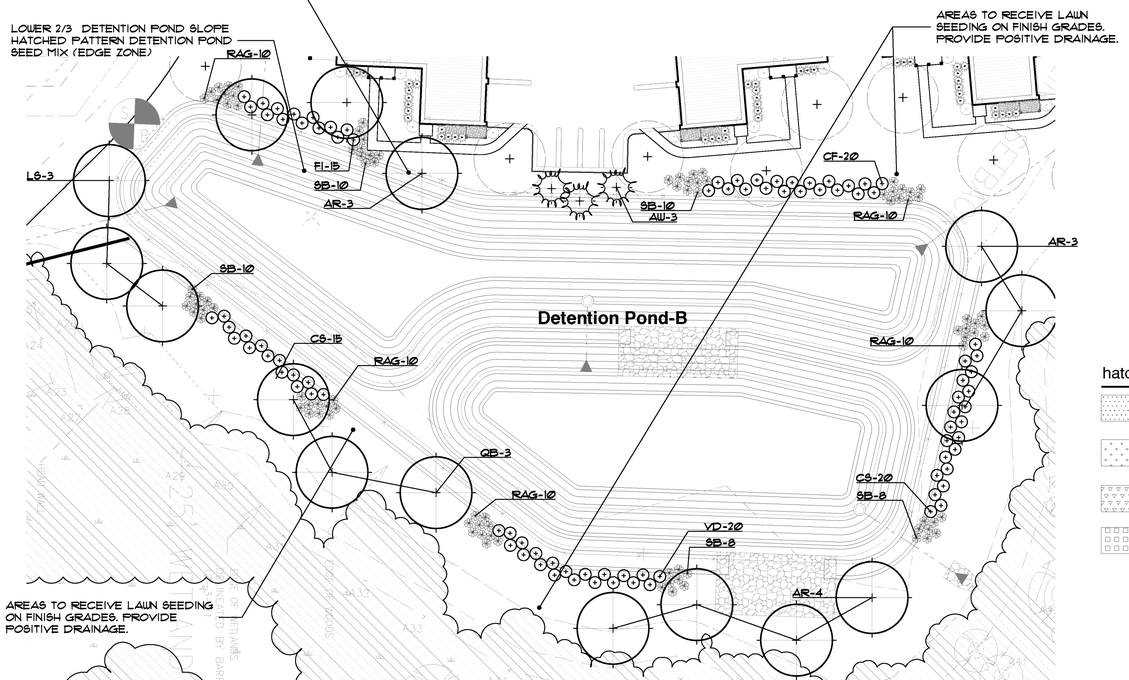
detention pond landscape requirement:

detention pond-A	required	provided
TOTAL LIN.FT. OF POND PERIMETER	727±	
ONE (1) DECIDUOUS OR EVERGREEN TREE PER 50 LIN.FT. (727 LIN.FT. / 50 LIN.FT. = 14.5 TREES)	15	15
TEN (10) SHRUBS PER 50 LIN.FT. (727 LIN.FT. / 50 LIN.FT. = 14.5 X 10-SHRUBS=145)	145	145

detention pond-B	required	provided
TOTAL LIN.FT. OF POND PERIMETER	932±	
ONE (1) DECIDUOUS OR EVERGREEN TREE PER 50 LIN.FT. (932 LIN.FT. / 50 LIN.FT. = 18.64 TREES)	19	19
TEN (10) SHRUBS PER 50 LIN.FT. (932 LIN.FT. / 50 LIN.FT. = 18.64 X 10-SHRUBS=186.4)	186	186



7A detention pond-A planting detail
SCALE: 1" =30' - 0"



7B detention pond-B planting detail
SCALE: 1" =30' - 0"

basin construction notes

PROPER CONSTRUCTION TECHNIQUES, PARTICULARLY INSTALLATION OF VEGETATION, ARE IMPORTANT TO THE SUCCESSFUL FUNCTIONING OF OPEN DETENTION BASINS, ESPECIALLY FOR CONSTRUCTED WETLAND TYPE OPEN DETENTION BASINS IN ORDER TO ESTABLISH A DENSE AND DIVERSE EMERGENT WETLAND PLANT COMMUNITY. GENERAL GUIDELINES FOR VEGETATION INSTALLATION INCLUDE:

1. IF EMERGENT PLANT STOCK IS PROPOSED IN THE POND ZONE,THE SUPPLIED PLUG MATERIAL MUST HAVE SUFFICIENT VEGETATIVE GROWTH EXTENDING OUT OF THE WATER ONCE PLANTED.
2. SEED MUST BE PLANTED ABOVE THE PERMANENT WATER ELEVATION.
3. ALL SEEDED AREAS SHOULD BE PROPERLY STABILIZED WITH A MUCH BLANKET PEGGED IN PLACE.
4. DEPENDING ON THE TYPE OF VEGETATION, BARRIERS MAY BE REQUIRED FOR ONE YEAR TO PROTECT THE PLANTINGS (E.G., SNOW FENCE OR NETTING TO DETER WILDLIFE, PREVENT MOWING).
5. IF DETENTION BASIN ARE COMPACTED, THE SLOPES MUST BE ROTOTILLED. 4" (FOUR) OF COMPOST OR TOPSOIL MUST BE ADDED
6. "NO MOW ZONE" SIGNS MUST BE PLACED AROUND THE BASIN
7. DETENTION BASIN NATIVE SEEDING TO BE PERFORMED IN EARLY SPRING OR LATE FALL. AQUATIC PLANTS SHOULD BE INSTALLED IN THE SUMMER AFTER THE COVER CROP HAS ESTABLISHED

lawn area:

SOD LAWN AREAS SHALL BE KENTUCKY BLUE GRASS BLEND GRASS IN A SOD NURSERY ON LOAM SOIL. SOD TO BE INSTALLED ON MINIMUM 4" TOPSOIL.

SEEDED LAWN AREAS SHALL CONSIST OF THE FOLLOWING TYPES AND PROPORTIONS:

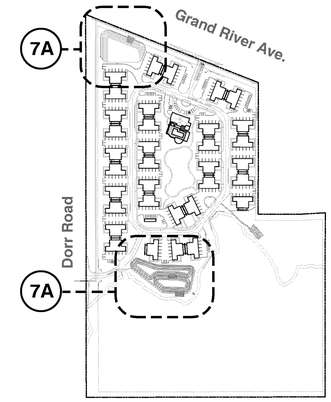
5% PERENNIAL RYE GRASS
10% RED FESCUE
25% CHEWING FESCUE
60% KENTUCKY BLUE GRASS

SEED MIX SHALL BE APPLIED AT A RATE OF 200 POUNDS PER ACRE AND WEED CONTENT SHALL NOT EXCEED 1%. SEED. PROVIDE A MINIMUM 4" TOP SOIL ON ALL SEEDED LAWN AREA

economy prairie seed mix

THIS PRAIRIE SEED MIX OFFERS AN ECONOMICAL WAY TO ESTABLISH A PRAIRIE. IN ADDITION TO NATIVE PRAIRIE GRASSES, FLOWERING SPECIES PROVIDE COLOR THROUGHOUT THE GROWING SEASON AND FOOD SOURCES FOR BIRDS AND BUTTERFLIES. ADDING SEED OR PLANT PLUGS AT A LATER DATE IS A WONDERFUL WAY TO INCREASE A PRAIRIE'S RICHNESS AND DIVERSITY. THIS SEED MIX INCLUDES AT LEAST 6 OF 7 NATIVE PERMANENT GRASS AND SEDGE SPECIES AND 10 OF 13 NATIVE FORB SPECIES. APPLY AT 40.95 PLS POUNDS PER ACRE.

BOTANICAL NAME	COMMON NAME	PLS OZ/ACRE
PERMANENT GRASSES/SEDGES		
ANDROPOGON GERARDII	BIG BLUESTEM	12.00
BOUTELOUA CURTIPENDULA	SIDE-OATS GRAMA	16.00
CAREX SPP.	PRAIRIE SEDGE SPECIES	3.00
ELYMUS CANADENSIS	CANADA WILD RYE	24.00
PANICUM VIRGATUM	SWITCH GRASS	2.50
SCHIZACHYRIUM SCOPARIUM	LITTLE BLUESTEM	32.00
SORGHASTRUM NUTANS	INDIAN GRASS	12.00
	TOTAL	101.50
TEMPORARY COVER		
AVENA SATIVA	COMMON OAT 512.00	
	TOTAL	512.00
FORBS		
ASCLEPIAS SYRIACA	COMMON MILKWEED	1.00
ASCLEPIAS TUBEROSA	BUTTERFLY WEED	1.00
CHAMAECRISTA FASCICULATA	PARTRIDGE PEA	10.00
COREOPSIS LANCEOLATA	SAND COREOPSIS	6.00
ECHINACEA PURPUREA	BROAD-LEAVED PURPLE CONEFLOWER	8.00
HELIOPSIS HELIANTHOIDES	FALSE SUNFLOWER	0.25
MONARDA FISTULOSA	WILD BERGAMOT	0.50
PENSTEMON DIGITALIS	FOXGLOVE BEARD TONGUE	1.00
RATIBIDA PINNATA	YELLOW CONEFLOWER	4.00
RUDBECKIA HIRTA	BLACK-EYED SUSAN	8.00
SOLIDAGO SPECIOSA	SHOWY GOLDENROD	0.50
SYMPHYOTRICHUM LAEVE	SMOOTH BLUE ASTER	1.00
SYMPHYOTRICHUM NOVAE-ANGLIAE	NEW ENGLAND ASTER	0.50
	TOTAL	41.75



key reference location map
NO SCALE

detention basin seed mix

A WETLAND SEED MIX FOR SATURATED SOILS IN A DETENTION POND OR FOR SEEDING A SATURATED BASIN. THIS MIX WILL TOLERATE HIGHLY FLUCTUATING WATER LEVELS AND POOR WATER QUALITY ASSOCIATED WITH URBAN STORMWATER WETLANDS AND PONDS. FOR DETENTION BASINS THAT EXPERIENCE LONG, DRY PERIODS, USE THE ECONOMY PRAIRIE SEED MIX IN THE UPPER THIRD TO HALF OF THE BASIN AREA IN COMBINATION WITH THIS MIX. THIS SEED MIX INCLUDES AT LEAST 10 OF 12 NATIVE PERMANENT GRASS AND SEDGE SPECIES AND 13 OF 17 NATIVE FORB SPECIES. APPLY AT 36.22 PLS POUNDS PER ACRE.

BOTANICAL NAME	COMMON NAME	PLS OZ/ACRE
PERMANENT GRASSES/SEDGES		
BOLBOSCHOENUS FLUVIATILIS	RIVER BULRUSH	1.00
CAREX CRISTATELLA	CRESTED OVAL SEDGE	0.50
CAREX LURIDA	BOTTLEBRUSH SEDGE	3.00
CAREX VULPINOIDEA	BROWN FOX SEDGE	2.00
ELYMUS VIRGINICUS	VIRGINIA WILD RYE	24.00
GLYCERIA STRIATA	FOWL MANNA GRASS	1.00
JUNCUS EFFUSUS	COMMON RUSH	1.00
LEERSIA ORYZOIDES	RICE CUT GRASS	1.00
PANICUM VIRGATUM	SWITCH GRASS	2.00
SCHOENOPLECTUS TABERNAEMONTANI	GREAT BULRUSH	3.00
SCIRPUS ATROVIRENS	DARK GREEN RUSH	2.00
SCIRPUS CYPERINUS	WOOL GRASS	1.00
	TOTAL	41.50
TEMPORARY COVER		
AVENA SATIVA	COMMON OAT	512.00
	TOTAL	512.00
FORBS		
ALISMA SUBCORDATUM	COMMON WATER PLANTAIN	2.50
ASCLEPIAS INCARNATA	SWAMP MILKWEED	2.00
BIDENS SPP. BIDENS	SPECIES	2.00
EUPATORIUM PERFOLIATUM	COMMON BONESET	1.00
HELENIUM AUTUMNALE	SNEEZEWEED	2.00
IRIS VIRGINICA V. SHREVEI	BLUE FLAG	4.00
LYCOPUS AMERICANUS	COMMON WATER HOREHOUND	0.50
MIMULUS RINGENS	MONKEY FLOWER	1.00
PENTHORUM SEDOIDES	DITCH STONECROP	0.50
PERSICARIA SPP.	PINKWEED SPECIES	2.00
RUDBECKIA SUBTOMENTOSA	SWEET BLACK-EYED SUSAN	1.00
RUDBECKIA TRILOBA	BROWN-EYED SUSAN	1.50
SAGITTARIA LATIFOLIA	COMMON ARROWHEAD	1.00
SENNA HEBECARPA	WILD SENNA	2.00
SYMPHYOTRICHUM LANCEOLATUM	PANICLED ASTER	0.50
SYMPHYOTRICHUM NOVAE-ANGLIAE	NEW ENGLAND ASTER	0.50
THALICTRUM DASYCARPUM	PURPLE MEADOW RUE	2.00
	TOTAL	26.00

hatch pattern legend

- AREAS TO RECEIVE IRRIGATION AND SOD, MAINTAINED AND MOWED WEEKLY
- AREAS TO RECEIVE LAWN SEEDING
- AREAS TO RECEIVE PRAIRIE SEED MIX. (NO MOWED AREA)
- AREAS TO RECEIVE DETENTION POND SEED MIX

plant material list

key	quant. 7A	quant. 7B	botanical name	common name	size	comments
			CANOPY AND EVERGREEN TREES			
QB	-	3	QUERCUS 'BICOLOR'	SWAMP WHITE OAK	2 1/2" BB	
AR	-	7	ACER R. 'FRANKSRED'	RED SUNSET RED MAPLE	2 1/2" BB	
AF	11	-	ACER X. FREEMANII'	AUTUMN BLAZE RED MAPLE	2 1/2" BB	
LS	-	3	LIQUIDAMBAR STYRACIFLUA	AMERICAN SWEETGUM	2 1/2" BB	
AW	4	3	ABIES CONCOLOR	CONCOLOR WHITE FIR	6' BB	
			SHRUBS			
RAG	75	30	VIBURNUM D. 'SYNNESTVEDT'	GRO LOW FRAGRANT SUMAC	#3 CONT	42" O.C. SPACING
VD	40	20	VIBURNUM D. 'SYNNESTVEDT'	CHICAGO LUSTRE VIBURNUM	#5 CONT	60" O.C. SPACING
CS	30	35	CORNUS STOLONIFERA	REDTWIG DOGWOOD	#5 CONT.	60" O.C. SPACING
CF	-	20	CORNUS FLAVIRAMEA	YELLOWTWIG DOGWOOD	#5 CONT.	60" O.C. SPACING
SB	-	40	SPIRAEA X.B. BUMALDA 'GOLDFLAME'	GOLDFLAME SPIREA	#3 CONT	42" O.C. SPACING
FI	-	15	FORSYTHIA INTERMEDIA	BORDER FORSYTHIA	#5 CONT.	60" O.C. SPACING
			GRASSES			
MSG	6	-	MISCANTHUS SINENSIS 'MORNING LIGHT'	MORNING LIGHT JAPANESE SILVER GRASS	#3 CONT.	48" O.C. SPACING
			SHRUBS			

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Farmington Hills, MI 48336
ph. (248) 557-5588
fax. (248) 557-5416

seal:

FELINO A. PASCUAL LANDSCAPE ARCHITECT No. 1433

client:
LAUTREC
31550 Northwestern HWY. Suite 200
Farmington Hills, Michigan 48334

project:
THE LEGACY APARTMENT HOMES

project location:
Genoa Township, Michigan
Grand River Avenue & Dorr Road

sheet title:
DETENTION LANDSCAPE PLANTING DETAIL PLAN

job no./issue/revision date:
LS22.028.11 SPA 11-2-2022
LS23.053.05 SPA 5-1-2023

drawn by:
JP, HP, DK

checked by:
FP

date:
4-15-2023

notice:

3 WORKING DAYS BEFORE YOU DIG CALL MISS DIG 1-800-482-7171
For free location of public utility lines

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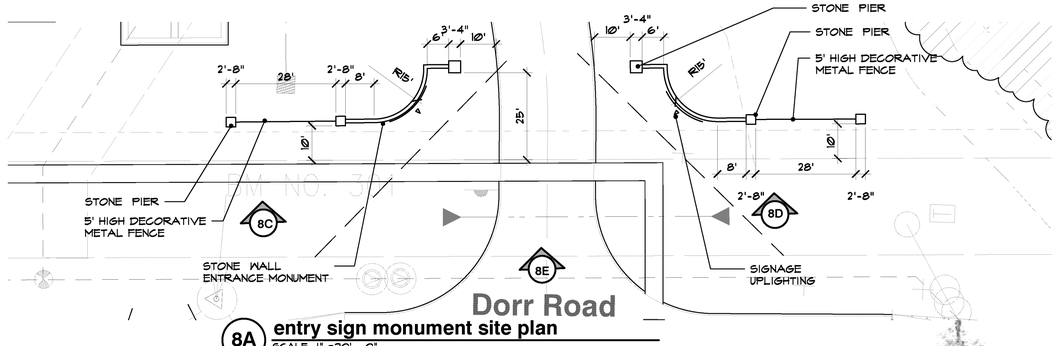
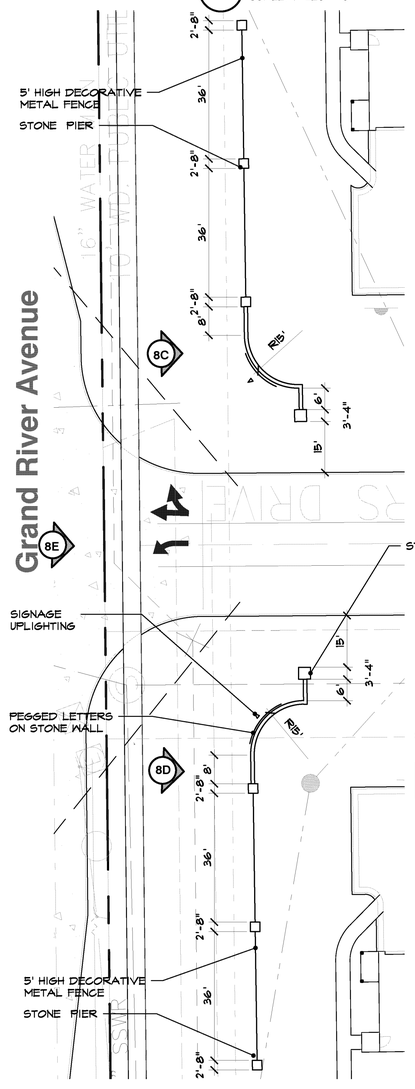
project no:
LS23.053.05

sheet no:
LS-7 of 9



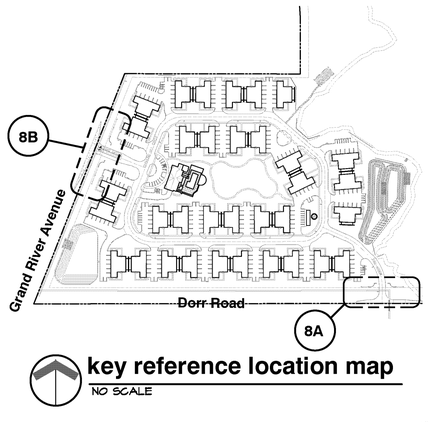
8A entry sign monument site plan

SCALE: 1" =20' - 0"



8B entry sign monument site plan

SCALE: 1" =20' - 0"



key reference location map

NO SCALE

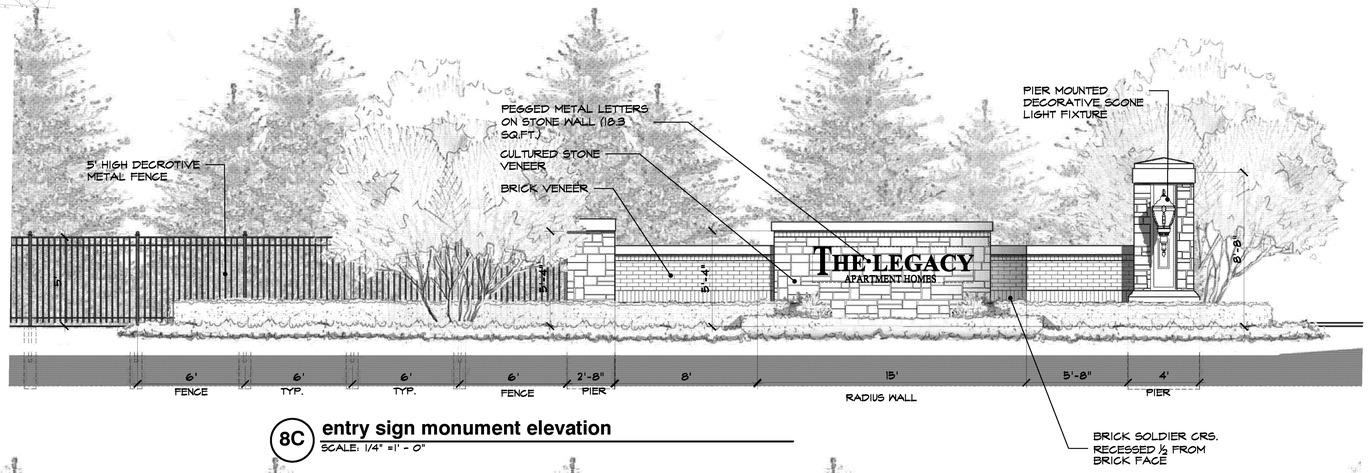
entry wall monument / pier/ signage / notes:

1. LOCATE AND STAKE ALL EXISTING AND PROPOSED UTILITIES PRIOR TO CONSTRUCTION. COORDINATE ANY ADJUSTMENTS WITH LANDSCAPE ARCHITECT.
2. ALL ENTRY WALL LIGHTING SHALL BE CONTROLLED WITH A 'PHOTO-EYE' SWITCH. ALL LIGHTING SHALL BE SHIELDED FROM PUBLIC R.O.W.'S AND ADJACENT PROPERTIES.
3. SEE LANDSCAPE PLAN FOR PROPOSED PLANTINGS ADJACENT TO PROPOSED ENTRY SIGN MONUMENT ON SHT. LS-2
4. VERIFY SOIL BEARING CAPACITY PRIOR TO TO ENTRY SIGN MONUMENT & PIER CONSTRUCTION. IF SOIL BEARING CAPACITY FALLS BELOW STANDARD REQUIREMENTS, CONSULT STRUCTURAL ENGINEER FOR RECOMMENDATION OF FINAL ENTRY MONUMENT & PIER FOOTING DESIGN.
5. SIGNAGE TEXT AND LOGO TO BE METAL PRISMATIC DIMENSIONAL LETTERS. PRIOR TO SIGN INSTALLATION, PERMITS TO BE OBTAINED PER GENOA TOWNSHIP REQUIREMENTS AND APPROVALS.
6. ALL INFORMATION CONTAINED HEREIN IS SUBJECT TO APPROVAL, AND PERMITS PERMITS TO BE OBTAINED PRIOR TO CONSTRUCTION.
7. FOOTINGS SHALL BEAR ON FIRM, UNDISTURBED SOIL WITH AN ASSUMED SAFE BEARING CAPACITY OF 2000 P.S.I. IF SOIL OF THIS CAPACITY IS NOT FOUND AT THE ELEVATIONS INDICATED, FOOTINGS SHALL BE ENLARGED OR LOWERED AT THE DIRECTION OF THE ARCHITECT. VERIFY FOUNDATION SOIL BEARING PRESSURE IN FIELD BY SOILS ENGINEER.
8. MINIMUM CONCRETE STRENGTH TO BE 3000 P.S.I. @ 28 DAYS, U.O.N.: SLABS SHALL BE 3500 P.S.I. MIN. U.O.N.: EXPOSED CONCRETE SHALL BE 4000 P.S.I. WITH 6% ± 1% ENTRAINED AIR U.O.N.
9. ALL CONCRETE WORK AND PLACEMENT SHALL CONFORM TO THE LATEST RECOMMENDATIONS OF A.C.I.
10. PROVIDE DOWELS INTO FOUNDATION TO MATCH SIZE AND SPACING OF VERTICAL REINFORCEMENT AT ALL WALLS, UNLESS OTHERWISE NOTED.
11. PROVIDE MINIMUM 3" CONCRETE COVER FOR REINFORCEMENT BARS BELOW GRADE AND MINIMUM 2" CONCRETE COVER FOR REINFORCEMENT BARS ABOVE GRADE.

MANUFACTURER:
ACUITY BRANDS LIGHTINGS
ONE LITHONIA WAY
CONYERS, GA 30012
PEACHTREE, GA 30269
PH. 770-922-9000
BRAND: HYDREL
MODEL: 475OSF or EQUAL (LED 4000K)
FINISH : BRONZE

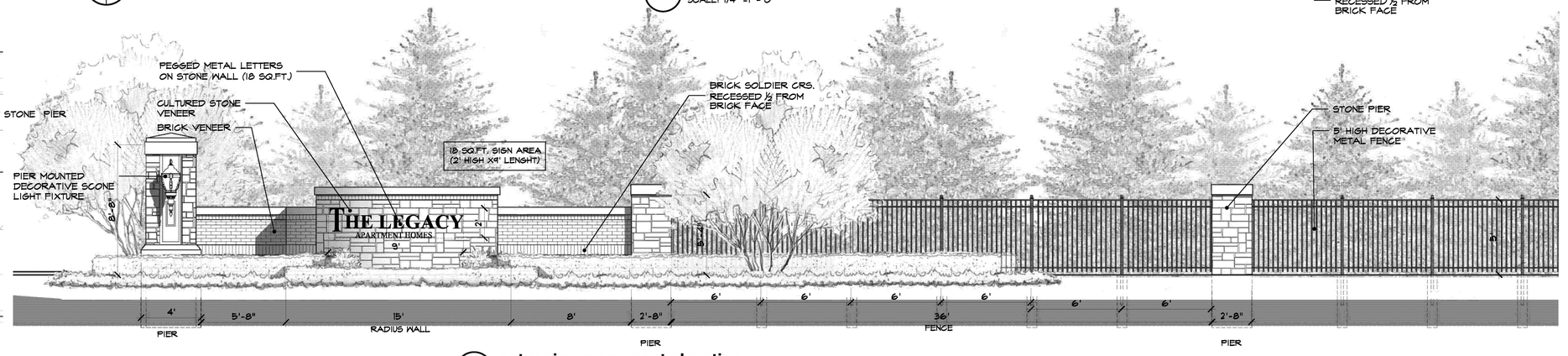
sign panel uplighting

(4-CONDITIONS)



8C entry sign monument elevation

SCALE: 1/4" =1' - 0"



8D entry sign monument elevation

SCALE: 1/4" =1' - 0"

8E entry sign monument elevation

SCALE: 1/8" =1' - 0"

FPA
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seal:

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client:
LAUTREC
31550 Northwestern HWY. Suite 200
Farmington Hills, Michigan 48334

project:
THE LEGACY APARTMENT HOMES

project location:
Genoa Township, Michigan
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sheet title:
ENTRNCE SIGN MONUMENT

job no./issue/revision date:
LS22.028.11 SPA 11-2-2022
LS23.053.05 SPA 5-1-2023

drawn by:
JP, HP, DK

checked by:
FP

date:
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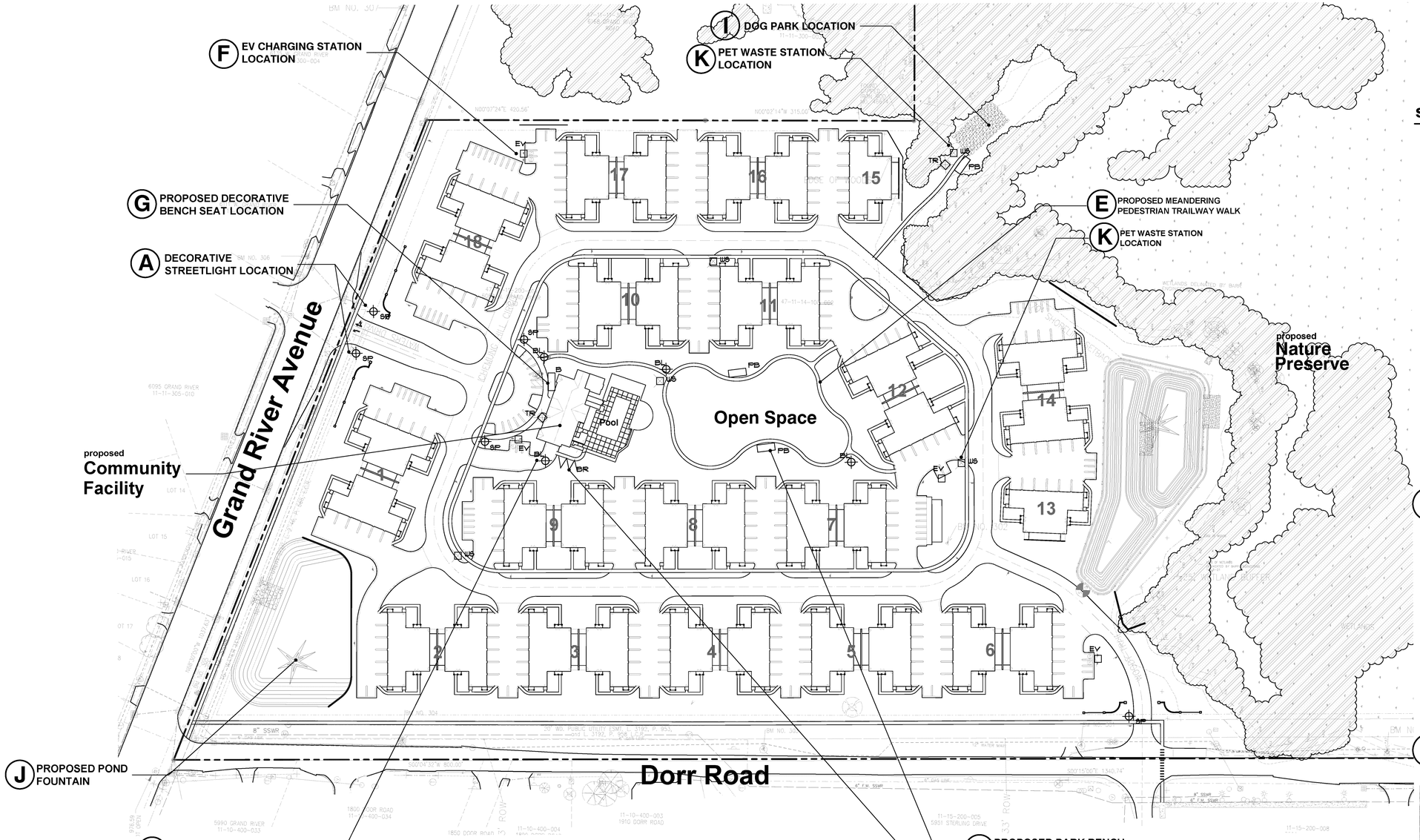
LS-8 of 9



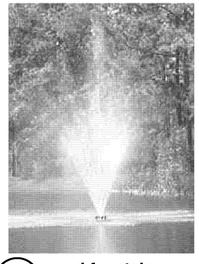
site amenity key

- BR BIKE RACK
- FB PARK BENCH SEAT
- B BENCH SEAT
- BL BOLLARD LIGHT
- SP STREET POLE LIGHT
- GAZEBO or PERGOLA FEATURE
- WS PET WASTE STATION
- TR TRASH RECEPTACLE
- EV EV CHANGING STATION

BY ZERO WASTE USA
12316 WORLD TRADE DRIVE #102
SAN DIEGO, CA. 92128
PH. 800-784-2563
WWW.ZEROWASTEUSA.COM

MODEL NO. JJBO06-BLACK
DESCRIPTION: SENTRY DOG WASTE STATION (73"H X 13"W)

K pet waste station
TOTAL OF 5-CONDITIONS

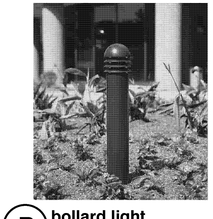


J pond fountain
TOTAL OF 2-CONDITIONS

I dog park

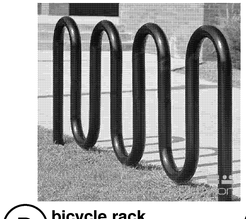
4A site amenity reference location map
NO SCALE

A decorative pole and light
(5-CONDITION)
DECORATIVE BLVD. ISLAND SITE FIXTURE LIGHTS AND ALUMINUM POLE.



B bollard light
BY LITHONIA LIGHTS OR EQUAL MODEL. DSXB LED (D-SERIES LED BOLLARD 8"DIAX42" HST.) OR EQUAL (4-CONDITIONS)

C trash receptacle
(2-CONDITION)
MANUFACTURED BY BY ANOVA, INC.
WWW.ANOVAFURNISHINGS.COM
DESCRIPTION:32 GAL
FINISH: TEXTURE PEWTER



D bicycle rack
(2-CONDITIONS)
BIKE RACK BY DUMOR, INC.
MODEL NO. 130-20 (5-2 SURFACE PLATE MOUNT) 2 3/8" O.D. BLACK POWER-COATED LOOP OR EQUAL

E meandering interior pedestrian walk

F EV charging station
TOTAL OF 4-CONDITIONS

G decorative bench seating
TOTAL OF 1-CONDITIONS
MANUFACTURED BY BY ANOVA, INC.
WWW.ANOVAFURNISHINGS.COM
MODEL NO. LEXC6
DESCRIPTION: 6' WIDE CONTOUR BENCH
FINISH: TEXTURE PEWTER

H park bench seating
TOTAL OF 3-CONDITIONS
6' WIDE PARK BENCH SEAT BY DUMOR, INC.
MODEL NO. 34-60D (3-1)
SUPPORT: 3-1 EMBEDMENT
FINISH: BLACK POWER-COATED

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SITE AMENITY PLAN

job no./issue/revision date:
LS22.028.11 SPA 11-2-2022
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project no: LS23.053.05

sheet no: LS-9 of 9

Notes:

Applicable Building Codes:

MICHIGAN BUILDING CODE 2015

STATE OF MICHIGAN ELECTRICAL CODE 2017
w/PART 8 AMENDMENTS

MICHIGAN MECHANICAL CODE 2015

MICHIGAN PLUMBING CODE 2015

ANSI A117.1 – 2009 ACCESSIBILITY CODE

INTERNATIONAL FIRE CODE 2015

MICHIGAN 2015 USE TYPE : R–2 (Apartments)
U (Private Garages)

MICHIGAN 2015 CONSTRUCTION TYPE: V–B

Areas:

	R–2	U	Total
UNIT "A"	1,471 s/f	417 s/f	1,888 s/f
UNIT "B"	1,629 s/f	417 s/f	2,046 s/f
UNIT "C"	1,585 s/f	428 s/f	2,013 s/f
TOTAL PER QUADRANT:	4,685 s/f	1,262 s/f	5,947 s/f
TOTAL FOR HALF BUILDING:	9,370 s/f	2,524 s/f	11,894 s/f

A 2 HOUR FIRE WALL IS REQURED BETWEEN THE RIGHT & LEFT HALVES OF THE BUILDING.
A 1 HOUR SEPERATION WILL BE PROVIDED BETWEEN THE 2 QUADRANTS.
A 1 HOUR SEPERATION WILL PROVIDED BETWEEN THE FIRST FLOOR AND THE SECOND FLOOR
A 1 HOUR SEPEATION WILL BE PROVIDED BETWEEN THE APARTMENTS AND THE PRIVATE GARAGE AREA.
A 1 HOUR SEPERATION WILL BE PROVIDED BETWEEN THE SECOND FLOOR AREA AND THE ATTIC

Occupancies:

1 OCCUPANT PER 200 s/f OF AREA
PER TABLE 1004.1.2

UNIT "A"	1,471 s/f / 200 =	7
UNIT "B"	1,629 s/f / 200 =	8
UNIT "C"	1,585 s/f / 200 =	8
TOTAL PER QUADRANT:	4,518 s/f	23
TOTAL PER BUILDING:		92

Fire Supression:

A NFPA 13–R 2010 AUTOMATIC FIRE SUPPRESSION SYSTEM SHALL BE PROVIDED THROUGHTOUT ALL AREAS OF THE BUILDING INCLUDING GARAGES, BALCONIES AND GROUND FLOOR PATIOS AS PER CHAPTER 9 OF THEMBC– 2012.

SMOKE ALARMS TO BE PROVIDED AS PER SECTION 907.2.9.2 & 907.2.11.2 OF THE MBC–2012.

CARBON MONOXIDE ALARMS TO BE PROVIDED AS PER SECTION 908.7 OF THE MBC–2012.

ATTIC DRAFT STOPS:
EACH OF THE ATTICS ABOVE THE SECOND FLOOR UNITS ARE SEPERATED BY THE EXTENSION OF THE FIRE WALLS BELOW SEPERATING EACH UNIT. THESE WALLS EXTEND TO THE UNDERSIDE OF THE ROOF DECK. THE WALL SEPERATING THE RIGHT HALF OF THE BUILDING FROM THE LEFT HALF IS A 2 HOUR FIRE RATED WALL. THE WALL SEPERATING THE FRONT UNITS FROM THE REAR UNITS ARE A 1 HOUR WALL. EACH OF THE ATTIC SPACES IS LESS THAN THE MAXIMUM OF 3,000 s/f.

Seperate Submittals

1. SHOP DRAWINGS FOR ENGINEERED FLOOR JOIST SYSTEMS & PRE–ENGINEERED ROOF TRUSSES SYSTEMS. ALL DRAWINGS TO BE SIGNED AND SEALED BY A PROFESSIONAL ENGINEER IN THE STATE OF MICHIGAN.
2. FIRE SUPRESSION SYSTEM DESIGN DRAWINGS. ALL DRAWINGS TO BE SIGNED AND SEALED BY A PROFESSIONAL ENGINEER IN THE STATE OF MICHIGAN.
3. ALL INTERIOR FINISHES SHALL MEET A CLASS C FLAME SPREAD INDEX 76–200 AND SMOKE–DEVELOPED INDEX 0–450. PROVIDE PRODUCT CUT SHEETS TO THE BUILDING DEPARTMENT SHOWING COMPLIANCE.

Special Inspections:

ALL SPECIAL INSPECTIONS SHALL BE DONE BY McDOWELL & ASSOCIATES

– GEOTECHNICAL TESTING
– SOIL BEARING CAPACITIES
– CONCRETE TESTING

COPIES OF ALL REPORTS TO BE SUBMITTED TO THE BUILDING DEPARTMENT OF MACOMB TOWNSHIP

Proposed New Apartments for:

M J C
Avalon

Attic Areas & Ventilation Requirements

(PER MBC 2015 SEC 1203)

ATTIC AREAS
Above Unit B: 1,611 S.F.
Above Unit C: 1,726 S.F.

VENTILATION AREA REQUIRED: 1/300 ALLOWED (Per 1203.2) IF:
MORE THAN 50% AND LESS THAN 80% OF REQUIRED VENTILATION TO BE LOCATED IN THE UPPER PORTION OF THE ATTIC SPACE

Unit B: 1,611 S.F. x 1/300 = 5.37 S.F.
Unit C: 1,726 S.F. x 1/300 = 5.75 S.F.

VENTILATION AREA PROVIDED:
Unit B: 36'–0" L.F. Soffit Vent @ 5 Sq. In./Ft. = 180 Sq. In.
180 Sq. In. per 144 Sq. In. per Sq. Ft. = 1.25 Sq. Ft.
Unit B: (10) Style 600 Roof Vents @ 60 Sq. In. = 600 Sq. In.
600 Sq. In. per 144 Sq. In. per Sq. Ft. = 4.17 Sq. Ft.
Unit B: Total Ventilation Area = 5.42 S.F. > 5.37 S.F. Required
(77% OF VENTILATION IN UPPER PORTION OF ATTIC)
Unit C: 80'–0" L.F. Soffit Vent @ 5 Sq. In./Ft. = 400 Sq. In.
400 Sq. In. per 144 Sq. In. per Sq. Ft. = 2.78 Sq. Ft.
Unit C: (11) Style 600 Roof Vents @ 60 Sq. In. = 660 Sq. In.
660 Sq. In. per 144 Sq. In. per Sq. Ft. = 4.58 Sq. Ft.
Unit C: Total Ventilation Area = 7.36 S.F. > 5.75 S.F. Required
(62% OF VENTILATION IN UPPER PORTION OF ATTIC)

1. ROOF VENT SPECS. PROVIDED ARE BY "LOMANCO VENTS"
2. PERFORATED SOFFIT/EAVE VENTS ARE JAMES HARDIE
3 . ALUM. ROOF VENTS ARE LOMANCO – 600 SERIES

Project Professionals:

Architects:
Burmann Associates Inc.
119 W. St. Clair
Romeo, Michigan 48065
o.586–752–5010 c.586–201–1602
greatarchitects@charter.net
Richard E. Burmann R.A.
Michigan #20749

Structural Engineering:
Simpson Engineering L.L.C.
119 W. St. Clair
Romeo, Michigan 48065
o.586–752–9872 c.810–614–5696
mpsimpson1959@yahoo.com
Mark P. Simpson P.E.
Michigan #33208

Mechanical Engineering:
Beechwood Engineering, P.L.C.
3462 Beechwood
Farmington Hills, Michigan 48335
248–408–8178
krj@sbcglobal.net
Kenneth R. Jenkins P.E.
Michigan #20003

Electrical Engineering:
Current Design L.L.C.
1290 Brook Lane
Rochester Hills, Michigan 48306
248–651–3681
currentdm@aol.com
Dominic A. Moceri

SEPARATE SUBMITTAL:

CIVIL ENGINEERING DESIGN & DRAWINGS ARE DONE BY OTHERS AND ARE NOT PART OF THIS SUBMITTAL

FIRE SUPRESSION DESIGN & DRAWINGS ARE DONE BY OTHERS AND ARE NOT PART OF THIS SUBMITTAL

Sheet Index:

Cover Page	-
Foundation Plan	1
First Floor Plan	2
Second Floor Plan	3
Elevations	4
Building Sections	5
Wall Sections	6
Wall Sections & Details	7
Wall Sections & Details	8
Specifications	9
Door Schedule	10

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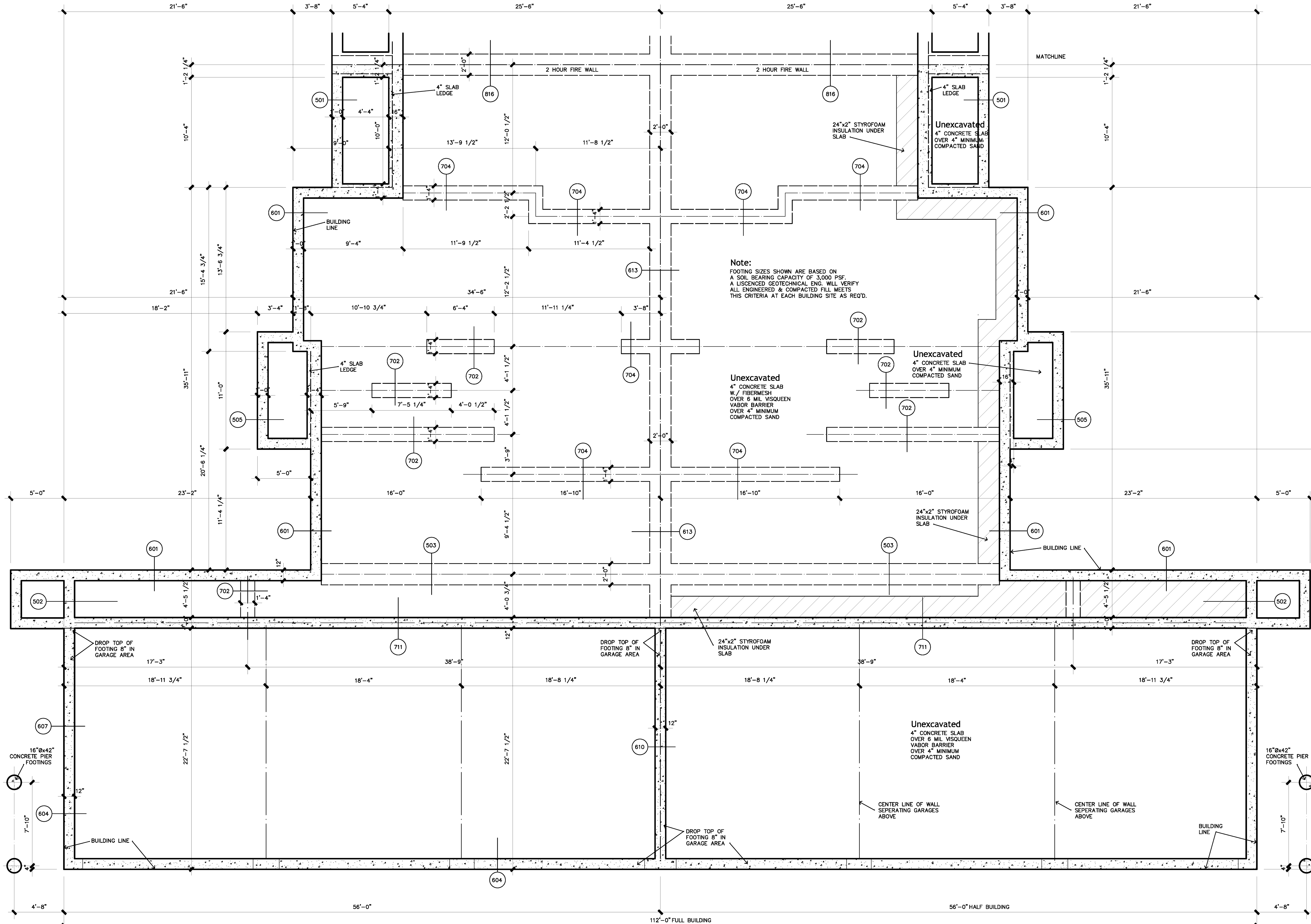
Architects • Engineers • Historic Restorations
119 W. St. Clair • Romeo • Michigan • 48065-4655
Office 586-752-5010 • 586-201-1602 Cell
greatarchitects@charter.net
A.I.A.
Member of the American Institute of Architects



Foundation Plan

Scale: 1/4" = 1'-0"

Proposed Condominiums for:

M J C

12 - Plex Condominiums

burmann Burmann Associates Inc.
Architects • Engineers • Historic Restorations
119 W. St. Clair • Romeo • Michigan • 48065-4655
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greatarchitects@charter.net
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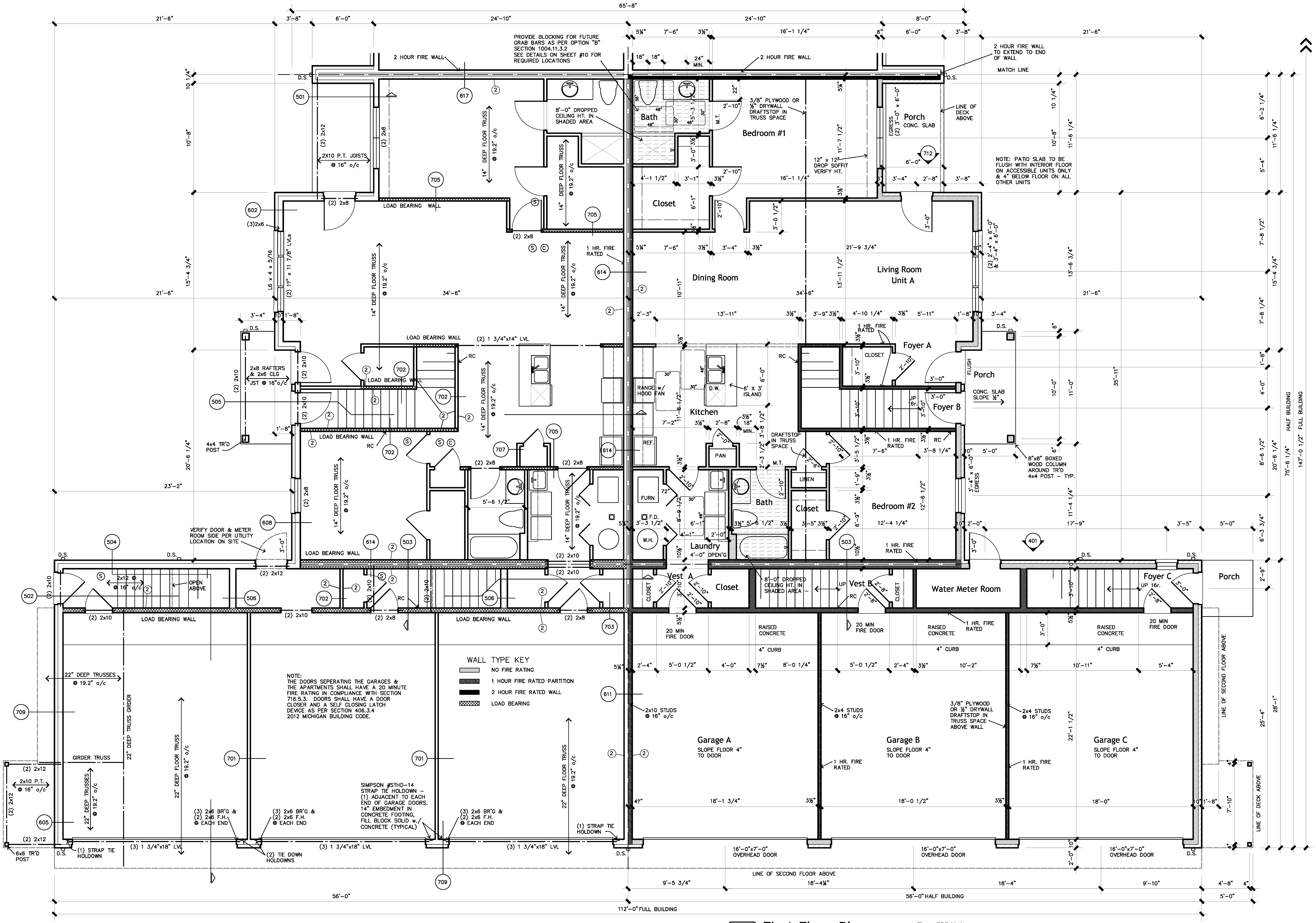
Sheet Contents:

Foundation Plan

Job:	18173
Drawn by:	REB
Date:	27JUN18
Sheet Number:	1



First Floor Plan

Scale: 1/4" = 1'-0"

Type "B" Units
ALL UNITS EXCEPT FOR:
BUILDINGS #3, #4 & #9 – SEE SHEET #10
BUILDING #10 – SEE SHEET #11

Proposed Condominiums for:
M J C
12 - Plex Condominiums

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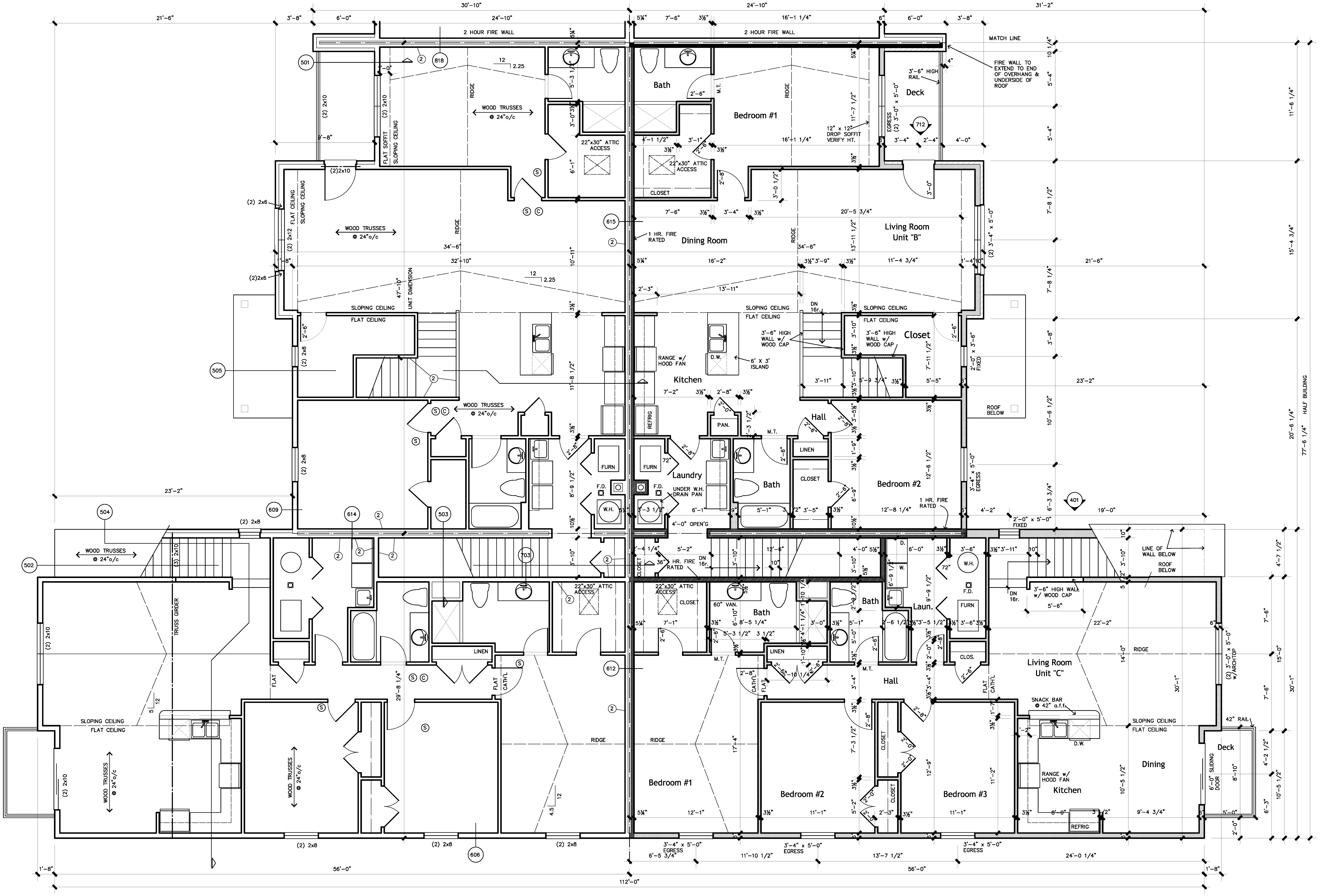
greatarchitects@charter.net

Sheet Contents:
First Floor Plan

Job:	18173
Drawn by:	REB
Date:	27JUN18
Sheet Number:	2



WALL TYPE KEY

- NO FIRE RATING
- 1 HOUR FIRE RATED PARTITION
- 2 HOUR FIRE RATED WALL
- LOAD BEARING

Second Floor Plan

Scale: 1/4" = 1'-0"

ALL UNITS "B" & "C" ARE NOT ACCESSIBLE UNITS.

Proposed Condominiums for:

M J C
12 - Plex Condominiums

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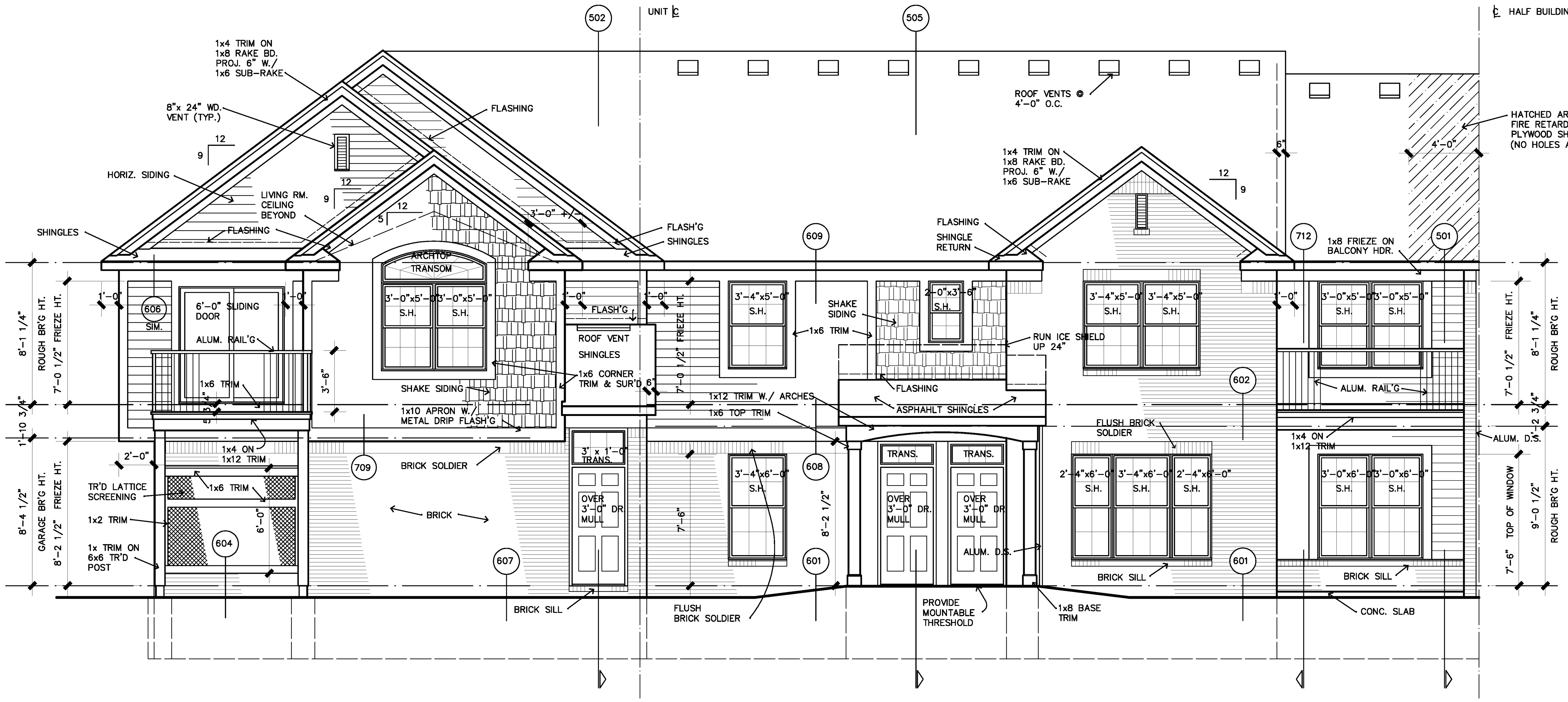
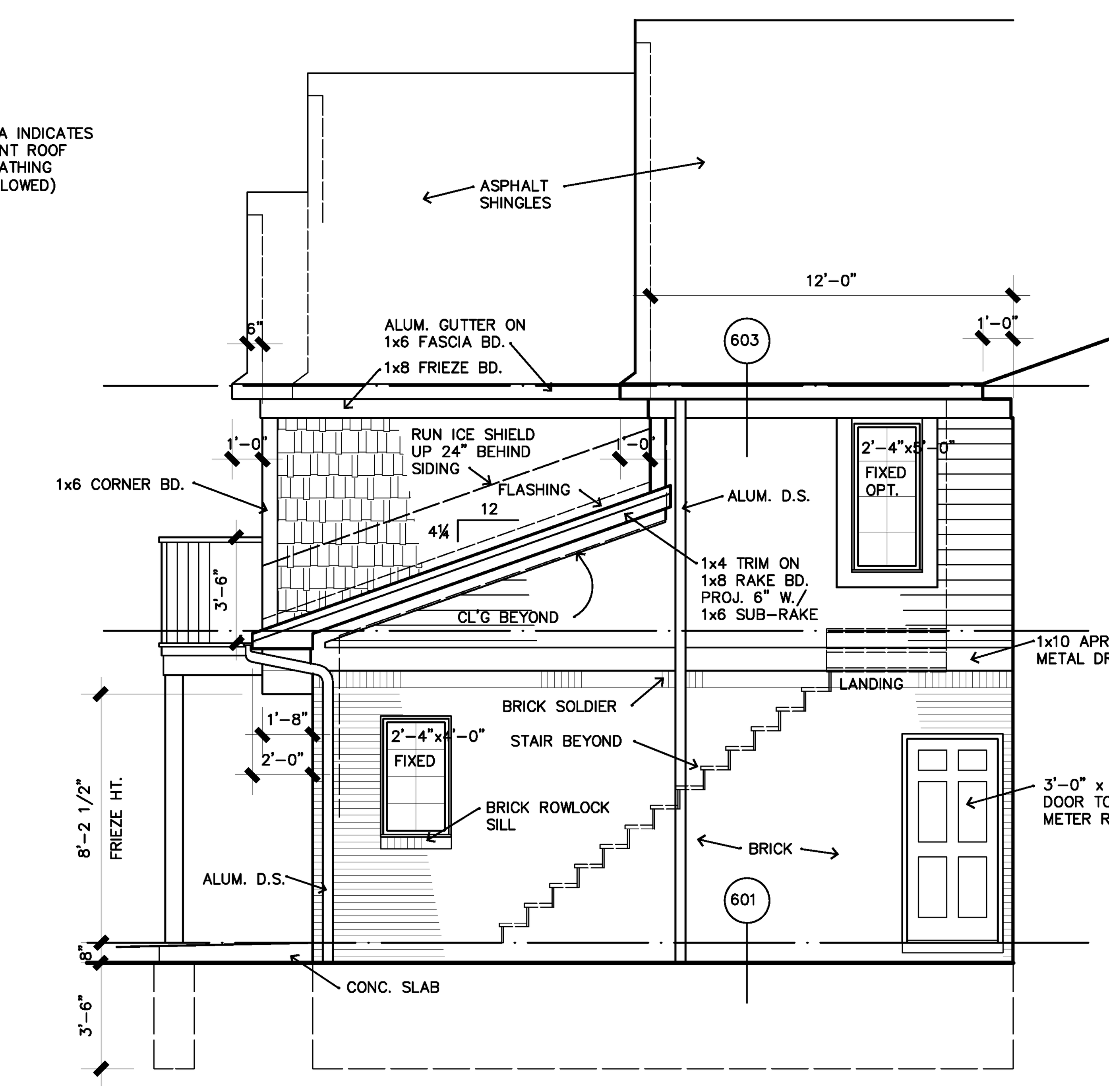
Sheet Contents:
Second Floor

Job:	18173
Drawn by:	REB
Date:	17JUL18
Sheet Number:	3-A



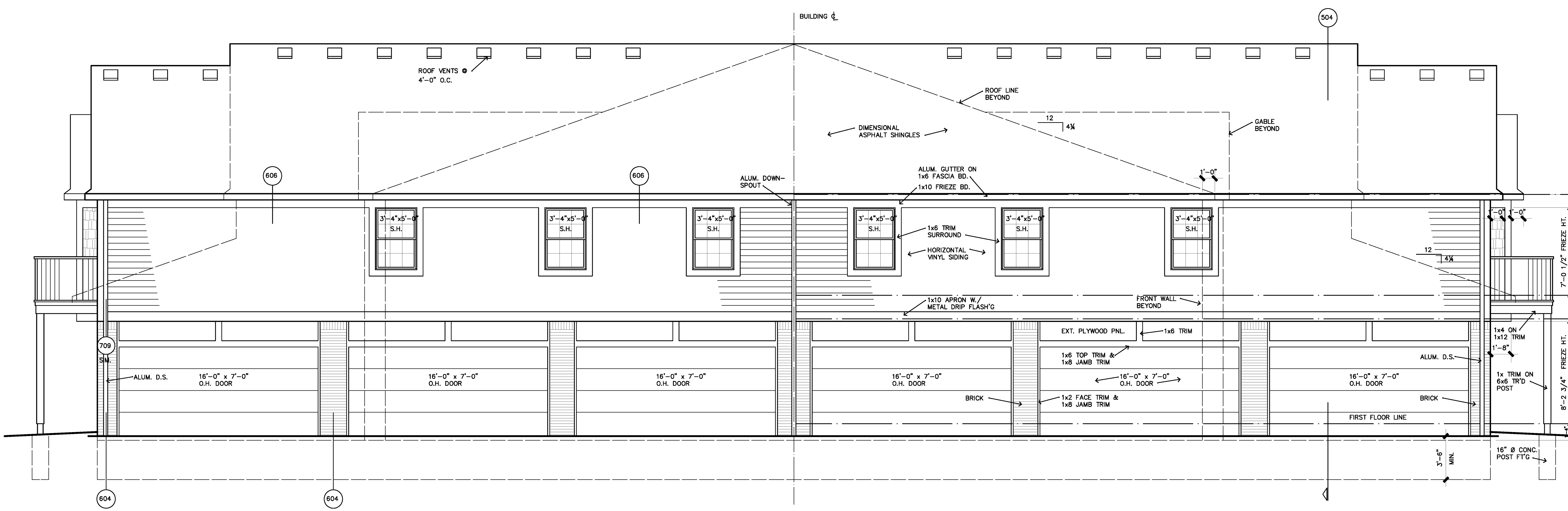
Front/Rear Elevation "A"

Scale: 1/4" = 1'-0"



401 Partial Elevation "A"

Scale: 1/4" = 1'-0"



Side Elevation "A"

Scale: 1/4" = 1'-0"

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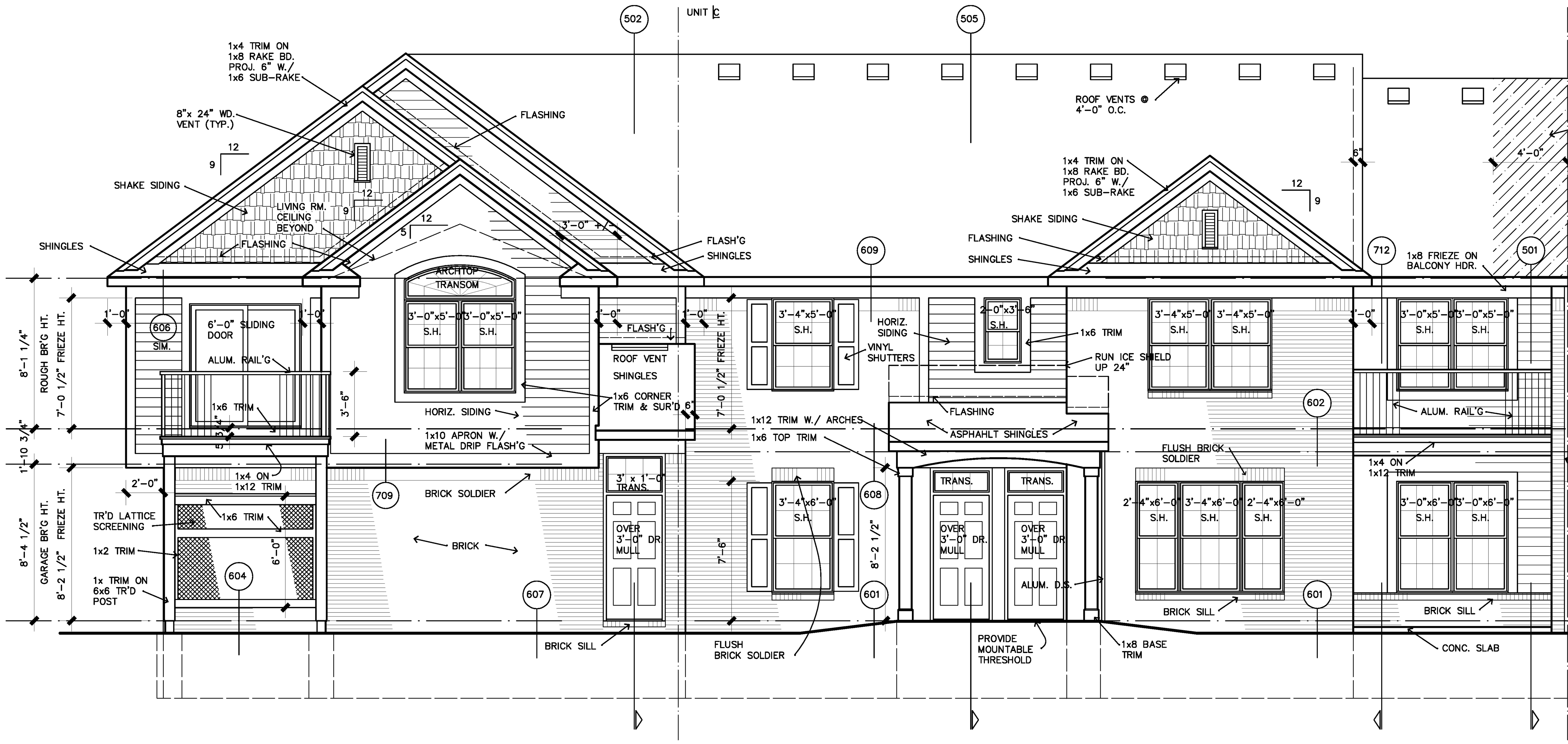
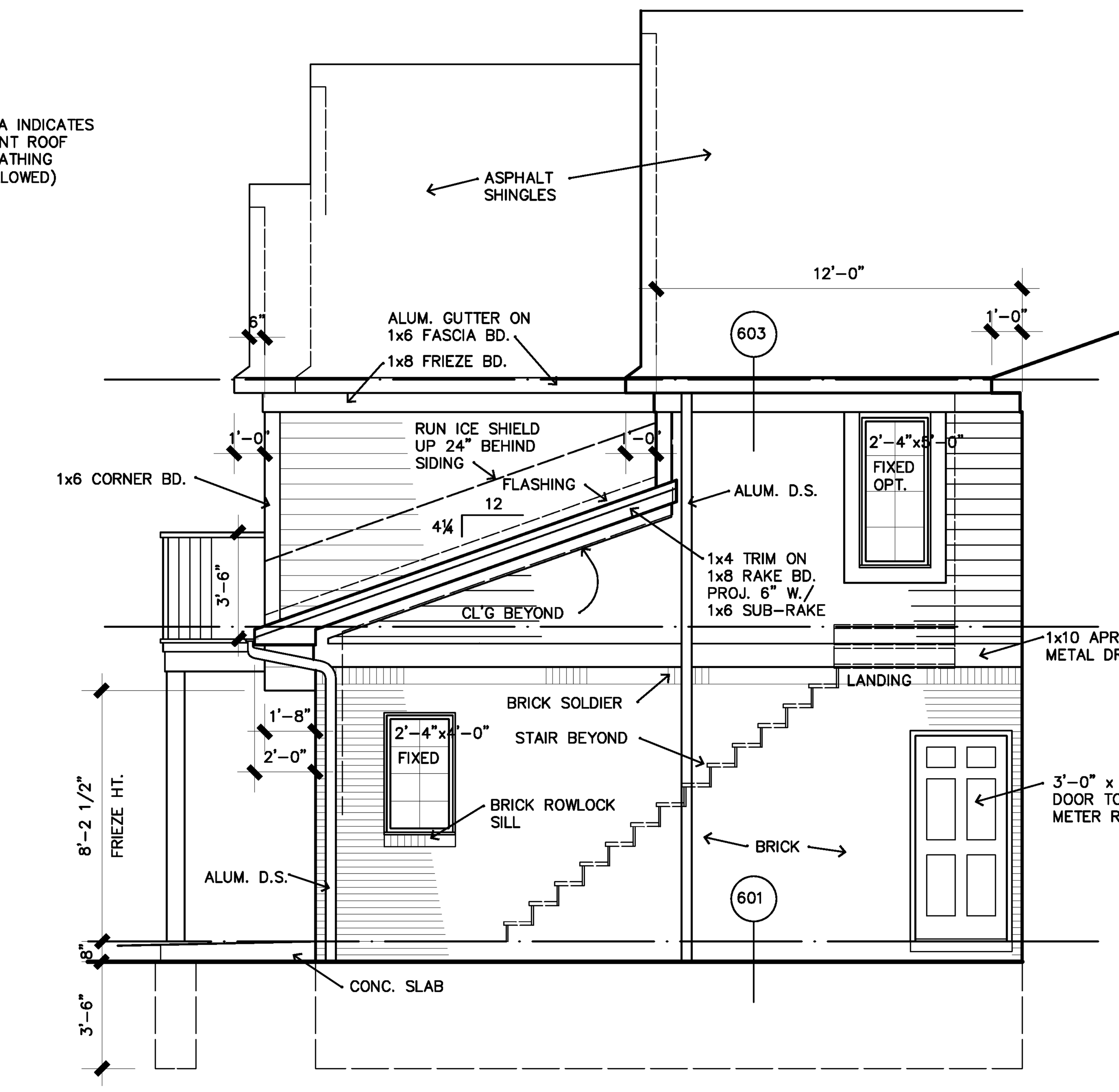
Sheet Contents:
Elevations

Job:	18173
Drawn by:	MAK
Date:	17JUL18
Sheet Number:	4-A



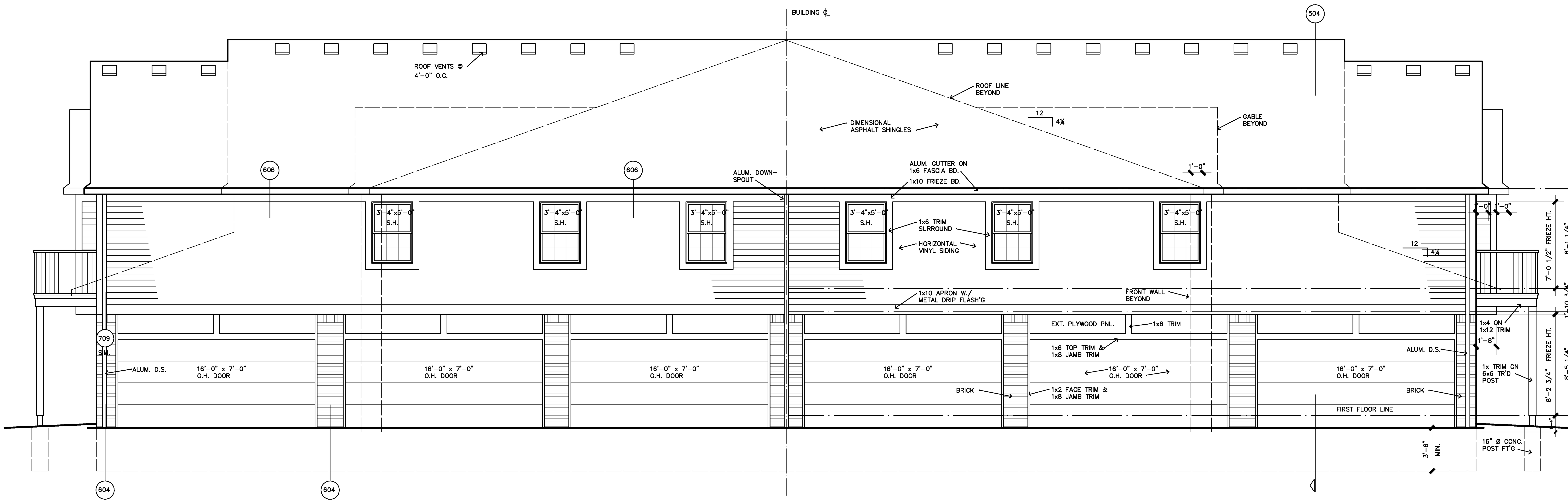
Front/Rear Elevation "B"

Scale: 1/4" = 1'-0"



401 Partial Elevation "B"

Scale: 1/4" = 1'-0"



Side Elevation "B"

Scale: 1/4" = 1'-0"

Proposed Condominiums for:

M J C
12 - Plex Condominiums

Architects • Engineers • Historic Restorations
119 W. St. Clair • Romeo • Michigan • 48065-4655
Office 586-752-5010 • 586-201-1602 Cell
greatarchitects@charter.net

A.I.A.
Member of the American Institute of Architects

burmann
Burmann Associates Inc.

Sheet Contents:
Elevations

Job: 18173
Drawn by: MAK
Date: 27JUN18
Sheet Number:
4-B

General Note

1. SEE SCHEDULE FOR LUMINAIRE MOUNTING HEIGHT.
2. CALCULATIONS ARE SHOWN IN FOOTCANDLES AT: 0' - 0"
3. LIGHTING ALTERNATES REQUIRE NEW PHOTOMETRIC CALCULATION AND RESUBMISSION TO CITY FOR APPROVAL.

THE ENGINEER AND/OR ARCHITECT MUST DETERMINE APPLICABILITY OF THE LAYOUT TO EXISTING / FUTURE FIELD CONDITIONS. THIS LIGHTING LAYOUT REPRESENTS ILLUMINATION LEVELS CALCULATED FROM LABORATORY DATA TAKEN UNDER CONTROLLED CONDITIONS IN ACCORDANCE WITH ILLUMINATING ENGINEERING SOCIETY APPROVED METHODS. ACTUAL PERFORMANCE OF ANY MANUFACTURER'S LUMINAIRE MAY VARY DUE TO VARIATION IN ELECTRICAL VOLTAGE, TOLERANCE IN LAMPS, AND OTHER VARIABLE FIELD CONDITIONS. MOUNTING HEIGHTS INDICATED ARE FROM GRADE AND/OR FLOOR UP.

THESE LIGHTING CALCULATIONS ARE NOT A SUBSTITUTE FOR INDEPENDENT ENGINEERING ANALYSIS OF LIGHTING SYSTEM SUITABILITY AND SAFETY. THE ENGINEER AND/OR ARCHITECT IS RESPONSIBLE TO REVIEW FOR MICHIGAN ENERGY CODE AND LIGHTING QUALITY COMPLIANCE.

UNLESS EXEMPT, PROJECT MUST COMPLY WITH LIGHTING CONTROLS REQUIRMENTS DEFINED IN ASHRAE 90.1 2013. FOR SPECIFIC INFORMATION CONTACT GBA CONTROLS GROUP AT ASG@GASSERBUSH.COM OR 734-266-6705.

FOR ORDERING INQUIRIES CONTACT GASSER BUSH AT QUOTES@GASSERBUSH.COM OR 734-266-6705.

THIS DRAWING WAS GENERATED FROM AN ELECTRONIC IMAGE FOR ESTIMATION PURPOSE ONLY. LAYOUT TO BE VERIFIED IN FIELD BY OTHERS.

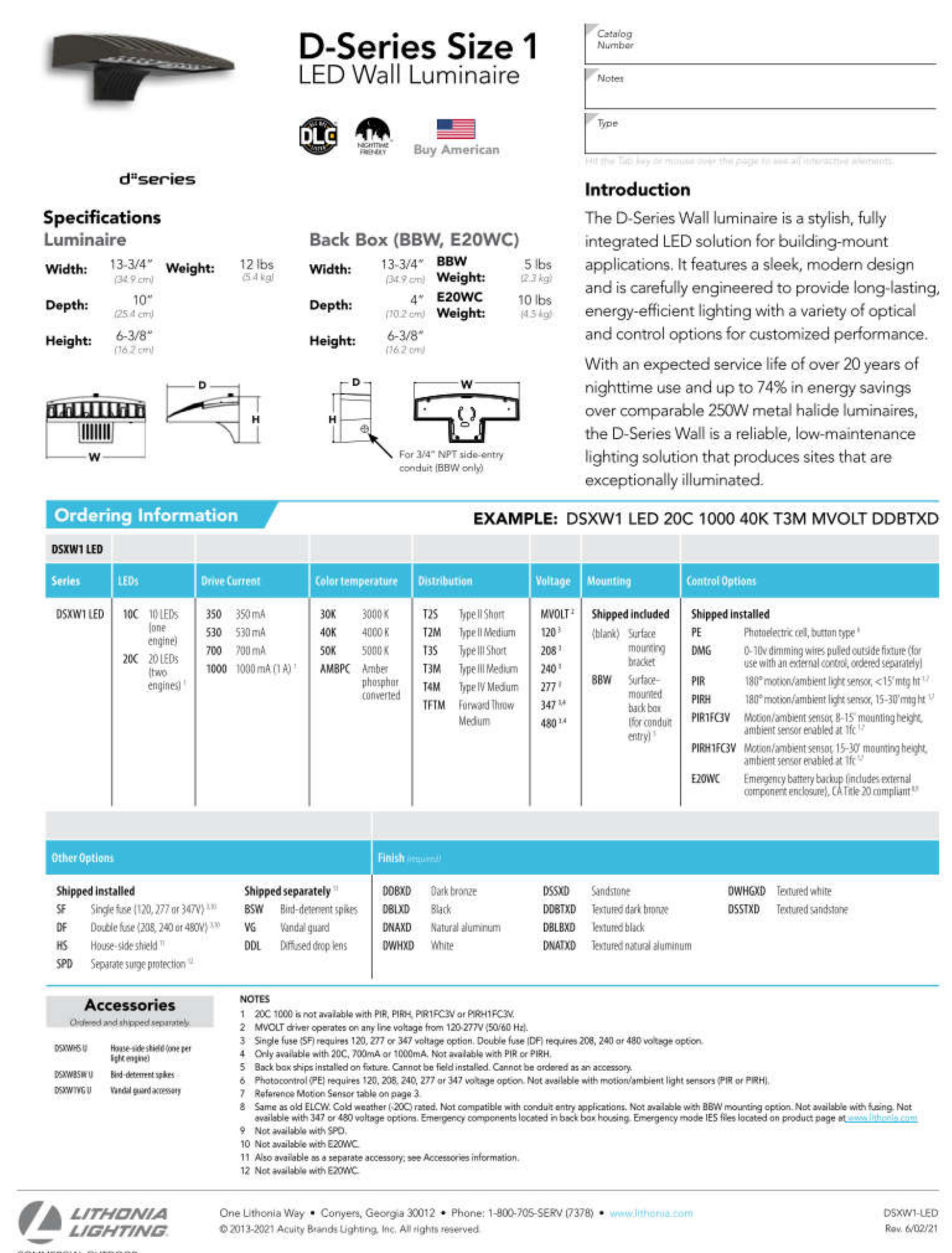
MOUNTING HEIGHT IS MEASURED FROM GRADE TO FACE OF FIXTURE. POLE HEIGHT SHOULD BE CALCULATED AS THE MOUNTING HEIGHT LESS BASE HEIGHT.

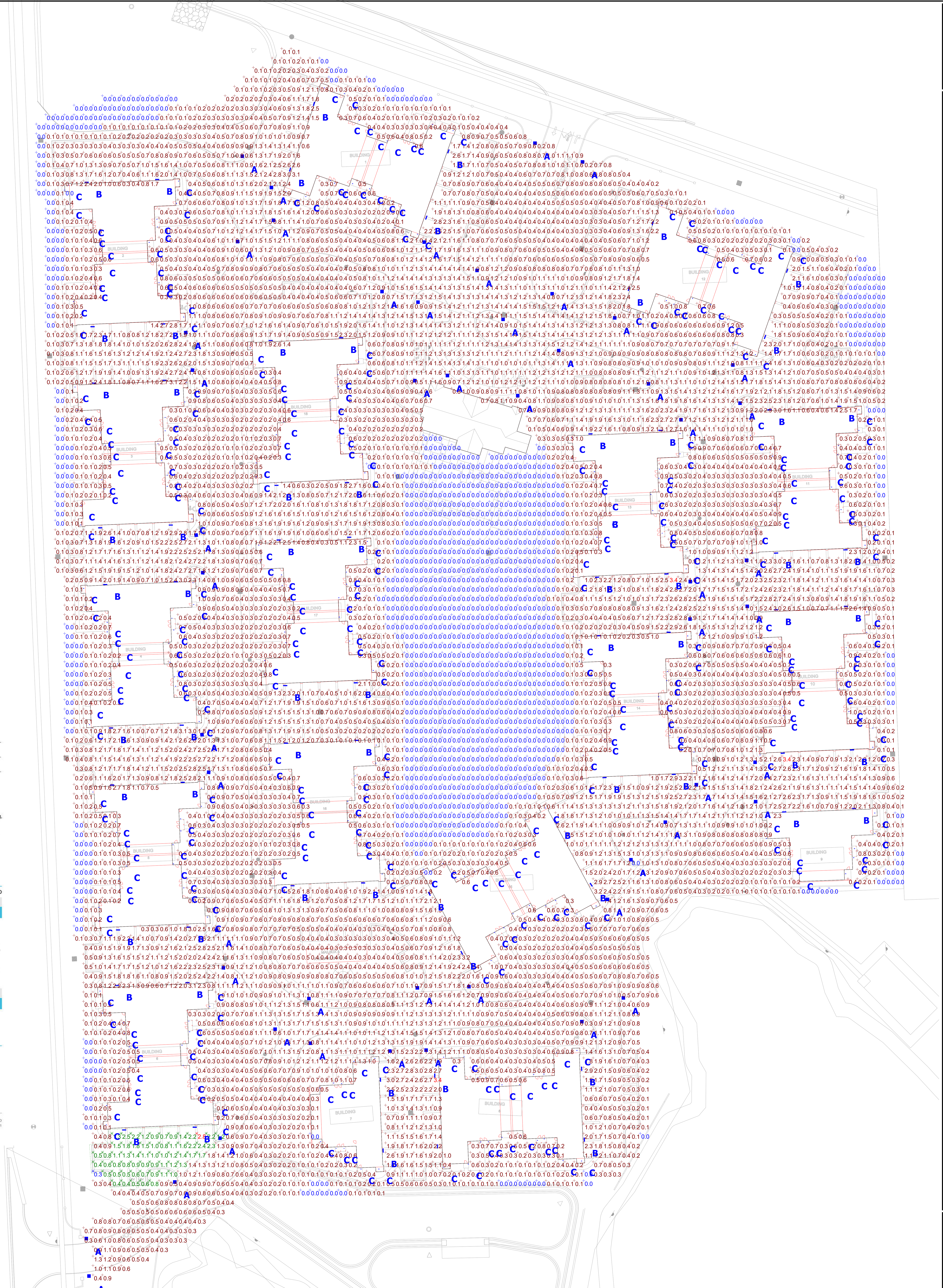
Statistics

Description	Symbol	Avg	Max	Min	Max/Min	Avg/Min	Avg/Max
Grade	+	0.7 fc	3.4 fc	0.0 fc	N/A	N/A	0.2:1
Parking Lot Typical	✱	1.2 fc	2.8 fc	0.3 fc	9.3:1	4.0:1	0.4:1

Schedule

Symbol	Label	Quantity	Manufacturer	Catalog Number	Description	Lumens Per Lamp	Light Loss Factor	Wattage
	A	52	Holophane	PUCL2 P30 30K XX L5	Utility Taft FCO LED 2, P30, 3000K, Type 5 Optic	6660	0.9	66
	B	68	Lithonia Lighting	DSXW1 LED 20C 530 30K TFTM MVOLT	DSXW1 LED WITH (2) 10 LED LIGHT ENGINES, TYPE TFTM OPTIC, 3000K, @ 530mA.	4066	0.9	34.9
	C	340	BEGA Converted by LUMCat V 09.11.2016 / H.R.		24 601 K3	603	0.9	12





Plan View
Scale - 1" = 60ft

MJC LEGACY APARTMENTS
PHOTOMETRIC SITE PLAN
GASSER BUSH ASSOCIATES
WWW.GASSERBUSH.COM

Designer
DB
Date
05/30/2023
Scale
Not to Scale
Drawing No.
QUICK CALC V1

. 11.06 SOLAR ENERGY SYSTEMS

06.01 **General:**

(a) **Intent:** The intent of these regulations is to provide suitable locations for Solar Energy Systems to meet a reasonable demonstrated need for renewable energy land uses while providing regulations that limit the impact of these facilities as follows:

(1) Protect public health, safety, welfare and quality of life by minimizing the potential adverse impacts of a solar energy system.

(2) To ensure the compatibility of land uses in the vicinity of the solar energy system.

(3) Protect the aesthetic quality of the natural, rural open spaces of the Township and to mitigate adverse impacts to agricultural lands, natural and environmentally-sensitive areas, and developed residential areas; and to preserve scenic views and cultural heritage.

(4) Protect neighboring property owners from glare, noise and safety impacts.

(5) Protect native vegetation, wildlife and pollinator habitat.

(6) To establish standards and procedures by which the siting, design, construction, operation, monitoring, modification, and removal of such systems shall be governed.

(7) Land considered for utility solar energy systems shall be within reasonable proximity to an electrical substation and electrical transmission lines to limit potential impact on other areas and uses within the Township.

(b) **Definitions:**

(1) **Abandonment:** Any solar energy system or facility that is no longer producing power.

(2) **Building Integrated Photovoltaics (BIPVs):** A private solar energy system that is integrated into the structure of a building (rather than a separate mechanical device), replacing or substituting for an architectural or structural component of the building. Building integrated systems include but are not limited to photovoltaic or hot water solar energy systems that are contained within roofing materials such as solar roof tiles or solar shingles, windows, skylights and awnings.

(3) **Decommission:** To remove or retire a solar energy system or facility from active service.

(4) **Ground-Mounted Solar Energy System:** A private or utility solar energy system that is not attached to or mounted on any roof or exterior wall of any principal or accessory building.

(5) **Height:** The height of a solar energy system, measured vertically from the adjacent grade to its highest point at maximum tilt.

(6) **Inhabited Structure:** Any existing structure usable for living or non-agricultural commercial purposes, including, but not limited to: working, sleeping, eating, cooking, recreation, office, office storage, or any combination thereof. An area used only for storage incidental to a residential use, including agricultural barns, is not included in this definition. If it is not clear by

this definition, the Zoning Administrator shall make a determination of any structure regarding whether or not if it is inhabited.

(7) **Maximum Tilt:** The maximum angle of a solar array (i.e., most vertical position) for capturing solar radiation as compared to the natural or unaltered ground or topography upon which the solar array is installed.

(8) **Minimum Tilt:** The minimal angle of a solar array (i.e., most horizontal position) for capturing solar radiation as compared to the natural or unaltered ground or topography upon which the solar array is installed.

(9) **Non-Participating Property:** A property that is not subject to a Utility Solar Energy Facility lease or easement agreement at the time an application is submitted for a Special Land Use for the purposes of constructing a Utility Solar Energy Facility.

(10) **Participating Property:** A property that participates in a lease or easement agreement, or other contractual agreement, with or that is owned by an entity submitting a Special Land Use Permit application for the purpose of developing a Utility Solar Energy Facility.

(11) **Photovoltaic Array (PV Array):** A device designed to collect and transform solar energy into electricity.

(12) **Private Solar Energy System:** A Solar Energy System used exclusively for private purposes with the purpose primarily of generating electricity for the principle use on the site and not used for commercial resale of energy, except for the sale of surplus electrical energy back to the electrical grid.

(13) **Repowering:** Replacing or upgrading Solar Energy System to increase power rating of panels or Solar Energy System accessory structures within the approved project footprint. This does not apply to regular maintenance.

(14) **Roof or Building-Mounted Solar Energy System:** A private solar energy system that is attached to or mounted on any roof or exterior wall of any principal or accessory building but excluding BIPVs.

(15) **Solar Energy System:** Any part of a system or device designed to collect or store solar radiation or energy for the purpose of transforming it into any other form of usable energy or electricity, including the collection and transfer of heat created by solar energy to any other medium by any mean which may include but is not limited to, PV arrays, racks, inverters, transformers, wiring, batteries, and electrical system components.

(16) **Solar Carport:** A solar energy system of any size that is installed on a structure that is accessory to a parking area, and which may include electric vehicle supply equipment or energy storage facilities. Solar panels affixed on the roof of an existing carport structure are considered a Roof-Mounted SES.

(17) **Solar Farm:** See Utility Solar Energy Facility.

(18) **Utility Solar Energy System or Facility:** A Solar Energy System where the principal design, purpose, or use of such system is to provide energy to off-site uses or the wholesale or retail sale of generated electricity to any person or entity.

(c) **General Provisions:** Solar Energy Systems shall comply with the standards below:

(1) All Solar Energy Systems shall be permanently and safely attached to the building or structure or to the ground and must conform to the provisions of this Ordinance and all County, State, and Federal regulations, and safety requirements, including applicable building codes and applicable industry standards, including those of the American National Standards Institute (ANSI).

(2) Solar Energy Systems shall be installed, maintained and used only in accordance with the manufacturer's directions. Upon request, a copy shall be submitted to the Township or building official prior to installation. The Township may inspect the completed installation to verify compliance.

(3) If an applicant or operator of a Solar Energy System fails to comply with this Ordinance, the Township, in addition to any other remedy under this Ordinance, may revoke any approvals after giving the applicant notice and an opportunity to be heard. Additionally, the Township may pursue any legal or equitable action to abate a violation and recover any and all costs, including the Township's actual attorney fees and costs.

11.06.02 **Private Solar Energy System:**

(a) Private Solar Energy Systems shall be permitted as an accessory use in all zoning districts, subject to the following:

(1) A land use permit from the Township is required for the installation of any private solar energy system. The applicant is responsible for contacting the building department to determine if a Private Solar Energy System requires a building permit. The application must include:

a. A site plan depicting setback, panel size and location, wiring location, lot coverage, location of property lines, buildings, structures, fences, greenbelts, and road right of ways. The site plan must be drawn to scale.

b. Photographs of the property's existing condition.

c. Renderings or catalogue cuts of the proposed solar energy equipment.

d. A certificate of compliance demonstrating that the system has been tested and approved by Underwriters Laboratories (UL) or other approved independent testing agency acceptable to Township.

e. A copy of the manufacturer's installation directions.

(2) The exterior surfaces of solar energy systems shall be generally neutral in color and substantially non-reflective of light. A unit may not be installed or located so that sunlight or glare is reflected into neighboring uses or onto adjacent streets.

(3) Solar energy systems shall be located in the least visibly obtrusive location where panels would remain functional.

(4) Batteries associated with Private Solar Energy Systems must be located within a secured container or enclosure.

(5) Solar energy systems that are damaged or are no longer in use for a period of one (1) year shall be replaced or removed by the property owner within six (6) months of the date of damage or abandonment.

(6) Signage shall be provided in a visible location with disconnection procedures for emergency first responders.

(7) All power transmission lines, wires, or conduits from a ground-mounted Private Solar Energy System to any building or other structure shall be located underground.

11.06.03 **Ground Mounted Private Solar Energy System.** Ground Mounted Private Solar Energy Systems are permitted in all zoning districts as an accessory use, subject to the following:

(a) Ground Mounted Private Solar Energy Systems are subject to special land use review except small residential accessory systems which occupy less than 500 square feet in area are subject to administrative review of a land use permit.

(b) Location. Ground Mounted Private Solar Energy System shall only be located in the non-required rear or side yard for principal buildings in the zoning district in which it is located. The unit may be located in the front yard only if permitted by the Planning Commission provided that the unit is no less than two-hundred (200) feet from the front lot line.

(c) Size. The total combined area of all Ground Mounted Private Solar Energy System must not exceed one (1) percent of the size of the lot with a maximum of 2,500 square feet.

(d) Lot Coverage. The total area of ground-mounted solar energy collectors shall be included in the calculation of maximum permitted lot coverage for impervious surface.

(e) Height. 16 feet maximum, measured from the natural grade below the unit to the highest point when oriented to maximum tilt.

(f) All power transmission lines, wires, or conduits from a ground-mounted Private Solar Energy System to any building or other structure shall be located underground.

(g) Screening. Greenbelt screening is required around any Ground Mounted Private Solar Energy System and around any equipment associated with the system to obscure, to the greatest extent possible, the Solar Energy System from adjacent residences. The greenbelt shall consist of shrubs, trees, and other non-invasive plant species that provide a visual screen. In lieu of a planting greenbelt, a decorative fence may be used if approved by the Planning Commission.

11.06.04 **Building Integrated Photovoltaics.** Private solar energy system BIVPs shall be permitted in all zoning districts and shall be subject to the zoning regulations applicable to the structure or building to which they are integrated. BIVP's must comply with the general provisions of 11.06.01(c).

11.06.04 **Roof or Building Mounted Private Solar Energy Systems:**

(a) Weight and Installation: A roof or building mounted unit shall be only of such weight as can safely be supported by the structure. Proof thereof, in the form of certification by a professional engineer or other qualified person, shall be submitted to the Township prior to installation.

(b) Application: Applications for building and roof mounted solar energy systems must include horizontal and vertical elevation drawings that show the location and height of the system on the building and the dimensions of the system.

(c) Location: Wall-mounted units shall not be located on the front yard elevation wall of a building.

(d) Height:

(1) Wall-mounted units shall not exceed the height of the building wall to which they are attached.

(2) A roof-mounted system shall not project more than three (3) feet above the highest point of the roof and shall not exceed the maximum building height for the zoning district in which it is located.

(e) Extension: A solar energy collector that is mounted on a building in an area other than the roof shall not extend vertically beyond the wall on which it is mounted and shall not extend more than twelve (12) inches beyond the wall on which it is mounted and may not extend into a required yard.

11.06.05 **Utility Solar Energy System or Facility**

(a) Intent and Purpose. The intent and purpose of this Section is to establish standards for the siting, installation, operation, repair, decommissioning, and removal of Utility Solar Energy Systems or Facilities; establish the process for the reviewing and permitting of such facilities; protect the health, welfare, safety, and quality of life of the general public; and ensure compatibility with land uses in the vicinity of the areas affected by such facilities.

(b) Locational Requirements. Utility Solar Energy Systems or Facilities are permitted by special land use in the Industrial (IND) District. Utility solar energy systems and facilities are not permitted on property enrolled in the Farmland and Open Space Preservation Act, being in PA 116, of 1974, now codified in Part 361 of the Natural Resources and Environmental Protection Act, PA 451 of 1974, as amended.

(c) Application Requirements. An applicant proposing a Utility Solar Energy System or Facility must comply with the Special Land Use requirements of Article 19 and the Site Plan review requirements of Article 18. The information, plans, documents, and other items identified as application requirements in this ordinance, including the site plan and special land use permit, are substantive requirements for obtaining approval for a Utility Solar Energy System or Facility. The Planning Commission will review the sufficiency of the application materials. If the Planning Commission determines that the substance of any application item is insufficient to protect the public health, safety, and welfare, the Planning Commission may deny approval on that basis. In addition, the applicant for a Utility Solar Energy System of Facility shall provide the Township will all of the following:

(1) Applicant Identification. The name of the applicant, any parent company or subsidiary of the parent company, along with any "doing business as" of the parent company along with address in full. A statement that the applicant is the owner involved or is acting on the owner's behalf. The address of the property involved in the application (substitution may include a legal description and parcel identifications number(s)), and any additional contact information. Each application for a Utility Solar Energy Facility shall also be dated to indicate the date the application is submitted to the Township.

(2) A complete of the agreement including all exhibits and attachments between the applicant and the utility company that will be purchasing electricity from the proposed Utility Solar Energy System or Facility.

(3) An affidavit or evidence of an agreement between the lot owner or operator confirming the owner or operator has the permission of the property owner to apply for the necessary permits for construction and operation of Utility Solar Energy System or Facility.

(4) Parcel Numbers. A list of all parcel numbers that will be used by the Utility Solar Energy System or Facility including applicable attachments, establishing ownership of each parcel, with all lease agreements, easements, or purchase agreements for the subject parcels.

(5) Project Description. A general description of the proposed project including a legal description of the property or properties on which the project would be located and an anticipated construction schedule.

(6) Insurance. Proof of the general liability insurance to cover the Utility Solar Energy Facility, the Township, and the Landowner.

(7) Certifications. Certification that applicant will comply with all applicable state and federal laws and regulations. Land enrolled in the Michigan Farmland Preservation Program must provide confirmation of approval from the Michigan Department of Agriculture to locate a Utility Solar Energy System or Facility on the property before issuance of a certificate of zoning compliance.

(8) Compliance with the County Building Code and the National Electric Safety Code. Construction of a Utility Solar Energy System or Facility shall comply with the National Electric Safety Code and the County Building Code (as shown by approval by the County) as a condition of any Special Land Use Permit under this section. In the event of a conflict between the County Building Code and National Electric Safety Code (NESC), the NESC shall prevail.

(9) Operations and Maintenance Agreement. This agreement shall include landscaping upkeep, regular checks, and maintenance with a detailed description of operations and parameters including anticipated regular and unscheduled maintenance and the hours maintenance will take place, the name and contact information of the certified operator, the applicant's equipment maintenance and repair plan, the applicant's inspection protocol, and general safety documentation as well as consequences and penalties for noncompliance. This agreement shall attach copies of manufacturer's directions and/or instruction manuals for installing, maintaining and using the Utility Solar Energy System or Facility.

(10) Hazardous Waste Plan. A plan for managing hazardous waste shall be provided. This plan shall include Manufacturers' Safety Data Sheets (MSDS) and documentation of the type, quantity and storage procedures of all materials used in the operation of all equipment.

(11) Environmental Impact: Copy of the Environmental Impact Assessment meeting the requirements of 11.06.05(c)(36)(f) section and those of Section 18.07.

(12) Sound modeling study including sound isolines extending from the sound sources to the property lines and indicating compliance with the requirements of 11.06.05(c)(36)(h).

(13) Wildlife Impact: A wildlife impact study, including an analysis of the impact on the properties within one mile of the project and meeting the requirements of 11.06.05(c)(36)(e).

(14) A ground cover vegetation establishment and management plan shall be provided and shall meet the requirements of 11.06.05(c)(36)(i).

(15) A groundwater analysis of all parcels in the participating property shall be provided.

(16) Glare Study: An analysis by a third-party qualified professional acceptable to the Township to determine if glare from the Utility-Scale Solar Energy System will be visible from nearby residents and roadways. If required, the analysis will consider the changing position of the sun throughout the day and year and its influences on the utility-scale solar energy system.

(17) Stormwater Study: An analysis by a third-party qualified professional acceptable to the Township studying the proposed layout of the Utility-Scale Solar Energy System and how the spacing, row separation, and slope affects stormwater infiltration, including calculations for a

100-year rain event. Percolation tests or site-specific soil information must be provided to demonstrate infiltration on-site without the use of engineered solutions.

(18) Visual Impact Assessment Analysis. A technical analysis by a third party qualified professional of the visual impacts of the proposed project, including a description of the project, the existing visual landscape, and important scenic resources, plus visual simulations that show what the project will look like (including proposed landscape and other screening measures) a description of potential project impacts, and mitigation measures that would help to reduce the visual impacts created by the project and documented on the site plan.

(19) Decommissioning and Land Reclamation Plan: This plan shall describe the actions to be taken following the abandonment or discontinuation of the Utility Solar Energy System or Facility, including evidence of proposed commitments with property owners to ensure proper final reclamation, repairs to roads, and other steps necessary to fully remove the system or facility and restore the subject parcels to a native state. This plan shall include the format of a financial security to be applied to the decommissioning process. This plan shall also comply with the requirements of Section 11.06.05(c)(37).

(20) Complaint Resolution Protocol: A plan for resolving complaints from the public or others concerning the construction and operation of the Utility Solar Energy System or Facility. This plan shall comply with the requirements as provided in Section 11.06.05(c)(38).

(21) Emergency Action Plan: Copy of a plan for the actions to be taken in event of an emergency. The emergency action plan must include a fire suppression plan, including the technology to be used and the training and equipment to be provided to Township or other firefighters before the facility becomes operational. The emergency action plan must include plans for immediate cleanup and long-term aftermath efforts following an emergency.

(22) Proof of approval by Livingston County, Road Commission, and Drain Commission.

(23) The applicant must also obtain a permit from the Livingston County Road Commission or Michigan Department of Transportation (MDOT) for permission to connect access roads to existing County or State roads and from the Livingston County Drain Commission for any culverts or other drainage facilities.

(24) Proof that the Applicant and/or its contractor has informed the Livingston County Road Commission (LCRC) and the Township of all the roads they propose to use as haul routes to each construction (including repair and decommissioning) site. This shall be done prior to beginning any construction (or decommissioning) at any site. A third-party road inspector will be retained, with mutual approval of the Township, the Applicant, and the LCRC or the Michigan Department of Transportation (MDOT) if a state highway is involved. The road inspector will determine any precautions to be taken (including videotaping and physical inspections) during the process to determine any damage that may be caused by Applicant's contractor(s), and then determine the appropriate road standards and measures to be taken to repair the damage. The cost of the third-party road inspector and/or any other required third-party assistance, and of all repairs necessitated to restore the roads [and related property which may be damaged by the contractor(s)], shall be the responsibility of the Applicant and/or their contractor, and shall in no case be the responsibility of the Township.

(25) Anticipated construction schedule including timeline to completion and scope of work.

(26) A complete description of the proposed technology to include type of solar panel and system, maximum height, fixed mounted versus tracking, number of panels and angles of orientation.

(27) Current ground and aerial photographs and video of the entire development area prior to construction.

(28) Proof of environmental compliance, including compliance with Part 31, Water Resources Protection, of the Natural Resources and Environmental Protection Act; (MCL 324.3101 et. seq.; Part 91, Soil Erosion and Sedimentation Control (MCL 324.9101 et. seq.) and any corresponding County ordinances; Part 301, Inland Lakes and Streams, (MCL 324.30101 et. seq.); Part 303, Wetlands (MCL 324.30301 et. seq.); Part 365, Endangered Species Protection (MCL324.36501 et. seq.); and any other applicable laws and rules in force at the time the application is considered by the Township.

(29) An attestation that the applicant will indemnify and hold the Township harmless from any costs or liability arising from the approval, installation, construction, maintenance, use, repair, or removal of the Solar Energy System. The Township shall be named as an additional insured for such indemnity under 3.(vi.).

(30) Airport Review: Any Solar Energy System must be reviewed using the current Solar Glare Hazard Analysis Tool (SGHAT) available through Sandia National Laboratories or a commercially available equivalent. The SGHAT will be used to ensure that airports and those that use them will not be affected by unwanted visual or ocular impacts. The process is designed to save costs and increase public safety.

a. The Study shall determine if there are any potential adverse effects on any registered airfield within ten miles of the project. Effects noted, but not exclusively, should include any possible decreased safety and utility.

b. In addition, all proposed solar facilities must obtain a Determination of No Hazard (DNH) from the Federal Aviation Administration (FAA). A DNH does not eliminate the need for the SGHAT study nor does it in any way eliminate the standard for glare on roadways or non-participating parcels.

c. The DNH must be obtained prior to breaking ground on any portion of the Solar Energy System.

d. No Solar Energy System that impacts safety or utility of any registered airfield shall be permitted.

(31) Any other relevant studies, reports, certificates, or approvals as may be reasonably required by the Planning Commission.

(32) Site Plan Requirements shall be submitted meeting the requirements of Section 18.04 and in addition, shall also include the following:

a. The approximate height, and dimensions of all existing structures, existing parcel drainage tile layouts, water bodies, waterways, floodplains, landscaping, and fencing, on the parcels planned for Solar Energy installation including other parcels within one thousand (1000) feet of the project's boundaries.

b. Documentation of existing vegetation, floodplains and regulated and/or endangered species.

c. Indication of how and where the system will be connected to the power grid.

d. Photometric plan meeting the requirements of Section 12.03.07.

e. Plan(s) showing the location of proposed Utility Solar Energy System or Facility including panels, equipment, transformers, inverters, fencing, underground and overhead wiring (including the depth of underground wiring), new drainage facilities (if any), access drives (including width), substations and accessory structures, along with a note indicating where any trees measuring over 2.5 feet in diameter within six inches of grade are to be removed.

f. Plan for ground cover establishment and management.

g. Plan for providing wildlife corridor that provides access for wildlife to navigate through the project.

h. Security plan detailing measures to prevent unauthorized trespass and access during the construction, operation, removal, maintenance, or repair of the Utility Solar Energy System or Facility.

i. Application Fee. Review fees shall be submitted for a Special Use application and Site Plan Review application. If requested by the Planning Commission, the applicant shall provide an escrow fee to the Township in the amount specified by the Zoning Administrator to cover the costs associated with but not limited to independent review by experts.

(33) Site Requirements.

a. The site shall be at least forty (40) acres.

b. The site may consist of a single participating property or multiple participating properties.

c. The site and all fenced compounds shall have access described below.

i. There shall be direct access from a public road or an access easement with a maximum length of one thousand (1,000) feet and a width of at least thirty-three (33) feet.

ii. Access drives shall be paved with a permanent, durable and dustless surface and shall be graded and drained to dispose stormwater without negatively impacting adjacent property. The Township Board, following a recommendation of the Planning Commission and the Township Engineer, may approve a gravel surface for low intensity use drives, upon a finding that neighboring properties and the environment will not be negatively impacted and that the surface is sufficient to support fire apparatus and provide access at all times of the year.

d. Utility Solar Energy Systems (including all solar panels, components, equipment and related accessory structures) must be set back at least two hundred fifty (250) feet from the property line of any Non-Participating Property at the time of application. If a single Utility Solar Energy System is located on more than one lot, or if the adjacent parcel is owned by the same owner as the property on which the Utility Solar Energy System is located, then the Planning Commission may eliminate the lot-line setbacks

of this subsection for the lot lines shared by those lots. All property in the setback areas, if not farmed, shall be maintained as defined in a maintenance setback plan acceptable to the Township.

e. Utility Solar Energy Systems must be set back at least one hundred (100) feet from the edge of any road or rail right-of-way, wetland, shoreline, river, wellhead protection area or drain easement. The Planning Commission may increase this setback requirement up to 200 feet if the Planning Commission determines that such a setback is necessary to protect the public health, safety, and welfare.

f. Utility Solar Energy Systems must be set back at least five hundred (500) feet from non-participating residential dwellings, churches or religious institutions, schools, family or group child day-care homes, bed and breakfast establishments, residential facilities, and any other residence or inhabited structure.

g. The height of the Utility Solar Energy System and any mounts, buildings, accessory structures, and related equipment must not exceed 10 feet when oriented at maximum tilt. The Planning Commission may allow a height of up to 16 feet if the applicant establishes that the lot is used for grazing by farm animals in a manner that requires increasing the height limit. Lightning rods shall not exceed 20 feet in height and shall not be any greater than necessary to protect the Utility Solar Energy System from lightning.

h. The ground mounting of panels must be by screw or a similar system that does not require a footing, concrete, or other permanent mounting, to minimize soil compaction. No pounding of panel posts is permitted.

i. Permits. All required county, state, and federal permits must be obtained before commencement of construction of the Utility Solar Energy System.

(34) Buffer and Screening Requirements. Greenbelt screening is required around any Utility Solar Energy System and around any equipment associated with the system to obscure, to the greatest extent possible. There shall be a landscape buffer at least fifty (50) feet wide along the exterior of the fenced compound with plantings required as described below.

a. Where adjacent to a residential use or zoning district, the buffer shall include an eight (8) foot tall landscaped berm upon which the required landscaping will be placed.

b. An evergreen buffer shall contain two rows of staggered evergreen trees planted not less than twelve (12) feet apart trunk to trunk, and the two rows shall be ten (10) ft apart. The buffer shall also include native shrubs planted with spacing of not more than six (6) feet apart on center. The Township may consider an alternative landscape buffer as a part of the special land use approval provided the alternative provides adequate screening.

c. Evergreen plantings shall be least eight (8) feet tall at time of planting, measured from the top of the root ball to the base of the leader (not including the height of the leader) and must be a species that can reasonably be expected to reach a height of ten (10) feet within three (3) growing seasons.

d. Native shrub plantings shall be a least two (2) feet tall at the time of planting measured from the top of the root ball to the top of the shrub.

e. The trees may be trimmed but must maintain a height of at least eighteen (18) feet.

f. The overall landscape plan shall not contain more than 33% of any one plant species. The use of trees native to the area, and mixture of trees from the same species association, is encouraged.

g. Good arboricultural techniques shall be followed with respect to vegetation, including but not limited to, proper pruning, proper fertilizing, and proper mulching, so that the vegetation will reach maturity as soon as practical and will have maximum density in foliage. Dead or diseased vegetation shall be removed and must be replanted in a manner consistent with this Section at the next appropriate planting time.

(35) Appearance. The exterior surface of the Utility Solar Energy System must be generally neutral in color and substantially non-reflective of light.

(36) Performance Standards:

a. Utility Solar Energy Systems or Facilities shall be designed, constructed, operated, and maintained in compliance with all applicable provisions of local, state, and federal laws and regulations.

b. PV Array Components: PV array components shall be approved by the Institute of Electrical and Electronics Engineers (IEEE), Solar Rating and Certification Corporation (SRCC), Electronic Testing Laboratories (Ell), or other similar certification organization if the similar certification organization is acceptable to the Township.

c. Fencing: If regulations require fencing, the Utility Solar Energy System or Facility compounds may be completely surrounded by a fence designed to prevent unauthorized access.

i. The fence shall be at least seven (7) feet tall without barbed wire and posts shall extend at least thirty-six (36) inches into the ground.

ii. Gate posts and corner posts shall have a concrete foundation.

iii. The fence shall be a woven agricultural-style fence or other design as approved by the Planning Commission.

iv. Gates shall be provided at all access points, unless otherwise permitted or approved. Gates for vehicular access shall be approved by the Fire Authority.

v. Gates shall be the same height and constructed of the same material as the fencing. Access, such as knox box, shall be provided for emergency responders.

vi. The Township may require or allow a fence design to allow for the passage of wildlife upon a finding that adequate access control and visual screening will be preserved.

vii. Alternate fencing may be approved by the Township upon a finding that the alternative provides adequate access control and visual screening.

d. Safety:

i. All collection system wiring shall comply with all applicable safety and stray voltage standards.

ii. All electrical connection systems and lines from the Utility Solar Energy System or Facility to the electrical grid connection shall be located and maintained a minimum of six (6) feet underground within and adjacent to the site.

iii. All access gates and doors to Utility Solar Energy System or Facility compounds and electrical equipment shall be lockable and kept secured at all times when service personnel are not present.

iv. The applicant shall be responsible for maintenance of the access roads.

v. The manufacturers or installer's identification and appropriate warning signs shall be posted on or near solar panels in a clearly visible manner.

vi. Fire suppression plans and Safety Data Sheets shall be kept on-site and be accessible for emergency responders.

vii. The applicant will provide an unredacted copy of the manufacturer's safety manual for each component of the Utility Solar Energy System without distribution restraints to be kept at the Township Hall or other locations deemed necessary by Planning Commission or local first responders. The Manual should include standard details for an industrial site such as materials, chemicals, fire, access, safe distances during system or facility failure, processes in emergencies, etc.

viii. The Township shall have the right upon issuing any Solar Energy System or Facility special use permit to inspect the premises on which each system is located at any reasonable time. The Township may hire a consultant to assist with any such inspections at a reasonable cost to be charged to the operator of the Solar Energy System or Facility.

ix. Advertising or non-project related graphics shall be prohibited. This exclusion does not apply to signs required by this Ordinance.

x. Signs shall be posted at entrances to Utility Solar Energy System or Facility compounds containing emergency contact information, operator contact information, and complaint resolution information. The Township may require additional signs with this information on the fence surrounding the compound.

xi. The Utility Solar Energy System or Facility owner, operator, and property owner shall be responsible, jointly and severally, for mitigating erosion, flooding, and all other environmental impacts resulting from the Utility Solar Energy System or Facility.

xii. The Utility Solar Energy System or Facility owner, operator, and property owner shall be responsible, jointly and severally, for making repairs to any public roads, drains, and infrastructure damaged by the construction of, use of, or damage to, a Utility Solar Energy System or Facility. Any solar panel damaged beyond repair or use must be removed from the project site within

five days and must be disposed of off-site in accordance with any state or federal requirements.

xiii. Utility Solar Energy Systems or Facilities shall not have any on-site battery storage systems for the sale of stored energy.

xiv. Plants or grasses not part of the buffer area shall be maintained not to exceed a height of twelve (12) inches. The Township may approve a taller height upon a finding that it will not result in a nuisance.

e. Wildlife Impact:

i. The applicant shall have a third-party qualified professional, acceptable to the Township, conduct an analysis to identify and assess any potential impacts on wildlife and endangered species. The applicant shall take appropriate measures to minimize, eliminate, or mitigate adverse impacts identified in the analysis. The applicant shall identify and evaluate the significance of any net effects or concerns that will remain after mitigation efforts.

ii. Sites requiring special scrutiny include wildlife refuges, other areas where birds are highly concentrated, bat hibernacula, wooded ridge tops that attract wildlife, sites that are frequented by federally or state listed endangered species of birds and bats, significant bird migration pathways, and areas that have landscape features known to attract large numbers of raptors.

iii. At a minimum, the analysis shall include a thorough review of existing information regarding species and potential habitats in the vicinity of the project area. Where appropriate, surveys for bats, raptors, or general avian use should be conducted. The analysis shall include the potential effects on species listed under the federal Endangered Species Act and Michigan's Endangered Species Protection Law. The applicant shall follow all pre-construction and post-construction recommendations of the United States Fish and Wildlife Service.

iv. The analysis shall indicate whether a post-construction wildlife mortality study will be conducted and, if not, the reasons why such a study does not need to be conducted. Power lines should be placed underground, when feasible, to prevent avian collisions and electrocutions. All above-ground lines, transformers, or conductors should follow any Avian Power Line Interaction Committee (APLIC, http://www.aplic.org/) guidelines to prevent avian mortality.

f. Environmental Impact:

i. The applicant shall have a third-party qualified professional, acceptable to the Township, conduct an analysis to identify and assess any potential impacts on the natural environment including, but not limited to, wetlands and other fragile ecosystems, historical and cultural sites, and antiquities. The applicant shall take appropriate measures to minimize, eliminate, or mitigate adverse impacts identified in the analysis.

ii. The applicant shall identify and evaluate the significance of any net effects or concerns that will remain after mitigation efforts. The applicant shall comply with applicable parts of the Michigan Natural Resources and Environmental

Protection Act (Act 451 of 1994, MCL 324.101 et seq.) including but not limited to Part 31 Water Resources Protection (MCL 324.3101 et seq.), Part 91 Soil Erosion and Sedimentation Control (MCL 324.9101 et seq.), Part 301 Inland Lakes and Streams (MCL 324.30101 et seq.), Part 303 Wetlands (MCL 324.30301 et seq.), Part 323 Shoreland Protection and Management (MCL 324.32301 et seq.), Part 325 Great Lakes Submerged Lands (MCL 324.32501 et seq.), and Part 353 Sand Dunes Protection and Management (MCL 324.35301 et seq.).

g. Spacing. Utility Solar Energy Systems or Facilities shall be at least two thousand five hundred (2,500) feet from any adjacent, existing Utility Solar Energy System or Facility.

h. Noise. The noise generated by a utility-scale solar energy system must not exceed the following limits:

i. Forty (40) Dba Lmax, as measured at the lot line of the project property.

ii. Thirty-Five (35) Dba Lmax, as measured at the lot line of the project property, between the hours of 9:00 p.m. and 7:00 a.m.

iii. In addition to the above limitations, a sound barrier of a solid decorative masonry wall or evergreen tree berm, with trees spaced not less than 10 feet apart, must be constructed to reduce noise levels surrounding all inverters. The berm must be no more than ten (10) feet from all inverters, must be at least as tall as all inverters but not more than three (3) feet taller than the height of all inverters.

iv. The noise level by a Utility Solar Energy Facility must be inspected every three (3) years, at the operator's expense, by an auditory expert to ensure compliance with these noise requirements.

i. Groundcover. Utility Solar Energy Facilities shall include the installation of perennial ground cover vegetation that shall be maintained for the duration of operation until the site is decommissioned.

i. Land enrolled or bound by the Farmland Preservation Program must follow the Michigan Department of Agriculture and Rural Development's Policy for Allowing Commercial Solar Panel Development on PA 116 Lands.

ii. Land not enrolled or bound by the Farmland Preservation Program must provide at least one (1) of the following types of dual use ground cover to promote ecological benefits:

a. Pollinator habitat with a score of at least seventy-six (76) on the Michigan Pollinator Habitat Planning Scorecard for Solar Sites (www.pollinators.msu.edu);

b. Conservation cover focused on restoring native plants, grasses, or prairie with the aim of protecting specific species, such as bird habitat, or providing specific ecosystem services, such as carbon sequestration or improving soil health;

c. Incorporation of rotational livestock grazing and forage production as part of an overall vegetative maintenance plan; or

d. Raising crops for food, fiber, or fuel and generating electricity within the site to maximize land use.

iii. The Township may approve or require alternative ground cover upon finding it is not feasible to provide groundcover as defined above.

iv. All groundcover must be native plants with substantial root system to support soil. Turf grass is not permitted as ground cover.

v. Invasive species and noxious weeds are not permitted and must be removed in a timely manner.

j. Lighting. Lighting shall be limited to inverter or substation locations only and shall comply with 14.04(E) Lighting.

k. Emergency Action Plan; Emergency Training. Before the Utility Solar Energy System or Facility is operational, it must provide the necessary training, equipment, or agreements specified in the application to Township or other emergency personnel.

l. General Liability Insurance; Bonding Requirements; Escrow Requirements.

i. Utility Solar Energy Systems or Facilities shall have and maintain general liability insurance of at least ten million ($10,000,000.00) dollars. The Township may require a higher amount for larger projects and may allow for a lesser amount for smaller projects upon a finding that the alternate amount is more consistent with the likely risk.

ii. In addition, In order to assure the funds will be available to perform all road repairs required under this ordinance, the Applicant will be required to post financial security acceptable to the Township, in the form of: a) a surety bond from a surety listed as acceptable on the Federal Surety Bond circular 570 of the U.S. Department of Treasury; or b) an acceptable letter of credit; or c) an escrow account established in a financial institution licensed in the State of Michigan. The amount of the security shall be a minimum of one million two hundred fifty thousand dollars ($1,250,000), but this amount may be increased if the third-party consultant determines the amount needed for road repairs is greater than this amount. The bond (or other security) shall only be released (in whole or part) when the Township Board, in consultation with LCRC and the third-party inspector, determines that all required road work has been completed and approved by LCRC and/or MDOT.

iii. General Maintenance Bond. The Township shall require a General Maintenance Bond to guarantee all aspects of this Ordinance are met at all times during the construction and operation of the Utility Solar Energy System. At the time of the Special Use application, the Applicant shall submit two third-party contractor bids for construction of all fencing, landscaping, and drainage improvements associated with the Utility Solar Energy System, and the bond shall be the higher of the two bids. The Township may use the bond to repair any landscaping, fencing, drainage infrastructure (including drainage tiles), and/or to correct any ongoing violation of this Ordinance, in the event

that the facility fails to adequately maintain the required site improvements, or fails to make operational changes to correct an operational violation.

iv. The Applicant shall be required, as a condition of the operation, to fund an escrow account for investigation of complaints for, but not limited to glare, stray voltage, noise, and signal interference in the amount of $15,000.00 to be used at the discretion of the Township Board to pay for third party investigative services, the provider of which shall be chosen by the Township. Such funds shall be deposited with the Township Treasurer, or with a third-party fiduciary, at the discretion of the Township. When the escrow account balance is below $5,000.00 the Township shall notify the Applicant and the Applicant shall replenish the account to the amount of $15,000.00 within 45 days.

m. Repowering or Modifications. Any modifications of an approved site plan that are made after the initial date of approval, including an expansion of project, shall be resubmitted to the Township Planning Commission for review at an additional fee based upon current fee schedule. Any changes of the approved site plan, subject to this Ordinance as it exists at time of application, will require a new site plan application and review, including reconfiguration of arrays, updating current technology, and Solar Energy Facility infrastructure.

n. The Applicant must submit an attestation that the Applicant will indemnify and hold the Township harmless from any costs or liability arising from the approval, installation, construction, use, maintenance, repair, or removal of the Utility Solar Energy System.

o. Prior to the start of construction, any existing drain tile must be inspected by robotic camera and the imagery submitted to the township for baseline documentation on tile condition. Any damage shall be repaired, and a report submitted to the landowner and Township. While the facility is in operation, the owner or operator must reinspect the drain tiles every three years by robotic camera for any damage and must repair any damage within 60 days of discovery. The owner or operator must report the inspection, along with any damage and repair, to the Township within 90 days after each three-year deadline. The Township reserves the right to have the Building Inspector or other agent present at the time of repair. Solar panel support structures and/or foundations shall be constructed to preserve any drainage field tile or system.

p. Transfer or Sale: In the event of a transfer or sale of the Facility, the new owner or operator must notify the Township in within 30 days, and the Zoning Administrator shall administratively amend the permit to name the new owner or operator. Upon transfer or sale, the cash bond shall be transferred to the new owner or operator and shall be maintained at all times, the estimated costs of decommissioning shall be resubmitted, and the security bond adjusted to account for the new estimate.

(37) Abandonment and Decommissioning: Following the operational life of the project, the Applicant shall perform decommissioning and removal of the Utility Solar Energy System or Facility and all its components and restore the site to its original conditions.

a. The decommissioning plan shall be written to provide security to the Township for one hundred twenty-five percent (125%) of the cost to remove and dispose of all panels, wiring, and restoration of the land to its original conditions. The value of decommissioning shall be determined by a third-party financial consultant or engineer selected by the Township and paid for by the developer. The decommissioning security

shall be paid in cash to the Township. Once value of decommissioning is determined, it shall be updated on a periodic basis of not less than every three (3) years and additional security may be required on the basis of the average inflation rate of the preceding three (3) years.

b. All abandonment and decommissioning work must be done when soil is dry or frozen to prevent compaction.

c. Solar energy systems that are not operated for a continuous period of twelve (12) months shall be considered abandoned and shall be subject to removal proceedings.

d. Solar energy systems that are damaged shall be replaced or removed within seven (7) days.

e. The ground must be restored to its original topography within three hundred sixty-five (365) days of abandonment or decommissioning. An extension may be granted if a good faith effort has been demonstrated and any delay is not the result of actions or inaction of the operator. An alternative topography can be approved by the Township as part of the original site plan review or later as part of decommissioning.

f. If land balancing is required, all top soil will be saved and spread evenly over balanced area.

g. An annual report shall be provided to the Zoning Administrator showing continuity of operation and shall notify the Zoning Administrator if use is to cease, prior to decommissioning, or abandonment.

h. Continuing Obligations: Failure to keep any required financial security in full force and effect at all times while a Utility Solar Energy System or Facility exists or is in place shall constitute a material and significant violation of the Special Land Use, Special Use Permit, and this Ordinance, and will subject the Utility Solar Energy System or Facility Applicant, owner, and operator, jointly and severally, to all remedies available to the Township, including any enforcement action, civil action, request for injunctive relief, and revocation of the Special Land Use Permit.

i. The Applicant shall be responsible for the payment of all attorney fees and other costs incurred by the Township in the event that the structure is not voluntarily removed and the Township has to enforce removal.

(38) Complaint Resolution. Utility Solar Energy Systems or Facilities shall provide a complaint resolution process, as described below.

a. The site shall have signs posted with contact information to collect complaints related to the Utility Solar Energy System or Facility.

b. A log shall be kept by the owner or operator of all complaints received and shall be available to Township officials for review, per Township request.

c. The operator or its agent shall respond to complainants within ten (10) business days and shall provide notification to the Zoning Administrator.

d. Any resolution shall include lawful and reasonable solutions consistent with the Zoning Ordinance, which shall also be provided to the Zoning Administrator.

e. The operator or its assigns reserve the right to adjudicate any claims, including residential claims, in a court of competent jurisdiction. An annual report shall be submitted to the Zoning Administrator and the Township Board that details all complaints received, the status of complaint resolution, and actions taken to mitigate complaints.

GENOA CHARTER TOWNSHIP
PLANNING COMMISSION
PUBLIC HEARING
May 8, 2023
6:30 P.M.
MINUTES

CALL TO ORDER: Chairman Grajek called the meeting of the Genoa Charter Township Planning Commission to order at 6:30 p.m. Present were Chris Grajek, Diana Lowe, Marianne McCreary, Eric Rauch, Tim Chouinard, Jeff Dhaenens and Glynis McBain. Also present was Planning Director Amy Ruthig, Brian Borden of Safebuilt and Shelby Byrne of Tetra Tech.

PLEDGE OF ALLEGIANCE: The pledge of allegiance was recited.

APPROVAL OF AGENDA:

Moved by Commissioner Lowe, seconded by Commissioner Dhaenens, to approve the agenda as presented. **The motion carried unanimously**.

DECLARATION OF CONFLICT OF INTEREST: None

CALL TO THE PUBLIC:

The call to the public was made at 6:31 pm with no response.

OLD BUSINESS:

OPEN PUBLIC HEARING # 1…Consideration of an amendment to the Summerfield Pointe Planned Unit Development Agreement, preliminary condominium site plan and environmental impact assessment to reduce the project from 140 attached condominiums to 102 single family detached homes and 12 attached condominiums. The project is located on Lawson Drive, North of Grand River Avenue. The request is petitioned by Healy Homes of Summerfield, LLC.

A. Recommendation of PUD Agreement Amendment
B. Recommendation of Environmental Impact Assessment (9-26-22)
C. Recommendation of Preliminary Site Condominium Plan (9-26-22)

Mr. Wayne Perry of Desine, Inc. and Mr. Jack Healy were present. Mr. Healy stated that his PUD Agreement and the master deed of the adjoining Hampton Ridge Condominiums both state that the roads should be connected. He is proposing to connect the two roads; however, he agreed to build a gate between the two neighborhoods to allow for emergency vehicle access. He met with the Board of the condominiums and they agreed to have the roads connected if there is a gate installed.

Mr. Perry stated a revised plan was not submitted for this meeting. They will be revising it to include the connected road and the gate as well as the Knox Box details. They will also be submitted an updated PUD Agreement.

Chairman Grajek noted no new letters were received from the planner, engineer or the fire marshal.

Commissioner McBain questioned the landscaping issues that were discussed at previous meetings. Mr. Perry confirmed that the Summerfield Pointe Estates Condominium Association will be required to provide all lawn mowing and maintenance on both the privately owned unit areas as well as on all common areas. Language in the documents will be coordinated to specify this requirement.

Commissioner McCreary suggested that the Hampton Ridge Board submit a letter advising the Township that they are in favor of connecting the roads if a gate is installed.

The call to the public was opened at 6:43 pm.

Ms. Liz Hoover 661 Abbington Court is on the Board and they did have a video meeting with Mr. Healy. They did tell him of their concerns regarding the different lifestyles that single-family residents would bring instead of condominium owners. She stated that Mr. Healy told them the homes can be sold for more than the condominiums. They are requesting the Township reject the proposed change in housing style as it would change the outdoor living style in that area, but they would ask the Township approve the gate with the Knox Box. She stated the Board can provide a letter as suggested by Ms. McCreary.

Ms. Peggy Stewart of 4067 Kirkway Ct does not understand why there is a need to connect the road and put a gate at Aster Boulevard. There are other roads that emergency vehicles can use to access the neighborhoods.

Ms. Joy Morten 4448 Aster Boulevard stated her condominium abuts the expansion. The trees behind her home have been removed and she can hear all the noise from the freeway. She would like the existing trees to not be taken down. She agrees with the gate being installed if the developments need to be connected.

Ms. Jeanine Gazley of 709 Abbington Court is concerned about the protection of the ponds. She also questioned what happens if the economy goes down and the homes cannot be built.

Ms. Jamie Schingeck of 4441 Aster Boulevard appreciates the response to her concern regarding the lawn care; however, she is still concerned that this can be changed. Residents in single-family homes have a different lifestyle than those in condominiums. She would like to see the changes be denied.

The call to the public was closed at 6:51 pm.

Chairman Grajek advised the public that the property owner has the right to develop the property as it was originally approved. This plan was approved prior to the adjoining condominiums being built. The developer has made changes to accommodate the neighbors' requests.

Mr. Healy advised that the financing is the reason they have changed to single-family homes. Since 2008, it is very difficult for buyers to obtain mortgages on condominiums that have not been built. He believes that the people that will buy these homes will be in favor of having their property maintained by the association instead of having to do it themselves so the landscaping rules in the Master Deed should not change. Commissioner McCreary stated that any Master Deed changes require 66 ⅔ of the property owners to agree to the change. It is very difficult.

Mr. Healy stated that it will be difficult to save all the existing trees when these homes are built. The detailed landscaping plan will be developed at the time of final site plan approval.

Commissioner McCreary stated that at a previous meeting a member of the public noted that they pile their snow at the end of the dead end where the road will be connected. That will not be able to be done any longer.

Moved by Commissioner Rauch, supported by Commissioner Lowe, to recommend to the Township Board approval of the Summerfield Pointe PUD Agreement Amendment to reduce the project from 140 attached condominiums to 102 single family detached homes and 12 attached condominiums for Healy Homes of Summerfield, LLC., with the following conditions:

- Language shall be added to include the proposed gate and Knox Box to block the cross access, but allow emergency access. The language and gate shall be approved by the Brighton Area Fire Authority.
- Language shall be added to include the consolidation of lawn care to be completed by the association and performed one day a week.
- Traffic from construction for the site development and the homes will not use that cross access
- Language shall be added to include that snow does not block the cross-access gate in the wintertime
- The petitioner shall receive a letter from the Board of Hampton Ridge showing their support of the gate
- The petitioner shall make all the updates to the PUD Agreement per Township Staff's markup copy

The motion carried unanimously.

Moved by Commissioner Rauch, supported by Commissioner Dhaenens, to recommend to the Township Board approval of the Environmental Impact Assessment dated September 26, 2022 to reduce the project from 140 attached condominiums to 102 single family detached homes

and 12 attached condominiums.to reduce the project from 140 attached condominiums to 102 single family detached homes and 12 attached condominiums for Healy Homes of Summerfield, LLC, with the following conditions:

- Language shall be added to include the proposed gate and Knox Box to block the cross access, but allow emergency access. The language and gate shall be approved by the Brighton Area Fire Authority.
- Traffic from construction for the site development and the homes will not use that cross access
- Language shall be added to include that snow does not block the cross-access gate in the wintertime
- The petitioner shall receive a letter from the Board of Hampton Ridge showing their support of the gate

The motion carried unanimously.

Moved by Commissioner Rauch, supported by Commissioner Lowe, to recommend to the Township Board approval of the Preliminary Site Condominium Plan dated September 26, 2022 to reduce the project from 140 attached condominiums to 102 single family detached homes and 12 attached condominiums.to reduce the project from 140 attached condominiums to 102 single family detached homes and 12 attached condominiums for Healy Homes of Summerfield, LLC, with the following conditions:

- Final Site Plan shall depict the proposed gate and Knox Box to block the cross access, but allow emergency access.
- Language shall be added to include that snow does not block the cross-access gate in the wintertime
- The petitioner shall receive a letter from the Board of Hampton Ridge showing their support of the gate
- The petitioner shall address all comments in the planners, engineers, and Brighton Area Fire Authority's letters

The motion carried unanimously.

OPEN PUBLIC HEARING #2…Consideration of a sketch plan for a proposed camp "giant swing" and a high ropes course for the Our Lady of the Fields located at 7000 McClements Road, south side of McClements Road, between Kellogg and Euler Roads. The request is petitioned by Chaldean Catholic Church of the United States.

A. Disposition of Sketch Plan (4-10-23)

Mr. Wayne Perry of Desine, Inc., Mr. Jim Berigan of Our Lady of the Fields Campground, and Ms. Kimberly Hamman, the attorney for Our Lady of the Fields Campground, were present. Mr. Berigan stated they are requesting to build a giant swing with 36 foot high poles. They have received approval from the ZBA for the height and they are requesting sketch plan approval this evening.

Mr. Borden reviewed his letter dated May 2, 2023.
1. The giant swing and high ropes course exceed the maximum height allowed by Ordinance.
2. The ZBA granted a variance for the height of the giant swing; however, the applicant must submit a new application regarding the height of the high ropes course.

He noted that the Township may wish to consider amending the Zoning Ordinance to better address accessory recreational structures. What is currently being used is the accessory structure section of the ordinance.

Ms. Byrne reviewed her letter dated May 3, 2023.
1. The cover sheet is dated April 10, 2022. This should be fixed to avoid confusion.
2. While not an engineering issue, she noted that The Brighton Area Fire Authority Fire Marshal expressed concern for safety in their email. The Petitioner should provide more detail on any safety measures or plan that will be implemented for the giant swing for the Planning Commission's consideration

The Fire Marshal's email dated April 28, 2023 stated, "I have no fire code comments on the giant swing. I do have safety questions; how do they get on it? The climbing tower detail goes to the zip line and the swing shows it is 10' above the ground, and also how are [they] secured or restrained from falling off it?"

Commissioner McCreary asked how safety will be ensured. Commissioner Rauch stated that this structure and activity is overseen by the State of Michigan. Mr. Berigan agreed and stated this is a very safe activity. She requested that all this information and inspections be submitted to the Township and the Brighton Area Fire Authority.

Commissioner McCreary asked if the site plan that is being shown this evening contains all aspects, buildings, etc. that are on the property. She noted that the ropes course has been on the site since 2019 and it is just now being requested to be approved. Mr. Perry stated he has not walked every part of the property; however, he has been on the developed portions and everything in those areas is shown on the plan. She stressed that whenever a new element is being built on this site, Township approval must be obtained.

Ms. Hamman stated the applicant is preparing a Master Plan, which will include any future plans, and they have been researching ordinances in other areas in the state that have day camps.

The call to the public was opened at 7:24 pm.

Mr. Mike Berean of 1273 Euler stated that his wife, Dory Berean, was not able to attend; however, she is requesting this be denied due to the increased traffic, dust, noise and increase in attendance. He stated the Township should have known that the high ropes course was there. The camp should have known that they needed approval. This is proof of their intent to

mislead. They have been adding elements and not getting approval. There will be four new outdoor attractions on this property. Their website says they are planning to install additional aspects and are actively fundraising for them. These additional activities will increase the participants. He questioned what that increase will be. This will increase traffic. They have purchased 80 acres across the street and put a bid on another 50 acres. He questioned why they haven't spoken to the Township to ensure that they will be able to use that property the way they would like. He is requesting this giant swing due to the increase in noise, traffic, dust, and attendance. He would like a special use permit to be requested.

Mr. Charles Saliba of 1829 Kellogg Road agrees that a Master Plan should be provided showing their future plans. Their property values are dropping. He is concerned with the noise that these new elements will bring.

Ms. Patty Kopicko of 6843 Felice Drive agrees with what Mr. Berean said. This should be denied due to the increase in traffic, dust, and noise. She walks on Kellogg and there is a lot of traffic. Their website advertises a larger camp than they own.

Mr. Robert Kopicko of 6843 Felice Drive is concerned with traffic. The Road Commission has told him that the roads in this area are under constructed and worn out. The residents' peace and quiet is gone and it is only going to get worse.

Mr. James Drouillard of 6781 Felice agrees with the neighbors. This should be denied. He noted the Master Plan is on the website but has not been provided to the Township.

The call to the public was closed at 7:34 pm.

Commissioner Rauch noted that one issue is what is being requested this evening. In looking at this issue, the evidence shown allows it to be approved.

The second issue is their vision and the reason for their fundraising. He agrees that would need a comprehensive conversation with the Township to ensure that plan aligns with the goals and objectives of the Township. Mr. Berigan stated they have started this conversation as they have met with township staff.

Commissioner Dhaenens agrees with the increase in traffic, noting there is a county park at the end of McClements. When he was little he went to this camp three times a year in the fall, winter and spring and there were hundreds of kids there each time. This was before the homes were built in the area. He agrees that rope climbing courses are great team building exercises.

Commissioner McBain stated that people are allowed to develop their property and profit from it. She would prefer there be a camp there instead of as many homes as can be built.

Moved by Commissioner Rauch, supported by Commissioner Dhaenens, to approve the sketch plan dated April 10, 2023 for a proposed camp "giant swing" and a high ropes course for the Our Lady of the Fields located at 7000 McClements Road, south side of McClements Road, between Kellogg and Euler Road for the Catholic Church of the United States, with the following conditions:

- Approval of a variance from the Zoning Board of Appeals for the high ropes course.
- The petitioner's activity designer shall submit pertinent information to the Township and Brighton Area Fire Authority.

The motion carried unanimously.

OPEN PUBLIC HEARING #3…Discussion regarding proposed solar ordinance.

Ms. Ruthig stated staff is requesting feedback regarding developing a solar ordinance and they would like direction from the Planning Commission. The main concern is the solar farms. Brian Borden stated he and staff will be working on altering the existing ordinance language for residential, smaller, solar appliance uses. Regarding the large, utility sized solar farms, they are suggesting that these be considered industrial uses.

Commissioner Dhaenens agrees that it should be allowed, but it must be put in the right place.

Commissioner Chouinard would like to be provided with detailed information, such as what noise they generate, what are the different types and sizes, etc. Commissioner Rauch referenced the chart in the information provided in tonight's package showing the different types and scales of solar systems included in the ordinance.

The Commissioners agreed to follow the Master Plan and requested that Mr. Borden and Ms. Ruthig provide a draft ordinance for review and approval.

ADMINISTRATIVE BUSINESS:

Staff Report

Ms. Ruthig stated there will be one item on the agenda next month, as well as the draft solar ordinance agenda.

Approval of the April 10, 2023 Planning Commission meeting minutes

Moved by Commissioner McCreary, seconded by Commissioner Dhaenens, to approve the minutes of the April 10, 2023 Planning Commission Meeting as presented. **The motion carried unanimously.**

Member Discussion

There were no items to discuss this evening.

Adjournment

Moved by Commissioner McBain, seconded by Commissioner Rauch, to adjourn the meeting at 8:06 pm. **The motion carried unanimously.**

Respectfully Submitted,

Patty Thomas, Recording Secretary